

IPBENCH: BENCHMARKING THE KNOWLEDGE OF LARGE LANGUAGE MODELS IN INTELLECTUAL PROPERTY

Anonymous authors

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ABSTRACT

Intellectual Property (IP) is a highly specialized domain that integrates technical and legal knowledge, making it inherently complex and knowledge-intensive. Recent advancements in LLMs have demonstrated their potential to handle IP-related tasks, enabling more efficient analysis, understanding, and generation of IP-related content. However, existing datasets and benchmarks focus narrowly on patents or cover limited aspects of the IP field, lacking alignment with real-world scenarios. To bridge this gap, we introduce **IPBench**, the first comprehensive IP task taxonomy and a large-scale bilingual benchmark encompassing **8 IP mechanisms and 20 distinct tasks**, designed to evaluate LLMs in real-world IP scenarios. We benchmark **17 main LLMs**, ranging from general purpose to domain-specific, including chat-oriented and reasoning-focused models, under zero-shot, few-shot, and chain-of-thought settings. Our results show that even the top-performing model, DeepSeek-V3, achieves only 75.8% accuracy, indicating significant room for improvement. Notably, open-source IP and law-oriented models lag behind closed-source general-purpose models. To foster future research, we publicly release IPBench, and will expand it with additional tasks to better reflect real-world complexities and support model advancements in the IP domain. We provide the data and code in the supplementary materials.

1 INTRODUCTION

Intellectual property (IP) is the embodiment of human creativity and innovation (WIPO, 2020a) protected through legal frameworks such as patents, copyrights, and trademarks. Owing to its intersection of technical and legal domains, IP-related tasks are inherently knowledge-intensive, highly applicable to real-world scenarios, and hold substantial practical value. Beyond domain-specific expertise, these tasks demand robust capabilities in information processing, logical reasoning, decision-making, and creative generation.

With the advancement of large language models (LLMs) (Achiam et al., 2023; DeepSeek-AI et al., 2024), there is increasing potential to automate tasks across domains, including those in IP. LLMs offer a generalizable framework for understanding, processing, and generating complex content, paving the way for more efficient IP information management and decision support. Nowadays, NLP researchers have been paying increasing attention to the field of intellectual property. This has spurred growing interest among NLP researchers in IP applications. For example, Jiang & Goetz (2024) provide a comprehensive survey of patent-related NLP tasks, classifying them into analysis and generation categories, but their focus is limited to patent text.

Recent efforts have introduced datasets such as HUPD (Suzgun et al., 2023), which compiles a corpus of patent and defines tasks including subject classification, language modeling, and summarization. While practically useful, HUPD emphasizes linguistic attributes and neglects the deeper technical and legal aspects essential to IP evaluation. Similarly, benchmarks like PatentEval (Zuo et al., 2024), MoZIP (Ni et al., 2024), and IPEval (Wang et al., 2024b) concentrate on narrow and specific IP task scopes. Moreover, most existing benchmarks center exclusively on patents, leaving other critical IP mechanisms-such as trademarks and copyrights-largely unaddressed. Despite the

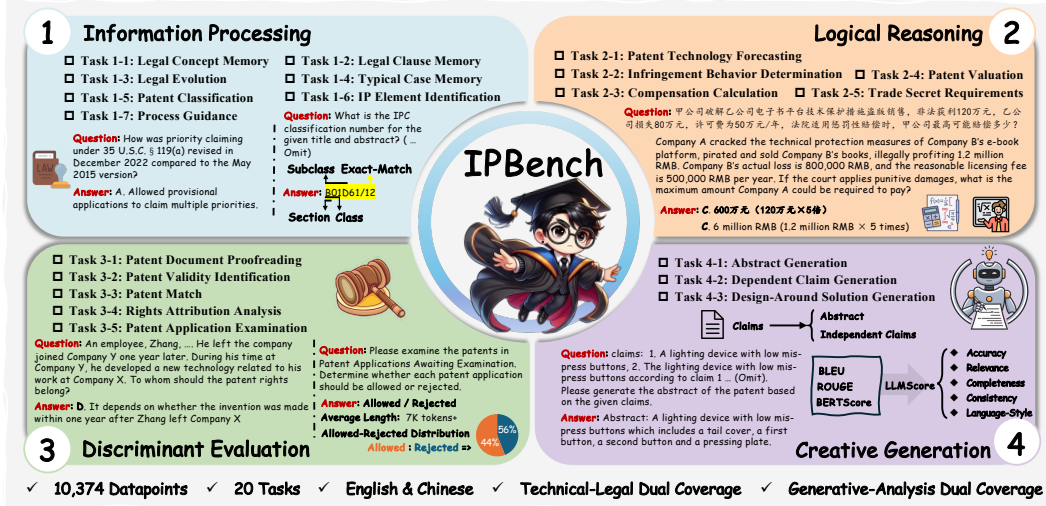


Figure 1: Overview of the comprehensive IP task taxonomy and IPBench.

field’s real-world impact, there remains a lack of a comprehensive task taxonomy and benchmark that fully captures the breadth and complexity of IP scenarios.

To address the growing demand for effective LLMs applications in IP, we introduce the first comprehensive task taxonomy tailored to real-world IP challenges, as illustrated in Figure 1. It is grounded in Webb’s Depth of Knowledge (DOK) theory (Webb, 2002) and extended to capture four hierarchical levels: *Information Processing*, *Logical Reasoning*, *Discriminant Evaluation*, and *Creative Generation*. These levels reflect the cognitive complexity inherent in IP tasks and provide a structured framework to assess the depth of LLMs understanding. Our taxonomy incorporates intrinsic knowledge evaluation and in-depth textual analysis from both point-wise and pairwise perspectives, covering the interplay between technical and legal reasoning.

Building on this taxonomy, we present **IPBench**, the first large-scale, comprehensive benchmark for evaluating LLMs on IP knowledge. **IPBench** comprises 10,374 data points across 20 diverse tasks, aligned with 8 core IP mechanisms. Our benchmark is bilingual (English and Chinese), and is grounded in the legal frameworks of the United States and mainland China, allowing cross-jurisdictional evaluation. IPBench tasks are carefully designed to span a spectrum of difficulty and task formats, including classification, retrieval, and open-ended generation, enabling holistic evaluation of model capabilities in knowledge recall, reasoning, legal judgment, and creative synthesis. We evaluate 17 leading LLMs on IPBench—including general-purpose models, law-oriented models, and IP-specialized models—covering both chat and reasoning-focused architectures, under zero-shot, few-shot and chain-of-thought settings. Our key contributions and findings are as follows:

- We propose the first hierarchical taxonomy for IP domain, rooted in cognitive theory, and introduce **IPBench**, a bilingual benchmark with 10,374 examples spanning 20 tasks and 8 IP mechanisms. This enables realistic, and multi-faceted evaluation of LLMs in IP contexts.
- Our experimental results reveal that even the best-performing model achieves only 75.8% accuracy overall, indicating that current LLMs fall short in reliably handling IP tasks. Notably, closed-source general-purpose models consistently outperform domain-specific open-source models, highlighting a pressing need for more capable and interpretable IP-focused LLMs.
- We include both IPC/CPC classification and conditional generation tasks in IPBench. DeepSeek-R1 achieves the best IPC classification accuracy at 10.8%, while DeepSeek-V3 leads in CPC classification at 9.5%. For generative tasks, we introduce **LLMScore**, a novel evaluation metric based on LLM-as-a-judge methodology, which exhibits stronger alignment with human judgments than traditional automatic metrics.

- We conduct comprehensive analyses, including cross-lingual performance comparisons, variations in prompt design, and a taxonomy of 7 major error types.

We believe **IPBench** offers a timely and essential tool for advancing the application of LLMs in IP. From a machine learning perspective, the complexity of IP language can serve as a robust stress test for LLMs. From a legal and innovation standpoint, automation in this domain can enhance service intelligence, reduce operational costs, and ultimately accelerate global technological advancement. We plan to continuously expand IPBench by incorporating additional languages, modalities, and tasks in future iterations.

2 RELATED WORK

Prior to the emergence of LLMs, researchers applied NLP techniques IP tasks, particularly within the domain of patent analysis. These efforts focused on applications such as patent classification (Lee & Hsiang, 2020), and abstract or claims generation (Sharma et al., 2019; Lee & Hsiang, 2020). However, traditional models used in these studies typically lacked generalization capabilities and required extensive task-specific adaptation, limiting their scalability and real-world applicability. With the advent of LLMs based on the decoder-only transformer architecture (Radford et al., 2019), models trained using next-token prediction have demonstrated impressive zero-shot (Kojima et al., 2022) and few-shot (Brown et al., 2020) capabilities across diverse tasks. This paradigm shift introduced a new approach to handling IP-related challenges using prompt-based inference, reducing the need for task-specific training and enabling more versatile applications in the IP domain.

Recent work has explored the adaptation of LLMs specifically for IP. Ni et al. (2024) developed MoZi, a multilingual IP-oriented LLM based on BLOOMZ and ChatGLM. Bai et al. (2024) proposed a cost-efficient training framework to fine-tune LLMs for IP tasks, claiming performance on par with human experts. Other studies, such as Pap2Pat (Knappich et al., 2024), AutoPatent (Wang et al., 2024b), and PatentFormer (Wang et al., 2024a), focus on long-context generation for patent documents using LLMs. These works predominantly emphasize the technical aspects of patent language and overlook broader IP mechanisms, such as trademarks, trade secrets, and copyrights. Moreover, they rarely consider legal reasoning and decision-making, which are essential for real-world applications.

Table 1: Comparison of IP related benchmark with Ours. *Gen.-Ana. Dual Cover.* refers to benchmarks that encompass both text generation and analysis tasks. *Tech.-Legal Dual Cover.* refers to benchmarks that contain both aspects of technical and legal content. Meanwhile, *Compre. Taxonomy* refers to a benchmark that possesses a comprehensive taxonomy.

Benchmark	PatentEval	IPEval	MoZIP	Ours
Evaluation for LLMs	✓	✓	✓	✓
Multilingual		✓	✓	✓
Multi-IP Mechanisms		✓	✓	✓
Tech.-Legal Dual Cover.			✓	✓
Gen.-Ana. Dual Cover.				✓
Compre. Taxonomy				✓
LLMs Evaluated #	6	15	5	17 *
Task #	2	1	3	20 *
Testset Size	400	2657	3121	10374 *

Our work differs fundamentally in both scope and design. IPBench builds upon and expands these earlier efforts by introducing a unified, comprehensive IP task taxonomy grounded in Webb’s Depth of Knowledge (DOK) theory. Notably, we include under-explored areas such as trade secret and trademark, offering a holistic evaluation of LLM performance across the IP landscape. This makes IPBench more comprehensive than prior benchmarks like IPEval, MoZIP, and PatentEval. A detailed comparison is presented in Table 1, highlighting our benchmark’s task diversity, linguistic coverage, and legal granularity.

3 IPBENCH

3.1 TASK TAXONOMY

While previous patent-related benchmarks have primarily focused on textual content such as classification or summarization they often overlook the broader real-world implications of IP tasks. To address this gap, we introduce the first comprehensive intellectual property task taxonomy that extends beyond in-domain textual analysis to encompass the multifaceted real-world demands of the

Table 2: Task taxonomy of IPBench. The *EN* in the Language column indicates English, while *ZH* represents Chinese. The *AE* in the Metric column indicates Automated Evaluation, while *HE* represents Human Evaluation.

Level	Index	Task Name	Metric	Data Source	Language	Size
Information Processing	1-1	Legal Concept Memory	Accuracy	Expert Annotation	EN/ZH	500
	1-2	Legal Clause Memory	Accuracy	Expert Annotation	EN/ZH	502
	1-3	Legal Evolution	Accuracy	Expert Annotation	EN/ZH	500
	1-4	Typical Case Memory	Accuracy	USTPO / CNIPA	EN/ZH	504
	1-5-1	Patent IPC Classification	Exact Match	USTPO / CNIPA	EN/ZH	1125
	1-5-2	Patent CPC Classification	Exact Match	USTPO	EN	600
	1-6	IP Element Identification	Accuracy	Expert Annotation	EN/ZH	557
	1-7	Process Guidance	Accuracy	Expert Annotation	EN/ZH	548
Logical Reasoning	2-1	Patent Technology Forecasting	Accuracy	Expert Annotation	EN/ZH	500
	2-2	Infringement Behavior Determination	Accuracy	Expert Annotation	EN/ZH	500
	2-3	Compensation Calculation	Accuracy	Expert Annotation	EN/ZH	316
	2-4	Patent Valuation	Accuracy	Expert Annotation	EN/ZH	301
	2-5	Trade Secret Requirements	Accuracy	Expert Annotation	ZH	301
Discriminant Evaluation	3-1	Patent Document Proofreading	Accuracy	Expert Annotation	EN/ZH	300
	3-2	Patent Validity Identification	Accuracy	Expert Annotation	EN/ZH	308
	3-3	Patent Match	Accuracy	MoZIP	EN/ZH	1000
	3-4	Rights Attribution Analysis	Accuracy	Expert Annotation	EN/ZH	400
	3-5	Patent Application Examination	Accuracy	USTPO	EN	314
Creative Generation	4-1	Abstract Generation	AE & HE	USTPO / CNIPA	EN/ZH	400
	4-2	Dependent Claim Generation	AE & HE	USTPO / CNIPA	EN/ZH	400
	4-3	Design-Around Solution Generation	Accuracy	Expert Annotation	EN/ZH	499

IP field, spanning both technical and legal dimensions. Given the intrinsic complexity of IP knowledge, effective modeling in this domain requires more than domain-specific understanding. LLMs must be capable of integrating diverse IP mechanisms, simulating real-world procedural reasoning, and interpreting varied linguistic styles present in different IP documents and legal jurisdictions. This necessitates a structured evaluation framework that captures different levels of cognitive depth and reasoning complexity.

To this end, our taxonomy is grounded in the Depth of Knowledge (DOK) theory by American educator Norman L. Webb, which categorizes cognitive complexity into four levels: *Recall and Reproduction*, *Skills and Concepts*, *Strategic Thinking*, and *Extended Thinking*. Originally developed to guide educational assessment, this framework aligns well with the stratified nature of IP reasoning. We adapt and reinterpret DOK into a legal and technical context, resulting in four hierarchical levels tailored for IP evaluation: **Information Processing**, **Logical Reasoning**, **Discriminant Evaluation**, and **Creative Generation**, as illustrated in Figure 1. These levels enable us to map tasks to specific reasoning capacities required by LLMs, ranging from simple fact recall to complex synthesis and decision-making. The taxonomy provides a principled foundation for evaluating LLMs not only in terms of accuracy but also cognitive depth and functional applicability. Table 2 summarizes the 20 tasks included in IPBench and we also provide further details on the task taxonomy, along with comprehensive definitions of each task, in Appendix D.

3.2 DATA PROCESSING AND ANNOTATION

Data Source and Collection. Our dataset is constructed from three primary sources: expert-curated annotations, databases maintained by national IP offices, and previously published public datasets. This diverse sourcing approach ensures broad coverage of real-world scenarios and IP mechanisms. For tasks grounded in statutory interpretation-such as *Legal Concept Memory*-data are drawn from official legal texts and documentation published on the public websites of IP offices, including the United States and China. For litigation-oriented tasks-such as *Infringement Behavior Determination*-we utilize publicly available judicial decisions, including case repositories such as China Judgements Online. Patent-related tasks leverage structured data from the USPTO and the China National Intellectual Property Administration (CNIPA). All sources used in IPBench are publicly accessible, ensuring transparency and reproducibility.

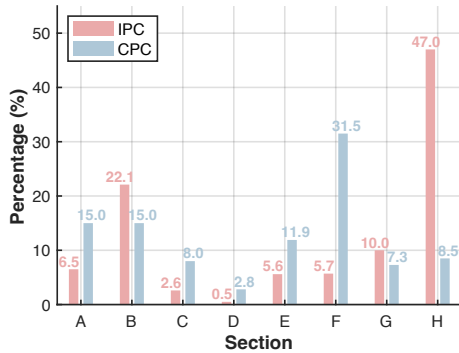
Data Processing and Annotation. Our IPBench is constructed as a gold-standard benchmark through extensive human expert annotation. Given the highly structured nature of patent documents,

both the USPTO and CNIPA datasets offer well-organized metadata-enabling the systematic creation of paired inputs, such as sequential claim pairs that reflect logical progression in legal language. To ensure annotation quality and domain relevance, we engaged 21 trained annotators, including senior undergraduate and PhD students, all supervised by four certified and experienced patent agents. Most annotators hold academic backgrounds in IP, equipping them with foundational knowledge of both technical and legal aspects of IP. This subject matter expertise was critical to generating high-fidelity annotations across legal, technical, and procedural tasks.

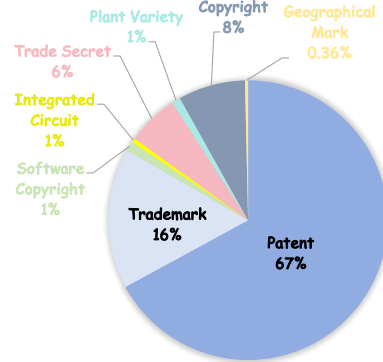
The annotation team is organized into four subgroups, each dedicated to one of the hierarchical levels in our taxonomy. Each task underwent a rigorous two-stage workflow: one team conducted the initial annotation while another team reviewed and validated the results. The roles were then rotated to ensure objectivity and consistency across all data points. Following annotation, we perform automatic quality filtering using cosine similarity based on the BGE-M3 model (Chen et al., 2024). This step eliminates semantically redundant examples and further enhanced the dataset’s diversity and representativeness. Our complete annotation and examination protocol is in Appendix E.

3.3 FEATURE OF IPBENCH

IPBench consists of 10,374 expertly curated questions spanning 20 tasks. These tasks are systematically organized across 4 hierarchical levels and cover 8 IP mechanisms, including patents and trade secrets, etc. The benchmark integrates both technical and legal domains and includes a mix of task formats, ranging from classification and comprehension to open-ended generative reasoning. This diverse coverage enables comprehensive evaluation of LLM capabilities, including factual recall, legal reasoning, procedural understanding, and content synthesis. As shown in Table 1, IPBench surpasses existing IP benchmarks across multiple dimensions, including task diversity, jurisdictional representation, cognitive complexity, and linguistic variation.



(a) Distribution of IPC and CPC sections.



(b) Distribution of IP mechanisms.

Figure 2: Distributions across IPC/CPC sections and IP mechanisms.

Given the wide scope of IP mechanisms and technical domains represented, we provide detailed statistical analysis of IPBench’s data characteristics. These include the distributions of International Patent Classification (IPC) and Cooperative Patent Classification (CPC) codes, as shown in Figure 2a, and IP mechanisms, as shown in Figure 2b. More feature details of IPBench can be found in Appendix F including the distributions of IPC/CPC classification codes, text lengths, and domain coverage.

4 BENCHMARKING RESULTS

4.1 EVALUATION SETUP

Evaluated Models. We evaluate 17 language models covering a broad range of sizes, architectures, and domain specializations, with details provided in Appendix I. Among them, 14 are general-purpose large language models, 2 are law-oriented models specifically fine-tuned for legal tasks, and one is an IP-oriented model developed for intellectual property applications.

Table 3: Main results of IPBench. The best-performing model in each task is in **darker red**, and the second best is in **lighter red**. The model DS-Qwen refers to DeepSeek-R1-Distill-Qwen.

Model	OA	1-1	1-2	1-3	1-4	1-6	1-7	2-1	2-2	2-3	2-4	2-5	3-1	3-2	3-3	3-4	3-5	4-3
GPT-4o	75.3	96.0	92.0	82.2	83.7	64.2	71.9	54.8	62.6	63.9	78.5	84.1	71.0	70.1	81.3	83.5	50.0	75.4
GPT-4o-mini	72.6	94.4	87.5	80.2	82.1	58.8	67.5	50.2	64.0	59.5	76.7	83.4	67.3	75.0	81.6	78.5	44.0	66.3
DeepSeek-V3	75.8	96.6	90.2	88.4	82.8	66.1	69.9	56.8	64.2	66.1	76.7	84.1	72.0	75.0	78.9	83.5	44.6	78.8
Qwen3	70.6	94.4	83.1	75.0	76.6	60.9	66.8	51.4	66.8	60.4	75.1	82.7	69.7	74.4	70.5	78.0	44.0	67.9
Qwen2.5-72B-it	74.7	96.0	90.4	84.2	83.5	61.3	69.2	54.4	66.6	63.0	80.4	82.1	71.7	73.4	79.9	80.7	43.3	75.3
Qwen2.5-7B-it	68.0	92.4	83.3	77.2	77.2	58.4	62.0	49.4	64.4	57.3	74.4	77.1	67.7	71.1	65.8	78.2	38.9	58.9
Llama3.1-70B-it	70.5	93.8	85.3	77.6	79.8	59.3	67.0	53.0	64.8	53.5	74.8	81.1	70.3	74.4	67.1	78.0	45.2	71.3
Llama3.1-8B-it	61.7	90.4	75.9	68.2	71.3	53.0	60.4	47.6	57.5	44.6	71.4	75.7	60.0	61.7	50.6	77.2	41.7	52.3
Gemma-2-27B-it	68.1	90.6	80.5	73.2	77.6	54.5	61.3	53.4	65.0	56.0	76.4	81.1	69.3	66.2	57.2	80.2	–	66.9
Gemma-2-9B-it	64.9	91.6	78.3	73.0	61.5	58.8	59.3	51.2	63.6	46.8	70.4	80.4	66.0	66.9	51.9	76.0	–	62.1
Mistral-7B-it	54.7	79.6	63.9	60.6	60.1	40.5	54.0	43.6	56.0	42.4	64.1	67.0	56.0	45.8	43.9	65.1	43.9	54.5
MoZi-qwen	64.9	93.8	83.3	77.0	66.1	58.2	64.2	50.6	58.0	41.8	67.8	76.4	68.0	64.3	56.1	79.0	43.9	57.1
DISC-LawLLM	52.8	79.0	65.3	67.6	60.1	54.5	52.0	40.8	60.4	31.3	60.1	64.8	53.7	45.1	28.2	71.2	–	35.3
Hanfei	40.1	63.0	46.4	51.8	45.4	39.8	47.3	30.8	45.6	33.9	40.9	49.2	42.7	28.6	18.9	48.8	–	29.5
DeepSeek-R1	73.9	96.0	92.0	87.6	80.8	64.9	71.7	53.6	64.6	71.8	78.1	85.4	63.3	78.2	67.2	82.0	47.5	74.3
DS-Qwen-7B	57.0	77.8	59.0	53.8	57.1	49.8	50.7	43.8	51.2	46.2	67.1	65.5	54.0	62.0	63.7	63.7	43.6	54.9
QwQ-32B	73.5	95.2	91.0	81.8	77.8	65.1	71.5	57.4	66.6	70.6	80.1	85.4	69.7	82.1	67.3	77.0	47.1	69.7

Experimental Settings. Inspired by previous benchmarks Team et al. (2025), we adopt five distinct evaluation settings for chat models: zero-shot, 1-shot, 2-shot, 3-shot, and Chain-of-Thought (CoT). For reasoning models, we use only the zero-shot setting to ensure a fair comparison given their limited prompt-handling flexibility. In few-shot settings, we randomly sample one to three in-context examples (excluding the current test instance) using a fixed seed to ensure reproducibility. To ensure consistency and reproducibility, we set the temperature to 0.0 across all experiments. The maximum input token limit is capped at 32k for reasoning models and 8k for chat models; for models with shorter context windows, we use the maximum supported length. All the prompts used are provided in Appendix G.

Metrics. We use accuracy as the primary evaluation metric for the most tasks. For IPC and CPC classification tasks, we follow the evaluation strategy of HELM (Liang et al., 2022), using Exact Match at **different granularity levels**: *Section*, *Class*, and *Subclass*. For generative tasks such as abstract and claim generation, we evaluate model outputs using the F1 score of metrics: BLEU (Papineni et al., 2002), ROUGE-L (Lin, 2004), and BERTScore (Zhang et al., 2019). Additionally, inspired by the fine-grained error taxonomy in PatentEval, we propose **LLMScore**, a multi-dimensional, automatic evaluation metric aligned with the LLM-as-a-judge paradigm (Liu et al., 2023; Li et al., 2025a). LLMScore is used to assess the semantic and structural quality of generated outputs, and we validate its consistency against human judgment. Details of metrics are provided in Appendix H.

4.2 MAIN RESULTS

As shown in Table 3, 4, and 5, we present the main results under the zero-shot setting, while results for the few-shot and CoT setting are provided in Figure 4a. More comprehensive results of IPBench can be found in Appendix K.

4.3 ANALYSIS

Disparity between IP-oriented and general-purpose models. Surprisingly, general-purpose models consistently outperform both law-oriented and IP-oriented models on IPBench. Although MoZi-qwen, an IP-oriented model, outperforms the 2 law-oriented models DISC-LawLLM and Hanfei, it still trails Qwen2.5-7B-it, by 3.1%. These results underscore a recurring issue in vertical domain models: despite being optimized for specific applications, they tend to underperform on domain-specific evaluations (Wang et al., 2024b; Hou et al., 2024; Li et al., 2024). This suggests that domain-specific models must adopt improved strategies for learning domain knowledge without sacrificing general-purpose capabilities.

Model performance across different languages. Model performance correlates strongly with the primary training language of the model. Results across the Chinese and English subsets of IP-

Table 4: Main results of IPC/CPC Classification tasks. The best-performing model is in **darker purple**, and the second best is in **lighter purple**.

Model	IPC Classification (1-5-1)				CPC Classification (1-5-2)			
	Exact-Match	Section	Class	Subclass	Exact-Match	Section	Class	Subclass
GPT-4o	4.8	81.6	71.3	55.1	3.3	82.7	69.7	62.0
GPT-4o-mini	1.0	80.5	66.8	50.1	0.5	79.0	64.5	52.7
DeepSeek-V3	10.6	83.7	73.3	58.3	9.5	84.0	73.3	65.2
Qwen3	2.8	80.6	64.8	48.0	0.5	62.7	48.3	38.7
Qwen2.5-72B-it	4.9	82.4	70.4	55.2	2.5	81.5	69.5	60.7
Qwen2.5-7B-it	1.9	76.8	63.0	46.6	0.2	65.5	44.8	34.8
Llama3.1-70B-it	3.5	80.4	65.6	50.0	1.0	79.5	64.3	52.7
Llama3.1-8B-it	0.9	71.8	56.2	35.8	0.0	63.8	45.0	30.7
Gemma-2-27B-it	1.2	72.9	57.4	41.5	0.2	70.5	56.7	44.3
Gemma-2-9B-it	0.3	73.7	55.6	37.2	0.2	56.2	39.0	26.7
Mistral-7B-it	0.1	67.2	42.8	26.8	0.0	39.0	21.5	10.3
MoZi-qwen	0.6	38.8	29.6	20.3	0.0	8.5	3.1	1.8
DISC-LawLLM	0.0	68.2	47.2	28.3	0.0	31.0	23.4	11.5
Hanfei	0.0	11.7	2.0	0.1	0.0	0.8	0.0	0.0
DeepSeek-R1	10.8	85.8	74.7	59.3	8.5	82.5	71.2	63.2
DS-Qwen-7B	0.0	20.5	6.9	1.4	0.0	5.1	0.5	0.2
QwQ-32B	2.9	83.8	70.4	53.8	0.5	76.0	62.3	51.3

Table 5: Main results of generation tasks. The best-performing model is in **darker blue**, and the second best is in **lighter blue**. R-L refers to ROUGE-L, BS refers to BERTScore, Tokens # denotes the average number of tokens in the generated text, and DC # indicates the average number of generated dependent claims.

Model	Abstract Generation (4-1)					Dependent Claim Generation (4-2)					
	BLEU	R-L	BS	LLMScore (1-10)	Tokens # (148.5)	BLEU	R-L	BS	LLMScore (1-10)	Tokens # (437.6)	DC # (5.2)
GPT-4o	17.7	31.1	89.3	8.42	271.4	18.9	26.5	88.8	6.63	647.8	6.5
GPT-4o-mini	23.4	31.9	89.6	8.05	218.1	20.3	28.3	88.4	6.37	478.1	6.5
DeepSeek-V3	19.6	28.3	89.0	8.38	246.1	19.1	26.8	89.0	7.45	691.7	14.9
Qwen2.5-72B-it	21.0	30.6	89.5	8.33	326.0	10.0	17.1	89.2	6.30	3790.9	69.1
Qwen2.5-7B-it	27.3	35.7	90.2	8.18	209.2	15.1	22.3	89.2	5.67	3511.3	45.7
Llama3.1-70B-it	31.0	38.2	90.4	7.98	226.5	16.0	23.8	88.1	5.67	2294.4	28.3
Llama3.1-8B-it	20.1	28.4	89.2	7.47	457.3	8.1	13.9	88.4	3.86	6287.9	90.8
Gemma-2-27B-it	19.7	27.5	88.9	7.64	193.3	15.2	22.6	87.3	5.98	582.3	3.3
Gemma-2-9B-it	21.6	29.4	89.0	7.91	219.3	14.7	23.2	87.1	5.55	511.9	6.4
Mistral-7B-it	20.2	27.4	89.4	7.49	361.7	7.2	11.7	88.0	3.42	6543.1	96.3
MoZi-qwen	31.2	51.0	90.4	7.73	316.4	16.3	34.4	89.0	4.81	5121.5	47.7
DeepSeek-R1	13.8	27.8	87.5	7.72	642.3	16.6	29.3	71.4	7.18	1302.9	19.1
DS-Qwen-7B	9.7	22.9	83.6	7.58	802.5	11.7	32.4	69.0	4.16	6096.9	54.1
QwQ-32B	16.6	32.0	87.9	8.51	1126.6	12.6	25.8	71.9	7.10	4997.7	41.8

Bench are provided in Figure 3a. DeepSeek-V3 achieves the highest accuracy on the Chinese subset (78.7%), while GPT-4o leads on the English subset (73.2%). These findings highlight the impact of legal system discrepancies across jurisdictions and the need for language models to recognize and adapt to structural and contextual differences during inference, consistent with the observations reported in IPEval (Wang et al., 2024b).

Disparity between Chat Model and Reasoning Model. In addition to chat models, we evaluate 3 reasoning-focused models, notably DeepSeek-R1. While these models do not achieve the highest overall scores, they demonstrate superior performance on logically intensive tasks. For example, in Task 2-3 (compensation calculation), DeepSeek-R1 surpasses the best-performing chat model, DeepSeek-V3, by 5.7%. This task requires not only domain knowledge but also strong arithmetic and logical reasoning skills. These findings highlight the need for future models to integrate both intuitive (*System 1*) and analytical (*System 2*) capabilities, particularly in high-stakes, knowledge-intensive domains such as IP.

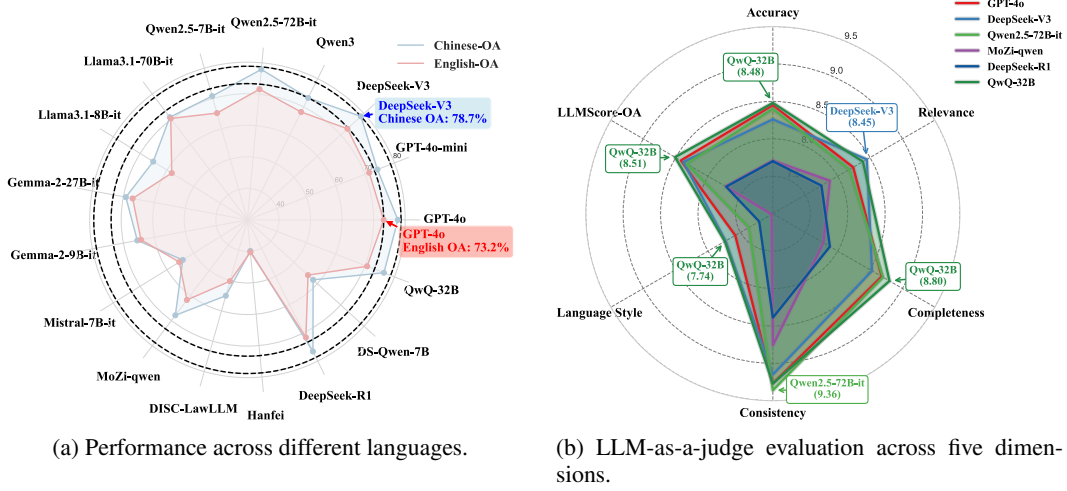


Figure 3: Comparative results: (a) performance across languages; (b) evaluation across fine-grained dimensions.

Disaster in IPC/CPC exact match performance. Performance on IPC/CPC classification tasks remains particularly weak. DeepSeek-R1 achieves the highest Exact Match score at 10.8%, followed by DeepSeek-V3 at 9.5%, while several models score as low as 0.0%. As the classification granularity increases -from Section to Class to Subclass to Exact Match -the difficulty also rises, given the increasingly specific technical distinctions required. These results reveal substantial limitations in current models’ abilities to perform fine-grained classification and highlight the complexity of capturing structured taxonomies in patent law. Since IPC/CPC classification underpins many foundational applications in patent management, this represents a critical area for model improvement.

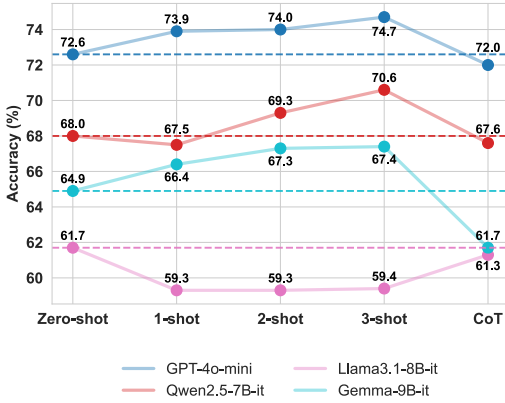
Lack of fine-grained, interpretable automatic evaluation for IP-related generative tasks. For these two generative tasks, there is a lack of fine-grained, interpretable automatic evaluation methods to provide more reliable results. Traditional metrics such as BLEU, ROUGE-L, and BERTScore are limited in their effectiveness and exhibit low consistency. To address this issue, we adopt an LLM-as-a-judge approach with five fine-grained dimensions, inspired by PatentEval’s error taxonomy, and introduce *LLMScore* for more reliable evaluation. As shown in Table 6, LLMScore demonstrates significantly higher consistency with human judgments than other metrics, which is reflected in its higher Kendall, Spearman, and Pearson correlation coefficients, and lower p -values. We present detailed LLM-as-a-judge evaluations of generative tasks across five dimensions: *Accuracy*, *Relevance*, *Completeness*, *Consistency*, and *Language Style*, as illustrated in Figure 3b. Detailed LLMScore results are provided in Appendix K.4.

Table 6: Correlation of LLMScore with human judgments on Task 4-1 and Task 4-2 (p -value in parentheses). \uparrow Correlation coefficients, \downarrow p -value.

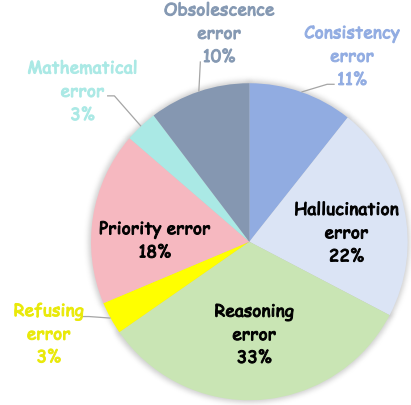
Metric	Task 4-1			Task 4-2		
	Kendall	Pearson	Spearman	Kendall	Pearson	Spearman
LLMScore	0.22 (0.0005)	0.29 (0.0011)	0.32 (0.0003)	0.40 (0.0000)	0.65 (0.0000)	0.58 (0.0000)
BLEU	0.17 (0.0042)	0.22 (0.0068)	0.23 (0.0046)	0.40 (0.0000)	0.47 (0.0000)	0.54 (0.0000)
ROUGE-L	0.15 (0.0123)	0.18 (0.0317)	0.20 (0.0154)	0.37 (0.0000)	0.51 (0.0000)	0.50 (0.0000)
BERTScore	0.10 (0.0746)	0.16 (0.0519)	0.14 (0.0847)	0.05 (0.3680)	0.09 (0.2950)	0.08 (0.3494)

Results and analysis of few-shot prompting. As shown in Figure 4a, the performance of models on IPBench generally improves as the number of shots increases, reflecting a positive correlation between in-context learning and task performance -except for Llama3.1-8B, which does not exhibit this trend. This observation is consistent with prior studies (Li et al., 2024; Wang et al., 2024b), which show that the effectiveness of few-shot prompting varies significantly across model architec-

tures. These findings suggest that few-shot learning may not be a universally effective strategy for injecting domain-specific knowledge for complex domains.



(a) Performance under different prompt settings.



(b) Error distribution of GPT-4o-mini's responses.

Figure 4: Few-shot performance and error distribution.

Results and analysis of CoT prompting. As shown in Figure 4a, all models experience a slight decline in performance-ranging from 0.4% to 0.6%-when using CoT prompting. Upon deeper analysis of the error cases, we observe that models generate not only the final answer but also a reasoning trajectory. This additional reasoning, while intended to aid logical flow, often introduces new sources of error or distracts from more intuitive solutions. These results align with recent findings (Zheng et al., 2025; Fan et al., 2025), which suggest that CoT prompting may conflict with the natural inferential preferences of language models-especially in tasks relying more on memorization or domain recall than on abstract reasoning. This is further reflected in the observation that reasoning models do not outperform chat models on IPBench, despite conducting longer reasoning sequences during inference.

4.4 ERROR ANALYSIS

To gain deeper insight into model limitations, we perform a qualitative error analysis. We randomly selected 300 incorrect responses generated by GPT-4o-mini under the CoT setting across all IPBench tasks. These samples were manually reviewed and annotated by expert evaluators. As shown in Figure 4b, the errors are categorized into seven types: **Consistency Error**, **Hallucination Error**, **Reasoning Error**, **Refusing Error**, **Priority Error**, **Mathematical Error**, and **Obsolescence Error**. Among these, **Reasoning Error** is the most frequent, accounting for 33% of the total. This error analysis is crucial for gaining deeper insights into the model's capabilities in the IP domain and for revealing potential directions for future research. More details of error analysis and case study are in Appendix L, M and N. We also provide more discuss and limitations in Appendix J, B.

