

From “Thinking” to “Justifying”: Aligning High-Stakes Explainability with Professional Communication Standards

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Abstract

Explainable AI (XAI) in high-stakes domains should help stakeholders trust and verify system outputs. Yet Chain-of-Thought methods reason before concluding, and logical gaps or hallucinations can yield conclusions that do not reliably align with their rationale (Turpin et al., 2023). Thus, we propose “Result \rightarrow Justify”, which constrains the *output communication* to present a conclusion before its structured justification. We introduce SEF (Structured Explainability Framework), operationalizing professional conventions (e.g., CREAC, BLUF) via six metrics for structure and grounding. Experiments across four tasks in three domains validate this approach: all six metrics correlate with correctness ($r = 0.20\text{--}0.42$; $p < 0.001$), and SEF achieves 83.9% accuracy (+5.3 over CoT). These results suggest structured justification can improve verifiability and may also improve reliability. Code and data will be released upon acceptance.

1 Introduction

As large language models (LLMs) are deployed in high-stakes domains, explainable AI (XAI) has become essential for helping humans assess model outputs (Bommasani et al., 2021). Prior XAI work has progressed from post-hoc attribution (Ribeiro et al., 2016; Lundberg and Lee, 2017) to process-oriented approaches like Chain-of-Thought (CoT) (Wei et al., 2022; Yao et al., 2023). While CoT prompting elicits step-by-step reasoning before a conclusion, hallucinations or logical gaps can yield conclusions that misalign with their rationale (Turpin et al., 2023; Lanham et al., 2023). Such misaligned or unfaithful explanations can hinder stakeholders’ understanding of the model’s reasoning.

To address this challenge, we draw on professional communication practices as a source of *justification structure*, and use them to

format explanations as verifiable justifications. CREAC (Conclusion-Rule-Explanation-Analysis-Conclusion) in legal writing (Mangan et al., 2022) and BLUF (Bottom Line Up Front), a U.S. military communication standard widely adopted in business (Sehgal, 2016), are widely used templates for presenting a defensible conclusion and its supporting evidence. Legal theory frames this as the distinction between the *context of discovery* (how one arrives at an answer) and the *context of justification* (how one defends it) (Burton, 2007). We hypothesize that AI explanations in high-stakes domains may benefit from adopting this justification-oriented structure: “**Result \rightarrow Justify.**” Crucially, SEF targets the *context of justification* by constraining output communication rather than internal deliberation. Such perspective is supported by mathematical writing, where results precede polished proofs that may differ from the original derivation, emphasizing clarity and evaluability (Lamport, 2012; Aigner and Ziegler, 2010).

We propose SEF (Structured Explainability Framework), which operationalizes CREAC and BLUF conventions through six metrics capturing *plausibility* (structural clarity) and *faithfulness* (evidence grounding) (Jacovi and Goldberg, 2020) (Figure 1). While mechanistic interpretability examines internal activations, SEF acts as a behavioral probe: by measuring output structure, we infer how prompting constraints shape reasoning organization (Lanham et al., 2023; Lyu et al., 2023). Experiments across four tasks in three domains validate this approach:

1. All six metrics correlate with correctness ($r = 0.20\text{--}0.42$; $p < 0.001$), suggesting that structured justifications align with more reliable outputs.
2. SEF achieves 83.9% accuracy (+5.3 over CoT). Notably, Direct (80.9%) outperforms CoT (78.6%), consistent with concerns about unconstrained reasoning.

