Hala Technical Report
Building Arabic-Centric Instruction & Translation Models at Scale

Anonymous ACL submission

Abstract

We present HALA, a family of *Arabic-centric* instruction and translation models built with our translate-and-tune pipeline. We first compress a strong AR↔EN teacher to FP8 (yielding ∼2× higher throughput with no quality loss) and use it to create high-fidelity bilingual supervision. A lightweight language model `LFM2-1.2B` is then fine-tuned on this data and used to translate high-quality English instruction sets into Arabic, producing a million-scale corpus tailored to instruction following. We train HALA models at 350M, 700M, 1.2B, and 9B parameters, and apply `slerp` merging to balance Arabic specialization with base-model strengths. On Arabic-centric benchmarks, HALA achieves state-of-the-art results within both the "nano" (≤2B) and "small" (7–9B) categories, outperforming their bases. We are committed to release models, data, evaluation, and recipes to accelerate research in Arabic NLP.

In Arabic, Hala, conveys sweetness and beauty - qualities long associated with the language itself. In this spirit, we call our models Hala.

1 Introduction

Large language models (LLMs) have rapidly advanced the state-of-the-art across general-purpose NLP, demonstrating strong capabilities in few-shot learning, instruction following, and multistep reasoning. Early milestones such as GPT-3 (Brown et al., 2020) catalyzed this progress, while more recent families (e.g., Gemini (Team et al., 2023), Claude 3) continue to expand the frontier of capability and reliability. Open-weight counterparts, including DeepSeek (Liu et al., 2024), LLaMA 3 (Grattafiori et al., 2024), Qwen (Yang et al., 2025), Gemma (Gemma Team et al., 2025), and Kimi K2 (Team et al., 2025b), have enabled broad experimentation and downstream applications, accelerating community research into scaling, alignment, and efficient deployment.

Multilingual modeling at scale. Alongside raw capability, a major thrust in recent work targets *multilinguality*: building models and resources that operate across many languages. Dataset efforts range from broad-coverage sentence-aligned corpora such as Tatoeba (Tiedemann, 2020) to large-scale conversational resources such as MASSIVE (FitzGerald et al., 2023). Engineering pipelines (e.g., warc2text extraction and parallel translation) have been used to derive multilingual corpora from web archives (de Gibert et al., 2024). Beyond data, analyses probe whether models preserve knowledge and answer consistency across languages (Ifergan et al., 2024). Model design has also embraced multilinguality from the ground up: BLOOM (Workshop et al., 2022) supports 46 languages, while Baichuan-2 (Yang et al., 2023) and other families emphasize improved performance on non-English tasks. Despite this breadth-first progress, per-language depth and cultural alignment remain uneven, especially for underrepresented languages.

Arabic LLMs and the instruction-data bottleneck. Arabic poses distinct challenges due to diglossia, rich morphology, and wide dialectal variation. A growing line of Arabic-centric work (Al-Khalifa et al., 2025) spans monolingual pretraining (e.g. AraBERT (Antoun et al., 2020)), foundation and chat models (e.g. JAIS (Sengupta et al., 2023), FANAR (Team et al., 2025a), PEACOCK (Alwajih et al., 2024), ACE-GPT (Huang et al., 2024), ALLAM (Bari et al., 2024)) and broader sovereign AI efforts such as Falcon (Almazrouei et al., 2023a). Benchmarks, including Arabic-MMLU (Koto et al., 2024) , provide initial evaluation scaffolding, although coverage and difficulty remain limited relative to English. A persistent bottleneck is the scarcity of *high-quality Ara-*