5 CONCLUSION

We introduce the first comprehensive IP task taxonomy and present IPBench, a bilingual benchmark comprising 20 tasks and 10,374 test instances, covering both technical-legal and generation-comprehension evaluations. Our experiments show that even the best-performing model, DeepSeek-V3, achieves only a 75.8% score. We observe that current models, including IP-oriented ones, still lag significantly behind powerful closed-source models, highlighting the need for improved domain-specific learning approaches. Our extensive performance analysis, error analysis and case study provide a comprehensive insight in models' IP knowledge and capabilities. We are committed to continuously expanding IPBench to foster advancements in both the IP domain and NLP research, providing meaningful guidance for the integration of LLMs into specialized vertical fields.

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APPENDIX

A THE USE OF LARGE LANGUAGE MODELS (LLMs)

In accordance with the policy on the use of Large Language Models, we clarify that in this work LLMs were employed exclusively for improving the presentation of the manuscript, such as correcting grammatical errors, enhancing clarity, and refining writing. The research design, conceptual development, and analytical contributions were made solely by the authors.

B LIMITATIONS

While IPBench represents a significant step forward in evaluating large language models for intellectual property tasks, several limitations remain.

First, due to the jurisdiction-specific nature of intellectual property law, the current version of IPBench focuses primarily on the legal frameworks of the United States and mainland China. This restricts its global applicability, as key differences in legal definitions, procedural structures, and enforcement standards exist across countries. Expanding the benchmark to include legal systems from jurisdictions such as the European Union, Japan, and Korea would enhance its cross-cultural robustness and relevance.

Second, resource constraints limited our evaluation to four reasoning models. While these include some of the most advanced publicly available systems, we were unable to include proprietary models such as OpenAI’s o1 (Jaech et al., 2024) and o3 series due to prohibitive costs. As pricing structures evolve and research access improves, future iterations of IPBench will aim to incorporate a wider array of state-of-the-art reasoning models.

Third, intellectual property remains an underexplored vertical domain in large language model research. Currently, MoZi is the only publicly available IP-specific model, and thus the only one benchmarked in this study. The development and release of more open-source IP-oriented models will be essential for driving progress in this field and enabling more comprehensive comparisons in future studies.

Lastly, although we propose *LLMScore*, a fine-grained, interpretable, and high-consistency evaluation metric grounded in the LLM-as-a-judge paradigm, there is still room for improvement. Future work should focus on minimizing bias and improving the robustness of automatic evaluation methods across diverse model architectures, task types, and cultural contexts.

We view these limitations not only as constraints, but also as valuable directions for extending the scope, depth, and impact of IPBench in future work.

C DATA USAGE STATEMENT

In developing IPBench, all data are collected exclusively from open and publicly available sources. We strictly adhered to all relevant copyright and licensing regulations. Any data originating from websites or platforms that prohibit copying, redistribution, or automated crawling are explicitly excluded from use. Furthermore, we confirm that all data are used solely for academic and research purposes, and not for any commercial applications. We are committed to upholding responsible data usage and transparency in our research practices. Future updates of IPBench will continue to follow the same principles and remain fully open to academic scrutiny and community feedback.

D TAXONOMY AND TASK DETAILS

D.1 TAXONOMY DETAILS

Information Processing. In the first level of the taxonomy, we replace Recall and Reproduction with Information Processing, which encompasses the legal concepts, clauses, evolution, and typical case knowledge of various IP mechanisms. It also includes real-world applications such as patent classification, IP element identification, and process guidance, requiring models to memorize different concepts, along with the procedures executed in real-world scenarios. Our expert-annotated memory-type tasks are inspired by those in LexEval (Li et al., 2024) but differ significantly from it across various IP mechanisms, using accuracy as the evaluation metric. The IP element identification task focuses on identifying key elements in a case, such as claim coverage in patent infringement. Previous work has made significant progress in patent classification (Li et al., 2018; Lee & Hsiang, 2020; Fall et al., 2003), which has been adopted by IP offices in many countries. However, these models are task-specific and lack the strong generalization ability of LLMs. Our patent classification task consists of two types: International Patent Classification (IPC) and Cooperative Patent Classification (CPC). We aim to accomplish these tasks within a single model, enabling it to distinguish both differences within the same classification system and across different classification systems. We adopt the top-prediction scheme, following Fall et al. (Fall et al., 2003), to compare the top predicted category with the label for an Exact Match (Liang et al., 2022) in the main IPC symbol, and CPC. This setup increases the task difficulty for LLMs, requiring models to be familiar with classification rules.

Logical Reasoning. At the second level of the taxonomy, we focus on examining a model’s ability to apply memorized concepts and utilize logical reasoning to provide insights into both text analysis and mathematical calculations. One of the important roles of IP is to protect inventors’ rights from infringement. Therefore, we define the tasks of Infringement Behavior Determination and Compensation Calculation. To complete these two tasks, models need to analyze the background of cases to identify infringement behavior and apply relevant laws to determine the appropriate penalties. Apart from the legal aspect, we introduce Patent Technology Forecasting, Patent Valuation, and Fact Checking to evaluate models’ ability in information mining and conditional reasoning. As we mentioned, our IPBench consists of different IP mechanisms. We specifically introduce a novel task called Trade Secret Requirements, which differs from Infringement Behavior Determination. This task focuses on trade secret rights, requiring the model to determine whether a situation meets the confidentiality requirements of trade secrets.

Discriminant Evaluation. At this level, we focus on evaluating models’ understanding of IP in-domain texts, particularly patent documents, as well as their ability to perform discriminative tasks such as rights attribution. AAs an important part of IP management activities, as mentioned before, IP offices face a massive volume of patent applications. Determining the quality of an application requires assessing its patentability based on four aspects outlined in the Manual of Patent Examining Procedure (MPEP) (USTPO, 2024b; EPO, 1994): utility, non-obviousness, statutory subject matter, and novelty. We aim to evaluate whether current LLMs can assist patent examiners in reducing time costs within a single model. To achieve this, we introduce three tasks: Patent Document Proofreading, Patent Validity Identification, and Patent Match. LLMs’ output mechanisms are not well-suited for retrieval-based approaches, and Li et al. (2025b) introduced a novel perspective on matching documents through a generative approach. Based on this insight, the Patent Match task draws in-

spiration from the corresponding task in MoZIP (Ni et al., 2024). We sample 1000 datapoints from MoZIP in both English and Chinese and require expert annotation for detailed examination.

Apart from the evaluation of in-domain text, we introduce one real-world common task for evaluating models’ discrimination ability: Rights Attribution Analysis. The Rights Attribution Analysis task requires the model to infer the legal rights holder of a specific intellectual property based on the context of IP creation, legal agreements such as contract terms and confidentiality agreements, and judicial precedents within the legal framework. At last, we extend HUPD’s (Suzgun et al., 2023) Patent Acceptance Prediction task into a more comprehensive Patent Application Examination task, leveraging the USPTO Office Action Dataset (Lu et al., 2017). In this task, the model is required to determine whether a given patent application should be accepted or rejected. Additionally, we provide stepwise examination actions for an interpretable examination process, which can be used in future work to construct a reliable examination system.

Creative Generation. At the final level of our IPBench, we focus on evaluating the models’ ability to extract critical information, convert between different linguistic styles, and generate new content. Previous works such as BigPatent (Sharma et al., 2019), Patent-CR (Jiang et al., 2024), and PatentEval (Zuo et al., 2024) focus on specific types of content for patent generation. We draw inspiration from some of their tasks and extend their scope to include both Chinese and English. All the data used in Abstract Generation, Claim Generation, Sequential Claim Generation are sourced from the latest patents, ensuring no data leakage and distinguishing our dataset from existing ones. At last, we introduce a novel task called Design-Around Solution Generation, which evaluates whether models can generate innovative solutions that avoid duplication of existing ones. This capability is crucial in strategic patent planning. Given the distinct characteristics of the tasks at this level, we use accuracy as the metric for Language Simplification and Design-Around Solution Generation. For the other three generative tasks, we note that PatentEval (Zuo et al., 2024) provides an LLM-based evaluation method for claim generation. However, this approach relies on the assumption that the employed LLMs are sufficiently capable. Moreover, for other types of content, no superior evaluation method currently exists. We adopt a combination of automated evaluation and human assessment. For automated evaluation, we use n-gram-based metrics such as BLEU (Papineni et al., 2002) and ROUGE (Lin, 2004), along with the semantic metric BERTScore (Zhang et al., 2019), and analyze their consistency with human evaluation to enhance result interpretation. We will explore better evaluation methods in future work, especially for patent generation, which involves complex technical and legal content.

It is important to note that the abstract generation evaluation in BigPatent (Sharma et al., 2019) is based on converting only the first 400 words of a patent’s description into an abstract, a limitation imposed by the context length of language models at the time. In our IPBench, we evaluate models on their ability to generate abstracts from the entire description, assessing their long-context understanding and summarization capabilities for complex patent documents.

D.2 TASK DEFINITION

D.2.1 INFORMATION PROCESSING

Task 1-1: Legal Concept Memory Legal Concept Memory refers to the ability to precisely memorize and recall foundational definitions within the intellectual property domain. These definitions, such as those of patents, copyrights, trademarks, and trade secrets, are grounded in authoritative legal frameworks and scholarly interpretations that constitute the foundation of intellectual property law. When given a concept name or contextual description, LLMs must retrieve the precise legal definition, scope, and jurisdictional boundaries as codified in statutes such as China’s Patent Law and Copyright Law, as well as relevant international agreements, purely from their intrinsic knowledge without relying on external databases or tools.

Task 1-2: Legal Clause Memory Legal Clause Memory requires the precise memorization and retrieval of specific legal provisions, including their exact article numbers and textual content. These clauses, drawn from authoritative legal codes such as China’s Criminal Law, Civil Code, and Intellectual Property Law, define rights, obligations, penalties, or procedural rules within statutory frameworks. When provided with an article number (e.g., Article 217 of China’s Copyright Law) or

a contextual description of a legal scenario, LLMs must accurately recall the verbatim wording and scope of the corresponding clause.

Task 1-3: Legal Evolution Legal Evolution refers to the ability to accurately memorize and analyze the revision history of legal texts, including the tracking of changes in specific clauses across different versions of statutes, regulations, or international treaties. This capability requires models to retain knowledge of amendments, such as updates to China’s Patent Law, and to systematically compare the wording, scope, and intent of clauses before and after revisions.

Task 1-4: Typical Case Memory Typical Case Memory requires the memorization of landmark intellectual property cases, including their judicial outcomes, factual details, and legal reasoning. These cases, such as high-profile patent disputes, copyright infringement rulings, or trademark opposition decisions, establish precedents that shape the interpretation and enforcement of IP law. When provided with a case name, jurisdiction, or factual scenario, models must accurately recall the judgment summary, key legal arguments, cited statutes, and contextual factors, without using an external database or retrieval tool.

Task 1-5: Patent Classification Patent Classification involves the capability to automatically assign International Patent Classification (IPC) or Cooperative Patent Classification (CPC) codes based on the technical content of patent documents. This task requires models to analyze patent texts, including titles and abstracts to identify the core inventions, technological domains, and functional features, then map them to hierarchical classification codes. This task evaluates the model’s capabilities across three hierarchical levels: Section, Class, and Subclass. A distribution table for the section level as shown in Table 7.

Table 7: International Patent Classification (IPC) Sections

Section	Content
A	Human Necessities
B	Performing Operations; Transporting
C	Chemistry; Metallurgy
D	Textiles; Paper
E	Fixed Constructions
F	Mechanical Engineering; Lighting; Heating; Weapons; Blasting
G	Physics
H	Electricity

Table 8: Cooperative Patent Classification (CPC) Sections

Section	Content
A	Human Necessities
B	Operations and Transport
C	Chemistry and Metallurgy
D	Textiles and Paper
E	Fixed Constructions
F	Mechanical Engineering and Lighting
G	Physics
H	Electricity
Y	Emerging Technologies

Task 1-6: IP Element Identification IP Element Identification entails detecting and categorizing intellectual property components such as patent claims, trademark-protected assets, copyrighted material, or trade secret identifiers within legal disputes, technical specifications, or commercial contracts. This task requires models to analyze textual data to identify legally protected innovations, distinctive brand assets, and ownership claims, while ensuring alignment with statutory definitions.

Task 1-7: Process Guidance Process Guidance focuses on delivering structured knowledge of intellectual property application procedures, covering legal requirements, technical documentation

standards, and jurisdictional workflows. This task requires models to provide step-by-step guidance on processes such as conducting patent or trademark searches, drafting application materials, navigating submission procedures, and ensuring compliance with examination regulations.

D.2.2 LOGICAL REASONING

The Logical Reasoning level is designed to evaluate the capability of large language models (LLMs) to perform multi-dimensional legal and technical reasoning within the complex framework of intellectual property (IP) law and textual analysis. This layer tests the model’s ability to analyze, interpret, and apply intersecting legal rules. It focuses on assessing whether models can synthesize statutory provisions, case law precedents, and technical domain knowledge to reach legally sound conclusions such as identifying infringement risks, resolving conflicts between overlapping rights, or predicting litigation outcomes based on factual scenarios.

Task 2-1: Patent Technology Forecasting Patent Technology Forecasting involves analyzing the technical features of patents such as claims, innovation summaries, and domain-specific terminology to predict future technological trajectories and potential application areas. This task requires models to identify emerging trends, interconnected technical fields, and latent innovation pathways within patent datasets, enabling the projection of how core inventions might evolve or intersect with adjacent industries.

Task 2-2: Infringement Behavior Determination Infringement Behavior Determination focuses on identifying acts that constitute violations of intellectual property rights. It involves analyzing the legally protected scope of patents, copyrights, trademarks, or other IP types, and comparing them with suspected infringing products, services, or content to determine whether an intellectual property infringement has occurred. This task requires models to evaluate technical equivalence, trademark similarity, or substantial similarity in copyrighted works, while accurately applying the relevant statutory criteria to determine whether an intellectual property infringement has occurred.

Task 2-3: Compensation Calculation Compensation Calculation focuses on determining statutory damages for intellectual property infringement by analyzing the severity, scope, and economic impact of the violation. This task requires models to perform mathematical reasoning and calculation, taking into account factors such as the rights holder’s actual losses, reasonable licensing fees, and statutory limits. Additionally, models must incorporate contextual elements such as the duration of infringement, geographic scope, and the presence of malicious intent to arrive at a legally grounded and quantitatively sound compensation estimate.

Task 2-4: Patent Valuation Patent Valuation entails evaluating the value trajectory of a patent by synthesizing its technical merit, market viability, and legal robustness. This task requires models to analyze technical claims, market analysis reports, and legal histories to project trends such as value appreciation, obsolescence risks, or licensing potential.

Task 2-5: Trade Secret Requirements Trade Secret Requirements assesses whether a given scenario satisfies the legal criteria for trade secret protection under statutory frameworks such as China’s Anti-Unfair Competition Law and the U.S. Defend Trade Secrets Act (DTSA). This task requires models to verify three core elements: the existence of secrecy, the presence of commercial value, and the implementation of reasonable confidentiality measures.

D.2.3 DISCRIMINANT EVALUATION

Task 3-1: Patent Document Proofreading Patent Document Proofreading involves identifying formatting deviations and logical inconsistencies within patent specifications, claims, and technical descriptions to ensure compliance with statutory drafting standards. This task requires models to detect issues such as mismatched section numbering, non-compliant claim dependencies, contradictory technical descriptions, and deviations from jurisdiction-specific filing guidelines.

Task 3-2: Patent Validity Identification Patent Validity Identification involves assessing whether a patent satisfies the statutory criteria of novelty, inventiveness (non-obviousness), and practical applicability (utility) by analyzing its technical disclosures in light of relevant prior art. This task

requires models to evaluate patent texts, including claims and specifications, against existing technologies to determine if the invention is new, involves an inventive step, and has industrial applicability.

Task 3-3: Patent Match Patent Match involves identifying the most relevant patents from a candidate pool based on technical, legal, and contextual alignment with a query patent. This task requires models to analyze technical features and semantic similarity to rank patents by relevance. This task is inspired by MoZIP (Ni et al., 2024).

Task 3-4: Rights Attribution Analysis Rights Attribution Analysis involves determining the legitimate rights holder in intellectual property ownership disputes by analyzing legal documents, contractual agreements, and contextual evidence. This task requires models to evaluate factors such as invention ownership under employment relationships, joint authorship claims in copyright cases, or trademark transfer agreements, while reconciling conflicting claims based on statutory frameworks.

Task 3-5: Patent Application Examination Patent Application Examination involves conducting compliance reviews of patent documents to ensure adherence to statutory and administrative requirements. This task requires models to verify the accuracy, completeness, and legal sufficiency of patent applications, including claims, specifications, and drawings, against jurisdictional standards. Key checks include clarity of technical disclosure, consistency between claims and descriptions, proper support for embodiments, and alignment with formalities. The data for this task is sourced from the USPTO Office Action Dataset (Lu et al., 2017).

D.2.4 CREATIVE GENERATION

Task 4-1: Abstract Generation Abstract Generation assesses a model’s ability to automatically extract core elements from intellectual property (IP) texts, such as patent claims, and synthesize them into concise, structured, and legally compliant summaries. This task requires models to distill technical innovations, legal scopes, and critical details while adhering to jurisdictional formatting rules and avoiding oversimplification that misrepresents legal or technical nuances.

Task 4-2: Dependent Claim Generation Dependent Claim Generation involves automatically drafting legally compliant and technically precise dependent claims based on the core inventions described in patent disclosures. This task requires models to analyze technical descriptions and generate claims that refine or limit the scope of independent claims by incorporating additional technical features, while ensuring logical dependency and alignment with jurisdictional formalities. This task is inspired by PatentEval (Zuo et al., 2024).

Task 4-3: Design-Around Solution Generation Design-Around Solution Generation focuses on creating non-infringing technical alternatives by analyzing existing patent claims and identifying opportunities to circumvent key protected elements. This task requires models to deconstruct patent claims and propose modifications that avoid literal or equivalent infringement, while maintaining technical feasibility.

Table 9: Data language distribution of IPBench.

Language	1-1	1-2	1-3	1-4	1-5-1	1-5-2	1-6	1-7	2-1	2-2	2-3	2-4	2-5	3-1	3-2	3-3	3-4	3-5	4-1	4-2	4-3	Sum
Chinese	259	276	294	252	525	0	338	308	250	228	156	139	301	160	159	500	217	0	200	200	328	5090
English	241	226	206	252	600	600	219	240	250	272	160	162	0	140	149	500	183	314	200	199	171	5284
Total	500	502	500	504	1125	600	557	548	500	500	316	301	301	300	308	1000	400	314	400	399	499	10374

E DATA ANNOTATION AND EXAMINATION PROTOCOL

E.1 DATA COLLECTION

We list the primary websites from which we collected the raw data as follows:

- USPTO’s Open Data Portal: <https://data.uspto.gov/home>

- CNIPA’s Official Website: <https://www.cnipa.gov.cn/>
- China Judgements Online: <https://wenshu.court.gov.cn/>

Ethical considerations. The data we collected come from open and public sources, and we confirm that they are not used for any commercial purposes. We strictly comply with all copyright and licensing regulations. Data originating from sources that do not allow copying or redistribution are deliberately excluded.

E.2 ANNOTATION AND EXAMINATION GUIDELINES

We provide detailed data annotation guidelines to ensure the quality, correctness, and difficulty of our benchmark. Notably, most of our human expert annotators, who come from backgrounds in intellectual property and public management, range from senior undergraduates to Ph.D. candidates. They are included as co-authors of this paper as a non-monetary form of acknowledgment for their efforts. They possess deep knowledge of intellectual property.

Preparation before annotation. We divide our 21 human expert annotators into four groups and assign them to different tasks, including data annotation and annotation review. Each group is required to thoroughly understand their assigned task and formulate a comprehensive annotation plan accordingly. This involves understanding the task definition, relevant legal concepts, and technical terminologies related to intellectual property.

General principles and process of annotation. Firstly, all raw data or information must be collected from official websites that are publicly accessible. For websites that prohibit copying, annotators are instructed not to use them. Secondly, all annotators are required to ensure the accuracy of their annotated questions and to ensure that the difficulty level is appropriate. For data containing mathematical equations or special notations, we ask annotators to convert them into LaTeX format. For other typographical errors, human expert annotators will correct them manually. Thirdly, all data will be examined by switching roles between annotation teams to verify and ensure their quality. For each datapoint, after the quality check, human expert annotators are required to label the language, the type of IP mechanism, and the data source.

Specific principles of examination. To ensure data quality, we assign a different annotation team to double-check and cross-validate the results. In cases where errors, inconsistencies, or misunderstandings are identified, human examiners must provide detailed explanations and determine whether the data can be corrected and preserved. After the annotator corrects the question, the examiner will re-evaluate the data until it passes the review with mutual agreement. This strict process ensures the reliability of our data, with each datapoint undergoing an average of three rounds of review to form IPBench.

F MORE DETAILS ABOUT DATA STATICS

In this section, we provide additional details about the data. Further statistical information can be found in Section F.

Our IPBench comprises 10,374 datapoints spanning 20 tasks, including multiple-choice questions, classification tasks, and generation tasks. In this section, we provide additional data statistics, covering language distribution, IP mechanism distribution, IPC/CPC classification distribution, text length distribution, and the distribution of option counts in multiple-choice questions.

F.1 DATA LANGUAGE DISTRIBUTION

Our IPBench is constrained to the legal frameworks of the United States and mainland China; therefore, the dataset includes both English and Chinese languages. We present the language distribution for each task, as well as for the entire dataset, in Table 9.

Table 10: Intellectual property mechanisms distribution of IPBench. TD: Trademark, SC: Software Copyright, TS: Trade Secret, PV: Plant Variety, CR: Copyright, IC: Integrated Circuit, GM: Geographical Mark.

Task	Patent	TD	SC	TS	PV	CR	IC	GM	Total
1-1	225	157	13	25	13	34	24	9	500
1-2	221	95	21	0	0	141	6	18	502
1-3	237	116	1	1	1	143	0	1	500
1-4	325	37	12	33	29	58	8	2	504
1-5-1	525	600	0	0	0	0	0	0	1125
1-5-2	600	0	0	0	0	0	0	0	600
1-6	159	103	22	107	1	157	1	7	557
1-7	190	358	0	0	0	0	0	0	548
2-1	320	21	9	77	39	24	10	0	500
2-2	183	105	16	49	3	144	0	0	500
2-3	101	94	11	10	0	100	0	0	316
2-4	301	0	0	0	0	0	0	0	301
2-5	0	0	0	301	0	0	0	0	301
3-1	300	0	0	0	0	0	0	0	300
3-2	308	0	0	0	0	0	0	0	308
3-3	1000	0	0	0	0	0	0	0	1000
3-4	353	0	8	13	18	5	3	0	400
3-5	314	0	0	0	0	0	0	0	314
4-1	400	0	0	0	0	0	0	0	400
4-2	399	0	0	0	0	0	0	0	399
4-3	497	1	0	1	0	0	0	0	499
Total	6958	1687	113	617	104	806	52	37	10374

Table 11: Distribution of intellectual property mechanisms in the English portion of IPBench.

Task	Patent	TD	SC	TS	PV	CR	IC	GM	Total
1-1	150	57	0	1	10	3	20	0	241
1-2	92	52	0	0	0	82	0	0	226
1-3	53	64	0	1	1	86	0	1	206
1-4	202	13	4	4	0	29	0	0	252
1-5-1	0	600	0	0	0	0	0	0	600
1-5-2	600	0	0	0	0	0	0	0	600
1-6	65	54	8	26	0	66	0	0	219
1-7	58	182	0	0	0	0	0	0	240
2-1	170	21	4	22	9	24	0	0	250
2-2	101	58	4	29	0	80	0	0	272
2-3	52	45	6	2	0	55	0	0	160
2-4	162	0	0	0	0	0	0	0	162
2-5	0	0	0	0	0	0	0	0	0
3-1	140	0	0	0	0	0	0	0	140
3-2	149	0	0	0	0	0	0	0	149
3-3	500	0	0	0	0	0	0	0	500
3-4	175	0	0	4	0	4	0	0	183
3-5	314	0	0	0	0	0	0	0	314
4-1	200	0	0	0	0	0	0	0	200
4-2	199	0	0	0	0	0	0	0	199
4-3	169	1	0	1	0	0	0	0	171
Total	3551	1147	26	90	20	429	20	1	5284

F.2 INTELLECTUAL PROPERTY MECHANISMS DISTRIBUTION

Our IPBench covers eight intellectual property mechanisms, including Patent, Trademark, Software Copyright, Trade Secret, New Plant Variety, Copyright, Integrated Circuit Layout Design, and Geographical Indication. We present a detailed distribution of these intellectual property mechanisms in our benchmark, as shown in Table 10, Table 11 (English section), and Table 12 (Chinese section).

Table 12: Distribution of Intellectual Property Mechanisms in the Chinese Portion of IPBench.

Task	Patent	TD	SC	TS	PV	CR	IC	GM	Total
1-1	75	100	13	24	3	31	4	9	259
1-2	129	43	21	0	0	59	6	18	276
1-3	184	52	1	0	0	57	0	0	294
1-4	123	24	8	29	29	29	8	2	252
1-5-1	525	0	0	0	0	0	0	0	525
1-5-2	0	0	0	0	0	0	0	0	0
1-6	94	49	14	81	1	91	1	7	338
1-7	132	176	0	0	0	0	0	0	308
2-1	150	0	5	55	30	0	10	0	250
2-2	82	47	12	20	3	64	0	0	228
2-3	49	49	5	8	0	45	0	0	156
2-4	139	0	0	0	0	0	0	0	139
2-5	0	0	0	301	0	0	0	0	301
3-1	160	0	0	0	0	0	0	0	160
3-2	159	0	0	0	0	0	0	0	159
3-3	500	0	0	0	0	0	0	0	500
3-4	178	0	8	9	18	1	3	0	217
3-5	0	0	0	0	0	0	0	0	0
4-1	200	0	0	0	0	0	0	0	200
4-2	200	0	0	0	0	0	0	0	200
4-3	328	0	0	0	0	0	0	0	328
Total	3407	540	87	527	84	377	32	36	5090

F.3 IPC AND CPC CLASSIFICATION DISTRIBUTION

We present the IPC Section classification distribution in Table 13a and the CPC Section classification distribution in Table 13b.

Table 13: Distribution of IPC and CPC sections.

Section	Count	Percentage (%)	Section	Count	Percentage (%)
A	72	6.5	A	90	15.0
B	249	22.1	B	90	15.0
C	29	2.6	C	48	8.0
D	6	0.5	D	17	2.8
E	63	5.6	E	71	11.9
F	64	5.7	F	189	31.5
G	113	10.0	G	44	7.3
H	529	47.0	H	51	8.5
All	1125	100	All	600	100

(a) Distribution of IPC sections

(b) Distribution of CPC sections

Table 14: Text length statistics (in tokens) for each task across three dimensions: average, minimum, and maximum length; each further split by language (EN/CH). Missing values are denoted by "-".

Task	Avg-All	Avg-EN	Avg-CH	Min-All	Min-EN	Min-CH	Max-All	Max-EN	Max-CH
1-1	83.9	68.9	97.8	46	46	66	258	112	258
1-2	81.2	71.3	89.3	47	47	66	135	105	135
1-3	102.2	80.3	117.6	55	55	76	208	129	208
1-4	116.2	112.8	119.6	61	61	73	195	151	195
1-5-1	216.7	163.6	277.4	49	49	110	305	305	455
1-5-2	165.1	165.1	-	50	50	-	337	337	-
1-6	89.4	77.0	97.5	55	55	70	146	146	128
1-7	41.7	-	74.2	40	40	53	107	101	107
2-1	161.6	103.1	220.1	66	66	177	310	140	310
2-2	109.4	97.4	123.6	59	59	71	211	189	211
2-3	122.8	107.9	138.1	70	70	80	263	171	263
2-4	99.8	88.1	113.5	66	66	87	144	125	144
2-5	112.1	-	112.1	51	-	51	302	-	302
3-1	158.2	145.8	169.1	-	-	-	-	-	-
3-2	91.4	76.0	105.9	53	53	78	150	121	150
3-3	1239.5	1231.8	1247.3	575	581	575	1956	1845	1956
3-4	166.1	169.8	163.0	60	92	60	297	297	327
3-5	7460.4	7460.4	60.5	1428	1428	-	10219	10219	-
4-1	1636.7	2199.3	1074.0	-	-	285	-	8064	5675
4-2	448.5	534.1	363.3	68	89	68	1861	1485	1861
4-3	121.2	111.8	126.1	56	56	84	218	183	218

Table 15: Aggregated text length statistics (in tokens) by task type. PE refers to Patent Examination (Task 3-5), MCQA refers to Multiple-choice Question Answering.

Type	Avg-All	Avg-EN	Avg-CH	Min-All	Min-EN	Min-CH	Max-All	Max-EN	Max-CH
MCQA	181.0	181.6	194.7	90.7	96.2	111.1	326.7	272.5	327.5
PE	7460.4	7460.4	60.5	1428.0	1428.0	-	10219.0	10219.0	-
Classification	190.9	164.4	277.4	49.5	49.5	110.0	321.0	321.0	455.0
Generation	1042.6	1366.7	718.7	68.0	89.0	176.5	1861.0	4774.5	3768.0

F.4 TEXT LENGTH DISTRIBUTION

We provide detailed statistics on the text length distribution for each task, across the three question types, in both Chinese and English. In all text length computations presented in this paper, we

Table 16: Distribution of answer choices by task.

Task	A	B	C	D	Total
1-1	125	129	126	120	500
1-2	117	162	117	106	502
1-3	125	126	126	123	500
1-4	126	126	127	125	504
1-6	151	137	142	127	557
1-7	132	194	124	98	548
2-1	155	130	124	91	500
2-2	101	177	154	68	500
2-3	74	108	85	49	316
2-4	74	83	75	69	301
2-5	57	165	63	16	301
3-1	114	82	59	45	300
3-2	72	76	76	84	308
3-3	240	256	230	278	1000
3-4	76	141	128	55	400
4-3	170	144	111	74	499
Total	1909	2236	1867	1528	7536

Table 17: Distribution of English questions’ answers by task.

Task	A	B	C	D	Total
1-1	64	53	65	59	241
1-2	65	69	48	44	226
1-3	44	47	58	57	206
1-4	70	71	57	54	252
1-6	39	70	40	70	219
1-7	41	70	64	65	240
2-1	92	65	64	29	250
2-2	70	68	77	57	272
2-3	38	68	26	28	160
2-4	39	45	40	38	162
3-1	54	38	33	15	140
3-2	38	35	39	37	149
3-3	120	126	115	139	500
3-4	44	64	50	25	183
4-3	44	65	42	20	171
Total	862	954	818	737	3371

adopt the tokenizer of GPT-4o for consistency and comparability. Table 14 and Table 15 present the distribution of text lengths from different perspectives: the former provides statistics by task, while the latter summarizes the data by question type.

F.5 MULTI-CHOICE QUESTION OPTION COUNT DISTRIBUTION.

In this section, we present the distribution of multiple-choice question option counts, as shown in Table 16, Table 17, and Table 18, along with the examination option distribution for Task 3-5, as shown in Table 19. For multiple-choice questions, each question has four options: A, B, C, and D. In contrast, for Task 3-5, each question has two options: allowed and rejected.

Table 18: Distribution of Chinese questions’ answers by task.

Task	A	B	C	D	Total
1-1	61	76	61	61	259
1-2	52	93	69	62	276
1-3	81	79	68	66	294
1-4	56	55	70	71	252
1-6	112	67	102	57	338
1-7	91	124	60	33	308
2-1	63	65	60	62	250
2-2	31	109	77	11	228
2-3	36	40	59	21	156
2-4	35	38	35	31	139
2-5	57	165	63	16	301
3-1	60	44	26	30	160
3-2	34	41	37	47	159
3-3	120	126	115	139	500
3-4	32	77	78	30	217
4-3	126	79	69	54	328
Total	1047	1278	1049	791	4165

Table 19: Examination outcome distribution for Task 3-5.

Examination Outcome	Count	Percentage (%)
Allowed	138	43.95
Rejected	176	56.05
Total	314	100

G PROMPTS

G.1 ZERO-SHOT AND FEW-SHOT PROMPT

We adapt four types of zero-shot prompts and few-shot prompts for our experiment, corresponding to different task types: choice questions, classification, examination, and generation, across both English and Chinese languages. The Chinese version uses the same content as the English version.

Zero-shot Prompt for Choice Question Task

Please answer the following question thoughtfully and provide your final answer at the end in the format 'Answer: **option**'

{ Question }

Zero-shot Prompt for IPC/CPC Classification Task (1-5)

Please answer the following question thoughtfully and provide your final answer at the end in the format 'Answer: **corresponding IPC number**'

{Question}

Zero-shot Prompt for Generation Task (4-1, 4-2)

Abstract Generation based on Claims (4-1):

Claims

{Claims Text}

Please generate the abstract of the patent based on the given claims.

Dependent Claim Generation (1-5-2):

Independent Claim

{Claim Text}

Please generate all dependent claims corresponding to the given independent claim.

Zero-shot Prompt for Patent Application Examination Task (3-5)

Please examine the patents in # Patent Applications Awaiting Examination. Determine whether each patent application should be allowed or rejected.
Return your decision in the following format:

Answer: allowed / rejected

Few-shot Prompt for Choice Question Task

There are k examples
 ## Example {1}
 Question: {1-shot-question}
 Answer:{1-shot-answer}
 ...
 ## Example {k}
 Question: {k-shot-question}
 Answer:{k-shot-answer}

Please answer the following question thoughtfully and provide your final answer at the end in the format 'Answer: **option**'

{ Question }

Few-shot Prompt for IPC/CPC Classification Task

There are k examples
 ## Example {1}
 Question: {1-shot-question}
 Answer:{1-shot-answer}
 ...
 ## Example {k}
 Question: {k-shot-question}
 Answer:{k-shot-answer}

Please answer the following question thoughtfully and provide your final answer at the end in the format 'Answer: **corresponding IPC/CPC number**'

{Question}

G.2 CHAIN-OF-THOUGHT PROMPT**Chain-of-Thought Prompt for Choice Question Task**

Please answer the following question thoughtfully and provide your final answer at the end in the format 'Answer: **option**'

{ Question }

Let's think step by step.

Chain-of-Thought Prompt for IPC/CPC Classification Task

Please answer the following question thoughtfully and provide your final answer at the end in the format 'Answer: **corresponding IPC/CPC number**'

{Question}

Let's think step by step.

H METRICS

In this section, we provide the details of the metrics used in our IPBench. The details of the multiple-choice question metric are in Section H.1, the details of the classification task metric are in Section H.2, and the details of the generation task are in Section H.3.

Table 20: The overview of evaluated models. Max Context refers to the maximum context length of the model without length extrapolation for all models.

Model	Size	Max Context	Type	Orientation	Access
GPT-4o (Hurst et al., 2024)	–	128k	Chat Model	General	OpenAI API
GPT-4o-mini (Hurst et al., 2024)	–	128k	Chat Model	General	OpenAI API
DeepSeek-V3 (DeepSeek-AI et al., 2024)	671B	128k	Chat Model	General	DeepSeek API
Qwen3 (Team, 2025a)	8B	32k	Chat Model	General	Weights
Qwen2.5-Instruct (Yang et al., 2024)	7/72B	32k	Chat Model	General	Weights
Llama3.1-Instruct (Dubey et al., 2024)	8/70B	32k	Chat Model	General	Weights
Gemma-2-Instruct (Riviere et al., 2024)	9/27B	8k	Chat Model	General	Weights
Mistral-7B-Instruct (Jiang, 2024)	7B	32k	Chat Model	General	Weights
MoZi-qwen (Ni et al., 2024)	7B	32k	Chat Model	IP	Weights
DISC-LawLLM (Yue et al., 2023; 2024)	6B	2048	Chat Model	Law	Weights
HanFei (He et al., 2023)	7B	2048	Chat Model	Law	Weights
DeepSeek-R1 (DeepSeek-AI et al., 2025)	671B	128k	Reasoning Model	General	DeepSeek API
Deepseek-R1-Distill-Qwen (DeepSeek-AI et al., 2025)	7B	32k	Reasoning Model	General	Weights
QwQ (Team, 2025b)	32B	32k	Reasoning Model	General	Weights

H.1 MULTI-CHOICE QUESTION METRIC

For multiple-choice questions, we use accuracy as the metric due to the straightforward nature of the judgment process. Each multiple-choice question has four options: A, B, C, and D. We use the same extraction method for each model’s response, compare the selected answer with the ground-truth option, and then compute the average accuracy. The average score ranges from 0 to 100, and is computed as shown in the Equation 1.

$$\text{Accuracy} = \frac{\text{Number of Correct Answers \#}}{\text{Total Number of Questions \#}} \quad (1)$$

H.2 IPC/CPC CLASSIFICATION TASK METRIC

For IPC/CPC classification task, we use exact-match as the metric. For example, in the IPC code A01B00/66, ‘A’ represents the Section, ‘01’ the Class, and ‘B’ the Subclass. If the model predicts ‘A’, it earns one point for the Section; if it predicts ‘A01’, it earns one point for the Class; and if it predicts ‘A01B’, it earns one point for the Subclass. If the entire code is predicted correctly, one point is awarded for the Exact Match. We evaluate all the test data to calculate the average exact-match score across these four levels. The difficulty increases as the model is required to make correct predictions at more levels.

H.3 GENERATION TASK METRIC

In this section, we provide the details of the LLM-as-a-judge approach used for LLMScore and analyze its consistency with human evaluation.

We design five evaluation dimensions for LLM-as-a-judge: Accuracy, Relevance, Completeness, Consistency, and Language-Style. The detailed definitions are provided in the prompts below. Each dimension is scored on a scale from 1 to 10 points. We use DeepSeek-V3 as the judge model because it achieves relatively better performance on the multiple-choice tasks, indicating solid knowledge in the intellectual property domain. In addition to the LLM-as-a-judge evaluation, we further sample 50 responses each from GPT-4o, DeepSeek-V3 and LLaMA3.1-8B-Instruct for the two tasks. These responses are assessed by three human experts using the same criteria as the LLM-as-a-judge framework. The results and the corresponding consistency between the LLM and human analysis are presented in Table 6.

We provide a consistency analysis between different metrics and human evaluations, including Kendall, Pearson, and Spearman coefficients. The higher the consistency coefficient, the better, indicating stronger consistency; the smaller the p-value, the better, indicating statistical significance. A smaller p-value, typically less than 0.05, indicates that the observed correlation is statistically significant.