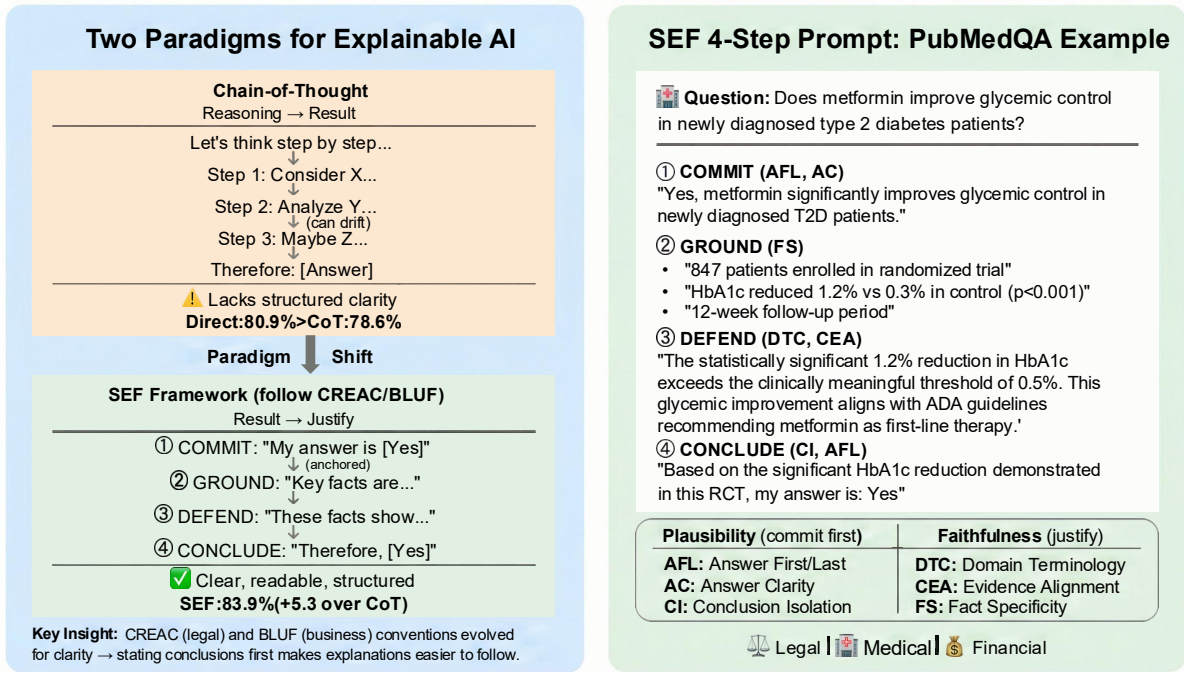


Figure 1: **SEF: Structured Explainability via CREAC/BLUF Conventions.** Left: Paradigm comparison showing CoT (“Reasoning → Result”) vs. SEF (“Result → Justify”). CoT traces can be hard to verify (Direct 80.9% > CoT 78.6%); SEF achieves 83.9%. Right: PubMedQA example demonstrating the 4-step prompt (Commit, Ground, Defend, Conclude) with metric mappings.

3. Ablations show the conclusion-first presentation scaffold is the main driver of accuracy: removing plausibility constraints causes the largest drop (−32.9), while removing faithfulness constraints reduces accuracy modestly (−4.3) but weakens domain grounding.

2 Related Work

Process-Oriented Reasoning. CoT (Wei et al., 2022) follows a “Reasoning → Result” paradigm but has known failures. Turpin et al. (2023) show CoT can be *unfaithful*, offering plausible reasoning unrelated to actual computation. Similarly, Lanham et al. (2023) note models may reach correct answers via flawed steps. Remedies like self-consistency (Wang et al., 2022), Tree-of-Thought (Yao et al., 2023), and Chain-of-Verification (Dhuliawala et al., 2024) improve accuracy but retain this paradigm without structural constraints, which reduces verifiability in high-stakes settings. We propose “Result → Justify” (like CREAC and BLUF): state the conclusion first, then build a structured, verifiable defense.

Explainability Evaluation. Explanation evaluation separates faithfulness (actual model reasoning) from plausibility (human reasonableness) (Jacovi and Goldberg, 2020; Wiegrefe and Marasović,

2021). Existing metrics (e.g., LIME, SHAP) focus on *token-level* attribution (Ribeiro et al., 2016; Lundberg and Lee, 2017). While these identify *what* inputs influence predictions, they ignore *how* the model structures arguments. Because current methods cannot distinguish coherent justification from a list of salient tokens, we propose metrics grounded in professional communication (e.g., evidence linking) to assess if AI explanations mirror expert practice.

Domain-Specific NLP. Benchmarks exist for legal (Guha et al., 2023), medical (Jin et al., 2019), and financial (Malo et al., 2013) NLP. We complement them with metrics that operationalize justification-oriented structure, which these domains value for review and accountability.