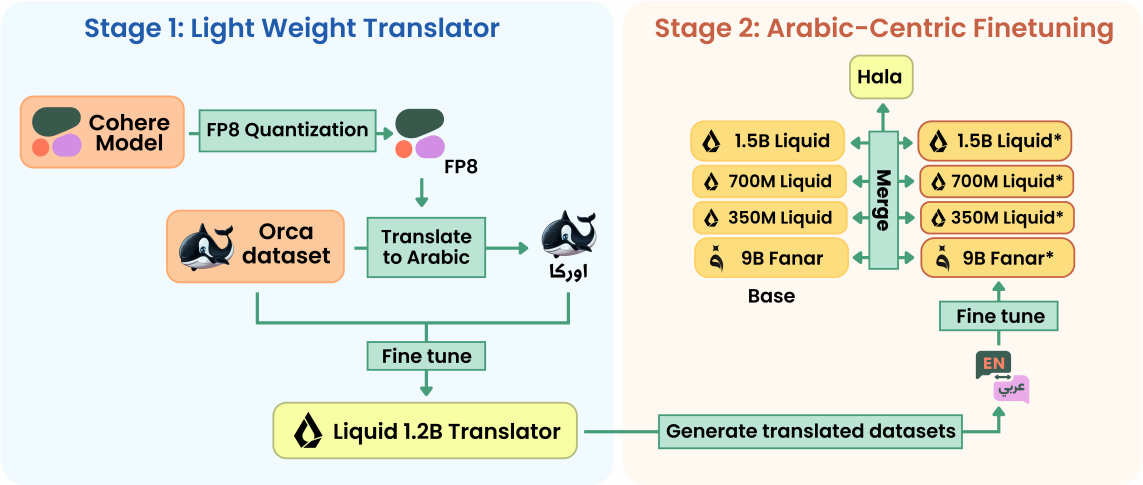

Figure 1: Cross-lingual translation and fine-tuning pipeline for Liquid 1.2B. In the teacher phase, the Cohere model with FP8 inference is used to translate the Orca dataset, which is then used to fine-tune Liquid 1.2B. In the bootstrapped translator phase, Liquid 1.2B translates datasets, producing group of arabic dataset. Liquid models and FANAR were then further fine-tuned on the combined translated datasets, yielding the final instruction-tuned models.

bic instruction data, which constrains both instruction tuning and scaling. Previous works document the underrepresentation of non-English languages in pretraining corpora and their impact on downstream performance (Lin et al., 2022; Xue et al., 2021; Touvron et al., 2023). In parallel, the community has explored the paradigms of 'AI trains AI', e.g., self-instruction and synthetic supervision, to overcome data scarcity (Xu et al., 2023; Mukherjee et al., 2023; Achiam et al., 2023; Wang et al., 2023). However, in Arabic, the volume and fidelity of the instruction data still lag behind.

Language-centric vs. multilingual. We adopt the term *language-centric* to denote models whose *primary optimization target* is depth of capability in a specific language (here, Arabic), rather than uniform breadth across many languages. A language-centric approach can better capture linguistic nuance (e.g. morphology, orthography)(Conneau et al., 2020), dialectal variation, and cultural/safety alignment, while still benefiting from cross-lingual transfer when appropriate. In practice, this requires (i) reliable translation pipelines to convert strong English supervision into Arabic *without* eroding instruction fidelity, and (ii) training strategies that scale across model sizes while preserving Arabic fluency and task competence.

LLMs as translators: opportunities for Arabic data bootstrapping. LLMs have recently emerged as strong machine translation engines (Lyu et al., 2024), capable of long-document and stylistic translation, interactive workflows, and even domain-preserving scientific translation (Kleidermacher and Zou, 2025). Creative strategies, such as searching for keywords / topics with multiple generations of candidates and selection (He et al., 2024), further improve quality. Broad evaluations in 120+ languages (Zhu et al., 2024) suggest that carefully managed LLMs can serve as reliable translators. These developments make *translation-first* bootstrapping especially attractive for Arabic instruction tuning: If we can (1) compress a capable translator for efficient, scalable inference and (2) preserve instruction semantics during translation, we can unlock large Arabic corpora suitable for high-quality tuning.

Our approach and contributions. In this report, we introduce HALA, a family of Arabic *language-centric* instruction and translation models built around an efficient translate-and-tune pipeline. Our contributions are as follows:

- **Lightweight AR↔EN translator.** We compress a strong multilingual translator to FP8 with dynamic scaling using *LLM Compressor* (AI and vLLM Project, 2024) and fine-tune `LiquidAI/LFM2-1.2B` to serve as a fast, robust AR↔EN engine. This translator is used to construct Arabic instruction data at scale

while maintaining fidelity to the source instructions.