LLMScore for Generation Task. For Task 4-1 and 4-2, we draw inspiration from the error taxonomy for abstract generation and dependent claims generation proposed in PatentEval (Zuo et al., 2024), and used five dimensions to evaluate the quality of the generated abstract. The specific prompt we use for LLM-as-a-judge in evaluating generation task are provided in code.

I DETAILS ABOUT EVALUATED MODELS

We provide details of the evaluated models, including their size, context length, type, and access method, as shown in Table 20.

J MORE DISCUSSION

The growing integration of LLMs into high-stakes domains demands rigorous, domain-specific evaluation frameworks. Among these domains, IP presents unique challenges that remain largely unaddressed in existing NLP benchmarks. IP tasks operate at the intersection of technical innovation and legal regulation, requiring precise reasoning over structured taxonomies (e.g., IPC/CPC classifications), formal legal constructs (e.g., claim scope and infringement logic), and high-stakes decisions (e.g., patentability, damages, licensing). Yet most LLM benchmarks either omit this domain or reduce it to surface-level tasks like summarization or basic classification.

This oversight poses real risks. As LLMs begin to influence decision-making pipelines in patent examination, IP analytics, or IP litigation support, the lack of tailored evaluation may lead to misleading conclusions about model capabilities. Moreover, the complexity of IP, spanning multiple jurisdictions, languages, legal doctrines, and technical fields, makes it an ideal stress test for measuring LLMs’ reasoning, memory, and generation under constraint.

Our work addressed this critical gap by introducing IPBench, a bilingual, multi-dimensional benchmark grounded in real-world IP tasks. The benchmark is built on a four-level task taxonomy adapted from Webb’s DoK theory, ranging from low-level recall to high-level creative synthesis. These levels are aligned not just with educational psychology but with actual workflows in patent offices, IP law firms, and technology transfer environments. Unlike prior benchmarks such as PatentEval (Zuo et al., 2024), which focus narrowly on a few patent tasks, IPBench spans 20 tasks across 8 IP mechanisms and includes both comprehension-based and generative formats.

Our empirical findings revealed several important trends and limitations in current LLMs. First, general-purpose models such as GPT-4o and DeepSeek-V3 consistently outperform law- and IP-specific models. This may seem counterintuitive, as vertical models like MoZi-qwen are explicitly trained on legal corpora. However, this underperformance likely results from a combination of overfitting, insufficient general reasoning capabilities, and inadequate coverage of the procedural and generative aspects of IP workflows. Vertical fine-tuning strategies may inadvertently narrow the model’s inferential space or induce catastrophic forgetting, degrading performance on multi-step reasoning tasks.

Second, our evaluation of reasoning-oriented models such as DeepSeek-R1 and QwQ-32B revealed that while they do not top the overall leaderboard, they outperform chat-based models on specific tasks requiring arithmetic logic, legal thresholds, or rule-based evaluation (e.g., compensation estimation or damages calculation). This supports the hypothesis that architecture matters: models with symbolic reasoning capabilities have a structural advantage in tasks where correctness hinges on numerical precision or multi-condition rule satisfaction.

Third, our analysis of prompting techniques showed mixed outcomes. Few-shot prompting improves performance on some models and tasks, particularly in instruction-following or retrieval-based scenarios. However, models like Llama3.1-8B-it show no consistent improvement, suggesting sensitivity to prompt design or training data mismatches. The CoT prompting, often touted as a reasoning enhancer, surprisingly leads to performance drops (0.40.6%) across models. Our error analysis attributes this to the injection of spurious reasoning paths and overthinking a phenomenon also observed in prior work (Zheng et al., 2025; Fan et al., 2025). In domains like IP, where many tasks hinge on memorized definitions or hierarchical rule structures, CoT may actually degrade performance by introducing incorrect logic.

Fourth, the performance on IPC/CPC classification is alarmingly low. Even the best model, DeepSeek-R1, achieves only a 10.8% Exact Match rate. These classification systems are essential for patent analytics, prior art search, and innovation tracking, and failure to resolve them accurately reflects fundamental limitations in LLMs’ ability to represent domain hierarchies, align semantic cues with technical structure, and disambiguate overlapping categories. These failures underscore a broader issue in LLM design: current architectures are not optimized for structured symbolic taxonomies or discrete label hierarchies that are common in regulatory domains.

We also introduced LLMScore, an automatic evaluation metric tailored to generative tasks in IP. Unlike traditional metrics such as BLEU and ROUGE, which are inadequate for legal text due to their lack of semantic granularity, LLMScore is based on the LLM-as-a-judge paradigm and evaluates responses across four human-aligned dimensions. Empirical results demonstrate that LLMScore correlates more strongly with human judgments and supports nuanced evaluation of claim and abstract generation, which are central to both patent drafting and retrieval.

Collectively, these results highlight not only current limitations in model generalization and prompting strategies but also the inherent complexity of the IP domain. This complexity arises from its hybrid nature: legal and technical, deterministic and interpretive, global and jurisdiction-specific. Benchmarks like IPBench are thus essential not only for evaluation but for guiding the next phase of model development.

Looking forward, we envision several extensions to IPBench and its applications. The current version focuses on U.S. and Chinese legal frameworks; future iterations will incorporate additional jurisdictions such as the EU and Japan, enabling cross-legal evaluation and comparative reasoning. Moreover, as more IP-specific models become available, IPBench can serve as a testbed for fine-tuning strategies, prompt engineering, and hybrid symbolicneural architectures. More broadly, IPBench offers a blueprint for evaluating LLMs in other complex verticalssuch as medicine, finance, or regulatory compliance, where task diversity, interpretability, and factual correctness are non-negotiable. By operationalizing cognitive depth and legal realism in benchmark design, we hope to catalyze the development of trustworthy, capable, and domain-aligned LLMs.

K MORE RESULTS

In Section Section K, we present additional results under various experimental settings, covering both Chinese and English. Specifically, Section K.1 reports the overall results on IPBench, Section K.2 presents the results for Chinese questions, Section K.3 covers the results for English questions, and Section K.4 provides detailed results of the LLM-as-a-judge evaluation along with its consistency with human judgments.

K.1 OVERALL RESULTS

We provide the results of overall performance under the few-shot setting (1-shot, 2-shot, and 3-shot) in Section K.1.1, and the results under the chain-of-thought setting in Section K.1.2. We provide a model performance heatmap as shown in Figure 5, where models are sorted by their overall performance. A redder color indicates that the model on the x-axis outperforms the corresponding model on the y-axis.

K.1.1 FEW-SHOT RESULTS

The 1-shot results of IPBench are presented in Table 21 and Table 22, the 2-shot results in Table 23 and Table 24, and the 3-shot results in Table 25 and Table 26.

K.1.2 CHAIN-OF-THOUGHT RESULTS

The chain-of-thought results of IPBench are presented in Table 27 and Table 28.

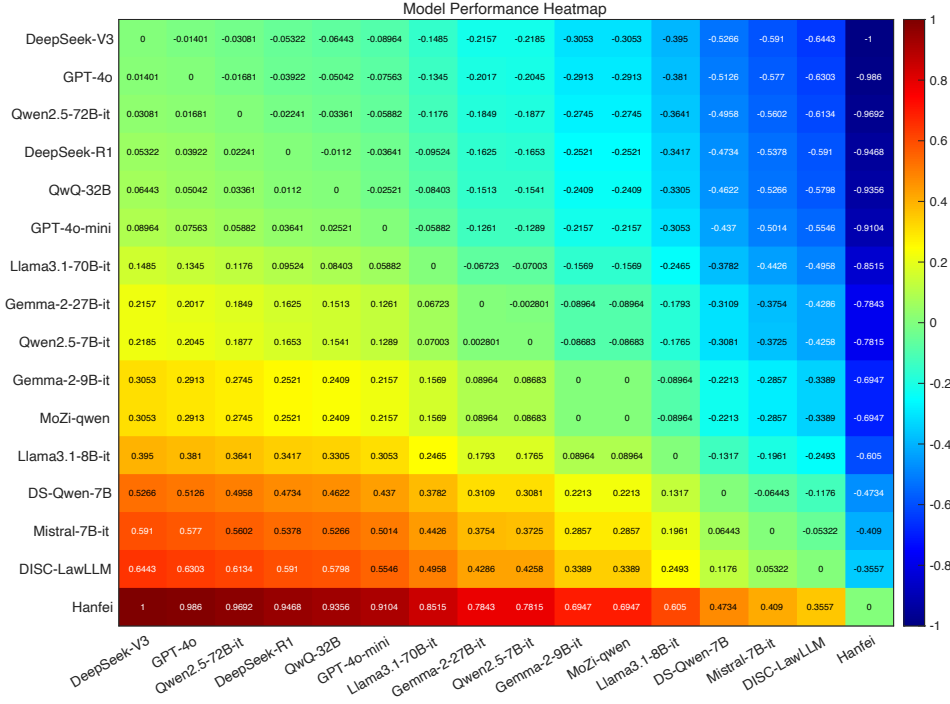


Figure 5: Model performance heatmap.

Table 21: Results of IPBench with 1-shot setting. The best-performing model in each task is in **darker red**, and the second best is in **lighter red**.

Model	OA	1-1	1-2	1-3	1-4	1-6	1-7	2-1	2-2	2-3	2-4	2-5	3-1	3-2	3-3	3-4	4-3
GPT-4o-mini	73.9	93.8	86.3	78.6	79.8	61.1	66.6	51.6	62.6	61.4	77.1	81.4	69.3	76.9	81.1	79.8	70.3
Qwen2.5-7B-it	67.5	94.2	82.5	76.4	72.8	60.8	63.5	48.8	62.0	52.2	70.4	76.1	69.0	69.5	55.6	79.5	62.1
Llama3.1-8B-it	59.3	87.0	69.7	67.4	72.0	50.7	64.6	46.0	57.6	43.7	69.4	45.9	60.0	69.8	36.8	73.2	57.1
Gemma-2-9B-it	66.4	89.2	74.3	71.0	73.2	55.6	60.8	50.8	65.0	50.0	72.8	82.7	70.0	70.8	53.9	75.7	69.5
Mistral-7B-it	54.8	79.0	61.6	63.4	59.9	43.4	52.9	44.6	57.4	36.4	61.8	62.1	60.3	48.4	39.4	67.2	57.1
MoZi-qwen	63.0	95.2	81.5	76.2	66.9	59.9	64.4	47.2	62.6	40.2	72.1	77.4	69.0	58.8	36.6	71.8	57.9
DISC-LawLLM	47.7	78.8	66.9	66.4	65.5	45.0	52.2	40.0	54.6	32.0	51.8	70.8	58.7	39.6	-	67.3	30.7
Hanfei	28.0	37.0	29.3	28.8	31.2	33.9	43.6	26.6	37.2	35.8	29.9	24.6	37.0	22.4	-	31.0	30.1

Table 22: Results of Patent IPC/CPC Classification tasks (1-5-1 and 1-5-2) with 1-shot setting. The best-performing model in each task is in **darker purple**, and the second best is in **lighter purple**.

Model	IPC Classification (1-5-1)				CPC Classification (1-5-2)			
	Exact-Match	Section	Class	Subclass	Exact-Match	Section	Class	Subclass
GPT-4o-mini	2.2	81.8	67.0	50.8	0.5	74.3	59.1	49.1
DeepSeek-V3	15.1	86.3	75.5	60.5	7.3	86.2	74.3	65.0
Qwen2.5-7B-it	2.2	73.8	57.9	42.2	0.3	67.5	48.8	37.2
Llama3.1-8B-it	0.7	64.1	49.7	33.7	0.0	45.2	35.2	22.2
MoZi-qwen	0.4	47.0	34.6	21.9	0.0	16.5	7.8	4.3

K.2 CHINESE QUESTIONS RESULTS

In Section Section K.2, we focus on the IPBench results for Chinese questions. We provide the zero-shot results for the Chinese portion of IPBench in Section K.2.1, the few-shot results in Section K.2.2, and the chain-of-thought results in Section K.2.3.

Table 23: Results of IPBench with 2-shot setting. The best-performing model in each task is in **darker red**, and the second best is in **lighter red**.

Model	OA	1-1	1-2	1-3	1-4	1-6	1-7	2-1	2-2	2-3	2-4	2-5	3-1	3-2	3-3	3-4	4-3
GPT-4o-mini	74.0	94.2	87.9	77.0	80.2	60.6	66.6	52.0	59.6	63.3	79.4	83.4	68.0	78.6	80.7	76.7	72.5
Qwen2.5-7B-it	69.3	94.8	83.3	76.0	77.0	59.9	65.0	47.8	60.4	56.0	71.8	83.7	67.7	69.5	65.9	81.5	57.7
Llama3.1-8B-it	59.3	85.8	67.3	68.4	69.6	52.3	61.7	48.0	56.6	45.6	71.4	66.8	60.0	61.4	37.8	69.8	53.9
Gemma-2-9B-it	67.3	89.0	76.3	71.4	72.2	56.3	61.1	51.4	62.8	52.2	74.7	84.7	66.7	72.4	57.4	78.0	70.3
Mistral-7B-it	57.2	79.8	64.1	64.6	61.5	44.4	53.8	47.0	56.6	38.0	65.1	73.1	61.8	48.7	47.1	67.5	56.5
MoZi-qwen	66.8	96.0	84.1	77.2	75.0	63.6	64.2	48.4	61.2	43.0	75.1	82.4	72.0	64.6	49.4	80.8	55.1
DISC-LawLLM	56.7	79.2	67.1	66.6	65.3	50.2	51.3	39.6	53.8	31.3	58.1	78.1	57.7	42.2	–	71.5	37.1
Hanfei	32.5	36.0	24.7	35.8	33.7	35.3	33.0	25.4	37.0	32.6	26.6	49.2	42.3	22.1	–	32.2	25.7

Table 24: Results of Patent IPC/CPC Classification tasks (1-5-1 and 1-5-2) with 2-shot setting. The best-performing model in each task is in **darker purple**, and the second best is in **lighter purple**.

Model	IPC Classification (1-5-1)				CPC Classification (1-5-2)			
	Exact-Match	Section	Class	Subclass	Exact-Match	Section	Class	Subclass
GPT-4o-mini	2.3	82.2	68.0	51.5	0.2	76.3	61.6	51.6
DeepSeek-V3	15.1	86.7	76.1	60.6	7.2	86.5	73.3	65.7
Qwen2.5-7B-it	2.5	78.2	62.4	46.2	0.3	68.5	51.2	38.8
Llama3.1-8B-it	1.1	59.7	44.7	29.2	0.0	63.3	45.7	26.7
MoZi-qwen	0.6	56.6	41.7	26.8	0.2	32.3	17.3	9.3

Table 25: Results of IPBench with 3-shot setting. The best-performing model in each task is in **darker red**, and the second best is in **lighter red**.

Model	OA	1-1	1-2	1-3	1-4	1-6	1-7	2-1	2-2	2-3	2-4	2-5	3-1	3-2	3-3	3-4	4-3
GPT-4o-mini	74.7	94.4	87.5	79.6	80.0	63.3	68.8	52.4	58.6	63.6	80.1	82.7	70.3	77.9	80.0	80.0	75.0
Qwen2.5-7B-it	70.6	94.2	83.3	73.6	76.0	62.2	68.2	50.8	62.2	51.3	74.8	84.7	70.7	72.4	68.5	82.2	60.3
Llama3.1-8B-it	59.4	87.4	67.0	66.4	69.8	52.7	63.7	45.6	55.4	43.0	66.4	75.4	61.0	62.7	36.7	70.5	56.3
Gemma-2-9B-it	67.4	89.4	76.1	70.6	70.6	56.6	62.5	51.2	62.2	51.6	76.4	85.1	68.3	69.5	58.7	76.3	70.7
Mistral-7B-it	56.5	80.6	63.9	62.8	61.7	45.9	54.4	47.4	56.0	36.1	64.1	73.8	63.3	50.3	40.1	67.8	58.1
MoZi-qwen	65.3	96.2	83.5	77.2	76.0	62.4	65.1	49.4	61.8	40.5	75.8	80.4	72.7	62.0	38.3	79.0	57.3
DISC-LawLLM	57.4	83.8	67.3	64.6	66.7	53.6	52.0	41.2	54.8	29.4	62.1	74.4	60.0	41.2	–	67.5	38.5
Hanfei	29.9	32.0	28.9	26.2	28.4	31.7	31.6	23.6	36.2	29.1	22.6	30.6	41.0	24.4	–	26.3	34.5

Table 26: Results of Patent IPC/CPC Classification tasks (1-5-1 and 1-5-2) with 3-shot setting. The best-performing model in each task is in **darker purple**, and the second best is in **lighter purple**.

Model	IPC Classification (1-5-1)				CPC Classification (1-5-2)			
	Exact-Match	Section	Class	Subclass	Exact-Match	Section	Class	Subclass
GPT-4o-mini	2.0	82.5	67.8	50.9	0.3	80.1	65.3	54.1
DeepSeek-V3	15.6	87.1	76.2	61.2	7.7	85.7	73.3	64.7
Qwen2.5-7B-it	2.3	78.8	62.7	46.8	0.5	68.3	50.8	38.8
Llama3.1-8B-it	1.2	65.6	48.9	32.8	0.0	64.8	45.8	29.8
MoZi-qwen	1.0	70.6	51.3	34.2	0.0	24.2	12.8	7.7

K.2.1 ZERO-SHOT RESULTS

The zero-shot results for the Chinese portion of IPBench are shown in Table 29, Table 30 and Table 31. Since the Patent CPC Classification task (1-5-2) only includes English questions, Table 30 does not include it.

Table 27: Results of IPBench with chain-of-thought setting. The best-performing model in each task is in **darker red**, and the second best is in **lighter red**.

Model	OA	1-1	1-2	1-3	1-4	1-6	1-7	2-1	2-2	2-3	2-4	2-5	3-1	3-2	3-3	3-4	3-5	4-3
GPT-4o-mini	72.0	94.4	85.9	78.0	80.4	59.9	67.3	51.4	62.6	62.0	74.8	80.4	65.7	71.1	81.1	78.8	44.9	66.9
Qwen2.5-7B-it	67.6	89.0	82.9	75.2	76.2	57.3	63.0	48.0	64.2	58.2	73.8	79.7	66.7	70.1	65.1	78.5	44.3	58.9
Llama3.1-8B-it	61.3	84.1	69.5	67.6	70.2	53.6	59.5	49.4	60.6	45.9	66.4	71.8	62.3	59.4	54.8	73.0	43.6	54.1
Gemma-2-9B-it	61.7	87.0	72.3	65.4	66.3	54.1	55.7	51.0	64.8	47.8	71.1	76.4	66.3	67.9	57.9	73.5	–	65.1
Mistral-7B-it	54.3	80.6	63.3	63.6	62.5	43.6	54.0	42.4	54.6	44.3	64.1	65.8	56.7	51.0	41.0	66.5	36.3	47.9
MoZi-qwen	60.2	93.0	79.9	72.0	65.3	50.2	61.9	45.2	52.4	45.2	66.8	72.4	58.3	62.7	49.2	71.0	43.9	44.1
DISC-LawLLM	37.3	65.4	57.4	48.6	39.3	42.8	41.4	25.4	34.8	25.9	32.2	62.8	26.7	25.7	17.5	39.0	–	30.5
Hanfei	29.9	42.0	28.5	32.4	34.1	30.6	26.8	28.8	29.6	21.5	25.9	24.3	34.3	26.6	24.6	31.7	–	35.3

Table 28: Results of Patent IPC/CPC Classification tasks (1-5-1 and 1-5-2) with chain-of-thought setting. The best-performing model in each task is in **darker purple**, and the second best is in **lighter purple**.

Model	IPC Classification (1-5-1)				CPC Classification (1-5-2)			
	Exact-Match	Section	Class	Subclass	Exact-Match	Section	Class	Subclass
GPT-4o-mini	0.2	80.4	67.4	51.6	0.0	76.8	63.0	52.5
DeepSeek-V3	1.3	82.3	72.0	57.4	1.0	83.3	70.7	63.0
Qwen2.5-7B-it	1.8	74.3	60.4	42.0	0.5	60.2	46.0	35.7
Llama3.1-8B-it	0.9	67.0	50.5	32.4	0.2	64.0	44.8	29.5
MoZi-qwen	0.3	22.4	17.2	12.6	0.0	7.7	2.8	1.8

Table 29: Chinese questions results of IPBench. The best-performing model in each task is in **darker red**, and the second best is in **lighter red**. The model DS-Qwen refers to DeepSeek-R1-Distill-Qwen, while the suffix *it* indicates the Instruct version of the model. OA denotes the overall average accuracy on the choice tasks.

Model	OA	1-1	1-2	1-3	1-4	1-6	1-7	2-1	2-2	2-3	2-4	2-5	3-1	3-2	3-3	3-4	4-3
GPT-4o	77.7	95.0	92.4	82.0	80.6	73.1	73.7	50.8	73.7	67.3	70.0	84.1	66.9	63.5	80.2	82.9	79.0
GPT-4o-mini	74.2	91.9	86.2	76.9	80.6	65.1	66.6	44.4	66.2	57.7	66.9	83.4	58.8	80.5	82.2	77.9	72.6
DeepSeek-V3	78.7	97.3	90.2	87.1	83.0	76.3	72.1	48.0	74.1	65.4	70.5	84.1	67.5	71.1	78.2	83.9	84.8
Qwen3	73.2	95.4	85.5	75.9	79.8	68.3	68.2	43.6	74.1	55.8	65.5	82.7	62.5	73.0	67.4	78.3	77.4
Qwen2.5-72B-it	77.9	96.5	92.4	82.0	81.8	69.8	70.5	48.0	81.1	62.2	74.8	82.1	67.5	68.6	81.8	79.3	82.6
Qwen2.5-7B-it	70.8	93.8	85.9	72.4	77.1	64.5	63.6	47.6	76.3	51.9	66.9	77.1	60.6	66.7	67.6	78.3	68.0
Llama3.1-70B-it	70.8	91.5	81.9	71.4	76.2	66.6	66.9	47.2	71.9	48.7	66.9	81.1	66.3	66.7	63.0	78.3	77.4
Llama3.1-8B-it	65.1	88.4	73.6	65.7	78.6	63.6	58.4	50.4	69.3	41.7	62.6	75.7	58.8	57.2	55.8	79.3	55.8
Gemma-2-27B-it	69.2	88.8	78.3	66.0	75.4	60.4	60.1	47.2	77.2	53.2	66.2	81.1	66.3	61.6	62.8	80.2	76.8
Gemma-2-9B-it	65.5	91.5	75.4	68.4	63.5	67.5	57.5	45.2	73.7	45.5	59.7	80.4	62.5	57.9	51.4	73.7	68.9
Mistral-7B-it	54.1	74.1	58.3	55.4	58.7	44.1	51.6	45.6	60.5	40.4	48.2	67.0	53.1	29.6	47.4	60.1	59.5
MoZi-qwen	67.9	93.1	86.2	73.1	59.1	69.2	64.6	48.4	64.0	41.0	56.8	76.4	60.0	57.9	64.0	82.0	65.5
DISC-LawLLM	55.0	86.9	69.2	64.6	63.5	64.5	49.7	38.0	66.7	40.4	46.8	64.8	50.6	37.7	28.4	72.8	41.5
Hanfei	39.9	65.3	46.7	50.3	53.2	45.9	51.3	28.4	43.4	26.9	36.7	49.2	41.9	20.1	10.0	45.2	35.1
DeepSeek-R1	76.6	95.8	91.3	84.4	79.4	74.0	73.1	44.8	76.8	66.0	67.6	85.4	59.4	78.6	64.8	84.3	82.9
DS-Qwen-7B	58.2	79.2	59.1	50.7	63.9	51.2	49.4	44.0	53.5	38.5	49.6	65.5	50.6	64.8	63.6	63.6	63.7
QwQ-32B	76.4	94.6	93.1	79.3	79.8	76.9	73.7	50.0	77.2	66.7	74.8	85.4	64.4	80.5	65.6	77.4	75.0

K.2.2 FEW-SHOT RESULTS

The 1-shot results for the Chinese portion of IPBench are shown in Table 32 and Table 33, the 2-shot results in Table 34 and Table 35 and the 3-shot results in Table 36 and Table 37.

Table 30: Results of Chinese Patent IPC Classification task (1-5-1). The best-performing model in each task is in **darker purple**, and the second best is in **lighter purple**.

Model	IPC Classification (1-5-1)			
	Exact-Match	Section	Class	Subclass
GPT-4o	8.0	76.4	70.5	62.1
GPT-4o-mini	1.0	76.0	66.1	53.7
DeepSeek-V3	20.2	80.4	72.8	66.3
Qwen3	3.4	76.8	61.0	47.6
Qwen2.5-72B-it	8.0	79.8	71.0	62.3
Qwen2.5-7B-it	2.3	68.6	57.9	46.3
Llama3.1-70B-it	5.0	77.9	64.8	55.2
Llama3.1-8B-it	0.4	65.1	51.8	34.1
Gemma-2-27B-it	1.0	72.4	56.4	45.9
Gemma-2-9B-it	0.0	66.3	51.0	34.9
Mistral-7B-it	0.0	49.9	26.1	16.8
MoZi-qwen	0.4	34.3	25.5	16.8
DISC-LawLLM	0.0	51.2	30.9	15.5
Hanfei	0.0	17.2	4.2	0.2
DeepSeek-R1	19.6	83.2	75.4	67.6
DS-Qwen-7B	0.0	29.3	8.5	1.2
QwQ-32B	3.9	80.9	71.5	60.7

Table 31: Results of Chinese generation tasks (4-1 and 4-2). The best-performing model in each task is in **darker blue**, and the second best is in **lighter blue**. R-L refers to ROUGE-L, BS refers to BERTScore, LLMscore refers to GPT-4 judge score (1-10), Avg Tokens # denotes the average number of tokens in the generated text, and Avg DC # indicates the average number of generated dependent claims.

Model	Abstract Generation (4-1)					Dependent Claim Generation (4-2)					
	BLEU	R-L	BS	LLMScore (1-10)	Tokens # (167.9)	BLEU	R-L	BS	LLMScore (1-10)	Tokens # (457.8)	DC # (4.1)
GPT-4o	17.7	34.8	91.0	8.77	278.7	12.7	25.0	90.3	6.30	658.3	6.8
GPT-4o-mini	17.9	35.2	90.9	8.51	224.9	15.0	28.6	90.3	6.09	497.9	11.8
DeepSeek-V3	12.4	29.9	90.5	8.92	273.8	10.8	23.4	90.0	7.36	799.7	14.9
Qwen2.5-72B-it	13.7	30.8	90.8	8.50	379.6	9.6	20.3	90.6	6.60	1374.2	17.4
Qwen2.5-7B-it	20.5	36.8	91.1	8.29	190.4	11.0	21.5	90.6	5.64	3453.3	43.5
Llama3.1-70B-it	24.9	40.3	91.1	7.89	261.2	7.3	19.8	89.7	4.99	4045.2	43.0
Llama3.1-8B-it	11.9	26.7	90.2	7.16	554.9	4.7	13.1	90.1	3.09	4932.2	36.1
Gemma-2-27B-it	14.7	30.6	90.2	7.74	215.5	6.5	19.1	88.6	5.46	678.5	3.1
Gemma-2-9B-it	17.7	33.9	90.6	8.07	247.8	5.7	20.8	88.3	5.15	577.1	5.8
Mistral-7B-it	11.8	26.2	90.4	7.24	479.5	3.5	10.7	88.8	2.13	4968.3	44.0
MoZi-qwen	31.3	53.4	91.6	7.91	335.9	7.7	28.6	90.3	4.28	8306.6	59.8
DeepSeek-R1	8.9	28.0	89.3	7.89	671.0	9.3	26.8	81.8	7.17	1374.2	15.8
DS-Qwen-7B	12.4	36.1	90.3	7.80	918.2	5.4	32.5	81.8	3.69	9878.2	89.8
QwQ-32B	11.1	33.6	90.2	8.84	1403.8	5.4	22.6	80.8	7.05	5360.0	37.8

K.2.3 CHAIN-OF-THOUGHT RESULTS

The chain-of-thought results for the Chinese portion of IPBench are presented in Table 38 and Table 39.

Table 32: Chinese questions results of IPBench with 1-shot setting. The best-performing model in each task is in **darker red**, and the second best is in **lighter red**.

Model	OA	1-1	1-2	1-3	1-4	1-6	1-7	2-1	2-2	2-3	2-4	2-5	3-1	3-2	3-3	3-4	4-3
GPT-4o-mini	73.1	91.5	85.9	72.5	76.6	67.2	65.9	43.6	68.9	53.2	66.9	81.4	63.1	74.2	79.2	77.0	76.5
Qwen2.5-7B-it	69.9	94.6	86.2	72.5	73.8	71.0	66.6	43.6	71.5	50.0	59.7	76.1	58.1	64.2	60.0	82.5	70.1
Llama3.1-8B-it	58.9	81.5	64.1	60.9	73.0	59.2	61.7	43.6	69.3	38.4	61.2	45.9	56.3	64.8	38.0	73.2	65.6
Gemma-2-9B-it	68.1	86.9	74.3	67.4	69.4	64.8	60.7	46.8	79.4	45.5	67.6	82.7	64.4	64.8	56.8	74.7	79.0
Mistral-7B-it	53.7	71.0	56.2	58.5	59.5	47.0	52.3	38.8	66.2	42.3	43.2	62.1	53.8	35.2	41.4	65.4	61.6
MoZi-qwen	67.5	95.0	87.3	73.8	61.9	71.0	63.0	44.8	71.9	39.4	64.0	77.4	63.1	60.4	48.2	80.7	71.7
DISC-LawLLM	55.7	79.2	68.8	62.9	69.1	51.5	44.8	38.8	56.6	35.9	46.0	70.8	55.6	38.4	–	75.1	31.1
Hanfei	31.6	34.0	23.9	23.1	33.7	33.1	49.0	24.0	49.1	35.9	29.5	24.6	38.1	18.9	–	33.6	27.4

Table 33: Results of Chinese Patent IPC Classification task (1-5-1) with 1-shot setting. The best-performing model in each task is in **darker purple**, and the second best is in **lighter purple**.

Model	IPC Classification (1-5-1)			
	Exact-Match	Section	Class	Subclass
GPT-4o-mini	3.6	76.8	67.1	54.9
DeepSeek-V3	30.2	82.4	75.4	68.9
Qwen2.5-7B-it	3.8	59.6	50.9	39.6
Llama3.1-8B-it	0.8	45.9	36.4	25.5
MoZi-qwen	0.0	11.6	8.2	3.6

Table 34: Chinese questions results of IPBench with 2-shot setting. The best-performing model in each task is in **darker red**, and the second best is in **lighter red**.

Model	OA	1-1	1-2	1-3	1-4	1-6	1-7	2-1	2-2	2-3	2-4	2-5	3-1	3-2	3-3	3-4	4-3
GPT-4o-mini	73.5	91.9	87.3	69.1	76.2	66.3	67.2	44.8	64.5	58.3	69.8	83.4	60.0	73.0	81.0	73.7	78.7
Qwen2.5-7B-it	70.8	95.0	86.2	70.8	76.2	69.5	68.8	39.6	68.9	51.9	63.3	83.7	54.4	60.4	67.2	83.0	65.6
Llama3.1-8B-it	58.9	79.5	63.4	63.6	69.8	58.3	59.1	46.8	64.0	36.5	65.5	66.8	53.1	54.7	38.0	66.4	61.3
Gemma-2-9B-it	68.7	86.5	76.1	66.7	70.6	65.4	60.4	46.8	75.9	46.8	68.4	84.7	61.3	63.5	58.6	77.9	79.6
Mistral-7B-it	56.6	73.0	58.0	58.5	63.1	49.1	52.6	44.4	63.2	42.3	51.1	73.1	55.6	37.1	48.6	66.4	61.0
MoZi-qwen	70.3	95.8	87.3	75.2	76.6	74.9	65.3	47.6	71.1	43.6	67.6	82.4	68.1	61.0	52.2	83.4	70.1
DISC-LawLLM	57.6	76.5	66.3	62.9	68.3	56.8	45.8	38.0	56.1	36.5	51.1	78.1	54.4	34.6	–	74.7	43.9
Hanfei	31.7	30.5	19.6	40.1	30.2	35.2	34.4	25.6	35.5	22.4	25.9	49.2	44.4	12.0	–	32.7	32.3

Table 35: Results of Chinese Patent IPC Classification task (1-5-1) with 2-shot setting. The best-performing model in each task is in **darker purple**, and the second best is in **lighter purple**.

Model	IPC Classification (1-5-1)			
	Exact-Match	Section	Class	Subclass
GPT-4o-mini	2.5	75.4	65.9	54.5
DeepSeek-V3	29.4	82.8	76.0	69.1
Qwen2.5-7B-it	3.6	70.5	60.0	47.6
Llama3.1-8B-it	1.0	34.9	28.4	18.9
MoZi-qwen	0.4	29.9	23.1	15.4

Table 36: Chinese questions results of IPBench with 3-shot setting. The best-performing model in each task is in **darker red**, and the second best is in **lighter red**.

Model	OA	1-1	1-2	1-3	1-4	1-6	1-7	2-1	2-2	2-3	2-4	2-5	3-1	3-2	3-3	3-4	4-3
GPT-4o-mini	74.7	91.5	87.3	73.5	77.0	70.1	67.9	47.2	64.0	59.6	71.9	82.7	62.5	73.6	80.6	79.3	79.3
Qwen2.5-7B-it	72.1	95.0	84.4	69.4	77.0	71.6	69.8	45.6	73.7	43.6	65.5	84.7	58.1	65.4	69.6	83.4	68.9
Llama3.1-8B-it	59.3	81.1	60.9	59.5	68.7	60.9	64.0	47.6	57.5	32.1	58.3	75.4	53.1	55.3	37.8	67.7	64.6
Gemma-2-9B-it	68.7	87.6	75.0	66.0	69.0	64.5	63.3	47.6	75.0	48.1	69.8	85.1	63.8	61.6	60.0	76.5	77.4
Mistral-7B-it	56.3	72.2	59.8	56.8	65.1	51.2	53.6	45.6	62.3	41.0	52.5	73.8	58.1	39.0	43.4	65.4	60.7
MoZi-qwen	69.2	95.8	87.0	74.5	75.8	72.5	65.3	51.2	70.6	37.8	68.4	80.4	67.5	55.4	47.4	81.6	72.9
DISC-LawLLM	58.0	81.9	69.2	60.9	70.6	61.0	47.4	40.4	53.5	35.9	53.2	74.4	58.1	34.0	–	67.7	43.9
Hanfei	30.1	27.8	22.8	28.9	25.8	34.3	34.7	27.2	41.7	24.4	20.9	30.6	43.1	22.0	–	27.2	39.9

Table 37: Results of Chinese Patent IPC Classification task (1-5-1) with 3-shot setting. The best-performing model in each task is in **darker purple**, and the second best is in **lighter purple**.

Model	IPC Classification (1-5-1)			
	Exact-Match	Section	Class	Subclass
GPT-4o-mini	2.3	76.4	66.3	55.6
DeepSeek-V3	29.4	83.8	76.9	70.8
Qwen2.5-7B-it	3.6	71.1	60.2	48.0
Llama3.1-8B-it	0.4	46.1	33.9	23.2
MoZi-qwen	0.6	59.4	42.1	31.4

Table 38: Chinese questions results of IPBench with chain-of-thought setting. The best-performing model in each task is in **darker red**, and the second best is in **lighter red**.

Model	OA	1-1	1-2	1-3	1-4	1-6	1-7	2-1	2-2	2-3	2-4	2-5	3-1	3-2	3-3	3-4	4-3
GPT-4o-mini	72.4	92.3	84.1	70.8	77.8	65.4	66.9	45.2	68.9	59.6	60.4	80.4	57.5	66.0	81.00	75.1	71.3
Qwen2.5-7B-it	70.9	93.4	86.2	72.8	79.4	63.0	65.3	46.0	74.1	55.1	61.9	79.7	59.4	69.8	67.00	78.3	67.1
Llama3.1-8B-it	62.3	83.4	63.8	62.9	66.7	58.3	55.8	52.4	66.7	39.1	51.8	71.8	58.8	51.6	62.20	71.4	61.0
Gemma-2-9B-it	63.1	85.3	69.9	57.8	63.1	59.8	52.3	46.8	75.0	49.4	59.7	76.4	59.4	61.0	53.80	67.3	70.7
Mistral-7B-it	54.5	76.1	55.8	57.8	60.3	48.8	50.0	45.6	59.7	45.5	51.1	65.8	56.9	39.6	44.80	61.8	54.3
MoZi-qwen	60.5	91.5	80.4	64.6	57.9	55.3	60.7	39.2	54.8	44.9	54.0	72.4	45.0	55.3	58.00	65.9	45.4
DISC-LawLLM	52.5	83.8	66.3	62.9	63.5	61.0	49.0	37.2	58.8	25.6	48.2	62.8	43.8	37.7	30.40	60.4	41.5
Hanfei	29.1	44.0	25.0	35.0	37.7	34.9	26.3	24.8	25.9	22.4	25.2	24.3	35.0	17.6	23.00	24.4	38.4

Table 39: Results of Chinese Patent IPC Classification task (1-5-1) with chain-of-thought setting. The best-performing model in each task is in **darker purple**, and the second best is in **lighter purple**.

Model	IPC Classification (1-5-1)			
	Exact-Match	Section	Class	Subclass
GPT-4o-mini	0.4	75.4	67.6	56.0
DeepSeek-V3	2.5	77.1	70.9	64.2
Qwen2.5-7B-it	1.7	58.7	50.1	36.4
Llama3.1-8B-it	0.2	56.6	41.3	26.7
MoZi-qwen	0.0	3.6	2.9	2.1

K.3 ENGLISH QUESTIONS RESULTS

In Section Section K.3, we focus on the IPBench results for English questions. We provide the zero-shot results for the English portion of IPBench in Section K.3.1, the few-shot results in Section K.3.2, and the chain-of-thought results in Section K.3.3.

K.3.1 ZERO-SHOT RESULTS

The zero-shot results for the English portion of IPBench are shown in Table 40, Table 41 and Table 42.

Table 40: English questions results of IPBench. The best-performing model in each task is in **darker red**, and the second best is in **lighter red**. The model DS-Qwen refers to DeepSeek-R1-Distill-Qwen, while the suffix *it* indicates the Instruct version of the model. OA denotes the overall average accuracy on the choice tasks.