3 SEF Framework

SEF is dual-purpose: a prompting specification and a heuristic metric suite. Concretely, we use the metrics both to evaluate all methods and to design a constrained, sectioned output format for generation. Full heuristic definitions and the prompt template are in Appendix A (App. A.1–A.2).

Six Justification Metrics. We score each explanation with six heuristic metrics in $[0, 1]$, grouped into two dimensions:

Plausibility (commitment and sectioning).

- *Answer First/Last (AFL)*: answer appears in the first/last 200 characters (1.0 both, 0.5 one, 0.0 neither).
- *Answer Clarity (AC)*: explicit answer statements via regex patterns (strong 1.0, medium 0.7, weak 0.3).
- *Conclusion Isolation (CI)*: conclusion structurally separated (explicit conclusion headers 1.0; discourse markers 0.6).

Faithfulness (justify with evidence).

- *Domain Terminology Consistency (DTC)*: counts curated domain terms (thresholded score 0.2–1.0).
- *Conclusion–Evidence Alignment (CEA)*: detects evidence-linking language (e.g., “based on”, “according to”) plus analysis cues.
- *Fact Specificity (FS)*: counts specificity indicators (numbers/quotes, enumerations) against vagueness markers.

Metric-informed prompting. The metrics induce a 4-step schema: **Commit** (AFL, AC), **Ground** (FS), **Defend** (DTC, CEA), **Conclude** (CI, AFL). Unlike CoT, SEF commits first and constrains format to reduce drift.

4 Experiments

4.1 Setup

Models. We evaluate four open-weight 12–14B instruction-tuned models: DeepSeek-R1-Distill-Qwen-14B (DeepSeek-AI et al., 2025), Gemma 3 12B (Gemma Team et al., 2024), Ministral-3-14B (Mistral AI, 2025), and Qwen 2.5 14B (Bai et al., 2023). We use greedy decoding (temperature=0) via vLLM (Kwon et al., 2023).

Tasks. We evaluate on four Yes/No classification tasks spanning legal (Guha et al., 2023), medical (Jin et al., 2019), and financial (Malo et al., 2013) domains (1,618 test samples total; see Appendix A.4 for details). The binary format makes accuracy a sufficient metric while enabling comparison of explanation quality through our six metrics.

Baselines. We compare against six prompting strategies: (1) **Direct**, answer without explanation; (2) **Chain-of-Thought** (CoT; Wei et al., 2022), “think step by step”; (3) **Tree-of-Thought** (ToT; Yao et al., 2023), explore multiple reasoning paths; (4) **Chain-of-Verification** (CoVe; Dhuliawala et al., 2024), verify reasoning steps; (5) **Vanilla RAG** (V-RAG; Lewis et al., 2020), retrieve relevant context;

Dimension	Metric	Pearson r	p -value
Plausibility	AFL	0.36	< .001
	AC	0.42	< .001
	CI	0.31	< .001
Faithfulness	DTC	0.20	< .001
	CEA	0.23	< .001
	FS	0.36	< .001

Table 1: Pearson correlation between each metric and prediction correctness ($n=90,608$ samples across all models, methods, and tasks). All metrics show significant correlations with accuracy ($p < 0.001$). Plausibility metrics tend to show stronger effects ($r = 0.31$ – 0.42) than faithfulness metrics ($r = 0.20$ – 0.36).

(6) **Self-RAG** (Asai et al., 2023), iterative retrieval with self-reflection. All baselines use the same greedy decoding and are evaluated on identical test sets; full prompt templates are in Appendix A.3.

Ablation Protocol. For systematic ablation, we create eight SEF variants: six single-component ablations (removing AFL, AC, CI, DTC, CEA, or FS instructions), plus two dimension-level ablations (removing all Presentation or all Domain instructions). Each variant runs on all four models across all four tasks (64 experimental conditions total).

4.2 Metric-Accuracy Correlation

We first examine whether the metrics correlate with prediction accuracy. Crucially, we compute each metric on 90,608 outputs from *all* methods (4 models \times 7 methods \times 4 tasks \times variable samples). The correlations reflect general associations between structure and correctness, not artifacts of SEF-specific formatting.