- **Million-scale bilingual supervision.** We build a 1.25M AR↔EN bilingual corpus by pairing translated and original texts (e.g., from Open-Orca (Mukherjee et al., 2023)) and a filtered subset of OPUS-100 (Zhang et al., 2020), enabling stable training of lightweight translation models and consistency checks.

- **Large Arabic instruction corpus.** Using our translation stack, we convert several high-quality English instruction datasets into Arabic, including Hermes 3 (Teknium et al., 2024), SCP-116K (Lu et al., 2025), ReAlign-Alpaca (Fan et al., 2024), LaMini (Wu et al., 2024), Tulu 3 (Lambert et al., 2024), and Synthetic Instruct-GPT-J Pairwise (Havrilla, 2023), alongside Open-Orca (Mukherjee et al., 2023). The resulting Arabic corpus (millions of pairs) emphasizes instruction following, reasoning, and alignment.

- **Arabic-centric models across scales.** We release HALA models at 350M, 700M, and 1.2B parameters (based on Liquid checkpoints) as well as a 9B model built on the FANAR architecture (Team et al., 2025a). To combine complementary strengths from English- and Arabic-tuned checkpoints, we employ *MergeKit* (Goddard et al., 2024) with spherical linear interpolation.

- **Open releases and recipes.** We release models, data, and training/evaluation scripts to facilitate reproducibility and further research on Arabic instruction tuning.

Summary. By coupling an efficient AR↔EN translator with million-scale data construction, HALA advances Arabic instruction tuning under constrained compute budgets. Our results (Section 3) indicate that HALA models achieve competitive performance within their parameter classes on Arabic-centric benchmarks (Koto et al., 2024), supporting the view that *language-centric* modeling is a practical and effective complement to breadth-first multilingual scaling.

2 Methodology

2.1 Quantizing the main translator to FP8

We begin with a high-capacity multilingual translator (`CohereLabs/command-a-translate-08-2025`) and compress it to FP8 (Kuzmin et al., 2022) with *dynamic scaling* using *LLM Compressor* (AI and vLLM Project, 2024), releasing the FP8 artifact as `our/command-a-translate-FP8-Dynamic`. The FP8 conversion reduces memory footprint and improves inference throughput (empirically $\approx 2\times$ faster than the non-quantized counterpart) while preserving translation quality on our evaluation sets. We follow the official `llm-compressor` recipe (per-tensor dynamic scaling and post-conversion validation) to ensure stability.

2.2 Bootstrapping bilingual supervision from Open-Orca

To construct high-quality AR↔EN supervision aligned with instruction-tuning style data, we translate the *first 405K* instruction–response pairs from `Open-Orca/OpenOrca` (Mukherjee et al., 2023) *into Arabic*, covering both the user questions and assistant responses. The quantized FP8 translator is prompted with a minimal instruction:

```
Translate from English to Arabic: {x}
```

For each example, we *pair* the Arabic translations with their original English counterparts, yielding bilingual tuples of the form $\langle \text{instr}_{\text{en}}, \text{instr}_{\text{ar}}, \text{resp}_{\text{en}}, \text{resp}_{\text{ar}} \rangle$. This produces an instruction-focused bilingual set mirroring the semantics and difficulty of `Open-Orca`, with substantial coverage of reasoning-heavy queries.

2.3 Quality filtering of OPUS-100 with a strict bilingual judge

We augment the above with a large parallel corpus drawn from the `Helsinki-NLP/opus-100` (Zhang et al., 2020) `ar-en` subset. From 1M candidate pairs, we filter for fidelity using a compact judge model (`Qwen2.5-3B-Instruct` (Yang et al., 2025)) prompted to emit a binary verdict (`accept/reject`):

```
prompt = f"""
You are a strict bilingual judge.
You will be given a translation pair.
Arabic: {ar_text}
English: {en_text}

If the English is a correct and natural
translation of the Arabic, output only:
accept
```

```
Otherwise, output only:
reject
"""
```

Pairs marked `accept` are retained; this procedure yields **439,592** accepted pairs out of ∼1M candidates, providing a clean AR↔EN signal complementary to the instruction-style data above.