Model	OA	1-1	1-2	1-3	1-4	1-6	1-7	2-1	2-2	2-3	2-4	3-1	3-2	3-3	3-4	3-5	4-3
GPT-4o	73.2	97.1	91.6	82.5	86.9	50.7	69.6	58.8	53.3	60.6	85.8	75.7	77.2	82.4	84.2	50.0	68.4
GPT-4o-mini	71.4	97.1	88.9	85.0	83.7	49.3	68.8	56.0	62.1	61.3	85.2	77.1	69.2	81.0	79.2	44.0	54.4
DeepSeek-V3	72.9	95.9	90.3	90.3	82.5	50.7	67.1	65.6	55.9	66.9	82.1	77.1	79.2	79.6	83.1	44.6	67.3
Qwen3	68.2	93.4	80.1	73.8	73.4	49.8	65.0	59.2	60.7	65.0	83.3	77.9	75.8	73.6	77.6	44.0	49.7
Qwen2.5-72B-it	71.6	95.4	88.1	87.4	85.3	48.4	67.5	60.8	54.4	63.8	85.2	76.4	78.5	78.0	82.5	43.3	61.4
Qwen2.5-7B-it	65.2	90.9	80.1	84.0	77.4	49.3	60.0	51.2	54.4	62.5	80.9	75.7	75.8	64.0	78.1	38.9	41.5
Llama3.1-70B-it	70.3	96.3	89.4	86.4	83.3	48.4	67.1	58.8	58.8	58.1	81.5	75.0	82.6	71.2	77.6	45.2	59.7
Llama3.1-8B-it	58.2	92.5	78.8	71.8	64.0	37.0	62.9	44.8	47.6	47.5	79.0	61.4	66.4	45.4	74.9	41.7	45.6
Gemma-2-27B-it	67.0	92.5	83.2	83.5	79.8	45.7	62.9	59.6	54.8	58.8	85.2	72.9	71.1	51.6	80.3	–	48.0
Gemma-2-9B-it	64.3	91.7	81.9	79.6	59.5	45.7	61.7	57.2	55.1	48.1	79.6	70.0	76.5	52.4	78.7	–	49.1
Mistral-7B-it	55.4	85.5	70.8	68.0	61.5	35.2	57.1	41.6	52.2	44.4	77.8	59.3	63.1	40.4	71.0	43.9	45.0
MoZi-qwen	61.8	94.6	79.6	82.5	73.0	41.6	63.8	52.8	52.9	42.5	77.2	77.1	71.1	48.2	75.4	43.9	40.9
DISC-LawLLM	50.2	70.5	60.6	71.8	56.8	39.3	55.0	43.6	55.2	22.5	71.6	57.1	53.0	28.0	69.4	–	23.4
Hanfei	40.3	60.6	46.0	53.9	37.7	30.6	42.1	33.2	47.4	40.6	44.4	43.6	37.6	27.8	53.0	–	18.7
DeepSeek-R1	71.6	96.3	92.9	92.2	82.1	51.1	70.0	62.4	54.4	77.5	87.0	67.9	77.9	69.6	79.2	47.5	57.9
DS-Qwen-7B	56.0	76.4	58.9	58.3	50.4	48.0	52.5	43.6	49.3	53.8	82.1	57.9	59.1	63.8	63.8	43.6	38.0
QwQ-32B	70.7	95.9	88.5	85.4	75.8	47.0	68.8	64.8	57.7	74.4	84.6	75.7	83.9	69.0	76.5	47.1	59.7

Table 41: Results of English Patent IPC/CPC Classification tasks (1-5-1 and 1-5-2). The best-performing model in each task is in **darker purple**, and the second best is in **lighter purple**.

Model	IPC Classification (1-5-1)				CPC Classification (1-5-2)			
	Exact-Match	Section	Class	Subclass	Exact-Match	Section	Class	Subclass
GPT-4o	2.0	86.2	72.0	49.0	3.3	82.7	69.7	62.0
GPT-4o-mini	1.0	84.5	67.5	47.0	0.5	79.0	64.5	52.7
DeepSeek-V3	2.3	86.7	73.8	51.3	9.5	84.0	73.3	65.2
Qwen3	2.2	84.0	68.2	48.3	0.5	62.7	48.3	38.7
Qwen2.5-72B-it	2.2	84.7	69.8	49.0	2.5	81.5	69.5	60.7
Qwen2.5-7B-it	1.5	84.0	67.5	46.8	0.2	65.5	44.8	34.8
Llama3.1-70B-it	2.2	82.7	66.3	45.3	1.0	79.5	64.3	52.7
Llama3.1-8B-it	1.3	77.7	60.0	37.3	0.0	63.8	45.0	30.7
Gemma-2-27B-it	1.3	73.3	58.3	37.7	0.2	70.5	56.7	44.3
Gemma-2-9B-it	0.5	80.2	59.7	39.2	0.2	56.2	39.0	26.7
Mistral-7B-it	0.2	82.3	57.3	35.5	0.0	39.0	21.5	10.3
MoZi-qwen	0.8	42.8	33.2	23.3	0.0	8.5	3.1	1.8
DISC-LawLLM	0.0	83.0	61.3	39.5	0.0	31.0	23.4	11.5
Hanfei	0.0	6.9	0.0	0.0	0.0	0.9	0.0	0.0
DeepSeek-R1	3.2	88.0	74.0	52.0	8.5	82.5	71.2	63.2
DS-Qwen-7B	0.0	12.9	5.5	1.7	0.0	5.1	0.5	0.2
QwQ-32B	2.0	86.3	69.5	47.7	0.5	76.0	62.3	51.3

K.3.2 FEW-SHOT RESULTS

The 1-shot results for the English portion of IPBench are shown in Table 43 and Table 44, the 2-shot results in Table 45 and Table 46 and the 3-shot results in Table 47 and Table 48.

Table 42: Results of English generation tasks (4-1 and 4-2). The best-performing model in each task is in **darker blue**, and the second best is in **lighter blue**. R-L refers to ROUGE-L, BS refers to BERTScore, LLMscore refers to GPT-4 judge score (1-10), Avg Tokens # denotes the average number of generated tokens, and Avg DC # denotes the average number of generated dependent claims.

Model	Abstract Generation (4-1)					Dependent Claim Generation (4-2)					
	BLEU	R-L	BS	LLMScore (1-10)	Tokens # (129.0)	BLEU	R-L	BS	LLMScore (1-10)	Tokens # (417.4)	DC # (13.1)
GPT-4o	17.7	27.3	87.7	8.07	264.2	25.2	28.0	87.4	6.97	637.4	6.2
GPT-4o-mini	28.8	28.6	88.4	7.59	211.3	25.5	28.0	86.5	6.66	458.4	1.1
DeepSeek-V3	26.7	26.8	87.4	7.84	218.3	27.4	30.1	88.0	7.54	583.7	14.8
Qwen2.5-72B-it	28.3	30.4	88.3	8.17	272.5	10.3	13.9	87.8	6.01	6207.6	120.8
Qwen2.5-7B-it	34.2	34.6	89.3	8.07	227.9	19.2	23.1	87.8	5.71	3569.3	48.0
Llama3.1-70B-it	37.1	36.1	89.7	8.07	191.8	24.8	27.8	86.5	6.36	543.6	13.6
Llama3.1-8B-it	28.4	30.1	88.1	7.79	359.7	11.4	14.6	86.7	4.64	7643.6	145.4
Gemma-2-27B-it	24.7	24.4	87.6	7.54	171.2	23.8	26.1	86.0	6.49	486.1	3.4
Gemma-2-9B-it	25.5	24.9	87.4	7.76	190.7	23.8	25.6	86.0	5.95	446.7	7.0
Mistral-7B-it	28.6	28.6	88.4	7.75	243.9	10.9	12.8	87.3	4.72	8117.8	148.5
MoZi-qwen	31.1	48.6	89.1	7.56	296.8	24.8	40.3	87.7	5.34	1936.5	35.5
DeepSeek-R1	18.7	27.6	85.7	7.55	613.6	23.8	31.8	61.1	7.19	1231.6	22.4
DS-Qwen-7B	7.0	9.7	76.8	7.36	686.9	17.9	32.2	56.2	4.62	2315.7	18.4
QwQ-32B	22.2	30.4	85.6	8.17	849.5	19.8	29.1	63.1	7.14	4635.4	45.7

Table 43: English questions results of IPBench with 1-shot setting. The best-performing model in each task is in **darker red**, and the second best is in **lighter red**.

Model	OA	1-1	1-2	1-3	1-4	1-6	1-7	2-1	2-2	2-3	2-4	3-1	3-2	3-3	3-4	4-3
GPT-4o-mini	75.4	96.3	86.7	87.4	82.9	52.1	67.5	59.6	57.4	69.4	85.8	63.1	79.9	83.0	83.1	58.5
Qwen2.5-7B-it	65.1	93.8	77.9	82.0	71.8	45.2	59.6	54.0	54.0	54.4	79.6	58.1	75.2	51.2	76.0	46.8
Llama3.1-8B-it	59.9	93.0	76.5	76.7	71.0	37.9	68.3	48.4	47.8	48.8	76.5	56.3	75.2	35.6	73.2	40.9
Gemma-2-9B-it	64.6	91.7	74.3	76.2	77.0	41.6	60.8	54.8	52.9	54.4	77.2	64.4	77.2	51.0	77.0	51.5
Mistral-7B-it	56.2	87.6	68.1	70.4	60.3	37.9	53.8	50.4	50.0	30.6	77.8	53.8	62.4	37.4	69.4	48.5
MoZi-qwen	57.6	95.4	74.4	79.6	71.8	42.9	66.3	49.6	54.8	39.4	79.0	63.1	57.1	25.0	61.2	31.6
DISC-LawLLM	54.1	78.4	64.6	71.4	61.9	35.2	61.7	41.2	52.9	28.1	56.8	55.6	40.9	–	57.9	29.8
Hanfei	32.9	40.3	35.8	36.9	28.6	35.2	36.7	29.2	27.2	35.6	30.3	38.1	26.2	–	27.9	35.1

Table 44: Results of English Patent IPC/CPC Classification tasks (1-5-1 and 1-5-2) with 1-shot setting. The best-performing model in each task is in **darker purple**, and the second best is in **lighter purple**.

Model	IPC Classification (1-5-1)				CPC Classification (1-5-2)			
	Exact-Match	Section	Class	Subclass	Exact-Match	Section	Class	Subclass
GPT-4o-mini	1.0	86.2	67.0	47.3	0.5	74.3	59.1	49.1
DeepSeek-V3	2.0	89.7	75.7	53.2	7.3	86.2	74.3	65.0
Qwen2.5-7B-it	0.8	86.2	64.0	44.5	0.3	67.5	48.8	37.2
Llama3.1-8B-it	0.6	80.0	61.3	40.8	0.0	45.2	35.2	22.2
MoZi-qwen	0.7	78.0	57.7	37.8	0.0	16.5	7.8	4.3

K.3.3 CHAIN-OF-THOUGHT RESULTS

The chain-of-thought results for the English portion of IPBench are presented in Table 49 and Table 50.

Table 45: English questions results of IPBench with 2-shot setting. The best-performing model in each task is in **darker red**, and the second best is in **lighter red**.

Model	OA	1-1	1-2	1-3	1-4	1-6	1-7	2-1	2-2	2-3	2-4	3-1	3-2	3-3	3-4	4-3
GPT-4o-mini	75.2	96.7	88.5	88.4	84.1	52.1	65.8	59.2	55.5	68.1	87.7	77.1	84.6	80.4	80.3	60.8
Qwen2.5-7B-it	68.3	94.6	79.7	83.5	77.8	45.2	60.0	56.0	53.3	60.0	79.0	82.9	79.2	64.6	79.8	42.7
Llama3.1-8B-it	60.1	92.5	72.1	75.2	69.4	43.4	65.0	49.2	50.4	54.4	76.5	67.9	68.5	37.6	73.8	39.8
Gemma-2-9B-it	66.0	91.7	76.5	78.2	73.8	42.5	62.1	56.0	51.8	57.5	80.2	72.9	81.9	56.2	78.1	52.6
Mistral-7B-it	58.0	87.1	71.7	73.3	59.9	37.4	55.4	49.6	51.1	33.8	77.2	68.8	61.1	45.6	68.9	48.0
MoZi-qwen	62.7	96.3	80.1	80.1	73.4	46.6	62.9	49.2	52.9	42.5	81.5	76.4	68.5	46.6	77.6	26.3
DISC-LawLLM	55.8	82.2	68.1	71.8	62.3	40.2	58.3	41.2	51.8	26.3	64.2	61.4	50.3	–	67.8	24.0
Hanfei	32.8	41.9	31.0	29.6	37.3	35.6	31.3	25.2	38.2	42.5	27.2	40.0	32.9	–	31.7	12.9

Table 46: Results of English Patent IPC/CPC Classification tasks (1-5-1 and 1-5-2) with 2-shot setting. The best-performing model in each task is in **darker purple**, and the second best is in **lighter purple**.

Model	IPC Classification (1-5-1)				CPC Classification (1-5-2)			
	Exact-Match	Section	Class	Subclass	Exact-Match	Section	Class	Subclass
GPT-4o-mini	2.17	88.2	69.8	48.8	0.2	76.3	61.6	51.6
DeepSeek-V3	2.67	90.2	76.2	53.2	7.2	86.5	73.3	65.7
Qwen2.5-7B-it	1.50	85.0	64.5	45.0	0.3	68.5	51.2	38.8
Llama3.1-8B-it	1.30	81.5	59.0	38.2	0.0	63.3	45.7	26.7
MoZi-qwen	0.83	80.0	58.0	36.7	0.2	32.3	17.3	9.3

Table 47: English questions results of IPBench with 3-shot setting. The best-performing model in each task is in **darker red**, and the second best is in **lighter red**.

Model	OA	1-1	1-2	1-3	1-4	1-6	1-7	2-1	2-2	2-3	2-4	3-1	3-2	3-3	3-4	4-3
GPT-4o-mini	74.7	97.5	87.6	88.4	82.9	53.0	70.0	57.6	54.0	67.5	87.0	79.3	82.6	79.4	80.9	66.7
Qwen2.5-7B-it	70.6	93.4	81.9	79.6	75.0	48.0	66.3	56.0	52.6	58.8	82.7	85.0	79.9	67.4	80.9	43.9
Llama3.1-8B-it	59.4	94.2	74.4	76.3	71.0	40.2	63.3	43.6	53.7	53.8	73.5	70.0	70.5	35.6	73.8	40.4
Gemma-2-9B-it	67.4	91.3	77.4	77.2	72.2	44.7	61.4	54.8	51.5	55.0	82.1	73.6	77.9	57.4	76.0	57.9
Mistral-7B-it	56.5	89.6	69.0	71.4	58.3	37.9	55.4	49.2	50.7	31.3	74.1	69.3	62.4	36.8	70.5	53.2
MoZi-qwen	65.3	96.7	79.2	81.1	76.2	47.0	65.0	47.6	54.4	43.1	82.1	78.6	69.1	29.1	76.0	27.5
DISC-LawLLM	56.6	85.9	65.0	69.9	62.7	42.5	57.9	42.0	55.9	23.1	69.8	62.1	49.0	–	67.2	28.1
Hanfei	28.9	36.5	36.3	22.3	31.0	27.9	27.5	20.0	31.6	33.8	24.1	38.6	26.9	–	25.1	24.0

Table 48: Results of English Patent IPC/CPC Classification tasks (1-5-1 and 1-5-2) with 3-shot setting. The best-performing model in each task is in **darker purple**, and the second best is in **lighter purple**.

Model	IPC Classification (1-5-1)				CPC Classification (1-5-2)			
	Exact-Match	Section	Class	Subclass	Exact-Match	Section	Class	Subclass
GPT-4o-mini	1.8	87.8	69.2	46.8	0.3	80.1	65.3	54.1
DeepSeek-V3	3.5	90.0	75.7	52.8	7.7	85.7	73.3	64.7
Qwen2.5-7B-it	1.2	85.7	64.8	45.7	0.5	68.3	50.8	38.8
Llama3.1-8B-it	1.8	82.7	62.0	41.2	0.0	64.8	45.8	29.8
MoZi-qwen	1.3	80.3	59.3	36.7	0.0	24.2	12.8	7.7

Table 49: English questions results of IPBench with chain-of-thought setting. The best-performing model in each task is in **darker red**, and the second best is in **lighter red**.

Model	OA	1-1	1-2	1-3	1-4	1-6	1-7	2-1	2-2	2-3	2-4	3-1	3-2	3-3	3-4	3-5	4-3
GPT-4o-mini	72.2	96.7	88.1	88.4	82.9	51.6	67.9	57.6	57.4	64.4	87.0	75.0	76.5	81.2	83.1	44.9	58.5
Qwen2.5-7B-it	64.4	84.2	78.8	78.6	73.0	48.9	60.0	50.0	55.9	61.3	84.0	75.0	70.5	63.2	78.8	44.3	43.3
Llama3.1-8B-it	60.4	84.9	76.6	74.3	73.8	46.6	64.2	46.4	55.5	52.5	79.0	66.4	67.8	47.4	74.9	43.6	40.9
Gemma-2-9B-it	60.3	88.8	75.2	76.2	69.4	45.7	60.0	55.2	56.3	46.3	80.9	74.3	75.2	62.0	80.9	–	54.4
Mistral-7B-it	54.1	85.5	72.6	71.8	64.7	35.6	59.2	39.2	50.4	43.1	75.3	56.4	63.1	37.2	72.1	36.3	35.7
MoZi-qwen	60.5	94.6	79.2	82.5	72.6	42.5	63.3	51.2	50.4	45.6	77.8	73.6	70.5	40.4	77.1	43.9	41.5
DISC-LawLLM	19.5	45.6	46.5	28.2	15.1	15.1	31.7	13.6	14.7	26.3	18.5	7.1	12.8	13.6	4.6	–	9.4
Hanfei	30.5	39.8	32.7	28.6	30.6	24.2	27.5	32.8	32.7	20.6	26.5	33.6	36.2	26.2	40.4	–	29.2

Table 50: Results of English Patent IPC/CPC Classification tasks (1-5-1 and 1-5-2) with chain-of-thought setting. The best-performing model in each task is in **darker purple**, and the second best is in **lighter purple**.

Model	IPC Classification (1-5-1)				CPC Classification (1-5-2)			
	Exact-Match	Section	Class	Subclass	Exact-Match	Section	Class	Subclass
GPT-4o-mini	0.0	84.8	67.3	47.8	0.0	76.8	63.0	52.5
DeepSeek-V3	0.3	86.8	73.0	51.5	1.0	83.3	70.7	63.0
Qwen2.5-7B-it	1.8	88.0	69.5	47.0	0.5	60.2	46.0	35.7
Llama3.1-8B-it	1.5	76.2	58.5	37.5	0.2	64.0	44.8	29.5
MoZi-qwen	0.5	38.8	29.8	21.8	0.0	7.7	2.8	1.8

K.4 LLM-AS-A-JUDGE RESULTS

We provide detailed results of the LLM-as-a-judge evaluation for the overall, Chinese, and English parts. The evaluation includes four dimensions and an overall score, as shown in Table 51, Table 52, and Table 53. The definitions of these metrics are provided in Section H.3, with all scores ranging from 1 to 10.

Table 51: Multi-dimension results of generation tasks (4-1 and 4-2) in LLM-as-a-judge. The best-performing model in each task is in **darker blue**, and the second best is in **lighter blue**. Accuracy (Acc.), Relevance (Rel.), Completeness (Comp.), Consistency (Cons.), L-S and LLMScore are generation quality metrics rated by an LLM-as-a-judge.

Model	Abstract Generation (4-1)						Dependent Claim Generation (4-2)					
	Acc.	Rel.	Comp.	Cons.	L-S	LLMScore	Acc.	Rel.	Comp.	Cons.	L-S	LLMScore
GPT-4o	8.45	8.24	8.68	9.27	7.58	8.42	7.45	6.28	6.22	6.58	7.17	6.63
GPT-4o-mini	7.99	8.02	8.13	8.94	7.47	8.05	7.17	5.92	6.06	6.30	7.02	6.37
DeepSeek-V3	8.26	8.45	8.53	9.15	7.73	8.38	7.93	7.30	7.13	7.38	7.92	7.45
Qwen2.5-72B-it	8.40	8.18	8.70	9.36	7.37	8.33	7.13	5.77	6.00	6.35	6.72	6.30
Qwen2.5-7B-it	8.17	8.14	8.19	9.08	7.61	8.18	6.59	5.47	5.09	5.68	5.96	5.67
Llama3.1-70B-it	7.98	8.03	7.94	8.96	7.31	7.98	6.57	5.38	5.16	5.69	6.21	5.67
Llama3.1-8B-it	7.52	7.41	7.71	8.57	6.54	7.47	4.70	3.95	3.18	3.91	4.15	3.86
Gemma-2-27B-it	7.63	7.78	7.46	8.40	7.32	7.64	6.51	5.56	5.71	5.84	6.54	5.98
Gemma-2-9B-it	7.89	8.03	7.82	8.76	7.43	7.91	6.21	5.23	5.20	5.51	6.12	5.55
Mistral-7B-it	7.47	7.38	7.86	8.62	6.40	7.49	4.19	3.30	3.07	3.38	3.71	3.42
MoZi-qwen	7.71	7.88	7.78	8.76	7.02	7.73	5.82	4.70	4.00	4.83	5.17	4.81
DeepSeek-R1	7.70	7.75	7.88	8.39	7.21	7.72	7.73	6.76	7.00	7.16	7.69	7.18
DS-Qwen-7B	7.58	7.50	7.78	8.43	6.90	7.58	4.67	4.02	3.97	4.01	4.60	4.16
QwQ-32B	8.48	8.39	8.80	9.27	7.74	8.51	7.63	6.61	6.97	7.13	7.61	7.10

Table 52: Multi-dimension results of Chinese generation tasks (4-1 and 4-2) in LLM-as-a-judge. The best-performing model in each task is in **darker blue**, and the second best is in **lighter blue**.

Model	Abstract Generation (4-1)						Dependent Claim Generation (4-2)					
	Acc.	Rel.	Comp.	Cons.	L-S	LLMScore	Acc.	Rel.	Comp.	Cons.	L-S	LLMScore
GPT-4o	8.66	8.77	8.96	9.50	8.00	8.77	7.06	5.85	5.91	6.27	6.94	6.30
GPT-4o-mini	8.39	8.59	8.46	9.24	8.00	8.51	6.93	5.59	5.69	6.10	6.85	6.09
DeepSeek-V3	8.80	9.05	9.08	9.54	8.27	8.92	7.90	6.98	7.09	7.40	7.93	7.36
Qwen2.5-72B-it	8.53	8.55	8.86	9.47	7.56	8.50	7.33	6.14	6.36	6.61	7.12	6.60
Qwen2.5-7B-it	8.21	8.50	8.09	9.05	8.03	8.29	6.56	5.45	5.11	5.58	5.89	5.64
Llama3.1-70B-it	7.85	8.22	7.76	8.88	7.26	7.89	6.04	4.80	4.37	5.00	5.45	4.99
Llama3.1-8B-it	7.12	7.30	7.47	8.31	6.11	7.16	3.55	3.48	2.47	3.03	3.49	3.09
Gemma-2-27B-it	7.65	7.98	7.52	8.45	7.49	7.74	5.89	5.14	5.33	5.19	5.92	5.46
Gemma-2-9B-it	7.94	8.30	7.98	8.86	7.52	8.07	5.82	4.87	4.88	5.14	5.68	5.15
Mistral-7B-it	7.20	7.35	7.73	8.50	6.03	7.24	2.50	2.22	1.96	2.05	2.36	2.13
MoZi-qwen	7.79	8.40	7.60	8.75	7.47	7.91	5.33	4.23	3.42	4.34	4.52	4.28
DeepSeek-R1	7.76	8.01	8.05	8.30	7.42	7.89	7.74	6.74	6.98	7.16	7.69	7.17
DS-Qwen-7B	7.68	7.84	8.08	8.10	6.97	7.80	4.26	3.71	3.30	4.47	4.00	3.69
QwQ-32B	8.71	8.82	9.10	9.09	8.09	8.84	7.70	6.55	6.92	7.13	7.58	7.05

Table 53: Multi-dimension results of English generation tasks (4-1 and 4-2) in LLM-as-a-judge. The best-performing model in each task is in **darker blue**, and the second best is in **lighter blue**.

Model	Abstract Generation (4-1)						Dependent Claim Generation (4-2)					
	Acc.	Rel.	Comp.	Cons.	L-S	LLMScore	Acc.	Rel.	Comp.	Cons.	L-S	LLMScore
GPT-4o	8.24	7.70	8.40	9.04	7.16	8.07	7.85	6.71	6.53	6.88	7.40	6.97
GPT-4o-mini	7.59	7.45	7.81	8.64	6.94	7.59	7.42	6.26	6.43	6.49	7.20	6.66
DeepSeek-V3	7.72	7.86	7.99	8.76	7.20	7.84	7.96	7.63	7.17	7.36	7.92	7.54
Qwen2.5-72B-it	8.28	7.82	8.54	9.25	7.19	8.17	6.93	5.40	5.64	6.09	6.33	6.01
Qwen2.5-7B-it	8.12	7.78	8.30	9.10	7.20	8.07	6.63	5.48	5.07	5.78	6.03	5.71
Llama3.1-70B-it	8.12	7.84	8.12	9.03	7.36	8.07	7.10	5.96	5.95	6.38	6.97	6.36
Llama3.1-8B-it	7.93	7.51	7.96	8.82	6.98	7.79	5.84	4.43	3.89	4.79	4.80	4.64
Gemma-2-27B-it	7.61	7.58	7.40	8.35	7.15	7.54	7.13	5.97	6.10	6.48	7.17	6.49
Gemma-2-9B-it	7.85	7.75	7.67	8.65	7.34	7.76	6.60	5.59	5.53	5.88	6.56	5.95
Mistral-7B-it	7.75	7.42	7.99	8.73	6.76	7.75	5.89	4.39	4.18	4.71	5.07	4.72
MoZi-qwen	7.63	7.37	7.97	8.77	6.57	7.56	6.32	5.18	4.59	5.32	5.83	5.34
DeepSeek-R1	7.63	7.48	7.70	8.47	6.99	7.55	7.71	6.77	7.02	7.16	7.68	7.19
DS-Qwen-7B	7.48	7.15	7.48	8.76	6.82	7.36	5.07	4.32	4.64	3.55	5.19	4.62
QwQ-32B	8.25	7.96	8.50	9.44	7.39	8.17	7.55	6.66	7.01	7.13	7.64	7.14

L MORE DETAILS ABOUT ERROR ANALYSIS

Definition of Different Error Type. We classify the error into 7 types: Consistency error, Hallucination error, Reasoning error, Refusing error, Priority error, Mathematical error and Obsolescence error. The detailed definitions of each error type are as follows:

- **Consistency error:** The content in the model’s response is inherently flawed or internally inconsistent, such as when the intermediate reasoning steps contradict the model’s final answer.
- **Hallucination error:** The large language model’s responses sometimes introduce fabricated legal information or include statements that sound plausible but are factually incorrect particularly in Tasks 14, which require familiarity with typical legal cases.
- **Reasoning error:** This type refers to flaws in the logical process used by the model to arrive at its answer. These errors may include invalid deductions, misinterpretation of conditions, or incorrect application of domain-specific rules. In many cases, the model’s intermediate reasoning steps fail to logically support its final conclusion, even if the answer appears superficially plausible. Such issues are particularly critical in the second-level tasks of IPBench, which demand accurate multi-step and conditional reasoning within legal and technical contexts.
- **Refusing error:** This error typically occurs in Tasks 14, which require the model to recall specific factual or legal cases. In these instances, some models respond by asking the user for additional information or by explicitly refusing to provide an answer. While such refusals may be more cautious or aligned with reliability principles, they still indicate a limitation in the model’s ability to engage with the task as expected.
- **Priority error:** Priority Error refers to the model’s failure to identify and prioritize the most critical factor(s) when multiple elements jointly influence the outcome. Instead of focusing on the decisive issue, the model may weigh secondary or irrelevant aspects equally, leading to incorrect or misleading conclusions.
- **Mathematical error:** This error type refers to issues related to a lack of precision in complex calculations, often resulting in incorrect outcomes. These errors can arise from miscalculations, rounding mistakes, or failure to properly apply mathematical operations, leading to significant discrepancies in the final result. This is particularly evident in Tasks 23, Compensation Calculation, where both IP law knowledge and an understanding of the case background are necessary to perform accurate calculations.
- **Obsolescence error:** Obsolescence Error refers to the model’s failure to account for differences between current and outdated versions of legal documents or frameworks. This error occurs when the generated answer overlooks changes in the law, leading to outdated or inaccurate information. This is especially relevant in Tasks 13, Legal Evolution, where the model must retain knowledge of both current and past laws and understand the differences between them. However, some models do not update their memory, resulting in the use of obsolete information.

The most common error type is reasoning error, accounting for 33%. This is consistent with the performance decrease observed in models using the Chain-of-Thought setting. This highlights the importance of developing an IP-oriented model that balances both System 1 and System 2 capabilities.

Case Study for Each Error Type. We provide two examples, one in Chinese and one in English, for each error type, as shown from Figure 6 to Figure 12. More extensive case studies for each task can be found in Appendix N.

M DATA EXAMPLES

We provide extensive data examples for each task in this section, as shown from Figure 13 to Figure 33. These examples include both English and Chinese datapoints, serving as representative samples for each corresponding task and helping to better illustrate the task definitions.

Chinese	Consistency Error	English
<p>问题:某发明将蓝牙模块与机械锁体集成实现APP控制开锁,现有技术中D1为带GPS的电子锁,D2公开蓝牙控制门锁。审查员应如何判断其创造性?</p> <p>Question: The invention integrates a Bluetooth module with a mechanical lock body to enable app-controlled unlocking. In the prior art, D1 is an electronic lock with GPS, and D2 discloses Bluetooth-controlled door locks. How should the examiner assess its inventiveness?</p> <p>A.具备创造性,因首次用于共享单车 A. Inventive, as it is the first application in shared bicycles. B.不具备,蓝牙应用属公知常识 B. Not inventive, as Bluetooth application is common knowledge. C.具备,解决车辆防盗难题 C. Inventive, as it solves vehicle anti-theft challenges. D.不具备,D2给出明确技术启示 D. Not inventive, as D2 provides clear technical inspiration.</p>		<p>Question: A lab-grown seafood patent expires in 3 years, but Congress proposes banning "cell-cultured" labeling. What drives its value erosion?</p> <p>A. Loss of consumer branding clarity. B. Accelerated obsolescence from regulatory bans. C. Shift to B2B industrial ingredient patents. D. Protected by USDA Bioengineered labels.</p>
<p>gpt-4o-mini: ✗ D.不具备,D2给出明确技术启示 D. Not inventive, as D2 provides clear technical inspiration.</p>		<p>gpt-4o-mini: ✗ A. Loss of consumer branding clarity.</p>
<p>Error Category: Consistency Error Error Reason: Option A mentions "the first application in shared bicycles," but the question does not provide sufficient information to support this claim, making it ambiguous. Option B argues against inventiveness on the grounds that Bluetooth applications are common general knowledge. Since D2 already discloses Bluetooth-controlled door locks, this rationale is valid. Option C claims inventiveness by addressing vehicle anti-theft challenges, but it fails to directly compare with the prior art or provide sufficient evidence. Option D asserts a lack of inventiveness because D2 provides clear technical teachings, which aligns with Option B's reasoning.</p>		<p>Error Category: Consistency Error Error Reason: If Congress bans "cell-cultured" labeling, it could confuse consumers about what they are buying. This could lead to a decrease in consumer trust and interest in lab-grown seafood, which would erode its market value. (Option C): This option implies that the market is moving towards business-to-business applications rather than consumer products. However, it does not directly address the immediate impact of the patent expiration and the labeling ban on consumer products. (Option D): However, if the labeling is banned, this protection may not be sufficient to maintain consumer interest or market value.</p>

Figure 6: Consistency error case study.

Chinese	Reasoning Error	English
<p>问题:采用表面码与拓扑编码结合,逻辑错误率降至10^{-6}。D1公开表面码方案,D2记载拓扑量子计算。该方案创造性如何评价?</p> <p>Question: By combining surface codes with topological encoding, the logical error rate is reduced to 10^{-6}. D1 discloses a surface code scheme, and D2 documents topological quantum computing. How should the inventiveness of this solution be evaluated?</p> <p>A.不具备,编码组合属理论研究 A. Not inventive, as the code combination is theoretical research. B.具备,实现实用化突破 B. Inventive, as it achieves practical breakthroughs. C.不具备,D2提示编码改进方向 C. Not inventive, as D2 suggests improvement directions for encoding. D.具备,解决量子退相干问题 D. Inventive, as it addresses quantum decoherence.</p>		<p>Question: In the case of "Mattel Inc. v. MGA Entertainment Inc.," What was one of the key legal issues addressed in the appeal by Mattel Inc.?</p> <p>A. Whether MGA's Bratz dolls were substantially similar to Mattel's Barbie dolls. B. Whether the jury's verdict was supported by sufficient evidence. C. Whether MGA's advertising was false or misleading. D. Whether Mattel had a valid copyright claim over the Bratz dolls' design.</p>
<p>gpt-4o-mini: ✗ B.具备,实现实用化突破 B. Inventive, as it achieves practical breakthroughs.</p>		<p>gpt-4o-mini: ✗ A. Whether MGA's Bratz dolls were substantially similar to Mattel's Barbie dolls.</p>
<p>Error Category: Reasoning Error Error Reason: The combination in this scheme is not only theoretically significant but also holds the potential to achieve practical breakthroughs in quantum computing. Both Options A and C argue that the scheme lacks inventiveness, which is clearly illogical. While Option D mentions addressing quantum decoherence, it fails to explicitly highlight the practical breakthrough. Option B, however, directly emphasizes the scheme's potential to realize practical implementation breakthroughs. Therefore, after comprehensive consideration, the most appropriate answer is B.</p>		<p>Error Category: Reasoning Error Error Reason: A. This option directly addresses the core of the dispute, as it involves the comparison of the two products and the potential for infringement. B. While this is a relevant legal issue in appeals, it is more procedural. C. This is a separate issue related to advertising practices and not the primary focus of the appeal regarding the dolls themselves. D. This option is also relevant, but it is more specific to copyright law rather than the broader issue of similarity and infringement. Given this analysis, the most pertinent legal issue that was addressed in the appeal by Mattel Inc. is option A.</p>

Figure 7: Reasoning error case study.

Chinese	Refusing Error	English
<p>问题: “空调专用微处理器控制芯片” 开发合同中, 最高人民法院认为泰某微电子(上海)公司是否构成违约?</p> <p>Question: In the case of the "Air Conditioner-Specific Microprocessor Control Chip" development contract, did the Supreme People's Court determine that TaiM Microelectronics (Shanghai) Co., Ltd. breached the contract?</p> <p>A. 无法确定 A. Cannot be determined. B. 部分构成违约 B. Partially breached the contract. C. 不构成违约 C. Did not breach the contract. D. 构成违约 D. Breached the contract.</p>		<p>Question: What limits claims covering "all sensory feedback systems integrating thalamocortical oscillations" after the inventor discloses only rodent models in the specification?</p> <p>A. § 112 enablement for cross-species applicability. B. Written description requirement under Amgen for human neurophysiology. C. § 101 abstract idea exclusion. D. Obviousness-type double patenting.</p>
<p>gpt-4o-mini: ✗ A. Cannot be determined.</p>		<p>gpt-4o-mini: ✗ A. § 112 enablement for cross-species applicability.</p>
<p>Error Category: Refusing Error Error Reason: If TaiM Microelectronics' actions indeed violated the contract terms but were minor in severity, they might be deemed a partial breach; if they substantially impaired contract performance, they could constitute a material breach. Without specific case details, it is impossible to conclusively assess whether TaiM breached the contract or to what extent. Thus, the most reasonable choice is A. Cannot be determined.</p>		<p>Error Category: Refusing Error Error Reason: This section of the patent law requires that the patent application must enable a person skilled in the art to make and use the invention without undue experimentation. If the inventor only discloses rodent models, it may not be sufficient to enable claims that apply to humans or other species, as the physiological differences could lead to different outcomes. Given this analysis, the most relevant limitation regarding the claims covering "all sensory feedback systems integrating thalamocortical oscillations" after disclosing only rodent models is likely related to the enablement requirement under § 112.</p>

Figure 8: Refusing error case study.

Chinese	Obsolescence Error	English
<p>问题: 相较于2010年《中华人民共和国著作权法》, 2020年修订版本中新增了哪项关于侵权举证的规定?</p> <p>Question: Compared to the 2010 "Copyright Law of the People's Republic of China," which new provision on evidentiary rules for infringement was added in the 2020 revised version?</p> <p>A. 网络平台承担过错推定责任 A. Online platforms bear presumed-fault liability. B. 技术措施合法性举证责任倒置 B. Inversion of the burden of proof for the legality of technical measures. C. 侵权复制品数量推定规则 C. Presumption rule for the quantity of infringing reproductions. D. 法院可责令侵权人提供账簿资料 D. Courts may order infringers to provide accounting records.</p>		<p>Question: How did 35 U.S.C. § 131 change examiner interview rules in December 2022 compared to the May 2015 version?</p> <p>A. Limited interviews to once per application. B. Required public disclosure of interview summaries. C. Mandated examiner approval for all amendments. D. Allowed virtual interviews by default.</p>
<p>gpt-4o-mini: ✗ B. 技术措施合法性举证责任倒置 B. Inversion of the burden of proof for the legality of technical measures.</p>		<p>gpt-4o-mini: ✗ D. Allowed virtual interviews by default.</p>
<p>Error Category: Obsolescence Error Error Reason: Option A's mention of "online platforms bearing presumed-fault liability" clarifies the responsibility of online platforms. Option B's "inversion of the burden of proof for the legality of technical measures" refers to situations where copyright holders no longer need to prove the legality of their technical measures; instead, the infringing party must demonstrate the legality of their actions. Option C's "presumption rule for the quantity of infringing reproductions" was not introduced. Option D's "courts may order infringers to provide accounting records" expands judicial authority but is not directly related to burden-of-proof rules.</p>		<p>Error Category: Obsolescence Error Error Reason: B. **Required public disclosure of interview summaries.** This option implies that there is now a requirement for interview summaries to be made public. This aligns with the trend towards transparency in patent examination processes, but we need to confirm if this was indeed a change made in December 2022. D. **Allowed virtual interviews by default.** This option indicates a shift towards accepting virtual interviews as the standard practice. Given the context of the pandemic and the increasing reliance on virtual communication, this change seems plausible.</p>

Figure 9: Obsolescence error case study.