Table 1 shows Pearson correlations between each metric and prediction correctness. All six metrics correlate significantly with accuracy ($p < 0.001$), supporting our hypothesis that CREAC/BLUF-style justification structure is associated with more reliable outputs. Both dimensions contribute: plausibility metrics ($r = 0.31$ – 0.42) capture commitment and sectioning, while faithfulness metrics ($r = 0.20$ – 0.36) capture domain grounding.

4.3 Main Results

Table 2 shows that SEF achieves 83.9% average accuracy, outperforming CoT by 5.3 points (+9.0 on PubMedQA, +4.6 on ConsumerQA, +2.8 on FPB). On Hearsay, SEF matches the best baseline (CoVe) at 54.5%.

Notably, Direct prompting (80.9%) outperforms CoT (78.6%) and most reasoning methods, a

Method	FPB	CQA	Hear.	PMQ	Avg
Direct	94.3	93.9	49.5	86.1	80.9
CoT	92.7	91.5	49.7	80.5	78.6
ToT	93.6	89.8	45.0	82.4	77.7
CoVe	88.9	90.2	54.5	83.9	79.4
V-RAG	95.3	86.6	45.0	81.0	76.9
Self-RAG	76.5	88.0	48.1	76.9	72.4
SEF	95.5	96.1	54.5	89.5	83.9

Table 2: Accuracy (%) averaged over four models. SEF achieves highest average accuracy (83.9%), outperforming all baselines including CoT (+5.3 points). **Tasks:** FPB = Financial PhraseBank, CQA = ConsumerQA, Hear. = Hearsay, PMQ = PubMedQA.

Variant	FPB	CQA	Hear.	PMQ	Avg	Δ
SEF (Full)	95.5	96.1	54.5	89.5	83.9	–
w/o AFL	94.5	92.3	41.3	86.9	78.8	–5.1
w/o AC	90.5	91.0	47.8	85.0	78.6	–5.3
w/o CI	70.9	68.9	49.3	56.7	61.4	–22.5
w/o DTC	94.0	91.4	48.3	84.8	79.6	–4.3
w/o CEA	90.5	90.5	54.7	84.5	80.0	–3.9
w/o FS	90.8	91.6	50.4	84.8	79.4	–4.5
w/o Pres.	35.1	67.5	53.8	47.8	51.0	–32.9
w/o Domain	92.3	90.5	50.9	84.5	79.6	–4.3

Table 3: Ablation results: accuracy (%) when removing individual components or entire dimensions. Plausibility components (especially CI) tend to cause larger drops than faithfulness components, consistent with correlation patterns in Table 1. **Notation:** w/o = without; Pres. = Plausibility (AFL+AC+CI); Domain = Faithfulness (DTC+CEA+FS).

counter-intuitive finding consistent with recent work showing that CoT’s free-form reasoning traces can introduce errors through drift or unfaithful explanations (Turpin et al., 2023). SEF outperforms even Direct (+3.0 points), suggesting that *structured* justification adds value beyond mere answer commitment.

4.4 Ablation Study

Table 3 reveals how constraints contribute to verifiable justifications:

Plausibility enables structured presentation. Without plausibility constraints, SEF degrades to unstructured reasoning, causing a massive accuracy drop (–32.9). This underscores that the explicit structural constraints are the primary driver of performance.

Faithfulness enables domain grounding. Removing faithfulness constraints reduces accuracy modestly (–4.3) but results in generic explanations. The impact is task-dependent: DTC is vital for

Hearsay (–6.2) due to legal precision, while FS drives performance on PubMedQA by enforcing clinical evidence citation.

Both dimensions are necessary. Plausibility provides the structural scaffold; faithfulness fills it with domain-appropriate content. Neither alone yields fully verifiable justifications.

5 Discussion

Accuracy as behavioral validation. Direct (80.9%) outperforming CoT (78.6%) is consistent with work questioning CoT faithfulness (Turpin et al., 2023), suggesting that CoT’s free-form reasoning traces may sometimes hurt rather than help. SEF (83.9%) combines answer commitment (like Direct) with structured justification (unlike Direct’s lack of explanation, and unlike CoT’s unconstrained traces). This accuracy pattern validates that CREAC/BLUF-style structure (Mangan et al., 2022; Sehgal, 2016) reflects effective output organization, not just convention.