2.4 Training a lightweight AR↔EN translator

We combine the translated `Open-Orca` set (405K × 2 = 810K) with the filtered `OPUS-100` pairs (440K), totaling ∼1.26M bilingual examples, and fine-tune `LiquidAI/LFM2-1.2B` into a fast, stable AR→EN translator specialized for instruction-style inputs (instructions and responses). We use simple chat-style prompting during training (for E→A) and standard supervised fine-tuning with cross-entropy. This lightweight translator serves as *workhorse* for the construction of large-scale Arabic data in the next stage.

2.5 Building the Arabic instruction corpus via translation

Using the above translator, we convert multiple high-quality English instruction datasets into Arabic, preserving formatting and answer style:

- **Open-Orca/OpenOrca** (Mukherjee et al., 2023): 405K (first subset), covering multi-step, reasoning-heavy queries.
- **NousResearch/Hermes-3-Dataset** (Teknium et al., 2024): filtered to remove all code-related samples to avoid translation artifacts.
- **EricLu/SCP-116K** (Lu et al., 2025): instructional and conversational pairs.
- **GAIR/ReAlign-Alpaca** (Fan et al., 2024): re-aligned version of Alpaca instructions.
- **Dahoas/synthetic-instruct-gptj-pairwise** (Havrilla, 2023): synthetic paired preference-style instructions.
- **MBZUAI/LaMini-instruction** (Wu et al., 2024): lightweight instruction data, translated fully.
- **allenai/tulu-3-sft-mixture** (Lambert et al., 2024): we keep only English subsets and translate them.

The resulting corpus emphasizes instruction following, reasoning, and alignment, providing broad coverage for Arabic-centric instruction tuning. We collect a total of roughly 4.5M samples.

2.6 Arabic instruction fine-tunes and model merging

We fine-tune models across scales on the translated Arabic instruction mix, then apply merging to balance Arabic gains with base-model strengths:

- **350M**: fine-tune `LiquidAI/LFM2-350M`, then merge with its base to obtain HALA-350M.
- **700M**: fine-tune `LiquidAI/LFM2-700M`, then merge with its base to obtain HALA-700M.
- **1.2B**: fine-tune `LiquidAI/LFM2-1.2B`, then merge with its base to obtain HALA-1.2B.
- **9B**: fine-tune on top of `QCRI/Fanar-1-9B-Instruct` (Team et al., 2025a), then merge with its base to obtain HALA-9B.

Merging is performed with *MergeKit* (Goddard et al., 2024) using spherical linear interpolation (`slerp`) at t=0.5, which we found to preserve general capability while boosting Arabic instruction-following performance. The overall translate–and–tune pipeline is illustrated in Fig. 1.

3 Evaluation

Benchmarks and protocol. We evaluate on a suite of Arabic-centric tasks following the *Open-Arabic-LLM-Leaderboard (OALL)* task selection where feasible. Concretely, we report results on: **AlGhafa** (Almazrouei et al., 2023b), **AraTrust** (Alghamdi et al., 2024), **ArabicMMLU** (Koto et al., 2024), **ArbMMLU-HT** (Koto et al., 2024), **EXAMS** (Hardalov et al., 2020), and **MadinahQA** (Koto et al., 2024). We *exclude* **Alrage** (present in some OALL variants) because it requires an LLM-as-a-judge setup. All evaluations are conducted with `LightEval` (Habib et al., 2023) using `vLLM` (Kwon et al., 2023) as the backend for efficient, reproducible inference. We will release exact *LightEval* command lines, task definitions, and configuration files in the accompanying GitHub repository.

Table 1: Arabic-centric evaluation across six benchmarks following the OALL task suite (excluding *Alrage*); higher is better. Columns 4–9 report task scores (%). **Average** is the unweighted mean across the six tasks. Best **Average** within each size bucket is **bold**; second-best is underlined. All runs use `LightEval` with `vLLM`; exact commands are released in the repo.