Chinese	Priority Error	English
<p>问题: 针对发明专利CN202588024680H记载的“再生冷却通道设计”, 其权利要求明确微通道水力直径1 ± 0.1 mm、冷却剂流速8 ± 0.5 m/s、热流密度≥ 5 MW/m², 且压降损失$< 10\%$。有效规避路径需包含?</p> <p>Question: Compared to the 2010 "Copyright Law of the People's Republic of China," which new provision on evidentiary rules for infringement was added in the 2020 revised version?</p> <p>A. 开发发汗冷却与冲击冷却复合系统 A. Online platforms bear presumed-fault liability. B. 优化通道形状将水力直径减至0.8 mm B. Inversion of the burden of proof for the legality of technical measures. C. 采用纳米流体提升冷却效率 C. Presumption rule for the quantity of infringing reproductions. D. 增加自适应流量控制阀调节压降 D. Adding deployable concentrator mirrors. D. Courts may order infringers to provide accounting records.</p>	<p>Question: A space solar patent (US 36,789,012AA) claims "ultralight perovskite solar films < 0.5 g/W with $> 28\%$ efficiency after 10^6 proton irradiation cycles at 1 MeV equivalent fluence" which modification constitutes non-infringement?</p> <p>A. Developing GaInP cells with 0.6 g/W and 30% efficiency. B. Using radiation-hardened QD heterojunctions. C. Optimizing encapsulation for 1.1×10^6 cycles. D. Adding deployable concentrator mirrors.</p>	
<p>gpt-4o-mini: ✗ D. 增加自适应流量控制阀调节压降 D. Courts may order infringers to provide accounting records.</p>	<p>gpt-4o-mini: ✗ B. Using radiation-hardened QD heterojunctions.</p>	
<p>Error Category: Priority Error Error Reason: A. This option involves a different cooling method but does not directly address <u>how to meet the microchannel's hydraulic diameter</u> and flow velocity requirements. B. While this option mentions optimizing the hydraulic diameter, reducing it to 0.8 mm would fall outside the claimed range of 1 ± 0.1 mm, <u>potentially avoiding infringement</u>. C. Nanofluids can improve cooling efficiency but do not directly resolve the pressure drop loss issue. D. This option directly addresses the pressure drop loss problem by regulating flow through adaptive valves, ensuring compliance with the requirement of pressure <u>drop loss $< 10\%$ stated in the claims</u>.</p>	<p>Error Category: Priority Error Error Reason: A. Developing GaInP cells with 0.6 g/W and 30% efficiency: This option involves a different type of solar cell (GaInP) and does not meet the weight requirement of < 0.5 g/W. Therefore, this modification <u>would likely infringe on the patent</u>. B. Using radiation-hardened QD heterojunctions: This option suggests a different technology (quantum dot heterojunctions) that may not fall under the perovskite solar films specified in the patent. If the technology is sufficiently different, <u>it could constitute non-infringement</u>.</p>	

Figure 10: Priority error case study.

Chinese	Hallucination Error	English
<p>问题: 甲游戏公司NPC对话树具独创分支逻辑, 乙公司AI聊天机器人模仿该逻辑架构。根据《著作权法实施条例》第13条, 哪一项是对的?</p> <p>Question: Game Company A's NPC dialogue tree features a unique branching logic. Company B's AI chatbot imitates this logical structure. According to Article 13 of the Implementing Regulations of the Copyright Law, which statement is correct?</p> <p>A. 不侵权, 因逻辑不受保护</p> <p>A. Not infringing, as logic is unprotected.</p> <p>B. 构成侵权, 若结构表达具独创性</p> <p>B. Infringement occurs if the structural expression demonstrates originality.</p> <p>C. 需比对代码行数差异</p> <p>C. Requires comparing differences in lines of code.</p> <p>D. 若乙公司更换角色名称则不侵权</p> <p>D. No infringement if Company B changes character names.</p>		<p>Question: In the case of "Funk Brothers Seed Co. v. Kalo Inoculant Co.", Which of the following is a potential remedy for trademark infringement?</p> <p>A. Monetary damages.</p> <p>B. Criminal penalties.</p> <p>C. Injunctions.</p> <p>D. All of the above.</p>
<p>gpt-4o-mini: ✗</p> <p>A. 不侵权, 因逻辑不受保护</p> <p>A. Not infringing, as logic is unprotected.</p>		<p>gpt-4o-mini: ✗</p> <p>C. Injunctions.</p>
<p>Error Category: Hallucination Error</p> <p>Error Reason: According to Article 13 of the Implementing Regulations of the Copyright Law, <u>copyright protects the expression of a work rather than the underlying ideas</u>, methods, or logic. While Company A's NPC dialogue tree features unique branching logic, the logic itself is not protected by copyright. Option A states that "logic is unprotected," which is correct <u>because copyright law explicitly excludes protection for ideas</u> or methodologies. Option B claims infringement "if the structural expression demonstrates originality." This could hold true <u>only if Company B copied the specific expressive elements of the dialogue tree</u>.</p>		<p>Error Category: Hallucination Error</p> <p>Error Reason: C. **Injunctions**: This is a frequent remedy in trademark cases. An injunction can prevent the infringing party from continuing to use the trademark, <u>thereby protecting the rights of the trademark owner</u>. D. **All of the above**: This option suggests that all the previous remedies are applicable. Given the analysis, while monetary damages and injunctions are standard remedies for trademark infringement, <u>criminal penalties are not typically a remedy in civil cases</u>. Therefore, the most accurate answer would be <u>the combination of the remedies</u> that are commonly applied.</p>

Figure 11: Hallucination error case study.

Chinese	Mathematical Error	English
<p>问题: 甲公司拥有一注册商标, 核定使用在服装商品上。乙公司未经许可, 在其生产的服装上使用了与甲公司注册商标近似的标识, 导致甲公司销量下降。甲公司因乙公司侵权行为少销售服装1000件, 每件服装的利润为50元。乙公司共销售侵权服装2000件, 每件服装的利润为30元。根据《商标法》, 甲公司应获得的赔偿数额为多少?</p> <p>Question: Due to B's infringement, Company A sold 1,000 fewer clothing items, with a profit of ¥50 per item. Company B sold 2,000 infringing clothing items, earning a profit of ¥30 per item. According to China's Trademark Law, what amount should Company A be awarded in damages?</p> <p>A. 50,000元 A. ¥50,000. B. 60,000元 B. ¥60,000. C. 100,000元 C. ¥100,000. D. 200,000元 D. ¥200,000.</p> <p>gpt-4o-mini: ✗ B. 60,000元 B. ¥60,000.</p> <p>Error Category: Mathematical Error Error Reason: Due to Company B's infringement, Company A sold 1,000 fewer clothing items, with a profit of **¥50 per item**. Therefore, Company A's actual losses from the infringement are: $1,000 \text{ items} \times 50 \text{ ¥/item} = 50,000 \text{ ¥}$. Company B sold 2,000 infringing clothing items, with a profit of **¥30 per item**. Thus, Company B's illicit profits from the infringement are: $2,000 \text{ items} \times 30 \text{ ¥/item} = 60,000 \text{ ¥}$. Under China's Trademark Law (Article 63), the damages awarded to the rights holder (Company A) are generally the higher of: The rights holder's actual losses (¥50,000), The infringer's illicit profits (¥60,000). The compensation amount is **¥60,000**.</p>	<p>Question: Company A is the copyright owner of a professional drawing software, and Company B copies and sells the software without permission. As a result, the court found that Company A had lost 100,000 copies sold at a price of 199 per copy, resulting in an actual loss of \$19.9 million. At the same time, Company A spent 120,000 yuan in notary fees for obtaining evidence. How much should Company B compensate?</p> <p>A. \$19.9 million. B. \$20.02 million. C. \$20.12 million. D. \$30 million.</p> <p>gpt-4o-mini: ✗ A. \$19.9 million.</p> <p>Error Category: Mathematical Error Error Reason: Company A lost 100,000 copies sold at a price of \$199 per copy. Actual loss = $100,000 \text{ copies} \times \\$199/\text{copy} = \\$19,900,000$ (or \$19.9 million). Company A incurred 120,000 yuan in notary fees. To include this in the compensation, we need to convert yuan to dollars. However, the problem does not provide a conversion rate. For the sake of this calculation, let's assume that 120,000 yuan is approximately \$17,000 (this is a rough estimate, as the actual conversion rate can vary). Total compensation = Actual loss + Additional costs. Total compensation = $\\$19.9 \text{ million} + \\$17,000 = \\$19,917,000$.</p>	

Figure 12: Mathematical error case study.


Task 1-1: Legal Concept Memory	
<p>问题:</p> <p>Question:</p> <p>根据《中华人民共和国专利法》, 下列哪项属于"实用新型"的定义?</p> <p>According to the Patent Law of the People's Republic of China, which of the following items falls under the definition of a "utility model"?</p> <p>选项:</p> <p>Options:</p> <p>A. 对产品的形状、图案或其结合提出的新设计 A. A new design concerning the shape, pattern, or combination thereof of a product</p> <p>B. 对产品的形状、构造或其结合提出的实用新型方案 B. A practical new technical solution relating to the shape, structure, or combination thereof of a product</p> <p>C. 对方法或其改进提出的新技术方案 C. A new technical solution proposed for a method or its improvement</p> <p>D. 对科学发现提出的技术应用 D. A technical application based on a scientific discovery</p> <p>答案: B Answer: B</p> <p>知识产权类型: 专利 Intellectual Property Type: Patent</p>	<p>Question:</p> <p>What is "dilution" under the Trademark Dilution Revision Act (TDRA)?</p>  <p>Options:</p> <p>A. Weakening a famous mark's uniqueness through unauthorized use</p> <p>B. Creating consumer confusion about a mark's source</p> <p>C. Using a descriptive term without secondary meaning</p> <p>D. Failing to renew a registration on time</p> <p>Answer: A</p> <p>Intellectual Property Type: Trademark</p>

Figure 13: Data example of task 1-1.


Task 1-2: Legal Clause Memory	
<p>问题: Question: 根据《中华人民共和国商标法(2019年修正)》第10条, 下列哪种标志可以作为商标使用? According to Article 10 of the Trademark Law of the People's Republic of China (2019 Amendment), which of the following signs may be used as a trademark?</p> <p>选项: Options: A.与外国国旗近似的图形 A.Signs that are similar to the military flags of foreign countries B.带有民族歧视性的文字 B. Text or symbols with ethnic discrimination C.县级以上行政区划地名但具有其他含义的 C. Names of administrative divisions at or above the county level that have other meanings D.与"红十字"名称相同的标志 D. Signs identical to the name 'Red Cross'</p> <p>答案: C Answer: C</p>	<p>Question: Under 17 U.S.C. § 110(1), what is allowed in classroom teaching?</p>  <p>Options: A.Public performance of a full movie B.Display of copyrighted materials during face-to-face instruction C.Unlicensed distribution of textbooks D.Broadcasting a play to the public Answer: B</p>
知识产权类型: 商标 Intellectual Property Type: Trademark	Intellectual Property Type: Copyright

Figure 14: Data example of task 1-2.


Task 1-3: Legal Evolution	
<p>问题: Question: 相较于2008年《中华人民共和国专利法》, 2020年修订版本新增了哪项关于药品专利期限补偿的制度? Compared to the 2008 Patent Law of the People's Republic of China, what new pharmaceutical patent term extension system was introduced in the 2020 amended version?</p> <p>选项: Options: A.允许专利期限延长至20年以上 A.Permits the extension of patent terms beyond 20 years B.针对仿制药上市给予专利豁免期 B. Provides a patent exemption period for generic drug marketing approval C.要求药品专利必须进行期限登记 C. Requires mandatory term registration for pharmaceutical patents D.对创新药专利给予最长5年的期限补偿 D. Grants a maximum 5-year term extension for innovative drug patents</p> <p>答案: D Answer: D</p>	<p>Question: Compared to 2015, what adjustment was made to patent term extension under 35 U.S.C. § 154(b)(1)(B) in 2022?</p>  <p>Options: A.Added compensation for PTAB appeal delays B.Excluded delays caused by PTAB reviews C.Limited extensions to biotechnology patents D.Reduced the maximum extension to 3 years Answer: A</p>
知识产权类型: 专利 Intellectual Property Type: Patent	Intellectual Property Type: Patent

Figure 15: Data example of task 1-3.


Task 1-4: Typical Case Memory	
<p>问题:</p> <p>Question:</p> <p>“郑州某研究所与陈某侵害植物新品种权纠纷案”中, 陈某被认定侵权的行为是什么?</p> <p>In the case of Zhengzhou Research Institute v. Chen regarding infringement of new plant variety rights dispute, What are the acts of infringement that Chen was found to have committed?</p> <p>选项:</p> <p>Options:</p> <p>A. 未经许可繁育“天使红”石榴新品种的繁殖材料</p> <p>A. Propagation of reproductive materials of the new pomegranate variety 'Angel Red' without authorization</p> <p>B. 销售假冒“天使红”石榴的果实</p> <p>B. Sale of counterfeit fruits of the 'Angel Red' pomegranate variety</p> <p>C. 未经授权使用“天使红”商标</p> <p>C. Unauthorized use of the 'Angel Red' trademark</p> <p>D. 未支付品种许可费用</p> <p>D. Non-payment of variety licensing fees</p> <p>答案: A</p> <p>Answer: A</p>	<p>Question:</p> <p>In the case of "Kewanee Oil Co. v. Bicron Corp.", what was the Supreme Court's decision regarding the preemption of state trade secret law by federal patent law?</p>  <p>Options:</p> <p>A. The Court did not address the issue of preemption</p> <p>B. The Court ruled that preemption applied only in specific cases</p> <p>C. State trade secret law was preempted by federal patent law</p> <p>D. State trade secret law was not preempted by federal patent law</p> <p>Answer: D</p>
<p>知识产权类型: 植物新品种</p> <p>Intellectual Property Type: New Plant Variety</p>	<p>Intellectual Property Type:</p> <p>Trade Secret</p>

Figure 16: Data example of task 1-4.

Task 1-5-1: Patent IPC Classification	
<p>问题:</p> <p>Question:</p> <p>标题: 基于物联网的数字孪生城市交通灯控制系统</p> <p>Title: IoT-based Digital Twin Urban Traffic Light Control System</p> <p>摘要: 本发明公开了基于物联网的数字孪生城市交通灯控制系统, 涉及智能控制的技术领域, 包括采集模块、分析模块和控制模块, 计算拥挤度变化率, 得到集中时间段, 计算历史自然数据的权重, 构造干扰函数, 计算干扰时长和新的集中时间段, 建立交通模型, 将新的拥挤度变化率与拥挤度变化量阈值进行比较, 执行第一操作, 并建立第一映射关系。本发明通过实时监测和分析交通流量、拥挤度变化情况, 以及考虑自然环境因素的影响, 优化交通流的通行时间分配, 动态调整交通信号灯的控制策略, 通过历史交通数据和自然数据的分析, 能够预测未来的交通情况, 提前做好相应的交通信号调整和路线规划, 物联网技术的应用使得交通灯控制系统能够实现远程监控和集中管理。</p> <p>Abstract: The present invention discloses an IoT-based digital twin urban traffic signal control system...(Omit)</p> <p>答案: G08G1/08</p> <p>Answer: G08G1/08</p>	<p>Question:</p> <p>Title: System and method for migrating agents between mobile devices</p> <p>Abstract: Mobile agents can be deployed to location aware mobile devices within specific regions of interest to achieve specific goals in respect of events occurring in the region of interest. In order to ensure that the agent can persist within the region of interest until the agent goals are achieved, the agent is configured to locate other devices within the region of interest and to propagate itself, by moving or copying itself, to those other devices. When a device hosting the agent exits the region of interest, the agent is terminated, thereby freeing device resources.</p> <p>Answer: A01D34/43</p>
<p>知识产权类型: 专利</p> <p>Intellectual Property Type: Patent</p>	<p>Intellectual Property Type:</p> <p>Patent</p>

Figure 17: Data example of task 1-5-1.


Task 1-5-2: Patent CPC Classification	
<p>Title: Multipurpose machine for cultivating trees</p>	
<p>Abstract: A multipurpose machine for cultivating trees, comprising an inverted U-shape structure that enables the machine to pass over existing trees to carry out pruning, disinfection or fruit picking tasks, provided at the bottom with wheels, driven by at least one motor that autonomously facilitates the movement thereof, and respective upper frames that telescopically couple to each other, being driven by respective cylinders to move the portion of the structure on the right with respect to the one on the left in order to vary the width of the machine. Likewise, the machine has the ability to raise or lower the upper structure of the same to adapt it to the height of the trees to be cultivated.s.</p>	
<p>Answer: A01D46/30</p>	
<p>Intellectual Property Type: Patent</p>	

Figure 18: Data example of task 1-5-2.

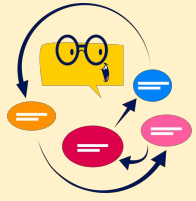
Task 1-6: IP Element Identification	
<p>问题: Question: 餐饮连锁企业注册声音商标（特定叫卖声），竞争对手使用相似韵律不同歌词进行宣传。侵权认定关键在于什么？ What is the key to determining infringement when a restaurant chain registers a sound trademark (a specific call), and its competitor uses a similar rhythm but different lyrics for promotion?</p> <p>选项: Options: A. 商标显著性获得时间 A. Time of obtaining distinctiveness of the trademark B. 声音商标的混淆可能性判定 B. Determination of Confusion Potential of Sound Trademarks C. 描述性使用正当性 C. Legitimacy of Descriptive Use D. 驰名商标跨类保护 D. Cross class protection of well-known trademarks 答案: B Answer: B</p>	<p>Question: Please select the correct answer from A, B, C, and D. A lab engineers synthetic DNA sequences encoding Shakespearean sonnets. Competitors replicate them. What governs?</p>  <p>Options: A. Myriad gene patent ban B. Copyright in non-functional expression C. Plant Variety Protection Act D. Biologics exclusivity Answer: A</p>
<p>知识产权类型: 专利 Intellectual Property Type: Patent</p>	<p>Intellectual Property Type: Patent</p>

Figure 19: Data example of task 1-6.

Task1-7: Process Guidance	
<p>问题: Question: 商标注册申请人可以通过什么方式提交《中华人民共和国商标法实施条例》规定的申请? How can trademark registration applicants submit applications as stipulated in the Implementing Regulations of the Trademark Law of the People's Republic of China?</p> <p>选项: Options: A. 只能通过纸质方式 A. Can only be done in paper form B. 只能通过电子方式 B Can only be done through electronic means C. 可以通过纸质或电子方式 C. Can be done through paper or electronic means D. 只能通过代理机构提交 D Can only be submitted through an agency</p> <p>答案: C Answer: C</p>	<p>Question: Please select the correct answer from A, B, C, and D. Who makes the decision that the international application is considered withdrawn?</p>  <p>Options: A. International Bureau B. Receiving Office C. International Searching Authority D. Chinese Answer: B</p>
<p>知识产权类型: 商标 Intellectual Property Type: Trademark</p>	<p>Intellectual Property Type: Patent</p>

Figure 20: Data example of task 1-7.


Task2-1: Patent Technology Forecasting	
<p>问题: Question: “横机设备”技术秘密许可案中, 横机设备的创新方向之一是提升其适应性和多功能性。以下哪种创新方向最能满足不同用户的需求? In the trade secret licensing case involving "flat knitting machines", one of the key innovation directions for such equipment is enhancing adaptability and multifunctionality. Among the following innovation approaches, which one would best meet the diverse needs of different users?</p> <p>选项: Options: A. 开发适用于极端环境的横机设备, 拓展其在特殊场景中的应用 A. Develop flat knitting machines engineered for extreme environments to expand their applications in specialized scenarios. B. 开发适用于不同织物类型的横机设备, 结合智能适配技术实现快速部署 B. Develop flat knitting machines suitable for different fabric types, and combine intelligent adaptation technology to achieve rapid deployment</p> <p>答案: B Answer: B</p>	<p>Question: Please select the correct answer from A, B, C, and D. A synthetic biology patent (US20259246819) engineers nitrogen-fixing cereal crops via chloroplast-targeted nif gene clusters with 95% ammonia production efficiency under 21% O₂. Which agricultural subsidy reform drives adoption?</p>  <p>Options: A. USDA Precision Agronomy Grants B. Farm Bill Conservation Reserve Expansion C. EPA CAFO Emission Trading System D. UNFCCC Climate-Smart Agriculture Answer: A</p>
<p>知识产权类型: 专利 Intellectual Property Type: Patent</p>	<p>Intellectual Property Type: Patent</p>

Figure 21: Data example of task 2-1.


Task2-2: Infringement Behavior Determination	
<p>问题: Question: 甲画家作品被用于训练AI模型, 乙公司生成"梵高风格化"图片销售。根据《著作权法实施条例》第21条, 哪一项是对的?</p> <p>Artist A's works are used to train AI models, while Company B generates "Van Gogh stylized" images for sale. According to Article 21 of Regulation for the Implementation of the Copyright Law, which one is correct?</p> <p>选项: Options: A. 不侵权, 因风格不受保护 A. Not infringing, style is not protected B. 构成侵权, 若训练数据包含未授权作品 B. If the training data contains unauthorized works, it constitutes infringement C. 需比对笔触相似度 C. The similarity of brushstrokes needs to be compared D. 若声明"AI辅助创作"则不侵权 D. If it is declared as "AI-assisted creation", there is no infringement</p> <p>答案: B Answer: B</p>	<p>Question: A company uses a logo that has a similar color scheme and general shape to another company's logo but different lettering. Is this trademark infringement?</p>  <p>Options: A. Yes, if the overall similarity can lead to consumer confusion B. No, because of the different lettering C. Only if the other company's logo is very new D. Only if the company uses the logo on a large number of products</p> <p>Answer: A</p>
<p>知识产权类型: 著作权 Intellectual Property Type: Copyright</p>	<p>Intellectual Property Type: Trademark</p>

Figure 22: Data example of task 2-2.

Task2-3: Compensation Calculation	
<p>问题: Question: 某游戏公司侵权使用他人美术设计, 法院认定: 权利人许可费为每幅设计5万元; 侵权使用设计20幅; 侵权游戏月收入100万元 (利润率60%)。赔偿金额应为?</p> <p>A game company infringed upon others' art designs. The court ruled that the licensing fee for each design was 50,000 yuan. Twenty infringing designs were used; The monthly revenue of infringing games is 1 million yuan (with a profit margin of 60%). What should be the amount of compensation?</p> <p>选项: Options: A. $20 \times 5\text{万} = 100\text{万}$ A. $20 \times 50,000 = 1\text{ million}$ B. $100\text{万} \times 60\% \times 12\text{月} = 720\text{万}$ B. $1\text{ million} \times 60\% \times 12\text{ months} = 7.2\text{ million}$ C. $\max(100\text{万}, 720\text{万}) = 720\text{万}$ C. $\max(1\text{ million}, 7.2\text{ million}) = 7.2\text{ million}$ D. 500万元以下 (如500万) D. Less than 5 million yuan (e.g. 5 million)</p> <p>答案: A Answer: A</p>	<p>Question: The defendant's misappropriation of trade secrets resulted in a loss of \$500,000 in the plaintiff's income and a profit of \$300,000 for the defendant. The court awarded damages on the basis of "unjust enrichment". What is the maximum number of damages a plaintiff can receive under Section 3(b)(1) of the Uniform Trade Secrets Act (UTSA)?</p>  <p>Options: A. 300,000 B. 500,000 C. 800,000 D. 1,500,000</p> <p>Answer: B</p>
<p>知识产权类型: 著作权 Intellectual Property Type: Copyright</p>	<p>Intellectual Property Type: Trade secret</p>

Figure 23: Data example of task 2-3.


Task2-4: Patent Valuation	
<p>问题:</p> <p>Question:</p> <p>某抗癌药化合物专利剩余保护期5年, 年销售额达12亿元。若该药被纳入国家医保集采目录导致单价下降60%, 其专利价值趋势是?</p> <p>The remaining patent protection period of a certain anti-cancer drug compound is five years, with an annual sales volume reaching 1.2 billion yuan. If the drug is included in the national medical insurance centralized procurement list, resulting in a 60% drop-in unit price, what is the trend of its patent value?</p> <p>选项:</p> <p>Options:</p> <p>A. 因销量暴增翻倍</p> <p>A. Because the sales volume has doubled sharply</p> <p>B. 因利润压缩大幅贬值</p> <p>B. It depreciated significantly due to the compression of profits</p> <p>C. 转为技术秘密后增值</p> <p>C. It increases in value after being converted into a technical secret</p> <p>D. 因政策保护维持不变</p> <p>D. It remains unchanged due to policy protection</p> <p>答案: B</p> <p>Answer: B</p>	<p>Question:</p> <p>Tesla's electric vehicle charging patents (e.g., U.S. 20170171460) were licensed to Rivian under a fixed-fee model. Why might this structure reduce valuation risk for Tesla?</p>  <p>Options:</p> <p>A. Fixed fees guarantee upfront cash flow</p> <p>B. Avoids dependency on fluctuating royalty rates</p> <p>C. Eliminates litigation risks</p> <p>D. Both A and B</p> <p>Answer: D</p>
<p>知识产权类型: 专利</p> <p>Intellectual Property Type: Patent</p>	<p>Intellectual Property Type: Patent</p>

Figure 24: Data example of task 2-4.


Task2-5: Trade Secret Requirements	
<p>问题:</p> <p>Question:</p> <p>根据《反不正当竞争法》, 下列哪项不属于商业秘密的构成要件?</p> <p>According to the Anti-Unfair Competition Law, which of the following is not a constituent element of trade secrets?</p>  <p>选项:</p> <p>Options:</p> <p>A. 不为公众所知悉</p> <p>A. Unknown to the public</p> <p>B. 具有商业价值</p> <p>B. Have commercial value</p> <p>C. 权利人已采取合理保密措施</p> <p>C. The right holder has taken reasonable confidentiality measures</p> <p>D. 已向行政机关登记备案</p> <p>D. It has been registered and filed with the administrative authority</p> <p>答案: D</p> <p>Answer: D</p>	
<p>知识产权类型: 商业秘密</p> <p>Intellectual Property Type: Trade secret</p>	

Figure 25: Data example of task 2-5.

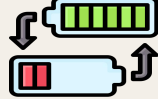
Task3-1: Patent Document Proofreading	
<p>问题: Question: 优先权文本记载: “支架的轴向弹性模量为10-20GPa”, 中国申请修改为..... (后略) The priority text states that "the axial elastic modulus of the bracket is 10-20GPa", and the Chinese application is modified to ...(Omit)</p> <p>选项: Options: A. 轴向模量与径向刚度的物理量纲不同 A. The physical dimensions of axial modulus and radial stiffness are different. B. 优先权文件未提供径向刚度测试数据 B. The priority document does not provide radial stiffness test data. C. 15GPa阈值与原始参数范围无直接对应关系 C. There is no direct correlation between...(Omit) D. 未说明测试方法的边界条件 D. The boundary conditions for the test method are not specified. 答案: C Answer: C</p>	<p>Question: Priority doc shows "battery capacity retention $\geq 80\%$ after 500 cycles at 1C." Continuation claims: "$\geq 90\%$ retention after 300 cycles at 2C." Spec only tests 1C cycling. Core deception?</p>  <p>Options: A. C-rate doubling accelerates degradation nonlinearly. B. Cycle count reduction invalidates long-term performance. C. Capacity retention depends on voltage cutoff. D. No data supports 2C rate performance. Answer: D</p>
<p>知识产权类型: 专利 Intellectual Property Type: Patent</p>	<p>Intellectual Property Type: Patent</p>

Figure 26: Data example of task 3-1.

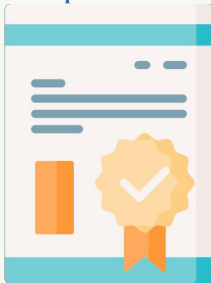
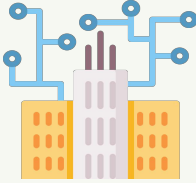
Task3-2: Patent Validity Identification	
<p>问题: Question: 某骨科螺钉专利的合金比例, 与某冶炼厂15年前客户定制产品 (未申请专利) 的配方记录完全一致。该专利缺乏? The alloy ratio of an orthopedic screw patent is exactly the same as the formula record of a customer's customized product (not patented) from a smelter 15 years ago. What is missing from this patent?</p>  <p>选项: Options: A. 充分公开 A. Full disclosure B. 实用性 B. Practicability C. 创造性 C. Creativeness D. 新颖性 D. Novelty 答案: D Answer: D</p>	<p>Question: An AI startup patented a neural network architecture in 2022. Evidence shows the same architecture was fully implemented in an open-source GitHub repository with 500+ stars 14 months pre-filing. What invalidates the patent?</p>  <p>Options: A. Novelty B. Non-obviousness C. Utility D. Enablement Answer: A</p>
<p>知识产权类型: 专利 Intellectual Property Type: Patent</p>	<p>Intellectual Property Type: Patent</p>

Figure 27: Data example of task 3-2.

Task3-3: Patent Match	
<p>问题:</p> <p>Question:</p> <p>请从A,B,C,D四个选项选出与下述专利最相似的专利序号, 该序号是?..... (后略)</p> <p>Please select the patent number that is most similar to the following patent from the four options A, B, C and D. What is the number? ...(Omit)</p> <p>选项:</p> <p>Options:</p> <p>A.一种多功能洁面仪..... (后略)</p> <p>A. A multi-functional facial cleanser...(Omit)</p> <p>B.一种具有吸毛发功能的宠物毛刷及其使用方法..... (后略)</p> <p>B. A pet brush with hair absorption function and its use method...(Omit)</p> <p>C.一种吸水刷头, 包括..... (后略)</p> <p>C. A water-absorbing brush head, including...(Omit)</p> <p>D.本发明公开了一种多功能化妆刷..... (后略)</p> <p>D. The invention discloses a multi-functional makeup brush...(Omit)</p> <p>答案: C</p> <p>Answer: C</p>	<p>Question:</p> <p>Provided is an adipose tissue preservation solution, comprising: polyethylene glycol 400, human albumin, norfloxacin, low molecular dextran, and Ac-DEVD-CHO...(Omit)</p> <p>Options:</p> <p>A. Provided in the present invention are a mesenchymal stem cell injection...(Omit)</p> <p>B. The present invention provides a mesenchymal stem cell injection...(Omit)</p> <p>C. Provided in the present invention is a cell freezing medium for clinical use...(Omit)</p> <p>D. The present invention provides a mesenchymal stem cell injection...(Omit)</p> <p>Answer: D</p>
<p>知识产权类型: 专利</p> <p>Intellectual Property Type: Patent</p>	<p>Intellectual Property Type: Patent</p>

Figure 28: Data example of task 3-3.

Task3-4: Rights Attribution Analysis	
<p>问题:</p> <p>Question:</p> <p>丙公司技术员张某, 完成本职工作之余, 利用业余时间, 自行购买材料研发 “新型焊接工具” (后略)</p> <p>Question: Zhang, a technician of Company C, developed a "new welding tool" by himself using spare time and materials purchased by himself after completing his own work...(Omit)</p> <p>选项:</p> <p>Options:</p> <p>A.丙公司, 因张某是公司员工。</p> <p>A. Company C, because...(Omit)</p> <p>B.张某, 因非职务发明创造。</p> <p>B. Zhang, because it is not an invention made in the course of his duties.</p> <p>C.双方共有, 因张某员工身份关联。</p> <p>C. The two parties share the same identity due to Zhang's employee status.</p> <p>D.归当地政府, 鼓励创新。</p> <p>D. Return to the local government...(Omit)</p> <p>答案: B</p> <p>Answer: B</p>	<p>Question:</p> <p>A biotechnology researcher invents a novel gene-editing tool while employed at University X, using university lab equipment and government grant funds. The researcher's employment contract states, "All inventions arising from university-funded projects belong to the institution." Who owns the patent?</p> <p>Options:</p> <p>A. The researcher individually.</p> <p>B. University X.</p> <p>C. The government funding agency.</p> <p>D. Shared between the researcher and University X.</p> <p>Answer: B</p>
<p>知识产权类型: 专利</p> <p>Intellectual Property Type: Patent</p>	<p>Intellectual Property Type: Patent</p>

Figure 29: Data example of task 3-4.


Task3-5: Patent Application Examination	
Question:	
METHOD FOR PREVENTING OVERLOAD IN MOBILE TELEPHONE NETWORKS BY USING 'ALWAYS-ON' IN THE CASE OF A CALL FROM A MOBILE TELEPHONE	
Abstract:	<p>The invention relates to a method for preventing overload in telecommunications networks with IMS by always-on for a call generated by a user, in which process said user makes a PDP Context request and a GGSN of said network provides a free IP address to him or her and the PDP Context becomes active; and wherein an S-CSCF of the network creates a record in which an association between said IP address and a characteristic identity of the IMS network is included...(Omit)</p>
Options:	
A. Allowed	<p>Answer: A</p>
B. Refuse	
Intellectual Property Type:	Patent

Figure 30: Data example of task 3-5.


Task4-1: Abstract Generation	
<p>问题:</p> <p>Question:</p> <p>#权利要求</p> <p>#Claims</p> <p>1.一种水田搅浆平地机, 包括牵引架 (1)、挡泥罩 (11)、平地刮板 (12)、驱动装置 (13)、搅拌轴 (14) 和搅浆刀 (15), 所述牵引架 (1) 与行走机械连接, 所述牵引架 (1) 用于对挡泥罩 (11) 进行固定..... (后略)</p> <p>1. A paddy field mixing and leveling machine, comprising a traction frame (1), a mudguard cover (11), a leveling scraper (12), a driving device (13), a mixing shaft (14), and a mixing blade (15), wherein the traction frame (1) is connected to a walking machinery, and the traction frame (1) is used to fix the mudguard cover (11)... (Omitted later)</p> <p>应用基于科学发现的... (Omit)</p> <p>答案: 本发明涉及一种水田搅浆平地机, 主要包括牵引架、挡泥罩..... (后略)</p> <p>Answer: The present invention relates to a paddy field mixing and leveling machine, which mainly includes components such as a traction frame, a mud blocking cover...(Omit)</p>	<p>Question:</p> <p># Claims</p> <p>1. A method comprising: obtaining circulating white blood cells from a subject; treating the white blood cells with a DNA damaging agent; performing a flow cytometry based functional variant analysis (FVA)...(Omit)</p> <p>Answer:</p> <p>The present invention relates to a method for assessing the functional status of DNA double strand break (DSB) repair pathway genes in circulating white blood cells obtained from a subject...(Omit)</p> 
知识产权类型: 专利	Intellectual Property Type: Trademark
Intellectual Property Type: Patent	

Figure 31: Data example of task 4-1.

Task4-2: Dependent Claim Generation	
<p>问题:</p> <p>Question:</p> <p>#独立权利要求项</p> <p>#Independent claims</p> <p>1.自动麻将机, 其特征在于, 包括环形推牌装置, 所述环形推牌装置包括推牌槽, (后略)</p> <p>1. An automatic mahjong machine, characterized by comprising a circular card pushing device, wherein the circular card pushing device comprises a card pushing groove....(Omit)</p> <p>请根据给定的独立权利要求项生成其对应的所有从属权利要求。</p> <p>Please generate all dependent claims corresponding to the given independent claims.</p> <p>答案: 根据权利要求1所述的自动麻将机, 其特征在于, 所述环形推牌装置的推牌槽的基座上设有驱动装置, 用于驱动推牌槽内的麻将牌沿推牌槽移动..... (后略)</p> <p>Answer: The automatic mahjong machine according to claim 1, characterized in that a driving device is provided on the base of the pushing slot of the circular pushing device, for driving the mahjong tiles in the pushing slot to move along the pushing slot ...(Omit)</p>	<p>Question:</p> <p># Independent Claim</p> <p>1. An information processing device comprising: a processor; and a memory storing, movement information relating to movement of a vehicle that is not occupied by a user the movement of the vehicle including movement to change a parking position of the vehicle...</p> <p>Answer:</p> <p>Dependent Claims</p> <p>The information processing device of claim 1, wherein the processor is further configured to receive the instruction from the external device via a wireless communication protocol.\n\n3. The information processing device of claim 1, wherein the memory further stores historical movement information of the vehicle...(Omit)</p>
<p>知识产权类型: 专利</p> <p>Intellectual Property Type: Patent</p>	<p>Intellectual Property Type: Trademark</p>

Figure 32: Data example of task 4-2.


Task4-3: Design-Around Solution Generation	
<p>问题:</p> <p>Question:</p> <p>请从A, B, C, D四个选项选出题目对应的答案。</p> <p>专利涉及散热器的蛇形迂回水道布局, 下列哪种改进最可能规避侵权?</p> <p>In the case of Zhengzhou Research Institute v. Chen regarding infringement of new plant variety rights dispute, What are the acts of infringement that Chen was found to have committed?</p> <p>选项:</p> <p>Options:</p> <p>A. 将水道壁厚减少1mm</p> <p>A. Reduce the wall thickness of the waterway by 1mm</p> <p>B. 设计树状分形分支水道</p> <p>B. Design a tree like fractal branch waterway</p> <p>C. 增加水道内部纳米涂层</p> <p>C. Add nano coating inside the waterway</p> <p>D. 加装水温LED指示灯</p> <p>D. Install water temperature LED indicator light</p> <p>答案: B</p> <p>Answer: B</p>	<p>Question:</p> <p>A synthetic biology patent (US 19,876,543) claims "CRISPRa activation system with dCas9-VPR fusion protein and modified sgRNA containing MS2 aptamers." Which redesign escapes infringement?</p>  <p>Options:</p> <p>A. Replacing VPR with p300 activation domain</p> <p>B. Using PP7 aptamers instead of MS2</p> <p>C. Implementing zinc finger proteins instead of dCas9</p> <p>D. Adding nuclear localization signals to sgRNA</p> <p>Answer: C</p>
<p>知识产权类型: 专利</p> <p>Intellectual Property Type: Patent</p>	<p>Intellectual Property Type: Trademark</p>

Figure 33: Data example of task 4-3.

N CASE STUDY

We provide extensive case studies for each task, including both correct and erroneous responses in both Chinese and English, as shown from Figure 34 to Figure 75. These case studies offer deeper insight into the scope of the model’s capabilities in the field of intellectual property.

Chinese

Task 1-1: Correct Case

English

问题:根据《中华人民共和国专利法》,以下哪项是“专利侵权纠纷中的现有技术抗辩”?

Question: According to the "Patent Law of the People's Republic of China," which of the following refers to the "existing technology defense" in patent infringement disputes?