What output structure reveals. The systematic correlation between structure and accuracy ($r = 0.20\text{--}0.42$) suggests prompting constraints shape how models organize their outputs. Imposing conclusion-first structure is associated with higher accuracy on average. This behavioral analysis complements mechanistic interpretability by highlighting *which output organization patterns* coincide with reliable outputs.

Implications. For high-stakes domains, explanations may benefit from mirroring professional practice: structured defenses of committed conclusions, rather than reasoning traces hoping to find answers. Our results suggest this improves both interpretability and reliability.

6 Conclusion

We introduced SEF, which structures AI explanations via CREAC and BLUF conventions. This “Result \rightarrow Justify” paradigm states the conclusion upfront, then builds a structured defense as a *presentation* scaffold. SEF achieves 83.9% accuracy (+5.3 over CoT), suggesting verifiable justifications may also improve reliability. Additionally, our six metrics provide scalable signals of quality to enable verification-oriented evaluation. For high-stakes domains, conclusion-first justification supports more trustworthy model use.

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Limitations

Proxy metrics. Our six metrics are scalable heuristics that approximate professional communication conventions, not deep domain soundness. They measure *structural* compliance (e.g., presence of conclusion headers, domain terms) rather than *semantic* correctness of the justification itself. A response can score well while containing factual errors. We mitigate this concern by computing correlations across *all* methods (not just SEF), showing that structure correlates with accuracy generally. Importantly, even when the answer is incorrect, structured justifications improve readability: the human-friendly format makes it easier for reviewers to identify errors in the reasoning. These automatic metrics serve as a scalable first-pass filter; human expert evaluation to assess semantic faithfulness remains future work.

Statistical interpretation. Our per-sample correlations quantify association (effect size r), not causality, and samples may not be independent due to shared prompts, models, and datasets. We therefore interpret them descriptively and complement them with ablations that intervene on prompting constraints.

Scope and artifacts. We validate on Yes/No tasks across three domains with 12–14B instruction-tuned models. Extending to multi-class settings, open-ended generation, additional domains, or larger models remains future work. We use public datasets and open-weight models under their stated licenses/terms and do not redistribute third-party datasets or model weights.

Ethical Considerations

Persuasive hallucinations. Structured justifications may make incorrect answers more convincing. Any use of SEF should include human oversight and avoid presenting generated justifications as professional advice or as evidence of correctness.

Professional boundaries. SEF should not replace professional judgment in legal, medical, or financial decisions. Our 83.9% accuracy implies substantial error rates.

Privacy and data use. We do not collect new personal data or deploy systems. We use publicly released research benchmarks; users should respect dataset terms and avoid applying the framework to

sensitive or identifiable records without appropriate approvals and safeguards.

Environmental impact. We do not train new models. Experiments use existing 12–14B models with deterministic decoding, but compute remains non-trivial; releasing code and configurations is intended to reduce redundant reruns.

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A Implementation Details

Reproducibility note. SEF’s metrics are **rule-based heuristics** (regex/pattern matching), not model-based judges. This makes the evaluation lightweight and deterministic. These metrics assess structural compliance rather than semantic correctness; their value lies in producing human-readable outputs that facilitate expert review. We summarize the exact scoring rules below.

A.1 Metric Computation (Regex/Heuristics)

Inputs. Each metric consumes an explanation string e and a predicted binary answer $a \in \{\text{Yes}, \text{No}\}$. All matching is performed on a low-ercased copy of e .

AFL (Answer First/Last). Let e_{head} be the first 200 characters of e and e_{tail} the last 200. AFL is 1.0 if a occurs in both e_{head} and e_{tail} , 0.5 if it occurs in exactly one, else 0.0. Occurrence is checked by direct substring match or a word-boundary match for Yes/No.