Size	Model Name	Params	Arabic-centric Benchmarks (%)						Average
			AlGhafa	ArabicMMLU	EXAMS	MadinahQA	AraTrust	ArbMMLU-HT	
Nano (≤2B)									
≤2B	meta-llama/Llama-3.2-1B	1B	33.9	26.5	21.2	25.7	37.1	23.9	28.0
≤2B	Qwen/Qwen2-1.5B-Instruct	1.5B	53.1	49.2	35.2	45.5	68.9	37.4	48.2
≤2B	Qwen/Qwen2.5-1.5B-Instruct	1.5B	48.4	43.5	31.8	38.2	70.8	35.9	44.8
≤2B	Sakalti/Saka-1.5B	1.5B	51.4	40.0	31.3	31.5	47.5	33.5	39.2
≤2B	Qwen/Qwen3-1.7B-Base	1.7B	56.8	49.7	38.2	40.0	75.6	43.9	50.7
≤2B	Qwen/Qwen1.5-1.8B	1.8B	32.7	26.7	23.8	26.0	31.5	23.6	27.4
≤2B	silma-ai/SILMA-Kashif-2B-Instruct-v1.0	2B	59.7	45.6	33.1	38.8	73.3	35.8	47.7
≤2B	google/gemma-2-2b-it	2B	34.1	30.1	23.6	20.1	31.2	23.4	27.1
≤2B	LiquidAI/LFM2-350M	350M	39.0	35.2	30.9	28.3	43.3	29.1	34.3
≤2B	HALA-350M	350M	51.4	41.2	36.9	34.5	52.1	35.4	41.9 (+7.6)
≤2B	LiquidAI/LFM2-700M	700M	50.1	38.3	34.3	32.5	56.3	37.2	41.4
≤2B	HALA-700M	700M	55.5	45.9	40.6	34.7	65.2	39.4	46.9 (+5.5)
≤2B	LiquidAI/LFM2-1.2B	1.2B	53.8	45.2	35.0	34.7	65.6	43.4	46.3
≤2B	HALA-1.2B	1.2B	59.2	48.6	43.4	41.6	71.7	44.2	**51.4** (+5.1)
Small (7B–9B)									
7B–9B	CohereForAI/c4ai-command-r7b-arabic-02-2025	7B	74.8	59.3	65.0	63.8	80.5	50.1	65.6
7B–9B	JasperV13/Yehia-7B-DPO-Reasoning-preview	7B	75.1	66.3	51.8	54.9	81.9	55.1	64.2
7B–9B	Navid-AI/Yehia-7B-preview	7B	70.8	64.9	52.1	54.4	87.5	53.4	63.9
7B–9B	JasperV13/Yehia-7B-Reasoning-preview	7B	75.2	66.3	52.7	55.0	80.8	55.2	64.2
7B–9B	ALLaM-AI/ALLaM-7B-Instruct-preview	7B	69.5	64.9	51.6	54.2	86.9	52.8	63.3
7B–9B	Qwen/Qwen2-7B-Instruct	7B	73.2	60.0	47.3	59.5	82.8	51.3	62.4
7B–9B	Qwen/Qwen3-8B-Base	8B	74.8	65.0	52.5	52.2	83.4	61.5	64.9
7B–9B	QCRI/Fanar-1-9B-Instruct	9B	76.4	65.8	52.7	73.3	88.3	58.6	69.2
7B–9B	HALA-9B	9B	78.3	65.6	53.8	70.4	89.6	61.4	**69.9** (+0.7)

Model families. To contextualize HALA within the broader landscape, we include models spanning both multilingual and Arabic-centric families: LLaMA (Grattafiori et al., 2024), Qwen (Yang et al., 2025), Gemma (Gemma Team et al., 2025), SILMA (silma-ai, 2024; SILMA-AI, 2025), Saka, FANAR (Team et al., 2025a), Yehia (Navid-AI, 2025), ALLAM, Command-R, and LiquidAI. We report our HALA models at 350M, 700M, 1.2B, and 9B parameters alongside their corresponding bases (LiquidAI checkpoints and FANAR), and representative competitive baselines (e.g., Command-R-7B Arabic).