A. 被控侵权人证明实施的技术属于现有技术

A. The accused infringer demonstrates that the technology implemented belongs to existing technology.

B. 专利权人证明其技术具有创造性

B. The patent holder proves that their technology has creativity.

C. 要求提供国际检索报告

C. Requires the submission of an international search report.

D. 必须通过司法鉴定确认

D. Must be confirmed through judicial appraisal.

gpt-4o-mini: ✓

A. 被控侵权人证明实施的技术属于现有技术

A. The accused infringer demonstrates that the technology implemented belongs to existing technology.

According to the Patent Law of the People's Republic of China, the prior art defense in patent infringement disputes refers to the defense that the accused infringer can raise by proving that the technology implemented belongs to the prior art. This means that if the technology accused of infringement already existed before the patent application, the accused infringer can claim that it does not constitute infringement. Therefore, the correct option is: A

Question: Under the Lanham Act, what is the "Official Gazette"?

A. A government database of abandoned marks.

B. A guide for drafting trademark applications.

C. A publication where proposed trademarks are listed for opposition.

D. The number of each party and their representatives participating in the oral hearing of a reexamination case shall not exceed four.

gpt-4o-mini: ✓

C. A publication where proposed trademarks are listed for opposition. To determine the correct answer regarding the "Official Gazette" under the Lanham Act, we need to analyze the options provided:

A. A government database of abandoned marks - This option does not accurately describe the Official Gazette, as it is not specifically focused on abandoned marks.

B. A guide for drafting trademark applications - This option is also incorrect, as the Official Gazette does not serve as a guide for drafting applications.

C. A publication where proposed trademarks are listed for opposition - This option aligns with the purpose of the Official Gazette. The Official Gazette is indeed a publication where trademarks that have been applied for are published, allowing third parties to oppose the registration of those marks.

D. A journal for patent filings - This option is incorrect because the Official Gazette is specifically related to trademarks, not patents.

Figure 34: Correct case of task 1-1.

Chinese

Task 1-1: Error Case

English

问题:《中华人民共和国刑法》中对于“销售侵权复制品罪”的定义是?

Question: What is the definition of the "crime of selling infringing reproductions" in the Criminal Law of the People's Republic of China?

A. 以营利为目的,销售明知是侵犯著作权的复制品,数量较大的

A. Selling, for profit, a relatively large quantity of reproductions that one clearly knows infringe copyright.

B. 以营利为目的,销售明知是侵犯著作权的复制品,造成严重后果的

B. Selling, for profit, reproductions that one clearly knows infringe copyright, resulting in serious consequences.

C. 以营利为目的,销售明知是侵犯著作权的复制品,情节严重的

C. Selling, for profit, reproductions that one clearly knows infringe copyright, where the circumstances are serious.

D. 以营利为目的,销售明知侵犯著作权的复制品,违法所得数额巨大的

D. Selling, for profit, reproductions that one clearly knows infringe copyright, where the illegal gains are of a huge amount.

gpt-4o-mini: ✗

C. 以营利为目的,销售明知是侵犯著作权的复制品,情节严重的

C. Selling, for profit, reproductions that one clearly knows infringe copyright, where the circumstances are serious.

Error Category: Reasoning error

Error Reason: According to the Criminal Law of the People's Republic of China, the definition of the "crime of selling infringing reproductions" is "selling, for profit, reproductions that one clearly knows infringe copyright, where the circumstances are serious."** Therefore, the correct answer is Option C.

Question: According to the United States Code, Title 35 - Patents, what is the definition of "patent"?

A. A temporary monopoly granted by the government to an inventor.

B. A trademark or service mark used in commerce.

C. A legal document granting the inventor exclusive rights to their invention for a limited time

D. A copyright protecting artistic works.

gpt-4o-mini: ✗

D. A copyright protecting artistic works.

Error Category: Consistency Error

Error Reason: A patent is indeed a legal document that grants the inventor exclusive rights to their invention for a limited time, typically 20 years from the filing date. This definition aligns with option D. Option A describes a patent as a temporary monopoly, which is somewhat accurate but not as precise as option C. Option B refers to trademarks, and option D pertains to copyrights, neither of which are relevant to the definition of a patent.

Figure 35: Error case of task 1-1.

Chinese	Task 1-2: Correct Case	English
<p>问题:根据《中华人民共和国专利法(2020年修正)》第65条规定,专利侵权纠纷的解决途径不包括?</p> <p>Question: According to Article 65 of the Patent Law of the People's Republic of China (2020 Amendment), which of the following is NOT a resolution pathway for patent infringement disputes?</p> <p>A.当事人协商 A. Negotiation between the parties. B.向人民法院起诉 B. Filing a lawsuit with a people's court. C.请求市场监管部门罚款 C. Requesting market regulatory authorities to impose fines. D.请求管理专利工作的部门处理 D. Requesting the patent administration department to handle the dispute.</p> <p>gpt-4o-mini: <input checked="" type="checkbox"/> C.请求市场监管部门罚款 C. Requesting market regulatory authorities to impose fines. According to Article 65 of the Patent Law of the People's Republic of China (Revised in 2020), the main ways to resolve patent infringement disputes include negotiation between the parties, filing a lawsuit with the people's court, and requesting the department responsible for managing patent work to handle them. However, requesting fines from market regulatory authorities is not one of the ways to resolve patent infringement disputes. Therefore, the correct answer is: Answer: C</p>	<p>Question: How does 35 U.S.C. § 112(d) govern multiple dependent claims?</p> <p>A. Prohibits combining multiple dependencies B. Allows referencing preceding claims in alternative form. C. Requires separate filing fees. D. Limits to three embodiments.</p> <p>gpt-4o-mini: <input checked="" type="checkbox"/> B. Allows referencing preceding claims in alternative form. To understand how 35 U.S.C. § 112(d) governs multiple dependent claims, we need to analyze what multiple dependent claims are and how they are treated under U.S. patent law. 1. Multiple Dependent Claims: These are claims that depend on more than one preceding claim. For example, a claim might state that it depends on both Claim 1 and Claim 2. 2. Prohibition on Combining Dependencies: Option A states that it prohibits combining multiple dependencies. This is not accurate because § 112(d) allows for multiple dependent claims, but it does impose certain restrictions. 3. Referencing Preceding Claims: Option B suggests that it allows referencing preceding claims in alternative form. This is indeed correct. Multiple dependent claims can refer back to more than one claim, but they must do so in a way that is clear and does not create ambiguity...(omit)</p>	

Figure 36: Correct case of task 1-2.

Chinese	Task 1-2: Error Case	English
<p>问题:根据《中华人民共和国专利法(2020年修正)》第25条,不能授予专利权的是?</p> <p>Question: According to Article 25 of the Patent Law of the People's Republic of China (2020 Amendment), which of the following is not patentable?</p> <p>A.新药制备方法 A. A method for preparing a new drug. B.疾病诊断仪器 B. Diagnostic instruments for diseases. C.植物品种的生产方法 C. Methods for producing plant varieties. D.计算机程序规则 D. Rules of computer programs.</p> <p>gpt-4o-mini: <input checked="" type="checkbox"/> C.植物品种的生产方法 C. Methods for producing plant varieties.</p> <p>Error Category: Staleness Error Error Reason: According to Article 25 of the Patent Law of the People's Republic of China (2020 Amendment), the following are excluded from patentability: methods for producing plant varieties and rules of computer programs. Therefore, the correct answer is Option C.</p>	<p>Question: Under 35 U.S.C. § 102(b), which scenario would NOT bar patentability?</p> <p>A. The invention was on sale in Canada 13 months before filing. B. A U.S. journal article describes the invention 14 months before filing. C. The inventor publicly uses the invention in the U.S. 11 months before filing. D. A third party files a foreign patent application 16 months before the U.S. filing.</p> <p>gpt-4o-mini: <input checked="" type="checkbox"/> C. The inventor publicly uses the invention in the U.S. 11 months before filing.</p> <p>Error Category: Consistency Error Error Reason: A. This scenario would bar patentability because the sale occurred more than one year before the U.S. filing date, and it happened outside the U.S. B. This scenario would also bar patentability because the publication occurred more than one year before the U.S. filing date. C. This scenario would NOT bar patentability because the public use occurred within the one-year grace period before the filing date. D. This scenario would bar patentability because the foreign filing occurred more than one year before the U.S. filing date.</p>	


Figure 37: Error case of task 1-2.

Chinese	Task 1-3: Correct Case	English
<p>问题:相较于2000年《中华人民共和国专利法》, 2008年修订版本新增了哪项关于现有技术抗辩的明确规定?</p> <p>Question: Compared to the 2000 Patent Law of the People's Republic of China, which of the following explicit provisions regarding the "prior art defense" was newly added in the 2008 Amendment?</p> <p>A.允许被诉侵权人援引现有技术主张不侵权 A. Allowing the alleged infringer to invoke prior art to claim non-infringement. B.要求现有技术必须为国内外公开出版物 B. Requiring prior art to be limited to publicly available publications domestically or abroad. C.规定现有技术抗辩需经专利局确认 C. Stating that prior art defenses must be confirmed by the patent office. D.限定现有技术抗辩仅适用于发明专利 D. Restricting prior art defenses only to invention patents.</p>	<p>Question: What change was made to the citation format of Public Law 112-29 in the April 2013 revision of 35 U.S.C. §5 compared to the January 2013 version?</p> <p>A. The statute number was changed from 112-29 to 112-30. B. The effective date was removed entirely. C. A footnote explaining the effective date was added. D. The effective date was moved into parentheses following the statute number.</p>	
<p>gpt-4o-mini: <input checked="" type="checkbox"/></p> <p>A.允许被诉侵权人援引现有技术主张不侵权 A. Allowing the alleged infringer to invoke prior art to claim non-infringement. According to the revised Patent Law of the People's Republic of China in 2008, a clear provision on the defense of prior art has been added, allowing the accused infringer to claim non infringement by citing prior art. Therefore, the correct answer is: Answer: A</p>	<p>gpt-4o-mini: <input checked="" type="checkbox"/></p> <p>D. The effective date was moved into parentheses following the statute number. To determine the correct answer regarding the change made to the citation format of Public Law 112-29 in the April 2013 revision of 35 U.S.C. §5 compared to the January 2013 version, we need to analyze the options provided: A. The statute number was changed from 112-29 to 112-30 - This option suggests a change in the statute number, which is not typically the case in revisions unless there is a new law enacted. B. The effective date was removed entirely - This option implies that the effective date was completely omitted, which is unlikely as effective dates are important in legal citations. C. A footnote explaining the effective date was ... (omit)</p>	

Figure 38: Correct case of task 1-3.

Chinese	Task 1-3: Error Case	English
<p>问题:相较于2000年《中华人民共和国专利法》, 2008年修订版本新增了哪项关于外观设计专利申请的实质性条件?</p> <p>Question: Compared to the 2000 Patent Law of the People's Republic of China, which of the following substantive requirements for design patent applications was newly added in the 2008 Amendment?</p> <p>A.要求外观设计必须具有明显区别性 A. The design must be clearly distinguishable. B.增加“富有美感”的创造性标准 B. The introduction of a "aesthetic appeal" creative standard. C.规定不得与他人在先权利冲突 C. A requirement that the design must not conflict with prior legal rights of others. D.要求提交产品六面视图 D. Submission of six-side orthographic views of the product.</p>	<p>Question: Compared to the 2015 U.S. Patent Act (35 U.S.C.), what key change was made to disclosure requirements in the 2022 revision?</p> <p>A. Removed specific format requirements for "written description" under Section 112. B. Added mandatory disclosure obligations for genetic resource origins under Section 114. C. Amended Section 101 to exclude patentability of software algorithms. D. Extended electronic filing deadlines for patent applications under Section 111.</p>	
<p>gpt-4o-mini: <input checked="" type="checkbox"/></p> <p>B.增加“富有美感”的创造性标准 B. The introduction of a "aesthetic appeal" creative standard.</p>	<p>gpt-4o-mini: <input checked="" type="checkbox"/></p> <p>C. The inventor publicly uses the invention in the U.S. 11 months before filing.</p>	
<p>Error Category: Obsolescence Error Error Reason: According to the 2008 Amended Patent Law of the People's Republic of China, a new substantive condition was added for design patent applications: the design must meet a creative standard of "aesthetic appeal". Therefore, the correct answer is Option B.</p>	<p>Error Category: Consistency Error Error Reason: A. This option suggests a change in the requirements for how a written description must be formatted. B. This option implies a new requirement for disclosing the origins of genetic resources. C. This option suggests a fundamental change in what can be patented, specifically targeting software algorithms, which is a major shift but not directly related to disclosure requirements. D. This option pertains to filing deadlines rather than disclosure requirements. After evaluating these options, the most relevant change to disclosure requirements in the 2022 revision appears to be related to the written description under Section 112.</p>	

Figure 39: Error case of task 1-3.



Chinese


Task 1-4: Correct Case

English

问题：“丹玉405号”玉米植物新品种侵权案中，凌海市农某种业科技公司被指控的侵权行为包括以下哪些？

Question: In the "Danyu 405" Corn New Plant Variety Infringement Case, what alleged infringements were committed by Linghai City Nong Mou Seed Technology Co., Ltd.?

A. 未经授权生产“丹玉405号”玉米种子
A. Unauthorized production of "Danyu 405" corn seeds.
B. 以其他品种名称套牌销售“丹玉405号”玉米种子
B. Repackaging and selling "Danyu 405" corn seeds under another variety name.
C. 多次实施套牌侵权、重复侵权
C. Repeated acts of repackaging infringement and repeated violations.
D. 以上都是
D. All of the above.

gpt-4o-mini: 
D. 以上都是
In the infringement case of the "Danyu 405" corn plant new variety, Linghai Agricultural Technology Company was accused of infringement, including: A. Unauthorized production of "Danyu 405" corn seeds - this is a clear infringement, as unauthorized production constitutes an infringement of intellectual property rights. B. Selling "Danyu 405" corn seeds under other variety names is also an infringement...(omit)

Question: In the case of "Mattel Inc. v. MGA Entertainment Inc.", What was the primary reason for the lawsuit filed by Mattel Inc. against MGA Entertainment Inc.?

A. MGA's production of Bratz dolls allegedly infringed on Mattel's copyrights.
B. MGA's advertising campaigns were misleading consumers.
C. MGA failed to pay licensing fees to Mattel.
D. MGA used Mattel's trade secrets to develop its products.



gpt-4o-mini: 
A. MGA's production of Bratz dolls allegedly infringed on Mattel's copyrights.
In the case of "Mattel Inc. v. MGA Entertainment Inc.", the primary reason for the lawsuit filed by Mattel Inc. against MGA Entertainment Inc. was that MGA's production of Bratz dolls allegedly infringed on Mattel's copyrights. Mattel claimed that the Bratz dolls were developed by a former Mattel employee who had used Mattel's intellectual property in the process.
Answer: A

Figure 40: Correct case of task 1-4.



Chinese


Task 1-4: Error Case



English

问题：“西某股份公司、西某（中国）有限公司与宁波奇某电器有限公司等侵害商标权及不正当竞争纠纷案”中，西某股份公司及西某（中国）有限公司提起诉讼的主要原因是？

Question: In the case , what were the main reasons for Xi Mou Co., Ltd. and Xi Mou (China) Co., Ltd. to file the lawsuit?


A. 宁波奇某电器有限公司未经授权使用“西门子”商标
A. Ningbo Qi Mou Electric Appliance Co., Ltd. used the Siemens trademark without authorization.
B. 宁波奇某电器有限公司使用“上海西门子电器有限公司”作为企业名称
B. Ningbo Qi Mou Electric Appliance Co., Ltd. used Shanghai Siemens Electric Appliance Co., Ltd. as its corporate name.
C. 宁波奇某电器有限公司未经授权销售“西门子”产品
C. Ningbo Qi Mou Electric Appliance Co., Ltd. sold Siemens products without authorization.
D. 宁波奇某电器有限公司在产品外包装及宣传活动中使用“上海西门子电器有限公司”名称
D. Ningbo Qi Mou Electric Appliance Co., Ltd. used the name Shanghai Siemens Electric Appliance Co., Ltd. on product packaging.

gpt-4o-mini: 
A. 宁波奇某电器有限公司未经授权使用“西门子”商标
A. Ningbo Qi Mou Electric Appliance Co., Ltd. used the Siemens trademark without authorization

Error Category: **Priority Error** 
Error Reason: A. This constitutes trademark infringement. B. This may involve unfair competition but does not directly relate to trademark rights. C. This also constitutes trademark infringement. D. This similarly involves unfair competition. Both Options A and C involve trademark infringement. Option A, however, more directly addresses the core issue of unauthorized trademark use, making it the primary reason for filing the lawsuit. 

Question: In the case of "S. Victor Whitmill v. Warner Bros. Entertainment Inc.", What was the primary defense argument presented by Warner Bros. Entertainment Inc. in response to the copyright infringement claim?

A. The tattoo design was not original.
B. The use of the tattoo design was fair use.
C. The tattoo design was in the public domain.
D. The use of the tattoo design was authorized by Mike Tyson.

gpt-4o-mini: 
B. The use of the tattoo design was fair use.



Error Category: **Consistency Error** 
Error Reason: In the case of "S. Victor Whitmill v. Warner Bros. Entertainment Inc.", Warner Bros. Entertainment Inc. primarily argued that the use of the tattoo design was fair use. They contended that the depiction of the tattoo on the character in the film was transformative and did not infringe on Whitmill's copyright. 

Figure 41: Error case of task 1-4.

Chinese

Task 1-5-1: Correct Case

English

问题:请根据专利的标题和摘要,给出其对应的国际专利分类号。
Question: Please provide the corresponding International Patent Classification (IPC) code based on the patent's title and abstract.

标题:一种铁氧体磁芯双面磨床
Title: A Double-Sided Grinding Machine for Ferrite Cores

摘要:本实用新型公开了一种铁氧体磁芯双面磨床,涉及双面磨削加工技术领域,包括框架,框架的安装板一端上方固定安装有对接板,在安装板和对接板上转动安装有低速转盘,安装板的另一端转动连接有打磨盘,低速转盘的一侧插入上磨盘和下磨盘之间,在安装板的下方设置有低速电机,还包括设置在低速转盘上的限位机构。
Abstract: The utility model discloses a double-sided grinding machine for ferrite cores, which pertains to the technical field of double-sided grinding processing. The machine comprises a frame. A docking plate is fixed above one end of the mounting plate of the frame, and a low-speed turntable is rotatably installed on the mounting plate and the docking plate. The other end of the mounting plate is rotatably connected to a grinding disc. One side of the low-speed turntable is inserted between an upper grinding disc and a lower grinding disc.

gpt-4o-mini:
Based on the title and abstract of the patent, this invention pertains to a device for double-sided grinding processing, especially for a grinding machine for ferrite magnetic cores. According to its functions and technical field, the corresponding International Patent Classification Number (IPC) can be inferred. In the International Patent Classification, technologies related to grinding machines and grinding processing are usually classified under B24 (grinding, polishing, buffing or similar processing), and for specific technologies related to double-sided grinding machines, they may be further subdivided. Therefore, considering the content of this patent, the most appropriate International Patent Classification Number is B24B (double-sided grinding).
Answer: **B24B7/17**

Question: Please provide the corresponding International Patent Classification (IPC) code based on the patent's title and abstract.

Title: Device for stimulating the clitoris using a variable pressure field and method for generating a variable pressure field

Abstract: An example device for stimulating a clitoris includes a housing; a drive device configured to provide a drive movement; a pressure chamber at least partially surrounded by a chamber wall; a chamber wall portion forming a portion of the chamber wall, the drive device to cause the chamber wall portion to repeatedly move between different wall positions to cause a chamber volume of the pressure chamber to repeatedly increase and decrease to generate a variable pressure field; a housing opening fluidly connected to the pressure chamber, the variable pressure field to be output via the housing opening in the form of negative and positive pressures.

gpt-4o-mini:
The title and abstract indicate that the device is specifically designed for stimulating the clitoris through a variable pressure field. This suggests that the invention falls under the category of sexual aids or devices designed for sexual stimulation. The mention of a pressure chamber and the generation of a variable pressure field further indicates that the device may involve mechanical or electromechanical components. Based on the IPC system, the relevant sections for this type of invention would likely fall under A61H: This section covers therapeutic appliances for medical or surgical purposes, which includes devices for stimulating sexual organs. A61F: This section includes devices for sexual stimulation.
Answer: **A61K31/4162**

Figure 42: Correct case of task 1-5-1.

Chinese

Task 1-5-1: Error Case

English

问题:请根据专利的标题和摘要,给出其对应的国际专利分类号。
Question: Please provide the corresponding International Patent Classification (IPC) code based on the patent's title and abstract.

标题:一种港口航道淤泥分离去水装置
Title: A Port Channel Sludge Separation and Dewatering Device

摘要:本实用新型涉及一种港口航道淤泥分离去水装置,属于淤泥处理技术领域,包括机架、封闭盖板、外筒体、内滤筒、转轴、轴承套、进泥管,转轴内孔中设有跟随其转动且能上下升降的控制轴,控制轴的底部固定有封闭内滤筒底部的封闭锥板,转轴的上部连接有驱动机构,控制轴的顶部转动连接有升降控制机构,外筒体的中部内壁上固定有环形的接水槽,接水槽的底部固定有排水管。
Abstract: The utility model relates to a port channel sludge separation and dewatering device, belonging to the technical field of sludge treatment. The device comprises a frame, a sealed cover plate, an outer cylinder, an inner filter cylinder, a rotating shaft, a bearing sleeve, and a sludge inlet pipe. A control shaft is arranged in the inner hole of the rotating shaft, which rotates with the shaft and can move vertically.

gpt-4o-mini:
B01D

Error Category: Reasoning Error
Error Reason: Based on the patent's title and abstract, the corresponding International Patent Classification (IPC) code is likely related to water treatment, sludge treatment, or separation technology. According to the IPC system, potential classification codes include: B01D: Separation; B03B: Apparatus for separating solids from solids using wet techniques; C02F: Water or wastewater treatment. Given the device's specific function and application, the most appropriate classification is B01D (Separation).

Question: Please provide the corresponding International Patent Classification (IPC) based on the patent's title and abstract.

Title: Video monitoring system


Abstract: An asset tracking system includes a camera adapted to capture images and output signals representative of the images. The camera may include one or more depth sensors that detect distances between the depth sensor and objects positioned within the field of view of the one or more cameras. A computer device processes the image signals and or depth signals from cameras and determines any one or more of the following: (a) whether a patient care protocol has been properly followed; (b) what condition a patient is in; (c) whether an infection control protocol has been properly followed; and (d) whether steps have been taken to reduce the risk of a patient from falling. Alerts may be issued if any conditions of importance are detected.

gpt-4o-mini:
A61B

Error Category: Reasoning Error
Error Reason: Based on this information, the relevant IPC classes can be identified: G06T - Image data processing or generation, which includes image analysis and processing techniques; A61B - Diagnosis, surgery; identification of persons; devices for transferring or applying fluids to the body, which is relevant due to the healthcare context of monitoring patient conditions; G08B - Signaling or calling systems, which could relate to the alerting aspect of the system. Given the focus on video monitoring in a healthcare context, the most relevant IPC classification would likely fall under A61B, as it pertains to medical technology and monitoring systems.

Figure 43: Error case of task 1-5-1.


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 **Task 1-5-2: Correct Case**

Please provide the corresponding Cooperative Patent Classification (CPC) based on the patent's title and abstract.

Title:Fishing bait, a mouldable composition for manufacturing the fishing bait, a method for manufacturing the fishing bait and a use of the mouldable composition

Abstract:The present invention relates to a fishing bait, a mouldable composition for manufacturing the fishing bait, a method for manufacturing the fishing bait and a use of the mouldable composition. The mouldable composition comprises a basic solution comprising water, a gelling agent and a plasticizer. The mouldable composition further comprises at least one cross-linking agent in the volume of the basic solution.

gpt-4o-mini:  To determine the appropriate Cooperative Patent Classification (CPC) for the provided patent title and abstract, we need to analyze the key components of the invention.


1. Fishing Bait: This indicates that the invention is related to products used in fishing, specifically bait.
2. Mouldable Composition: This suggests a focus on materials science, particularly formulations that can be shaped or formed.
3. Manufacturing Method: This implies that the invention includes a process for creating the fishing bait.
4. Composition Components: The mention of a basic solution, gelling agent, plasticizer, and cross-linking agent indicates a chemical composition aspect.

Given these points, the CPC classification would likely fall under categories related to fishing and bait, as well as materials and compositions used in their manufacture. The relevant CPC classes for fishing bait and related compositions typically include: A01K: This class covers "Animal husbandry" and includes fishing bait. A01K 85/00: This subclass specifically relates to "Baits for fishing".

Considering the focus on the composition and method of manufacturing, the classification may also touch on aspects of chemical compositions, but the primary focus remains on fishing bait.

Thus, the most appropriate CPC classification for this patent would be: Answer: A01K 85/00


Figure 44: Correct case of task 1-5-2.

 **Task 1-5-2: Error Case**

Question: Please provide the corresponding Cooperative Patent Classification (CPC) based on the patent's title and abstract.


Title:Multipurpose machine for cultivating trees.

Abstract:A multipurpose machine for cultivating trees, comprising an inverted U-shape structure that enables the machine to pass over existing trees to carry out pruning, disinfection or fruit picking tasks, provided at the bottom with wheels, driven by at least one motor that autonomously facilitates the movement thereof, and respective upper frames that telescopically couple to each other, being driven by respective cylinders to move the portion of the structure on the right with respect to the one on the left in order to vary the width of the machine. Likewise, the machine has the ability to raise or lower the upper structure of the same to adapt it to the height of the trees to be cultivated.

gpt-4o-mini:  A01B 79/00


Error Category: Reasoning Error
Error Reason: It features a unique structure that allows it to navigate around existing trees and adjust its width and height. The relevant CPC classifications for this type of agricultural machinery typically fall under the following sections: 1. A01B 79/00 - This section covers "Soil working in agriculture or forestry; Cultivating; Planting" which includes machines and implements for cultivating trees. 2. A01D 47/00 - This section pertains to "Harvesting" and includes machines for picking fruits and other agricultural products. Given the multifunctional nature of the machine, particularly its capabilities for both cultivation and harvesting, the most appropriate CPC classification would likely be A01B 79/00. This classification specifically covers "Machines or apparatus for cultivating or working the soil, specially adapted for trees or shrubs".

Figure 45: Error case of task 1-5-2.

 **Chinese** **Task 1-6: Correct Case** **English**

请从A、B、C、D四个选项选出题目对应的答案。
工程师在专利公开日至授权日期间改进技术方案并实施，专利权人主张侵权。抗辩成立的关键是什么？
Please refer to A、B. Choose the answer corresponding to the question from the four options C and D. The engineer improves the technical solution and implements it during the period from the patent disclosure date to the authorization date, and the patent owner claims infringement. What is the key to establishing a defense?


A. 先用权成立要件
A. Requirements for the Establishment of First Use Rights
B. 临时保护期效力
B. Effectiveness of temporary protection period
C. 实验性使用例外
C. Experimental use exception
D. 权利用尽原则
D. Principle of exhaustion of rights

gpt-4o-mini:  In patent law, the improvement and implementation of technical solutions by the patentee between the date of patent publication and the date of authorization involve the effectiveness of the temporary protection period. According to relevant laws and regulations, after a patent application is published, the applicant enjoys a certain temporary protection period, and others are not allowed to implement the technical solution during this period. Therefore, the key to the establishment of the defense lies in the effectiveness of the temporary protection period.
Answer: B

Please select the correct answer from A, B, C, and D.

An AI company trains a neural network to design nanobots but only publishes input output examples in its patent. Competitors decode the model. What invalidates the patent?

A. Lack of enablement per In re AI Models Corp.
B. Algorithmic abstraction as prior art
C. Trade secret protection for training data
D. Fair use of published research

gpt-4o-mini:  To determine which option invalidates the patent, we need to analyze each choice in the context of patent law and the situation described.

A. Lack of enablement per In re AI Models Corp. - This option suggests that the patent does not provide sufficient detail for someone skilled in the art to replicate the invention. If the patent only includes input output examples without a clear methodology or sufficient detail on how to create the nanobots, it could indeed be considered lacking in enablement.

B. Algorithmic abstraction as prior art - This option implies that the methods or algorithms used in the neural network are already known and thus cannot be patented. However, the scenario does not indicate that the competitors are using prior art; they are decoding the model based on the examples provided.

C. Trade secret protection for training data - This option suggests that the training data used to develop the neural network is protected as a trade secret. However, the question focuses on the patent's validity rather than the protection of trade secrets.

D. Fair use of published research - This option refers to the ability of competitors to use published research without infringing on the patent. However, the competitors are decoding the model based on the patent's input output examples, which may not fall under fair use.

Given these analyses, the most relevant option that directly addresses the potential invalidation ... (omit)

Figure 46: Correct case of task 1-6.

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Chinese

Task 1-6: Error Case

English

问题: 运动品牌商标 "QUICKFIT" 因长期未使用被第三方在健身APP领域注册。争议焦点涉及什么?
Question: The sports brand trademark "QUICKFIT" was registered by a third party in the fitness app domain due to prolonged non-use. What does the dispute focus on?

A. 商标通用化认定
A. Determination of trademark genericide.
B. 跨类保护范围
B. Scope of cross-class protection.
C. 驰名商标认定
C. Determination of a well-known trademark.
D. 商标共存协议
D. Trademark coexistence agreement.

gpt-4o-mini: ✗
B. 跨类保护范围
B. Scope of cross-class protection.

Error Category: Consistency Error
Error Reason: Among the options: A. Determination of trademark genericide: Refers to a trademark becoming a generic term due to widespread use, which likely does not apply here. B. Scope of cross-class protection: Relates to trademark protection across different categories, which is likely relevant. C. Determination of a well-known trademark: Generally involves a trademark's fame and broader protection, but here, since the trademark was not actively used, this is likely not applicable. D. Trademark coexistence agreement: Usually involves agreements between trademark holders, which is likely irrelevant here. The most relevant option is B, as the dispute centers on the use and protection of the trademark in a different category (e.g., fitness apps). Cross-class protection would determine whether the original trademark owner can block third-party registration in unrelated fields, even if the trademark was not actively used.

A. Nominative fair use under New Kids.
B. Parody defense under Rogers v. Koons.
C. First Amendment artistic expression.
D. Trademark tarnishment.

gpt-4o-mini: ✗
B. Parody defense under Rogers v. Koons.

Error Category: Consistency Error
Error Reason: A. This doctrine allows for the use of a trademark to refer to the trademarked goods or services, but it typically applies when the use is necessary to identify the product and does not suggest sponsorship or endorsement. B. This doctrine allows for the use of a trademark in a way that is transformative and serves as a parody, which could be relevant if the designs are intended to mock or critique the luxury brands. C. This could apply if the designs are considered a form of artistic expression, but it may not provide a strong defense if the use of the logos is deemed to cause confusion. D. This doctrine applies when a trademark is used in a way that harms its reputation, which could be a concern for luxury brands if the anti-brand designs are seen as derogatory.

Figure 47: Error case of task 1-6.

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Chinese

Task 1-7: Correct Case

English

请从A, B, C, D四个选项中选择题目对应的答案。
下列哪项不属于职务发明创造的情形?
Please refer to A, B. Choose the answer corresponding to the question from the four options C and D. Which of the following does not fall under the category of a service invention or creation?

A. 退休后10个月内完成与原工作相关的发明
A. Complete inventions related to the original job within 10 months after retirement
B. 利用个人设备完成的发明
B. Inventions made using personal devices
C. 履行单位临时指派任务完成的发明
C. Inventions completed by fulfilling temporary tasks assigned by the unit
D. 调离原单位后1年内作出的与原职相关的发明
D. Inventions related to the original position made within one year after being transferred from the original unit

gpt-4o-mini: ✓
Service inventions and creations refer to inventions and creations completed within the scope of duties. According to relevant laws and regulations, service inventions usually include inventions completed during work, utilizing unit resources, or under tasks assigned by the unit. Analysis options:
A. Inventions related to the original job completed within 10 months after retirement - this falls under the category of service inventions, as they are related to the original job even after retirement.
B. Inventions made using personal devices - this does not belong to service inventions, as it is made using personal devices rather than organizational resources. Invention completed by fulfilling temporary tasks assigned by the unit - This is a service invention because it was completed under the unit's assignment.
D. Inventions made within one year after being transferred from the original unit that are related to the original position may also be considered as service inventions, but are usually no longer considered as service inventions after the transfer. In summary, option B is the least suitable situation for service inventions and creations. Answer: ** B**

Please select the correct answer from A, B, C, and D.

Question: Which entities can be designated as International Searching Authorities?

A. Any national office
B. Only intergovernmental organizations
C. National offices or intergovernmental organizations
D. Non-governmental organizations

gpt-4o-mini: ✓
International Searching Authorities (ISAs) are designated entities that conduct international searches for patent applications under the Patent Cooperation Treaty (PCT). According to the PCT regulations, ISAs can be either national patent offices or intergovernmental organizations that have been authorized to perform this function. Given this information, the correct answer is: C. National offices or intergovernmental organizations.
Answer: C

Figure 48: Correct case of task 1-7.

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Chinese

Task 1-7: Error Case

English

问题: 下列哪项不属于职务发明创造的情形?
Question: Which of the following is not a case of an invention made in the course of employment?

A. 退休后10个月内完成与原工作相关的发明。
A. Complete inventions related to the original job within 10 months after retirement.

B. 利用个人设备完成的发明。
B. Inventions made with personal devices.

C. 履行单位临时指派任务完成的发明。
C. Invention accomplished by a unit assigned a temporary task by the performing unit.

D. 调离原单位后1年内作出的与原职相关的发明。
D. Inventions related to the original position made within one year after leaving the original unit.

gpt-4o-mini: ✗
B. 利用个人设备完成的发明。
B. Inventions made with personal devices.

Error Category: Reasoning error
Error Reason:
A service invention refers to an invention completed within the scope of one's duties. According to relevant laws and regulations, service inventions typically include those made during working hours, using company resources, or under tasks assigned by the company. Analysis options:
A. An invention related to the original job completed within 10 months after retirement-This falls under the category of a service invention because, although it was completed after retirement, it is still related to the original job.
B. An invention made using personal equipment-This does not qualify as a service invention because it was made using personal equipment rather than company resources.
C. An invention made while performing a temporary task assigned by the company-This is considered a service invention because it was completed under the company's assignment.
D. An invention related to the original position made within 1 year after leaving the original company-This may also be regarded as a service invention, but it usually ceases to be considered such after the transfer.

Question: What triggers a 'Notice to File Missing Parts'?

A. Missing essential filing requirements.

B. Non-payment of maintenance fees.

C. Errors in patent claims.

D. Incomplete prior art search.

gpt-4o-mini: ✗
A. Missing essential filing requirements.

Error Category: Hallucination error
Error Reason:
A 'Notice to File Missing Parts' is typically triggered by the absence of essential filing requirements in a patent application. This notice is issued by the patent office when the submitted application does not meet the necessary criteria for completeness, which can include missing documents, forms, or fees that are required for the application to be processed.
A. Missing essential filing requirements- This directly aligns with the definition of what triggers a 'Notice to File Missing Parts'.
B. Non-payment of maintenance fees - This is related to maintaining a patent after it has been granted, not the initial filing process.
C. Errors in patent claims - While errors can lead to issues, they do not specifically trigger a 'Notice to File Missing Parts'.
D. Incomplete prior art search - This is not a requirement for filing and would not trigger such a notice.

Figure 49: Error case of task 1-7.

✓

Chinese

Task 2-1: Correct Case

English

问题: 克氏针折弯装置”发明专利授权案中, 克氏针折弯装置的自动化操作功能使其适用于批量生产场景。随着骨科手术机器人市场的快速增长, 以下哪种合作模式最能推动装置的技术升级和商业落地?
Question: With the rapid growth of the orthopedic surgical robot market, which collaboration model would best drive technological upgrades and commercialization of the device?

A. 与政府医疗机构合作, 针对基层医院推出经济型版本, 降低设备采购门槛, 并提供远程技术支持和培训服务
A. Partner with government medical institutions to launch a cost-effective version for grassroots hospitals, lower procurement barriers, and provide remote technical support and training.

B. 与医疗器械经销商合作, 开发定制化售后服务方案, 结合患者术后反馈优化装置性能, 并提供定期升级服务
B. Collaborate with medical device distributors to develop customized after-sales service packages, optimize device performance based on postoperative patient feedback, and offer regular upgrades.

C. 与骨科手术机器人厂商合作, 开发模块化接口, 将装置作为机器人手术系统的标准化配件, 并集成术前规划与术中实时调整的双模式功能
C. Partner with orthopedic surgical robot manufacturers to develop modular interfaces, integrate the device as a standardized accessory for robotic surgery systems, and combine preoperative planning with intraoperative real-time adjustment capabilities.

D. 与影像设备厂商合作, 开发基于术前影像的智能折弯算法, 并集成至现有装置中, 同时提供术后康复数据分析服务
D. Work with imaging equipment manufacturers to develop intelligent bending algorithms based on preoperative imaging.

gpt-4o-mini: ✓
When considering the technological upgrade and commercialization of the Kirschner needle bending device, we need to analyze the potential impact and feasibility of each option.
A. Cooperate with government medical institutions to launch an economical version and lower the threshold for equipment procurement. This cooperation model can help the device enter the primary hospital market, but it may have limited driving force in terms of technological upgrading because the main focus is on cost rather than technological innovation... (Omit)
Answer: C

Question: A quantum sensor patent (US202536789012C3) claims entanglement-enhanced detection of nanoscale magnetic fields (10⁻¹⁸ T resolution) using nitrogen-vacancy centers in 3D-printed diamond waveguides. Which industry would face disruptive competition?

A. Cardiac arrhythmia diagnostics.

B. Neuromarketing analytics.

C. Oil reservoir mapping.

D. Semiconductor lithography.

gpt-4o-mini: ✓

Understanding the Technology:
The patent describes a quantum sensor that utilizes entanglement to detect extremely small magnetic fields (10⁻¹⁸ T resolution) using nitrogen-vacancy centers in diamond waveguides. This technology is particularly sensitive to magnetic fields at the nanoscale.

Analyzing the Options:
A. Cardiac arrhythmia diagnostics: This field primarily focuses on electrical signals and heart rhythms rather than magnetic fields. While there may be some magnetic field applications in medical diagnostics, this is not the primary focus.
B. Neuromarketing analytics: This industry studies consumer behavior and brain activity, often using techniques like fMRI or EEG, which are not directly related to magnetic field detection at the nanoscale.
C. Oil reservoir mapping: This industry often uses magnetic field measurements to locate oil reserves and understand subsurface geology. The ability to detect nanoscale magnetic fields could significantly enhance the precision of mapping and exploration in this field.
D. Semiconductor lithography: This industry involves the patterning of semiconductor materials, which can be influenced by magnetic fields, but the primary focus is on light and electron beams rather than magnetic field detection.
Conclusion:
The most relevant industry that would face disruptive competition from the quantum sensor technology is **C. Oil reservoir mapping**.