AC (Answer Clarity). We detect explicit answer statements with regexes. If any *strong* pattern matches, AC=1.0; else if any *medium* pattern matches, AC=0.7; else if a appears anywhere in e , AC=0.3; else 0.0. Strong patterns capture explicit declarations (e.g., “My answer is: Yes”, “Final answer: No”, “The answer is: Yes”, or “Answer: Yes”); medium patterns capture discourse markers that directly precede a Yes/No conclusion (e.g., “therefore, Yes” or “in conclusion, No”).

CI (Conclusion Isolation). CI=1.0 if the output contains an explicit conclusion header (e.g., “CONCLUSION:” / “Conclusion:”); CI=0.6 if it contains common concluding markers (e.g., “in conclusion”, “to conclude”, “in summary”, “therefore”, “thus”); else 0.0.

DTC (Domain Terminology Consistency). We count occurrences of curated, domain-specific terms (legal/medical/financial lexicons). If no lexicon is defined, DTC=0.5. Otherwise, if the term-count is ≥ 5 , DTC=1.0; if ≥ 3 , DTC=0.8; if ≥ 1 , DTC=0.5; else DTC=0.2.

CEA (Conclusion–Evidence Alignment). We count evidence-linking cues and analysis cues. If link-cue count ≥ 3 and analysis-cue count ≥ 1 , CEA=1.0; else if link-cue count ≥ 2 , CEA=0.8; else if link-cue count ≥ 1 , CEA=0.5; else if analysis-cue count ≥ 1 , CEA=0.3; else 0.0. Cues

Metric	Heuristic scoring rule (summary)
AFL	Answer appears in both the first and last 200 characters (1.0); only one side (0.5); neither (0.0).
AC	Explicit answer declaration (1.0); weaker conclusion marker preceding Yes/No (0.7); answer appears anywhere (0.3); otherwise (0.0).
CI	Explicit conclusion header present (1.0); concluding discourse markers present (0.6); otherwise (0.0).
DTC	Domain term count ≥ 5 (1.0); ≥ 3 (0.8); ≥ 1 (0.5); otherwise (0.2).
CEA	Link-cue count ≥ 3 and analysis-cue count ≥ 1 (1.0); link cues ≥ 2 (0.8); ≥ 1 (0.5); analysis cues ≥ 1 (0.3); otherwise (0.0).
FS	Specificity count ≥ 4 and vagueness count ≤ 1 (1.0); specificity ≥ 3 (0.8); ≥ 2 (0.6); ≥ 1 (0.4); otherwise (0.2).

Table 4: Summary of the six SEF metrics and their heuristic scoring rules.

include phrases such as “based on”, “according to”, “this suggests”, and explicit “ANALYSIS” sectioning.

FS (Fact Specificity). We count specificity indicators and vagueness indicators. FS=1.0 if specificity count ≥ 4 and vagueness count ≤ 1 ; else if specificity count ≥ 3 , FS=0.8; else if ≥ 2 , FS=0.6; else if ≥ 1 , FS=0.4; else 0.2. Specificity cues include numbers and quotes, enumerations (e.g., “first/second”), and explicit fact headers (e.g., “KEY FACTS”); vagueness cues include hedges (e.g., “generally”, “possibly”).

A.2 SEF Prompt Template

Overview. Our SEF prompting method enforces a conclusion-first structured format with four labeled sections. Table 5 shows the prompt template (domain role/instructions + sectioned format) used in our experiments; ablations remove the corresponding instructions/sections.

A.3 Baseline Prompt Templates

For reproducibility, we document the core prompt structures for each baseline. All methods receive the same Context and Question inputs; only the instruction wrapper differs.

Direct. Minimal prompt requesting only the answer:

Answer the following question.

Context: [context]

Question: [question]

Provide only the answer (Yes/No).

Answer:

Prompt component	Template text (verbatim headers)	Metrics targeted
Role instruction	[Domain role] Analyze the following question with precision and clarity.	–
Domain terminology (optional)	Use precise [legal/medical/financial] terminology consistently.	DTC
Fact specificity (optional)	Cite specific facts from the context, not vague generalizations.	FS
Context + question	Context: ... Question: ...	–
Section 1: Commit	ANSWER PREVIEW: State your answer upfront (Yes or No).	AFL (first), AC
Section 2: Ground	KEY FACTS: List 2-3 specific facts from the context that are most relevant.	FS
Section 3: Defend	ANALYSIS: - Use precise domain terminology - Explain how each fact supports your answer	DTC, CEA
Section 4: Conclude	CONCLUSION: - State your final answer clearly and unambiguously - Summarize the key evidence supporting your answer - End with: My answer is: [Yes/No]	CI, AFL (last), AC

Table 5: SEF prompt template used in our experiments.