Main results. The aggregated results across the six benchmarks are summarized in Table 1. In the *nano* regime (≤2B), HALA-1.2B improves substantially over its base (LiquidAI/LFM2-1.2B), achieving the best average within the size bucket (cf. Table 1). Similarly, HALA-350M and HALA-700M consistently outperform their Liquid bases across most tasks, indicating that our translate–and–tune pipeline yields *consistent Arabic gains* even at very small scales. In the *small* regime (≤9B), HALA-9B consistently outperforms the previous state-of-the-art `QCRI/Fanar-1-9B-Instruct` baseline on the average metric, while maintaining competitive scores on individual tasks. These trends support our central claim: *language-centric* tuning on high-fidelity Arabic instruction data improves Arabic capability across scales, and merging (Sanyal et al., 2023) (`slerp`, t=0.5) preserves general competence while enhancing Arabic instruction-following.

Translator quality: EN→AR MMLU question translation. We assess translation fidelity in an instruction-style regime by constructing a controlled, reference-based evaluation using `cais/mmlu` (English questions) and `openai/mmmlu` (Arabic questions). We uniformly sample n=500 English questions from `cais/mmlu` with a fixed random seed, translate each to Arabic using the system under test, and align it to its ground-truth Arabic counterpart from the `openai/mmmlu` Arabic subset (same subject and item ID). We report *BLEU* (SacreBLEU, 13a tokenization), *ROUGE-L* (F1, `rouge-score`), and

Table 2: **EN→AR translation quality on 500 sampled MMLU questions.** References come from the Arabic subset of `openai/mmmlu`. Higher is better. Values in (·) denote absolute deltas vs. the reference system within each block (FP8 vs. FP16 for the teacher translator; HALA vs. `LFM2-1.2B` base for the lightweight translator). Prompts are fixed as specified above.

System	BLEU ↑	ROUGE-L ↑	chrF++ ↑
Teacher translator			
CohereLabs/command-a-translate-08-2025 (FP16)	53.1	26.0	68.6
CohereLabs/command-a-translate-08-2025 (FP8)	53.5 (+0.3)	26.0 (+0.0)	68.9 (+0.3)
Lightweight translator (LFM2-1.2B family)			
LiquidAI/LFM2-1.2B (base)	16.0	19.3	43.2
HALA-LFM2-1.2B Translator (ours)	48.2 (+32.1)	25.1 (+5.9)	64.2 (+21.0)

chrF++ (SacreBLEU) between the system output and the reference Arabic question. Exact sampling seeds, preprocessing, and metric commands will be released in the accompanying repository.

Prompting setup (fairness control). To ensure comparability across systems, we use fixed prompts:

- **LiquidAI/LFM2-1.2B (specialized translator) prompt:**

```
You are a professional translation
engine.  Translate English to
Modern Standard Arabic. Reply ONLY
with the Arabic translation—no quotes,
notes, or explanations.
Translate everything that follows
into Arabic: {text}
```

- **All other models (teacher FP16/FP8 and baselines) prompt:**

```
Translate everything that follows
into Arabic: {text}
```

Here, `{text}` is replaced verbatim by the English question from `cais/mmlu`. Outputs are evaluated directly against the paired Arabic reference from `openai/mmmlu` without post-processing beyond each metric's built-in normalization.

Compute and cost. All models were trained within a budget of $1,000 on 8×H100-SXM GPUs, and dataset translation was performed on 12×A100 GPUs at an additional cost of roughly $500.

4 Limitations

In this work, we focus exclusively on nanoscale and small-scale models. Extending our investigation to larger models could provide further insight into whether similar improvements can be obtained at scale. However, this exploration is omitted because of the substantial computational cost associated with training and evaluating larger models.

5 Conclusion

We presented HALA, a family of *language-centric* Arabic models that leverage an efficient translate–and–tune pipeline: compress a capable AR↔EN translator to FP8, bootstrap million-scale Arabic instruction data from high-quality English sources, and fine-tune compact and small models with `slerp`-based merging. HALA delivers consistent improvements over base Liquid and FANAR checkpoints, achieving state-of-the-art averages in both the *nano* (≤2B) and *small* (≤9B) categories on a diverse Arabic benchmark suite. We release models, data, and recipes to catalyze further research on Arabic instruction tuning and to encourage *language-centric* approaches as a complement to breadth-first multilingual scaling.

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