Figure 50: Correct case of task 2-1.

Chinese	Task 2-1: Error Case	English
<p>请从A, B, C, D四个选项选出题目对应的答案。 “耐克”用于运动装备,“奈克”用于运动装,都有一定市场份额。是否构成商标侵权? Please refer to A, B. Choose the answer corresponding to the question from the four options C and D. Nike is used for sports equipment, while Nike is used for sportswear, both of which have a certain market share. Does it constitute trademark infringement?</p> <p>A. 需考虑商标的知名度和影响力 A. Need to consider the brand's visibility and influence B. 是, 因标识近似且商品相同 B. Yes, because the labels are similar and the products are the same C. 否, 因“奈克”有自身特色 C. No, because 'Nike' has its own characteristics D. 是, 但受指示性使用免责 D. Yes, but exempt from liability for indicative use</p> <p>gpt-4o-mini: ✗ A. 需考虑商标的知名度和影响力 A. Need to consider the brand's visibility and influence</p> <p>Error Category: Reasoning Error Error Reason: When analyzing the situation of the "Nike" and "Nike" trademarks, we need to consider several key factors. Firstly, the popularity and influence of a trademark are important criteria for determining trademark infringement. If Nike is a well-known brand, its trademark protection will be stronger. Secondly, the similarity of identification and the similarity of goods are also important criteria for determining infringement. If "Nike" and "Nike" are visually or phonetically similar and belong to the same product category, the likelihood of infringement will increase. Option A mentions the need to consider the brand's visibility and influence, which is an important legal factor to consider. Option B directly states that infringement is caused by similar labeling and identical products, which is also a reasonable judgment. Option C believes that "Nike" has its own characteristics and therefore does not constitute infringement, which may be valid in certain circumstances, but if "Nike" is too similar to "Nike", it may still constitute infringement. Option D mentions the indicative use exemption, which usually applies in cases of reasonable use, but whether it applies in this context requires specific analysis. Taking all these factors into consideration, the most reasonable answer is A, because the popularity and influence of a trademark are the basis for determining whether it constitutes infringement.</p>	<p>Please select the correct answer from A, B, C, and D. A toy manufacturer makes a toy that has a similar shape to a patented toy and also uses a character from a copyrighted cartoon on it. What infringements occur? A. Only patent infringement. B. Only copyright infringement. C. Both patent and copyright infringement. D. It's okay as long as the toys are sold at a low price.</p> <p>gpt-4o-mini: ✗ C. Both patent and copyright infringement.</p> <p>Error Category: Reasoning Error Error Reason: To determine the correct answer, we need to analyze the situation regarding the toy manufacturer and the potential infringements involved. 1. Patent Infringement: A patent protects inventions and designs. If the toy has a similar shape to a patented toy, it could potentially infringe on that patent, depending on the specifics of the design and the claims of the patent. 2. Copyright Infringement: Copyright protects original works of authorship, including characters from cartoons. If the toy uses a character from a copyrighted cartoon, this would likely constitute copyright infringement, as the character is protected under copyright law. 3. Combining Both: Since the toy manufacturer is infringing on both the patent (by making a toy similar in shape to a patented toy) and copyright (by using a character from a copyrighted cartoon), both types of infringement are present. 4. Price Consideration: The option stating that it's okay as long as the toys are sold at a low price is not relevant to the legal considerations of patent and copyright infringement. Infringement occurs regardless of the price at which the toys are sold. Based on this analysis, the correct answer is: Answer: C</p>	

Figure 51: Error case of task 2-1.

Chinese	Task 2-2: Correct Case	English
<p>问题:一首歌曲《爱的旋律》,有独特的旋律和歌词,被诉作品:《情的乐章》,部分旋律相似但歌词不同。有评论认为旋律有借鉴,是否构成著作权侵权? Question: A song titled "The Melody of Love" has a unique melody and lyrics, while the accused work, "The Symphony of Love," has a similar melody but different lyrics. Some critics believe the melody is borrowed. Does this constitute copyright infringement? A.是, 因部分旋律相似 A. Yes, because some melodies are similar. B.否, 因歌词不同 B. No, because the lyrics are different. C.是, 但受教学使用免责 C. Yes, but disclaimer for educational use. D.需确定相似部分是否构成实质性相似 D. It is necessary to determine whether the similar parts constitute substantial similarity.</p> <p>gpt-4o-mini: ✓ To determine whether there is copyright infringement, the key lies in the existence of substantial similarity. Although "The Melody of Love" and "The Symphony of Love" have some similarities in melody, the different lyrics may affect the judgment of infringement. Just having some melody similarity doesn't necessarily mean infringement, so option A is not conclusive. And the difference in lyrics alone doesn't rule out the possibility of melody-related copyright infringement, so option B is incorrect. Option C's mention of educational use disclaimer is not relevant to the core issue here, which is mainly about determining similarity. Therefore, a detailed analysis of the similar parts is required to determine whether they constitute substantial similarity.</p> <p>Answer: D. It is necessary to determine whether the similar parts constitute substantial similarity.</p>	<p>Question: An intern at Company H takes a draft of a new product design home without permission. Is this an infringement of trade secrets? A. No, as long as the intern doesn't show it to anyone. B. Only if the intern intends to use it for personal gain. C. Yes, because they took the confidential draft without permission. D. Only if the new product is a revolutionary one.</p> <p>gpt-4o-mini: ✓ Analysis: 1. A. This option is incorrect. The act of taking the draft out of the workplace without permission already violates the confidentiality of the trade secret. 2. B. This is also wrong. The company has the right to keep its product - design information private, and the intern's action of taking it home without consent breaches that right, regardless of the motive for personal gain. 3. C. This is the correct answer. By taking the confidential draft of the new product design home without permission, the intern has directly violated the company's protection of its trade secrets. Unauthorized access and removal of such information are key elements in determining trade - secret infringement. 4. D. This option is incorrect. The revolutionary nature of the product has no bearing on whether the act of taking the draft is an infringement. Trade - secret protection applies to any confidential business information that gives the company a competitive edge, not just to revolutionary products.</p> <p>Answer: C. Yes, because they took the confidential draft without permission.</p>	

Figure 52: Correct case of task 2-2.

Chinese	Task 2-2: Error Case	English
<p>问题:美国某公司拥有一项关于医疗设备的发明专利。中国丙企业生产的医疗设备在工作原理上与美国公司专利产品相同,但在外观设计上有较大差异。依据美国专利法及相关案例,判定丙企业是否侵权的关键在于:</p> <p>Question: A certain American company holds a patent for an invention related to medical devices. The medical devices produced by Chinese company C are identical in terms of working principles to the American company's patented product, but they differ significantly in terms of appearance design. According to U.S. patent law and relevant case law, the key factor in determining whether company C has infringed is:</p> <p>A. 工作原理相同就构成侵权, 不论外观差异 A. If the working principles are the same, it constitutes infringement, regardless of the differences in appearance.</p> <p>B. 外观差异是否导致产品的实质性不同 B. Whether the differences in appearance lead to substantial differences in the products.</p> <p>C. 丙企业产品的生产成本是否低于美国公司产品 C. Is the production cost of the products of Enterprise C lower than that of the products of the American company.</p> <p>D. 美国公司专利的申请时间 D. The application time for patents of American companies.</p>	<p>Question: A toy manufacturer makes a toy that has a similar shape to a patented toy and also uses a character from a copyrighted cartoon on it. What infringements occur?</p> <p>A. Only patent infringement.</p> <p>B. Only copyright infringement.</p> <p>C. Both patent and copyright infringement.</p> <p>D. It's okay as long as the toys are sold at a low price.</p>	
<p>gpt-4o-mini: ✗ A. 工作原理相同就构成侵权, 不论外观差异 A. If the working principles are the same, it constitutes infringement, regardless of the differences in appearance.</p>	<p>gpt-4o-mini: ✗ D. It's okay as long as the toys are sold at a low price.</p>	
<p>Error Category: Consistency error and Reasoning error ✓ Error Reason: According to U.S. patent law, the key factor in determining infringement is the claims of the patent and the substantial differences between the products. Although identical working principles may raise concerns about infringement, the more important consideration is whether the differences in appearance design result in substantial differences in the function or effect of the products. Therefore, the correct answer is: Answer: "B". ✗</p>	<p>Error Category: Consistency error ✓ Error Reason: The explanation clearly states that both patent infringement and copyright infringement are occurring due to the actions of the toy manufacturer. However, the selected answer D claims that it's okay as long as the toys are sold at a low price, which is inconsistent with the reasoning in the explanation. There is a contradiction between the answer chosen and the reasoning provided to support it. ✗</p>	

Figure 53: Error case of task 2-2.

Chinese	Task 2-3: Correct Case	English
<p>问题:某集体商标侵权案, 法院认定, 权利人认证费用为每件产品50元; 侵权人销售未认证产品2万件。赔偿金额应为?</p> <p>Question: In a case of collective trademark infringement, the court ruled that the certification fee for the right holder was 50 yuan per product. The infringer sold 20,000 uncertified products. What should be the amount of compensation?</p> <p>A. 2万 × 50元 × 3倍 = 300万 A. 20,000 × 50 yuan × 3 times = 3 million.</p> <p>B. 2万 × 50元 = 100万 B. 20,000 × 50 yuan = 1 million.</p> <p>C. 2万 × 50元 × 2倍 = 200万 C. 20,000 × 50 yuan × 2 times = 2 million.</p> <p>D. 法院酌定50万元 D. The court determined 500,000 yuan at its discretion.</p>	<p>Question: Company B sued Company A for patent infringement, and the court ordered Company A to compensate Company B for the actual losses of US\$600,000 and bear the reasonable attorney's fees of US\$150,000 for Company B. How much compensation does Company A have to pay in total under U.S. law?</p> <p>A. \$600,000.</p> <p>B. \$750,000.</p> <p>C. \$1,200,000.</p> <p>D. \$1,800,000.</p>	
<p>gpt-4o-mini: ✓ Information Analysis: Certification fee per product for the right - holder: 50 yuan. Number of uncertified products sold by the infringer: 20,000. Calculation Method The total certification fee for uncertified products is calculated as follows: Number of products × Certification fee per product = 20,000 × 50 yuan = 1 million yuan. Analysis: A. This option applies a 3 - fold compensation. However, there is no indication in the question that a 3 - fold compensation should be used. B. This option calculates the compensation based on the actual loss, which is the total certification fee for the uncertified products. In the absence of other information about applying multiple - fold compensation, this is a reasonable calculation. C. This option applies a 2 - fold compensation. But without specific instructions in the question regarding the use of a 2 - fold multiplier, this calculation is not justified. D. This amount is lower than the actual loss calculated based on the certification fee and the number of products. It is not a reasonable choice as it does not adequately compensate for the loss.</p> <p>Answer: B. 20,000 × 50 yuan = 1 million</p>	<p>gpt-4o-mini: ✓ Information Extraction: Actual losses that Company A needs to compensate Company B for: US\$600,000. Reasonable attorney's fees that Company A needs to bear for Company B: US\$150,000. Calculation Process: Substituting the given values: Total compensation = US\$600,000 + US\$150,000 = US\$750,000. Analysis: A. This option only includes the actual losses and ignores the attorney's fees, so it is incorrect. B. This option correctly sums up the actual losses and the attorney's fees, which is in line with the legal requirements for compensation in this case. C. This amount has no basis in the calculation according to the given information and is incorrect. D. This amount is also not related to the correct calculation of the sum of actual losses and attorney's fees, so it is incorrect.</p> <p>Answer: B. \$750,000</p>	

Figure 54: Correct case of task 2-3.

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Chinese

Task 2-3: Error Case

English

问题: 某茶商冒用“西湖龙井”地理标志, 销售金额300万元, 获利50万元。赔偿计算依据应为?

Question: A tea merchant falsely used the "West Lake Longjing" geographical indication, with sales amounting to 3 million yuan and a profit of 500,000 yuan. What should be the basis for calculating the compensation?

A. 权利人实际损失 (需举证) B. 侵权获利50万元 C. 销售金额300万元 D. 法定赔偿500万元

A. Actual loss of the rights holder (evidence required). B. Infringer's profit of 500,000 yuan. C. Sales amount of 3 million yuan. D. Statutory compensation of 5 million yuan.

gpt-4o-mini: D. 参加复审案件口头审理的每方当事人及其代理人的人数不得超过四人

D. The number of each party and their representatives participating in the oral hearing of a reexamination case shall not exceed four.

Error Category: Reasoning error and Consistency error
Error Reason: A. Actual loss of the rights holder (evidence required) - The rights holder needs to provide evidence, which may be difficult. B. Infringer's profit of 500,000 yuan - Directly reflects the economic benefit of the infringement. C. Sales amount of 3 million yuan - May be too high and may not reflect the actual loss. D. Statutory compensation of 5 million yuan - Needs to be based on legal provisions and may not apply. Considering all factors, the most appropriate basis for calculating compensation is the infringer's profit of 500,000 yuan. Answer: B

Question: Company A's patent was infringed by Company B, and the court found that Company A's profit loss was US\$800,000, and Company B's profit from infringement was US\$1.2 million, with a technology contribution rate of 50%. What is the amount of damages to be awarded by the court?

A. \$800,000.
B. \$1,200,000.
C. \$600,000.
D. \$400,000.

gpt-4o-mini: C. \$600,000.

Error Category: Reasoning error and Consistency error
Error Reason: In this scenario, we need to determine the appropriate amount of damages to be awarded to Company A for the patent infringement by Company B. The court found that Company A suffered a profit loss of \$800,000 due to the infringement. Additionally, Company B made a profit of \$1.2 million from the infringement, and the technology contribution rate is 50%. To calculate the damages, we can consider the following: Company A's Profit Loss: This is directly stated as \$800,000. Company B's Profit from Infringement: This is \$1.2 million. Technology Contribution Rate: This indicates that 50% of the profits made by Company B can be attributed to the technology that was infringed. To find the damages based on Company B's profits, we calculate 50% of \$1.2 million: 0.5 times 1,200,000 = 600,000. Now, we have two potential figures for damages: - Company A's profit loss: \$800,000 - 50% of Company B's profit: \$600,000. Typically, the damages awarded would be the greater of the two amounts, which in this case is Company A's profit loss of \$800,000. Thus, the amount of damages to be awarded by the court is: Answer A

Figure 55: Error case of task 2-3.

Chinese

Task 2-4: Correct Case

English

问题: 某基因编辑CRISPR专利在欧美被认定为无效, 但在中国维持有效, 其全球估值应如何调整?

Question: A CRISPR patent for gene editing has been deemed invalid in Europe and the United States, but remains valid in China. How should its global valuation be adjusted?

A. 按中国市场规模计算
B. 完全失去商业价值
C. 依赖专利池交叉许可
D. 需重新提交PCT申请

A. Calculated by the scale of the Chinese market. B. Completely lose commercial value. C. Rely on patent pool cross-licensing. D. The PCT application needs to be resubmitted.

gpt-4o-mini: In this situation, the CRISPR patent for gene editing has been deemed invalid in Europe and the United States. This implies that it can no longer offer protection or commercial value in these markets. However, since the patent remains valid in China, it can still generate commercial value within the Chinese market.

Analysis:
A. This is a reasonable choice. Given that the patent is valid in China, its value can be evaluated based on the scale of the Chinese market.
B. This is inaccurate. As the patent is valid in China, it still holds value in this significant market.
C. While this could potentially be a strategic approach in some patent-related scenarios, it does not directly address the issue of how to adjust the global valuation of the patent.
D. This is irrelevant to the valuation of the patent. The PCT (Patent Cooperation Treaty) application is mainly related to the process of seeking patent protection in multiple countries, not directly to the current valuation of a patent that is valid in one country (China) and invalid in others (Europe and the United States).

Answer: A. Calculated by the scale of the Chinese market

Question: A semiconductor patent was recently upheld in litigation against a major competitor, resulting in \$150M in damages. What best describes its current value?

A. Lower due to litigation costs.
B. Unchanged as markets already priced in validity.
C. Higher due to proven enforceability and competitive deterrence.
D. Dependent on cross-licensing opportunities.

gpt-4o-mini: **Analysis:**
A. While litigation does incur costs, the fact that the patent was upheld and resulted in \$150M in damages suggests that the positive aspects of the ruling outweigh the costs.
B. The litigation outcome provides new and significant information. Before the ruling, the market may have had some uncertainty about the patent's enforceability. The successful upholding and the large-scale damages award change the perception of the patent's value. So, it is incorrect to assume that the value has remained unchanged.
C. As mentioned earlier, the successful litigation against a major competitor shows that the patent can be enforced. This proven enforceability makes the patent more attractive to others in the industry, whether for licensing or investment purposes.
D. Although cross-licensing opportunities can affect a patent's value, the primary impact in this case is the validation of the patent through litigation and the resulting enforceability and competitive advantages.

Answer: C. Higher due to proven enforceability and competitive deterrence.

Figure 56: Correct case of task 2-4.

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✓
Task 2-5: Correct Case

问题: 下列哪种情形构成“违反保密义务”?

Question: Which of the following circumstances constitutes "violation of the duty of confidentiality"?

A. 员工离职后使用自身记忆中的技术诀窍
A. Employees use the technical know-how in their memory after leaving the company.

B. 合作方将约定保密的信息在学术论文中发表
B. The cooperating party will publish the confidential information as agreed in the academic paper.

C. 根据法院要求披露商业秘密
C. Disclose trade secrets as required by the court.

D. 向税务机关提交包含商业秘密的审计报告
D. Submit an audit report containing trade secrets to the tax authority.

gpt-4o-mini: ✓
In this question, we need to determine which of the given circumstances constitutes a "violation of the duty of confidentiality".
Analysis:
A. Memories in an employee's mind are generally not subject to legal protection in the context of confidentiality obligations. There is no improper disclosure or use of protected confidential information in a way that breaches an agreement or legal duty.
B. This clearly constitutes a violation of the duty of confidentiality. The cooperating party has an obligation under the confidentiality agreement not to disclose the confidential information. Publishing it in an academic paper goes against this agreement, which is a direct breach of the confidentiality duty.
C. When the court requires the disclosure of trade secrets, it is a legally - mandated act. The obligation to comply with court orders supersedes the normal confidentiality obligations in such cases.
D. Submitting the audit report to the tax authority is a compliant action required by law. It is not an unauthorized or improper disclosure of confidential information.

Answer: B. The cooperating party will publish the confidential information as agreed in the academic paper.

Figure 57: Correct case of task 2-5.

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Chinese
Task 2-4: Error Case
English

问题: 某机械专利被无效宣告, 但无效决定显示被诉侵权方实际使用了专利的改进技术, 此时原专利权价值如何变化?

Question: A certain mechanical patent was declared invalid, but the invalidation decision indicated that the accused infringer actually used the improved technology of the patent. How would the value of the original patent right change at this time?

A. 完全归零
A. Completely reset to zero.

B. 转化为商业秘密增值
B. Transform into trade secrets to increase value.

C. 可通过反垄断诉讼获得部分赔偿
C. Partial compensation can be obtained through anti-monopoly litigation.

D. 需重新缴纳年费恢复
D. The annual fee needs to be paid again for restoration.

gpt-4o-mini: ✗
C. 可通过反垄断诉讼获得部分赔偿
C. Partial compensation can be obtained through anti-monopoly litigation.

Error Category: Consistency Error and Reasoning error
Error Reason: In this case, although the original patent right was invalidated, the value of the original patent does not completely drop to zero because the accused infringer is actually using an improved version of the patented technology. On the contrary, the original patent right may be transformed into a trade secret, thus retaining some value to a certain extent. Therefore, the most appropriate option is B. ✗

Question: A pharmaceutical patent for a blockbuster drug expires in 6 months, with generic competitors already filing ANDA applications. How will its value likely change?

A. Spike due to final monopoly pricing.
B. Drop to near-zero immediately.
C. Retain residual value from manufacturing know-how.
D. Increase due to compulsory licensing.

gpt-4o-mini: ✗
B. Drop to near-zero immediately.

Error Category: Consistency Error and Reasoning error
Error Reason: When a pharmaceutical patent for a blockbuster drug is about to expire, the value of the patent typically decreases as generic competitors are poised to enter the market. The expiration of the patent means that the company will lose its exclusive rights to sell the drug, allowing generic manufacturers to produce and sell their versions, which usually leads to a significant drop in the original drug's market price and revenue. Let's analyze the options: A. Spike due to final monopoly pricing - This is unlikely because the market anticipates the entry of generics, which would drive prices down rather than up. B. Drop to near-zero immediately - While the value will decrease significantly, it may not drop to near-zero immediately, as there could still be some residual value in the brand or remaining market share. C. Retain residual value from manufacturing know-how - This is a possibility, as the original company may still have valuable expertise and processes that could be monetized, but it does not directly address the patent's value. D. Increase due to compulsory licensing - Compulsory licensing typically occurs in specific circumstances, such as public health emergencies, and is not a common outcome for expiring patents. Considering these points, the most accurate answer is that the value of the patent will likely drop significantly as generics enter the market, but it may not drop to zero immediately. Therefore, the best option that reflects the situation is: Answer: C ✓

Figure 58: Error case of task 2-4.

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Task 2-5: Error Case

问题:1999年,AB齿轮公司(私营)为获取国有CD齿轮集团的商业秘密,通过退休职工马某介绍,贿赂CD集团工程师张某、技术科科长姚某,多次窃取已采取保密措施的齿轮箱图纸(型号包括E750、F300等),用于生产并造成CD集团经济损失377.6万元。经鉴定,涉案图纸重置成本价值51.7万元。AB公司被控单位行贿罪和侵犯商业秘密罪,法定代表人张一奇自首,马某、张某、姚某分别被控介绍贿赂罪和受贿罪。本案商业秘密保护的核心漏洞是?

Question: In 1999, AB Gear Company (a private company) obtained commercial secrets from the state-owned CD Gear Group through retired employee Mr. Ma, who introduced bribery to CD Group engineers Mr. Zhang and Mr. Yao, the head of the technical department. They repeatedly stole confidential gearbox blueprints (including models such as E750, F300, etc.) for production, causing CD Group an economic loss of 3.776 million yuan. After evaluation, the reset cost value of the involved blueprints was 517,000 yuan. AB Company was charged with bribery and infringement of commercial secrets, and the legal representative, Zhang Yiqi, turned himself in. Mr. Ma, Mr. Zhang, and Mr. Yao were respectively charged with introducing bribery and accepting bribes. What is the core loophole in the protection of commercial secrets in this case?

A. 图纸具有经济价值
A. The drawings have economic value.
B. 图纸未被公开
B. The drawings have not been made public.
C. 通过贿赂手段获取
C. Obtained through bribery.
D. 造成重大损失
D. Cause significant losses.

gpt-4o-mini: ✗
D. 参加复审案件口头审理的每方当事人及其代理人的人数不得超过四人
D. The number of each party and their representatives participating in the oral hearing of a reexamination case shall not exceed four.

Error Category: **Hallucination Error and Priority error** ✓
Error Reason: In this case, AB Gear Company obtained the commercial secrets of CD Gear Group through bribery, and these blueprints were protected by confidentiality measures and not made public. Therefore, the core loophole in the protection of commercial secrets lies in the fact that the blueprints were not made public. While the economic value of the blueprints, the significant losses caused, and the bribery used to obtain them are all important factors, the most direct loophole is that the blueprints were not made public. Answer: B. ✗

Figure 59: Error case of task 2-5.

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Chinese **Task 3-1: Correct Case** **English**

问题:优先权文献记载:“支架的轴向弹性模量为10-20GPa”,中国申请修改为“径向压缩刚度≥15GPa”,说明书新增测试方法显示径向刚度与轴向模量存在非线性关系。该修改的隐藏错误是?

Question: Priority doc shows "battery capacity retention ≥80% after 500 cycles at 1C." Continuation claims: "≥90% retention after 300 cycles at 2C." Spec only tests 1C cycling. Core deception?

A. 轴向模量与径向刚度的物理量纲不同。
A. The physical dimensions of axial modulus and radial stiffness are different.
B. 优先权文件未提供径向刚度测试数据。
B. The priority document does not provide radial stiffness test data.
C. 15GPa阈值与原始参数范围无直接对应关系。
C. There is no direct correlation between the 15GPa threshold and the original parameter range.
D. 未说明测试方法的边界条件。
D. The boundary conditions for the test method are not specified.

gpt-4o-mini: ✓
C. 15GPa阈值与原始参数范围无直接对应关系。
C. There is no direct correlation between the 15GPa threshold and the original parameter range.

Response:
A: The physical dimensions of axial modulus and radial stiffness differ. This option is correct because axial modulus and radial stiffness are indeed different physical quantities, although there may be some relationship between them, their units and dimensions are distinct.
B: The priority document does not provide radial stiffness test data. This option might be a hidden error, but it does not directly indicate the error in the modification.
C: There is no direct correspondence between the 15GPa threshold and the original parameter range. This option highlights a potential issue, that is, the modified parameters may not align with the original parameters, but it does not directly address the error in the physical quantity.
D: The boundary conditions of the test method are not specified. This option could also be a hidden error, as the boundary conditions of the test method may affect the test results, but it does not directly involve an error in the physical quantity.

A. C-rate doubling accelerates degradation nonlinearly.
B. Cycle count reduction invalidates long-term performance.
C. Capacity retention depends on voltage cutoff.
D. No data supports 2C rate performance.

gpt-4o-mini: ✗
D. No data supports 2C rate performance.

Response:
A. C-rate doubling accelerates degradation nonlinearly: This option suggests that moving from 1C to 2C would lead to a significant increase in degradation, which is a valid concern in battery performance.
B. Cycle count reduction invalidates long-term performance: This option implies that fewer cycles (300 at 2C vs. 500 at 1C) may not provide a reliable measure of long-term performance, which is also a valid point.
C. Capacity retention depends on voltage cutoff: While voltage cutoff can affect capacity retention, it does not directly address the core issue of comparing performance at different C-rates and cycle counts.
D. No data supports 2C rate performance: This option points out that the data provided does not support the claims made at the 2C rate, which is a critical observation.

Figure 60: Correct case of task 3-1.

Chinese	Task 3-1: Error Case	English
<p>问题:The priority document states: "Gene editing efficiency $\geq 70\%$," while the Chinese application modifies it to: "Knockout efficiency in CHO-K1 cells $\geq 80\%$." It is known that Example 1 using HEK293 cells achieved an efficiency of 75%, and Example 2 using CHO-K1 cells achieved an efficiency of 65%. 该修改的生物学陷阱是?</p> <p>Question: The priority text states: "Gene editing efficiency $\geq 70\%$," and the Chinese application modifies it to: "Knockout efficiency in CHO-K1 cells $\geq 80\%$." It is known that Example 1 used HEK293 cells with an efficiency of 75%, and Example 2 used CHO-K1 cells with an efficiency of 65%. What is the biological pitfall of this modification?</p> <p>A. 修改后细胞类型特异性排除原始数据支持。 B. 效率提升未提供转染条件优化证据。 C. 优先权未记载CHO-K1细胞的具体参数。 D. 不同细胞系的编辑机制一致性。 E. The consistency of editing mechanisms in different cell lines has not been verified.</p> <p>gpt-4o-mini: ✗ A. 修改后细胞类型特异性排除原始数据支持。 A. The modified cell type-specific exclusion of the original data is supported.</p> <p>Error Category: Reasoning error Error Reason: A. The modified cell type-specific exclusion of original data supports : This option is reasonable because the modified requirement is for CHO-K1 cells, and the original data (75% efficiency of HEK293 cells) does not support this specific cell type ✗ B. Efficiency improvement lacks evidence of transfection condition optimization: The mention of transfection condition optimization in this option is not related to the issue as it was not mentioned in the problem. ✗ C. Priority is not recorded for specific parameters of CHO-K1 cells: Although the priority text does not specify parameters, the core of the issue lies in comparing efficiencies rather than the lack of parameters. ✗ D. The consistency of editing mechanisms across different cell lines has not been verified: While editing mechanisms may differ across cell lines, the key to the issue is comparing efficiencies, not the consistency of mechanisms. ✓</p>	<p>Question: The description of the invention's solution for creating an external metal-to-metal seal between the pin and box connection of a threaded tubular, it explains that a separate metal seal base is added to the external surface of the pin. It further elaborates on how this allows for the repair or replacement of the seal if damaged. When evaluating the clarity and sufficiency of this description of the invention's key feature, which option is correct?</p> <p>A. The description is incomplete as it doesn't mention how the added metal seal base affects the overall weight and strength of the pipeline connection. B. There are unclear claims regarding the durability of the new seal formed with the separate metal seal base as compared to the prior art seals. C. The description clearly conveys the concept and functionality of the invention's key feature, and there is no error in the way it is presented. D. The description is incorrect because it assumes that the repair process of the seal is always feasible without considering potential manufacturing tolerances.</p> <p>gpt-4o-mini: ✗ C. The description clearly conveys the concept and functionality of the invention's key feature, and there is no error in the way it is presented.</p> <p>Error Category: Reasoning error Error Reason: A. This option suggests that the description is incomplete because it does not address the impact of the added metal seal base on the overall weight and strength of the pipeline connection. While these factors are important in a comprehensive evaluation of the invention, the question specifically asks about the clarity and sufficiency of the description of the key feature, which is the addition of the metal seal base itself. ✗ B. This option points out that there are unclear claims regarding the durability of the new seal compared to prior art seals. The question does not indicate that durability is a key feature of the description, so this option may not be the most relevant. ✓ C. This option states that the description clearly conveys the concept and functionality of the invention's key feature, indicating that there is no error in the presentation. If the description effectively communicates how the separate metal seal base functions and its benefits, this option could be valid. ✓ D. This option claims that the description is incorrect because it assumes the repair process is always feasible without considering manufacturing tolerances. It critiques an assumption rather than the clarity of the description. ✓</p>	

Figure 61: Error case of task 3-1.

Chinese	Task 3-2: Correct Case	English
<p>问题:某骨科螺钉专利的合金比例,与某冶炼厂15年前客户定制产品(未申请专利)的配方记录完全一致。该专利缺乏?</p> <p>Question: The alloy ratio of an orthopedic screw patent is exactly the same as the formula record of a customer's customized product (not patented) from a smelter 15 years ago. What is missing from this patent?</p> <p>A. 充分公开 B. 实用性 C. 创造性 D. 新颖性 E. Novelty</p> <p>gpt-4o-mini: ✓ D. Novelty</p> <p>Response: A. Full Disclosure: The patent application must detail the invention in sufficient detail so that a person skilled in the relevant field can understand and implement it. B. Practicality: The invention must have the potential for practical application. C. Creativity: The invention must represent a significant advancement over existing technology and cannot be obvious. D. Novelty: The invention must be new and not already disclosed.</p>	<p>Question: An AI startup patented a neural network architecture in 2022. Evidence shows the same architecture was fully implemented in an open-source GitHub repository with 500+ stars 14 months pre-filing. What invalidates the patent?</p> <p>A. Novelty B. Non-obviousness C. Utility D. Enablement</p> <p>gpt-4o-mini: ✓ A. Novelty</p> <p>Response: A. Novelty: For a patent to be granted, the invention must be novel, meaning it must not have been publicly disclosed before the patent application was filed. In this case, since the same architecture was fully implemented in an open-source GitHub repository 14 months before the patent filing, it indicates that the architecture was already known to the public. This directly challenges the novelty requirement. B. Non-obviousness: This criterion assesses whether the invention is sufficiently inventive or if it would have been obvious to someone skilled in the field at the time of the patent application. While the prior art (the GitHub repository) could also affect this, the primary issue here is the lack of novelty. C. Utility: This requirement states that the invention must have a specific, substantial, and credible utility. The information provided does not suggest that the architecture lacks utility, so this is not a relevant factor in invalidating the patent. D. Enablement: This requirement means that the patent application must provide enough detail for someone skilled in the art to make and use the invention. The existence of the open-source implementation suggests that the architecture is indeed enabled, so this is not a reason for invalidation.</p>	

Figure 62: Correct case of task 3-2.

Chinese	Task 3-2: Error Case	English
<p>问题: 某手术机器人专利的力反馈算法, 被证实与某国际会议3年前公开的未申请专利的演示视频技术方案相同。该专利无效的核心问题是?</p> <p>Question: The force feedback algorithm patented by a surgical robot has been proved to be the same as the unpatented demonstration video technology scheme disclosed at an international conference three years ago. What is the core problem of the invalidation of this patent?</p> <p>A. 技术启示 A. Technological implications B. 工业适用性 B. Industrial applicability C. 附图说明缺陷 C. Illustrative defects in the drawings D. 新颖性 D. Novelty</p> <p>gpt-4o-mini: ✗ D. 新颖性 D. Novelty</p> <p>Error Category: Reasoning error Error Reason: To determine the core issue of invalidating a surgical robot patent, we need to analyze the relationship between options and the reasons for patent invalidation. A. Technical Inspiration: This usually refers to the source of technical inspiration or insight, which may be related to the validity of the patent but is not the direct core issue leading to its invalidation. B. Industrial Applicability: This refers to whether the invention can be applied in industry. Even if a technology is theoretically feasible, it may still lead to patent invalidation if it cannot be practically applied. However, the question does not mention the applicability of the technology. C. Defects in Drawings and Descriptions: This involves the clarity and completeness of drawings and descriptions in the patent document. If the drawings or descriptions are unclear, it may result in patent invalidation, but this point is not mentioned in the question. D. Novelty: Novelty refers to whether the invention is new and has not been disclosed before the application for the patent. The question mentions that the force feedback algorithm of the patent is identical to an unpatented demonstration video technology from three years ago, which directly addresses the issue of novelty.</p>	<p>Question: A patent claims a "new" drug dosage but admits it causes severe side effects in 90% of patients. What is the rejection reason?</p> <p>A. Non-obviousness B. Ethical issues C. Enablement failure D. Lack of utility</p> <p>gpt-4o-mini: ✗ D. Lack of utility</p> <p>Error Category: Reasoning error Error Reason: A. This criterion assesses whether the invention is sufficiently different from existing knowledge or products. If the dosage is truly new and not obvious to someone skilled in the field, this might not be the rejection reason. B. While the severe side effects could raise ethical concerns, patent law primarily focuses on the technical aspects of the invention rather than ethical implications. Therefore, this is unlikely to be the primary reason for rejection. C. This criterion requires that the patent application must provide enough information for someone skilled in the art to make and use the invention. If the dosage causes severe side effects, it might not be considered adequately enabled, but this is more about the practical application rather than the inherent utility of the drug. D. This is the most relevant option. A patent must demonstrate that the invention has a specific, substantial, and credible utility. If a drug dosage causes severe side effects in 90% of patients, it may not be considered useful or beneficial, leading to a rejection based on lack of utility.</p>	

Figure 63: Error case of task 3-2.

Chinese	Task 3-3: Correct Case	English
<p>问题: 请从A, B, C, D四个选项选出与下述专利最相似的专利序号, 该序号是? 一种刷头及吸尘器。刷头包括: 连接管 (1), 一端用于连接负压源, 另一端为吸气口…… (后略)</p> <p>Question: Please select the patent number that is most similar to the following patent from the four options A, B, C and D. What is the number? A brush head and vacuum cleaner. The brush head includes: a connecting tube (1), one end for connecting to a negative pressure source, the other end is a suction port... (omit)</p> <p>A. 一种多功能洁面仪, 包括外壳 (110)、刷头组件、电机 (130) 与电源组件, 外壳 (110) 内设电源组件、电机 (130) 与支撑电机 (130) 的支架…… (后略) A. A multi-functional facial cleanser, including a housing (110), a brush head assembly, a motor (130) and a power supply assembly. The housing (110) is provided with a power supply assembly, a motor (130) and a bracket supporting the motor (130)... (omit) B. 一种具有吸毛发功能的宠物毛刷及其使用方法, 适用于宠物护理设备领域…… (后略) B. A pet brush with hair absorption function and its use method, suitable for pet care equipment field... (omit) C. 一种吸水刷头, 包括刷头壳体 (1), 所述刷头壳体 (1) 具有与真空源连通用以产生吸引流的吸入通道…… (后略) C. A water-absorbing brush head, including a brush head housing (1), the brush head housing (1) having an intake channel connected to a vacuum source for generating suction flow... (omit) D. 本发明公开了一种多功能化妆刷, 包括第一刷头、第二刷头、第三刷头…… (后略) D. The invention discloses a multi-functional makeup brush, including a first brush head, a second brush head, a third brush head... (omit)</p> <p>gpt-4o-mini: ✓ C. 一种吸水刷头, 包括刷头壳体 (1), 所述刷头壳体 (1) 具有与真空源连通用以产生吸引流的吸入通道…… (后略) C. A water-absorbing brush head, including a brush head housing (1), the brush head housing (1) having an intake channel connected to a vacuum source for generating suction flow... (omit)</p>	<p>Question: Please select the most similar patent number from A, B, C and D. Which number is it? Provided is an adipose tissue preservation solution, comprising: polyethylene glycol 400, human albumin, norfloxacin, low molecular dextran, and Ac-DEV-D-CHO. The present invention uses the polyethylene glycol 400 as a base component for the first time; said substance has good compatibility with an oil-type substance, and may also separate out a lipid-type substance after being compatible with a water-type substance; and human albumin is used as a nutritional component of adipose mesenchymal stem cell preservation solution... (omit)</p> <p>A. Provided in the present invention are a mesenchymal stem cell injection, a preparation method thereof and the use in preparing drugs for treating dilated cardiomyopathy in children... (omit) B. The present invention provides a mesenchymal stem cell injection, a preparation method thereof, and application thereof in preparing a drug for treating ulcerative colitis... (omit) C. Provided in the present invention is a cell freezing medium for clinical use. In particular, the cell freezing medium of the present invention comprises the following components... (omit) D. The present invention provides a mesenchymal stem cell injection, a preparation method thereof, and application thereof in preparing a diabetes drug... (omit)</p> <p>gpt-4o-mini: ✓ D. The present invention provides a mesenchymal stem cell injection, a preparation method thereof, and application thereof in preparing a diabetes drug... (omit)</p>	

Figure 64: Correct case of task 3-3.