581	Chain-of-Thought (CoT). Free-form reasoning triggered by “think step by step”:	Vanilla RAG (V-RAG). Retrieve-then-generate with top- $k=3$ passages:	618
582			619
583	Given the following context and question, let’s think step by step.	Answer the question using the provided context.	620
584	Context: [context]	Retrieved Context: [top-k passages by keyword overlap]	621
585	Question: [question]	Question: [question]	622
586	Let’s think step by step:	Based on the retrieved context, provide your reasoning and answer.	623
587	1. First, let me understand the context and relevant rules.		624
588	2. Then, I’ll analyze how they apply to this question.		625
589	3. Finally, I’ll determine the correct answer.		626
590	Step-by-step reasoning:		
591		Self-RAG. Multi-stage retrieval with reflection and self-critique:	627
592			628
593	Tree-of-Thought (ToT). Three-stage process: (1) generate $k=3$ initial approaches, (2) develop each into full analysis, (3) evaluate and select best path.	Stage 1: Assess if retrieval is needed (RETRIEVE or USE_FULL).	629
594		(RETRIEVE or USE_FULL).	630
595	Stage 1: Propose 3 different analytical approaches (1-2 sentences each).	Stage 2: If retrieving, filter passages by relevance (RELEVANT or NOT_RELEVANT).	631
596	Stage 2: For each approach: “Develop this into a complete analysis... then state your final answer.”	Stage 3: Generate with reflection: “[Reflection: ...] [Generation: ...] [Answer: ...]”	632
597	Stage 3: “Which path (1, 2, or 3) provides the most thorough and accurate analysis?”	Stage 4: Self-critique for accuracy (NEEDS_REFINEMENT or SUFFICIENT).	633
598		Stage 5: If needed, refine based on critique.	634
599			635
600			636
601			637
602			638
603			639
604			
605			
606			
607	Chain-of-Verification (CoVe). Four-stage process with self-verification:	A.4 Datasets and Input Formatting	640
608		Tasks and sources. We evaluate on four binary classification tasks spanning three high-stakes domains, totaling 1,618 test samples:	641
609	Stage 1: “Answer the question with reasoning.”	• Legal (Guha et al., 2023): ConsumerQA (396 samples), identifying unfair terms in consumer contracts; Hearsay (94 samples), applying Federal Rule of Evidence 801(c).	642
610	Stage 2: “Generate 3 verification questions to check accuracy.”	• Medical: PubMedQA (Jin et al., 2019) (1,000 samples), answering biomedical research questions based on abstracts.	643
611	Stage 3: Answer each verification question against the context.		644
612	Stage 4: “Based on initial analysis and verification, provide your final answer (incorporate any corrections).”		645
613			646
614			647
615			648
616			649
617			650

- 651 • **Financial:** FPB (Malo et al., 2013) (128 sam-
652 ples), classifying sentiment in financial news
653 phrases.

654 **Evaluation splits.** We use the evaluation splits
655 provided by each benchmark.

656 **Input formatting.** Each example is format-
657 ted into a `Context` field (the provided pas-
658 sage/document) and a `Question` field. All prompt-
659 ing methods receive the same inputs; only the in-
660 struction/prompt wrapper differs across methods.

661 **A.5 Exact Model Identifiers**

662 We report paper-friendly names in the main text;
663 the exact vLLM/HF identifiers used by our experi-
664 ment runner are:

- 665 • DeepSeek-R1-Distill-Qwen-14B:
666 `deepseek-ai/DeepSeek-R1-Distill-Qwen-14B`
- 667 • Gemma 3 12B: `google/gemma-3-12b-it`
- 668 • Ministral-3-14B:
669 `mistralai/Ministral-3-14B-Instruct-2512`
- 670 • Qwen 2.5 14B Instruct:
671 `Qwen/Qwen2.5-14B-Instruct`