Chinese

Task 3-3: Error Case

English

问题: 请从A, B, C, D四个选项选出与下述专利最相似的专利序号, 该序号是? 本申请适用于图像处理技术领域, 提供了一种脑萎缩程度的定量检测方法、检测装置及终端设备, 包括……(后略)

Question: Please select the patent number that is most similar to the following patent from the four options A, B, C and D. What is the patent number? This application is applicable to the field of image processing technology, and provides a quantitative detection method, detection device and terminal equipment for brain atrophy degree, including...(omit)

A. 本发明公开了一种图像特征的提取方法及装置……(后略)
A. The invention discloses an image feature extraction method and device...(omit)

B. 一种病变部位识别方法、识别装置、计算机装置及……(后略)
B. A method for identifying a lesion site...(omit)

C. 本申请适用于图像处理技术领域, 提供了一种……(后略)
C. This application is applicable to the field of image processing technology and provides a method...(omit)

D. 本申请公开了一种目标检测方法和装置……(后略)
D.D: This application discloses a target detection method and device...(omit)

gpt-4o-mini:
B. 一种病变部位识别方法、识别装置、计算机装置及……(后略)
B. A method for identifying a lesion site...(omit)

Error Category: Reasoning error
Error Reason:
A: Methods involving image feature extraction primarily focus on the field of computer vision. Although they also involve image processing, they have no direct connection with brain atrophy detection.

B: Describes a method for identifying lesion sites using MRI images, which involves image registration and calculation of lesion probability. This has a high degree of similarity with brain atrophy detection methods in terms of technical domain and application.

C: Focuses on face detection, which is also an image processing task but has no direct link to brain atrophy detection.

D: Involves target detection and confidence fusion, mainly applied in sensor technology, and has no direct relation to brain atrophy detection.

Question: Please select the most similar patent number from A, B, C and D. Which number is? A blood fat-reducing and blood pressure-reducing health care tea and a preparation method therefor...(omit)

A. Provided are a traditional Chinese medicine lip balm having Yin nourishment and internal heat relief effects, and a method for preparation thereof, belonging to the field technical field of cosmetics...(omit)

B. A tea massage oil, a preparation method therefor and an application thereof. The tea massage oil is prepared from the following raw materials in parts by weight...(omit)

C. A healthcare tea, including the following raw material components: 7-15 parts of tangerine peel, 11-25 parts of cocculus sarmentosus, 10-32 parts of hedyotis diffusa, 5-20 of flos ioniceae, 4-12 parts of wolfberry...(omit)

D. A composition facilitating lowering of blood pressure, use of the composition in preparing a dietary supplement for facilitating lowering of blood pressure...(omit)

gpt-4o-mini:
D. A composition facilitating lowering of blood pressure, use of the composition in preparing a dietary supplement for facilitating lowering of blood pressure...(omit)

Error Category: Reasoning error
Error Reason:
A: This patent describes a traditional Chinese medicine lip balm with effects related to nourishing Yin and relieving internal heat. It focuses on cosmetic applications rather than health care tea, making it less relevant.

B: This patent discusses a tea massage oil with various oils and health benefits, but it does not focus on tea for health care or specifically on blood fat or blood pressure reduction. Thus, it is not closely related.

C: This patent describes a healthcare tea with various herbal components aimed at relieving chronic diseases and improving health. While it does not specifically mention blood fat or blood pressure, it is still in the realm of health care tea, which is similar to the original patent.

D: This patent focuses on a composition for lowering blood pressure and includes various extracts and vitamins. It directly addresses blood pressure reduction, which aligns closely with the original patent's focus on blood pressure and health care.

Figure 65: Error case of task 3-3.

Chinese

Task 3-4: Correct Case

English

问题: 丙公司技术员张某, 完成本职工作之余, 利用业余时间、自行购买材料研发“新型焊接工具”, 未利用丙公司物质技术条件, 公司与张某也未约定权属。该工具的专利申请权属于?

Question: Zhang, a technician of Company C, developed a "new welding tool" by himself using spare time and materials purchased by himself after completing his own work, without using the material and technical conditions of Company C, and the company and Zhang did not agree on ownership. Who owns the patent application right of the tool?

A. 丙公司, 因张某是公司员工。
A. Company C, because Zhang is an employee of the company.

B. 张某, 因非职务发明创造。
B. Zhang, because it is not an invention made in the course of his duties.

C. 双方共有, 因张某员工身份关联。
C. The two parties share the same identity due to Zhang's employee status.

D. 归当地政府, 鼓励创新。
D. Return to the local government and encourage innovation.

gpt-4o-mini:
B. 张某, 因非职务发明创造
B. Zhang, because it is not an invention made in the course of his duties

Response:
According to China's Patent Law, a service invention refers to an invention or creation completed during the performance of one's duties. The patent application rights for service inventions typically belong to the entity (company), whereas those for non-service inventions belong to the inventor (individual). In this case, Zhang completed the "new welding tool" using his spare time and purchased materials on his own, without utilizing any material or technical resources from the company, and without agreeing on ownership with the company. Therefore, this invention does not qualify as a service invention.

Question: A biotechnology researcher invents a novel gene-editing tool while employed at University X, using university lab equipment and government grant funds. The researcher's employment contract states, "All inventions arising from university-funded projects belong to the institution." Who owns the patent?

A. The researcher individually.

B. University X.

C. The government funding agency.

D. Shared between the researcher and University X.

gpt-4o-mini:
B. University X.

Response:
A. Employment Contract: The researcher's employment contract explicitly states that "All inventions arising from university-funded projects belong to the institution." This clause indicates that any invention developed using university resources or funding is owned by University X.
B. Use of University Resources: The researcher used university lab equipment and government grant funds to develop the gene-editing tool. This further supports the claim that the invention is tied to university resources.
C. Government Funding: While the invention was developed with government grant funds, the contract with University X takes precedence in this scenario. Typically, government funding agencies may have their own policies regarding inventions, but in this case, the employment contract clearly assigns ownership to the university.
D. Shared Ownership: The option of shared ownership between the researcher and University X is not supported by the contract, which states that the university owns all inventions arising from university-funded projects.

Figure 66: Correct case of task 3-4.

✔ **Task 3-5: Correct Case**

Patent Applications Awaiting Examination

<ApplicationNumber> 12763093 </ApplicationNumber>
 <Title> METHODS AND APPARATUS FOR ENSURING
 COMPATIBILITY ON A HIGH PERFORMANCE SERIAL BUS
 </Title>
 <Abstract> A data communications system is disclosed having at least
 one Legacy cloud coupled to at least one Beta cloud. The system further
 having at least one BOSS node and at least one border node. A method
 for ensuring compatibility is disclosed comprising determining when the
 BOSS node is idle, determining whether the last packet transmitted by
 any border node was an Alpha format packet if the BOSS node is idle,
 and unlocking the Legacy cloud if the last packet transmitted by the
 border node was not an Alpha format packet. </Abstract>
 <Background> <SOH> BACKGROUND OF THE INVENTION
 <EOH>1. Field of the Invention The present invention relates to data
 communications...(omit)

A. Allowed
 B. Rejected

gpt-4o-mini: ✔

To determine whether the patent application should be allowed or
 rejected, we need to analyze the content of the application, including the
 title, abstract, background, claims, and summary.

Analysis:

1. Title: "METHODS AND APPARATUS FOR ENSURING
 COMPATIBILITY ON A HIGH PERFORMANCE SERIAL BUS"
 The title suggests a focus on compatibility in data communication
 systems, which is a relevant and important area in technology.

2. Abstract:
 The abstract describes a system that ensures compatibility between
 different types of data packets in a high-performance serial bus system.
 It outlines a method involving a BOSS node and border nodes to manage
 packet transmission and compatibility.

3. Background:
 The background provides context about the need for compatibility in
 data communication systems, particularly with the evolution of
 standards like IEEE 1394-1995 and its successors...(omit)

Answer: allowed

Figure 67: Correct case of task 3-5.

✖ **Chinese** Task 3-4: Error Case English

问题: 戊公司员工孙某的下列发明中, 哪个不属于职务发明?
 Question: Which of the following inventions made by Sun, an employee of
 Company V, is not a service invention?
 A. 利用单位保密技术资料研发的 “量子通信设备”。
 A. "Quantum communication equipment" developed using unit confidential
 technical data.
 B. 执行单位任务研发的 “人脸识别系统”。
 B. The "face recognition system" developed by the executing unit to carry out its
 tasks.
 C. 离职后 1 年内研发的 “新能源电池”。
 C. "New energy battery" developed within one year after leaving the job.
 D. 主要利用单位资金研发的 “智能穿戴设备”。
 D. "Smart wearable devices" developed mainly with unit funds.

gpt-4o-mini: ✖
 C. 离职后 1 年内研发的 “新能源电池”
 C. "New energy battery" developed within one year after leaving the job.

Error Category: Consistency error
Error Reason:
 When analyzing this issue, we need to understand the definition of "service
 invention." A service invention refers to an invention created by an employee while
 performing their duties, typically closely related to their job responsibilities, tasks, or
 resources of the organization.
 A. "Quantum communication equipment" developed using the organization's
 confidential technical data-This is a service invention because it utilizes the
 organization's confidential technical data.
 B. "Facial recognition system" developed while performing organizational tasks-This
 is also a service invention because it was developed while performing organizational
 tasks.
 C. "New energy battery" developed within one year after leaving the organization
 (not related to previous work) -This does not qualify as a service invention because it
 was developed after leaving the organization and is unrelated to previous work.
 D. "Smart wearable device" primarily funded by the organization-This is a service
 invention because it mainly utilized organizational funds.

Question: Amgen had an ongoing research project on PCSK9 - binding antibodies.
 A researcher, Dr. Smith, who was part of this project, left Amgen and joined a
 competitor. Before leaving, Dr. Smith had made some key preliminary discoveries
 related to a new antibody structure. After joining the competitor, Dr. Smith
 further developed this antibody structure and the competitor filed for a patent.
 Amgen claims that it should own the patent rights. Which of the following is the
 most likely basis for Amgen's claim?
 A. Dr. Smith's work was a continuation of Amgen's research project, and he used
 Amgen's confidential information.
 B. Amgen was the first to start researching PCSK9 - binding antibodies.
 C. The competitor had no right to hire Dr. Smith as he was still under a non -
 compete agreement with Amgen.
 D. D. Amgen had already filed a provisional patent application on a related
 concept.

gpt-4o-mini: ✖
 A. Dr. Smith's work was a continuation of Amgen's research project, and he used
 Amgen's confidential information.

Error Category: Priority error
Error Reason:
 A. Dr. Smith's work was a continuation of Amgen's research project, and he used
 Amgen's confidential information. This option suggests that Dr. Smith's new work was
 directly related to the research he conducted at Amgen and that he utilized proprietary
 information from Amgen. If this is the case, Amgen could argue that the patent rights
 belong to them because the new discoveries were built upon their confidential research.
 B. Amgen was the first to start researching PCSK9 - binding antibodies. While being the
 first to research a topic can establish a claim to the field, it does not automatically grant
 patent rights to subsequent discoveries made by former employees unless they are
 directly tied to the original research and confidential information.
 C. The competitor had no right to hire Dr. Smith as he was still under a non-compete
 agreement with Amgen. If Dr. Smith was indeed under a non-compete agreement,
 Amgen could potentially pursue legal action against both Dr. Smith and the competitor.
 However, this does not directly address the patent rights issue regarding the antibody
 structure.
 D. Amgen had already filed a provisional patent application on a related concept. Filing
 a provisional patent application can establish a priority date for an invention, but it
 would depend on whether the provisional application covers the specific antibody
 structure developed by Dr. Smith. If it does, Amgen could claim rights based on their
 prior application.

Figure 68: Error case of task 3-4.

Task 3-5: Error Case

Patent Applications Awaiting Examination
 <ApplicationNumber> 12765091 </ApplicationNumber>
 <Title> METHOD AND DEVICE OF ASSIGNING RING IDENTIFIER
 </Title>
 <Abstract> A control message having stored therein a link identifier for identifying a link such as a fiber or cable and a ring identifier for identifying a ring (or a control message having stored therein a ring identifier) is transmitted to a neighbor node. A ring identifier preliminarily assigned to a link identified by the link identifier received from the neighbor node (or a ring identifier preliminarily assigned to a link having received the control message) is compared with a ring identifier received from the neighbor node to select either one of the ring identifiers according to specified selection criteria. The ring identifier selected is assigned to the link identified. </Abstract>
 <Background> <SOH> BACKGROUND <EOH>A large number of transmission networks have adopted a configuration having a plurality of ring networks R 1 and R 2 ...(omit)
 A. Allowed
 B. Rejected

gpt-4o-mini: ✗
 B. Rejected

Error Category: Hallucination Error
Error Reason:
 1. Novelty: The application describes a method and device for assigning ring identifiers in a network, which involves transmitting control messages, comparing identifiers, and selecting based on specified criteria. We need to check if this method is novel compared to existing technologies.
 2. Non-obviousness: The claims must not be obvious to someone skilled in the art. The application references existing protocols and methods, such as Link Management Protocol (LMP) and other related documents. If the method described is an obvious extension of existing technologies, it may be rejected.
 3. Utility: The application appears to have a clear utility in managing network resources efficiently, which is a positive aspect for allowing the patent.
 4. Claims Analysis: The claims detail specific steps and components involved in the method and device. If these claims are sufficiently detailed and not merely abstract ideas or general concepts, they may be allowed.
 5. Prior Art: The background section references existing technologies and protocols. If similar methods have been patented or published, this could impact the novelty and non-obviousness of the application.

Figure 69: Error case of task 3-5.

Chinese **Task 4-1: High-quality Case** **English**

权利要求
 1. 液压深松铲，包括支撑臂(2)和深松头(3)，深松头(3)安装在支撑臂(2)底端；其特征在于，还包括固定装置、提升装置、套筒(1)和两组破土片(4)，支撑臂(2)上下滑动穿过套筒(1)内部，套筒(1)通过固定装置安装在旋耕机前端，固定装置用于对套筒(1)位置固定……(后略)
 1. Hydraulic deep loosening shovel, including support arm (2) and deep loosening head (3), the deep loosening head (3) is installed at the bottom of the support arm (2); Its features include a fixing device, a lifting device, a sleeve (1), and two sets of soil breaking pieces (4). The support arm (2) slides up and down through the interior of the sleeve (1), and the sleeve (1) is installed at the front end of the rotary tiller through the fixing device. The fixing device is used to fix the position of the sleeve (1), and the lifting device is installed on the fixing device and pushed to the side of the sleeve (1)...

gpt-4o-mini:
 本发明涉及一种液压深松铲，主要包括支撑臂和深松头，深松头安装在支撑臂底端。该液压深松铲还包括固定装置、提升装置、套筒和两组破土片。支撑臂上下滑动穿过套筒内部，套筒通过固定装置安装在旋耕机前端，固定装置用于固定套筒位置。提升装置安装在固定装置上并推动设置在套筒侧方，用于带动支撑臂升降移动。两组破土片分别安装在深松头的左右两侧……(后略)
 The present invention relates to a hydraulic deep loosening shovel, mainly comprising a support arm and a deep loosening head, wherein the deep loosening head is installed at the bottom end of the support arm. The hydraulic deep loosening shovel also includes a fixing device, a lifting device, a sleeve, and two sets of soil breaking pieces. The support arm slides up and down through the inside of the sleeve, and the sleeve is installed at the front end of the rotary tiller through a fixing device, which is used to fix the position of the sleeve. The lifting device is installed on the fixed device and pushed to the side of the sleeve to drive the support arm to move up and down. Two sets of soil breaking pieces are installed on the left and right sides of the deep loosening head respectively...

Claims
 1. A method for controlling a blind spot detector on a motorcycle, the method comprising: detecting, from lane markings shown in a field of view of a camera of a lane position sensor, a lateral change in a position of the motorcycle, wherein the lateral change comprises the motorcycle moving towards an edge of a lane on a first side of the motorcycle; and adjusting, based on the lateral change detected from the lane markings shown in the field of view of the camera of the lane position sensor, a width of a detection zone of the blind spot detector, wherein: the adjusting the width of the detection zone comprises decreasing the width of the detection zone on the first side of the motorcycle, and the width of the detection zone is further adjusted by steering the blind spot detector.
 2. detecting, from lane markings shown in a field of view of a camera of a lane position sensor, a lateral change in a position of the motorcycle, wherein the lateral change comprises the motorcycle moving towards an edge of a lane on a first side of the motorcycle...(omit)

gpt-4o-mini:
 The present invention relates to a method and system for enhancing blind spot detection on motorcycles. The method involves detecting lateral changes in the motorcycle's position within its lane using a lane position sensor equipped with a camera. Based on this detection, the width of the blind spot detection zones on either side of the motorcycle is dynamically adjusted. Specifically, when the motorcycle moves closer to the edge of a lane, the detection zone on that side is narrowed, while the opposite side's detection zone is correspondingly widened. The system includes one or more sensors to monitor these zones, a controller to process the lane markings and adjust the detection zones in real-time, and a signaling device to alert the rider of any vehicles detected within these zones. The alerts can be provided through haptic, audible, or visual signals, ensuring the rider is informed of potential hazards in their blind spots. This innovative approach aims to improve rider safety by providing timely and accurate awareness of surrounding vehicles.

Figure 70: High-quality case of task 4-1.

Chinese	Task 4-1: Low-quality Case	English
<div><div><div>✖</div></div><div># 权利要求</div><div>1. 一种旋耕机耐磨刀片, 包括机壳(1), 其特征在于: 所述机壳(1)的左右两侧均固定设置有侧板(2), 所述机壳(1)的上端面安装有驱动机构(3); 所述驱动机构(3)贯穿于机壳(1), 所述驱动机构(3)的内部安装有转轴(4), 所述转轴(4)的左右两端分别安装在左右两侧侧板(2)的内侧, 所述转轴(4)的外侧设置有安装组件(20); 所述安装组件(20)包括安装环板(5)、刀片本体(9)、耐磨层(14) …… (后略)</div><div>#Claims of Rights</div><div>1. A wear-resistant blade for a rotary tiller, comprising a housing (1), characterized in that: side plates (2) are fixedly provided on both sides of the housing (1), a driving mechanism (3) is installed on the upper end surface of the housing (1), the driving mechanism (3) penetrates through the housing (1), a rotating shaft (4) is installed inside the driving mechanism (3), and the left and right ends of the rotating shaft (4) are respectively installed on the inner sides of the left and right side plates (2), and an installation component (20) is provided on the outer side of the rotating shaft (4); The installation component (20) comprises an installation ring plate (5), a blade body (9), and a wear-resistant layer (14)...(omit)</div><div>gpt-4o-mini:</div><div>本发明涉及一种旋耕机耐磨刀片及其旋耕机。所述耐磨刀片包括机壳、侧板、驱动机构和转轴, 转轴外侧设有安装组件, 安装组件包括安装环板、刀片本体和耐磨层。安装环板的正面设有限位槽一, 槽内固定有限位凸块, 并开设有多个螺孔以便于安装。刀片本体的右端设有安装部, 安装部上端面开设有限位槽二和螺孔二, 螺孔二与螺孔一相互匹配并配有锁紧螺栓… (后略)</div><div>The present invention relates to a wear-resistant blade of a rotary tiller and its rotary tiller. The wear-resistant blade comprises a casing, side plates, a driving mechanism, and a rotating shaft. The outer side of the rotating shaft is equipped with an installation component, which includes an installation ring plate, a blade body, and a wear-resistant layer. The front of the installation ring plate is equipped with a limiting groove, in which a limiting protrusion is fixed and multiple screw holes are opened for easy installation. The right end of the blade body is equipped with an installation part, and the upper end surface of the installation part is provided with a limited slot two and a screw hole two. The screw hole two matches the screw hole one and is equipped with a locking bolt.</div></div>	<div><div># Patent Applications Awaiting Examination</div><div># Claims</div><div>A system comprising: one or more processors; and one or more non-transitory computer-readable media storing instructions executable by the one or more processors, wherein the instructions, when executed, cause the system to perform operations comprising: determining a position of a vehicle in an environment, the position comprising two-dimensional coordinates and a yaw value; determining a heading vector associated with the vehicle based at least in part on the position, wherein the heading vector comprises a heading direction; determining a sideslip vector associated with the vehicle based at least in part on a direction of motion of the vehicle and a velocity, wherein the sideslip vector comprises a sideslip direction that is different from the heading direction; determining a curvature of the vehicle by: determining a predicted heading vector associated with the vehicle based at least in part on a predicted position of the vehicle; determining a predicted sideslip vector associated with the vehicle based at least in part on a predicted direction of motion of the vehicle and a predicted velocity; and determining the curvature based at least in part on a difference between the predicted sideslip vector and the sideslip vector and a difference between the predicted heading vector and the heading vector...(omit)</div></div> <div><div>gpt-4o-mini:</div><div>The present invention relates to a system and method for retrieving patient information utilizing large language models (LLMs). The system comprises a processor and a memory that stores instructions for processing natural language queries received from users. Upon receiving a query, the system inputs it into an LLM to generate a computer language query composed of multiple nodes. These nodes are then mapped to entries in a patient database, and a database response is obtained based on this mapping. The system generates a final database query from the database response and queries the patient database accordingly. The user response is then transmitted to a graphical user interface, which includes generating a natural language response through the LLM. This response generation involves analyzing a user profile, training a classifier with exemplary query data, and classifying the user profile into language groupings. The system also includes features for generating user interface data structures and identifying atomic elements within queries to enhance the accuracy and relevance of the information retrieved...(omit)</div></div>	

Figure 71: Low-quality case of task 4-1.

Chinese	Task 4-2: High-quality Case	English
<div><div></div><p># 独立权利要求项</p><p>1. 自动麻将机, 其特征在于, 包括环形推牌装置, 所述环形推牌装置包括推牌槽, 所述推牌槽包括基座、环形直立挡板和环形挡牌侧板, 所述环形直立挡板和环形挡牌侧板设在所述基座上, 所述环形挡牌侧板位于所述环形直立挡板的内圈, 所述环形直立挡板的弯曲角度大于180°, 所述推牌槽设有进牌口和出牌口 (后略)</p><p>请根据给定的独立权利要求项生成其对应的所有从属权利要求。</p><p>#Independent claims</p><p>An automatic mahjong machine, characterized in that it comprises a circular card pushing device, the circular card pushing device comprising a card pushing groove, the card pushing groove comprising a base, a circular upright baffle, and a circular blocking side plate. The circular upright baffle and the circular blocking side plate are arranged on the base, and the circular blocking side plate is located on the periphery of the circular upright baffle. The bending angle of the circular upright baffle is greater than 180°, and the card pushing groove is provided with a card inlet and a card outlet. Please generate all corresponding dependent claims based on the given independent claims</p><p>gpt-4o-mini:</p><p>根据给定的独立权利要求项, 以下是可能的从属权利要求:</p><p>1. 根据权利要求1所述的自动麻将机, 其特征在于, 所述环形推牌装置的推牌槽的基座上设有驱动装置, 用于驱动推牌槽内的麻将牌沿推牌槽移动。</p><p>2. 根据权利要求1所述的自动麻将机, 其特征在于, 所述环形直立挡板和环形挡牌侧板由耐磨材料制成, 以提高使用寿命。</p><p>3. 根据权利要求1所述的自动麻将机, 其特征在于, 所述进牌口和出牌口的设计使得麻将牌在推牌过程中不易卡住…… (后略)</p><p>dependent claims:2. The automatic mahjong machine according to claim 1, characterized in that a driving device is provided on the base of the pushing slot of the circular pushing device, for driving the mahjong tiles in the pushing slot to move along the pushing slot.3. The automatic mahjong machine according to claim 1, characterized in that the annular upright blocking plate and the annular blocking side plate are made of wear-resistant materials to improve their service life.4. The automatic mahjong machine according to claim 1, characterized in that the design of the card inlet and outlet makes it difficult for mahjong tiles to get stuck during the pushing process...(omit)</p></div>	<div><p># Independent Claim</p><p>A scanning mirror assembly, comprising: a two-dimensional micro-electromechanical system (MEMS) scanning mirror; a first pair of piezoelectric electrodes coupled to the MEMS scanning mirror through a first pair of looped torsion springs, wherein the first pair of piezoelectric electrodes drives the MEMS scanning mirror to rotate around a first axis; and a second pair of piezoelectric electrodes coupled to the MEMS scanning mirror through a second pair of looped torsion springs, wherein the second pair of piezoelectric electrodes drives the MEMS scanning mirror to rotate around a second axis orthogonal to the first axis, wherein at least one of the first pair of looped torsion springs or the second pair of looped torsion springs are multiple-looped torsion springs, a two-dimensional micro-electromechanical system (MEMS) scanning mirror; a first pair of piezoelectric electrodes coupled to the MEMS scanning mirror through a first pair of looped torsion springs, wherein the first pair of piezoelectric electrodes drives the MEMS scanning mirror to rotate around a first axis; and a second pair of piezoelectric electrodes coupled to the MEMS scanning mirror through a second pair of looped torsion springs, wherein the second pair of piezoelectric electrodes drives the MEMS scanning mirror to rotate around a second axis orthogonal to the first axis, wherein at least one of the first pair of looped torsion springs or the second pair of looped torsion springs are multiple-looped torsion springs. Please generate all dependent claims corresponding to the given independent claim.</p><p>gpt-4o-mini:</p><p>Here are several dependent claims that correspond to the provided independent claim regarding the scanning mirror assembly:</p><p>Dependent Claim 2: The scanning mirror assembly of claim 1, wherein the multiple-looped torsion springs are configured to provide enhanced rotational stability and precision for the MEMS scanning mirror.</p><p>Dependent Claim 3: The scanning mirror assembly of claim 1, wherein the first pair of piezoelectric electrodes is configured to operate in a push-pull manner to achieve a greater range of motion for the MEMS scanning mirror....(omit)</p></div>	

Figure 72: High-quality case of task 4-2.

Chinese	Task 4-2: Low-quality Case	English
<p>✗</p> <p># 独立权利要求</p> <p>1. 一种用于性感带的刺激装置 (1), 包括: 至少一个压力场生成器 (2), 该至少一个压力场生成器 (2) 具有: 至少一个第一腔室 (3); 所述第一腔室 (3) 具有单个开口, 和驱动部件 (6), 所述驱动部件 (6) 改变所述第一腔室 (3) 的体积, 以改变所述压力场生成器 (2) 中的总压力, 其中, 所述总压力包括经调制的相对于参照压力的正压或负压; 和使所述驱动部件 (6) 开动的控制装置 (7); 所述压力场生成器 (2) 没有阀门; 所述刺激装置 (1) 是手持的装置。</p> <p>请根据给定的独立权利要求生成其对应的所有从属权利要求。</p> <p>#Independent claims</p> <p>1. A stimulation device (1) for a sex belt, comprising: at least one pressure field generator (2), the at least one pressure field generator (2) having: at least one first chamber (3); The first chamber (3) has a single opening and a driving component (6) that changes the volume of the first chamber (3) to alter the total pressure in the pressure field generator (2), wherein the total pressure includes modulated positive or negative pressure relative to a reference pressure; And a control device (7) for activating the driving component (6); The pressure field generator (2) does not have a valve; The stimulation device (1) is a handheld device. Please generate all dependent claims corresponding to the given independent claims.</p> <p>gpt-4o-mini:</p> <p>根据给定的独立权利要求, 以下是可能的从属权利要求:</p> <p>1. 根据权利要求1所述的刺激装置 (1), 其中所述第一腔室 (3) 的开口具有可调节的直径, 以便调节所述压力场生成器 (2) 的输出压力。</p> <p>2. 根据权利要求1所述的刺激装置 (1), 其中所述驱动部件 (6) 为电动驱动装置, 能够通过电信号控制其动作。</p> <p>3. 根据权利要求1所述的刺激装置 (1), 其中所述控制装置 (7) 包括一个用户界面, 允许用户选择不同的刺激模式……(后略)</p> <p>Based on the given independent claims, the following are possible dependent claims: 1. The stimulation device (1) according to claim 1, wherein the opening of the first chamber (3) has an adjustable diameter for adjusting the output pressure of the pressure field generator (2). 2. The stimulation device (1) according to claim 1, wherein the driving component (6) is an electric driving device capable of controlling its action through electrical signals. 3. The stimulation device (1) according to claim 1, wherein the control device (7) comprises a user interface that allows the user to select different stimulation modes...(omit)</p>	<p># Independent Claim</p> <p>A semiconductor device comprising: a substrate; an alignment marker embedded in the substrate, the alignment marker comprising tantalum (Ta) and having a line edge roughness of less than 2.5 nm; a plurality of transistors in the substrate; and a plurality of metal interconnects and metal vias connected to the plurality of transistors. a substrate; an alignment marker embedded in the substrate, the alignment marker comprising tantalum (Ta) and having a line edge roughness of less than 2.5 nm; a plurality of transistors in the substrate; and a plurality of metal interconnects and metal vias connected to the plurality of transistors. Please generate all dependent claims corresponding to the given independent claim.</p> <p>gpt-4o-mini:</p> <p>Here are several dependent claims that could correspond to the independent claim provided:</p> <p>Dependent Claim 1: The semiconductor device of claim 1, wherein the alignment marker is positioned at a predetermined location within the substrate to facilitate alignment during manufacturing processes.</p> <p>Dependent Claim 2: The semiconductor device of claim 1, wherein the plurality of transistors includes at least one type selected from the group consisting of NMOS transistors, PMOS transistors, and FinFET transistors.</p> <p>Dependent Claim 3: The semiconductor device of claim 1, wherein the metal interconnects are made of copper (Cu) or aluminum (Al).</p> <p>Dependent Claim 4: The semiconductor device of claim 1, wherein the substrate is made of silicon (Si) or silicon-on-insulator (SOI).</p> <p>Dependent Claim 5: The semiconductor device of claim 1, wherein the line edge roughness of the alignment marker is less than 2.0 nm.</p> <p>Dependent Claim 6: The semiconductor device of claim 1, further comprising a dielectric layer between the alignment marker and the plurality of transistors.</p> <p>Dependent Claim 7: The semiconductor device of claim 1, wherein the alignment marker is formed using a deposition technique selected from the group consisting of sputtering, chemical vapor deposition (CVD), and atomic layer deposition (ALD)...</p>	

Figure 73: Low-quality case of task 4-2.

Chinese	Task 4-3: Correct Case	English
<p>✓</p> <p>请从A, B, C, D四个选项选出题目对应的答案。</p> <p>某专利保护工业机器人手臂的齿轮传动关节结构, 核心为三级减速齿轮组。下列哪种改进最可能规避侵权?</p> <p>Question: A patent protects the gear transmission joint structure of an industrial robot arm, with the core being a three-stage reduction gear set. Which of the following improvements is most likely to avoid infringement?</p> <p>A. 改用谐波减速器替代齿轮组 A. Replace the gear set with a harmonic reducer. B. 将齿轮材料从钢换成钛合金 B. Replace the gear material from steel to titanium alloy. C. 增大齿轮模数以提升强度 C. Increase gear module to enhance strength. D. 增加润滑油注入入口数量 D. Increase gear module to enhance strength.</p> <p>gpt-4o-mini: ✓</p> <p>在这个问题中, 我们需要考虑如何通过改进来规避对某专利的侵权。专利的核心是三级减速齿轮组, 因此我们需要寻找一种改进方式, 能够在不使用该专利的核心技术的情况下, 达到类似的功能。</p> <p>A. 改用谐波减速器替代齿轮组: 谐波减速器是一种不同于传统齿轮组的减速装置, 使用了不同的工作原理, 因此这种改进最有可能规避侵权。</p> <p>B. 将齿轮材料从钢换成钛合金: 虽然材料的改变可能会影响性能, 但核心的齿轮结构和工作原理没有改变, 因此这并不能有效规避侵权。</p> <p>C. 增大齿轮模数以提升强度: 这仍然是在使用齿轮组的设计, 只是改变了齿轮的尺寸和强度, 依然可能侵犯专利。</p> <p>D. 增加润滑油注入入口数量: 这只是对现有设计的一个小改动, 并没有改变齿轮组的基本结构和工作原理, 因此也无法规避侵权。</p> <p>综上所述, 最有效的改进方式是选项A, 即改用谐波减速器替代齿轮组。In this issue, we need to consider how to avoid infringement of a certain patent through improvement. The core of the patent is the three-stage reduction gear set, so we need to find an improved way to achieve similar functionality without using the core technology of the patent. A. Replacing gear sets with harmonic reducers: Harmonic reducers are a type of reduction device different from traditional gear sets, using different working principles, so this improvement is most likely to avoid infringement. B. Replacing the gear material from steel to titanium alloy: Although the change in material may affect performance, the core gear structure and working principle have not changed, so this cannot effectively avoid infringement. C. Increasing the gear module to enhance strength: This is still using the design of gear sets, only changing the size and strength of the gears, which may still infringe on patents. D. Increasing the number of lubricant injection ports: This is only a minor modification to the existing design and does not change the basic structure and working principle of the gear set, so infringement cannot be avoided. In summary, the most effective improvement method is option A.</p>	<p>Question: Please select the correct answer from A, B, C, and D.</p> <p>A patented autonomous drone navigation system (US 10,555,123) requires "LiDAR-based obstacle avoidance with 360° point cloud fusion" and "dynamic path recalculation every 0.1 seconds." Which redesign avoids infringement under the doctrine of equivalents?</p> <p>A. Using stereo cameras instead of LiDAR but achieving similar resolution</p> <p>B. Increasing path recalculation frequency to 0.05 seconds</p> <p>C. Combining LiDAR with ultrasonic sensors for redundancy</p> <p>D. Adopting pre-mapped static routes without real-time recalculation</p> <p>gpt-4o-mini: ✓</p> <p>To determine which redesign avoids infringement under the doctrine of equivalents, we need to analyze each option in relation to the patented features of the autonomous drone navigation system.</p> <p>1. Understanding the Patent Claims: The patent requires "LiDAR-based obstacle avoidance with 360° point cloud fusion." It also specifies "dynamic path recalculation every 0.1 seconds."</p> <p>2. Evaluating Each Option: A. Using stereo cameras instead of LiDAR but achieving similar resolution: This option substitutes LiDAR with stereo cameras. While it may achieve similar resolution, it does not use LiDAR, which is a specific requirement of the patent. This could potentially avoid infringement. B. Increasing path recalculation frequency to 0.05 seconds: This option changes the frequency of recalculation but still uses dynamic path recalculation. Since it still falls under the same functional requirement of the patent, it does not avoid infringement. C. Combining LiDAR with ultrasonic sensors for redundancy: This option still uses LiDAR, which is a key element of the patent. Therefore, it does not avoid infringement. D. Adopting pre-mapped static routes without real-time recalculation: This option eliminates the dynamic recalculation aspect entirely, which is a critical feature of the patent. By not recalculating paths dynamically, it avoids the infringement of that specific claim.</p> <p>3. Conclusion: The best option that avoids infringement under the doctrine of equivalents is D, as it fundamentally changes the method of navigation by removing the dynamic recalculation requirement.</p> <p>Final answer: D</p>	

Figure 74: Correct case of task 4-3.

Chinese	Task 4-3: Error Case	English
<p>请从A, B, C, D四个选项选出题目对应的答案。 某专利保护机床刀具的三点式径向定位夹具, 下列哪种改进最可能规避侵权?</p> <p>Please refer to A, B, C, D. Choose the answer corresponding to the question from the four options C and D. Question: A three-point radial positioning fixture for machine tool tools protected by a certain patent. Which of the following improvements is most likely to avoid infringement?</p> <p>A. 加装温度传感器 A. Install temperature sensor. B. 使用碳化钨镀层夹具 B. Use tungsten carbide coating fixture. C. 增加定位点至四个 C. Increase the number of positioning points to four. D. 设计为V型槽轴向夹紧结构 D. Designed as a V-shaped groove axial clamping structure.</p> <p>gpt-4o-mini: ✗ C. 增加定位点至四个 C. Increase the number of positioning points to four.</p> <p>Error Category: Composite error Error Reason: The most effective way to avoid patent infringement is usually to modify or replace the key features of the patent. The core feature of the three-point radial positioning fixture mentioned in the title is the design of its three-point positioning. ✗ A. Installing a temperature sensor - this is not related to the positioning function of the fixture and may not effectively avoid infringement. B. Using tungsten carbide coating fixtures - this is mainly a change in material and may not affect the core design of the patent. C. Increasing the number of positioning points to four directly changes the design features of the original patent from three points to four points, which may effectively avoid infringement. D. Designed as a V-shaped groove axial clamping structure - although this is a design change, it may still be similar in function to the original patent. Taking all factors into ✗ consideration, increasing the number of positioning points to four is the most direct and effective way to avoid infringement.</p>	<p>Please select the correct answer from A, B, C, and D. Question: A medical device patent (US 9,878,210) covers a "wearable insulin pump with real-time glucose monitoring using subcutaneous microdialysis." Which modification would most likely avoid infringement if the original patent claims specify "microdialysis membrane thickness of 10-15µm" and "feedback-controlled dosing based on glucose levels"?</p> <p>A. Replacing microdialysis with non-invasive Raman spectroscopy for glucose detection. B. Using a 16µm microdialysis membrane with identical feedback algorithms. C. Adding Bluetooth connectivity to share data with smartphones. D. Implementing an open-loop dosing system without glucose feedback.</p> <p>gpt-4o-mini: ✗ A. Replacing microdialysis with non-invasive Raman spectroscopy for glucose detection.</p> <p>Error Category: Reasoning Error Error Reason: To determine which modification would most likely avoid infringement of the patent covering a "wearable insulin pump with real-time glucose monitoring using subcutaneous microdialysis," we need to analyze each option in relation to the specific claims of the patent. A. Replacing microdialysis with non-invasive Raman spectroscopy for glucose detection - This modification changes the method of glucose detection entirely, moving away from microdialysis to a different technology. This would likely avoid infringement as it does not utilize the patented method. ✗ B. Using a 16µm microdialysis membrane with identical feedback algorithms** - This option still uses microdialysis, which is a key aspect of the original patent. ✗ The change in membrane thickness (from 10-15µm to 16µm) may not be sufficient to avoid infringement, especially since the feedback-controlled dosing based on glucose levels remains unchanged. C. Adding Bluetooth connectivity to share data with smartphones - While this adds a feature to the device, it does not change the core technology of glucose monitoring or dosing. Therefore, it is unlikely to avoid infringement. D. Implementing an open-loop dosing system without glucose feedback - This modification removes the feedback-controlled dosing aspect, which is a critical part of the original patent. By eliminating the feedback mechanism, this option could potentially avoid infringement. ✗ Considering the analysis, the most effective modification to avoid infringement is option A, as it completely changes the method of glucose detection, thus steering clear of the patented technology.</p>	

Figure 75: Error case of task 4-3.