

AMD AI PREMIER LEAGUE (AAIPL)

A High-Performance Adversarial Agent System for
Logic Puzzles

Team 17

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THE CHALLENGE

Objective:

Build two adversarial agents (Questioner & Answerer) to compete in a logic puzzle tournament.

Key Constraints:

- Strict Formats: JSON output only.
- Latency Limits: Q-Agent < 13s, A-Agent < 9s.
- Topics: Syllogisms, Seating Arrangements, Blood Relations, Alphanumeric Series.
- Hardware: AMD MI300X GPU.



SOLUTION ARCHITECTURE

High-Level Pipeline:

- Data Engine: synthetic-data-kit + vLLM for topic-specific training data.
- Training Core: Unsloth framework for memory-efficient LoRA fine-tuning on AMD ROCm.
- Inference Engine: Custom Python agents with regex parsing and latency guardrails.

Tech Stack:

- Base Model: Qwen/Qwen2.5-14B-Instruct
- Inference: HuggingFace Transformers (FP16)
- Accelerator: AMD Instinct MI300X



DATA STRATEGY (THE FOUNDATION)

Synthetic Data Generation:

- Tool: synthetic-data-kit with local vLLM server.
- Source Material: Topic descriptions + example puzzles.
- Prompt Engineering: Strict Teacher Prompts for valid JSON puzzles.
- Volume: Focused datasets for Seating Arrangements & Blood Relations.

MODEL TRAINING & OPTIMIZATION

- Why Qwen 2.5 14B?
 - Stronger logic & math reasoning vs 8B models.
 - Fits MI300X memory with 4-bit quantization during training.

Fine-Tuning Process:

- Method: LoRA via Unsloth (Rank $r=16$).
- Merged LoRA into base model.
- Saved as 16-bit (bfloat16) for faster inference.

AGENT ENGINEERING (THE SECRET SAUCE)

1. Chatty Model Fix:

- Regex Parser (`re.search(r'{}.*', ..., re.DOTALL)`) to extract valid JSON.

2. Latency Guardrails:

- Q-Agent: `max_new_tokens=400` (~5.3s avg).
- A-Agent: `max_new_tokens=200` (~3.2s avg).

3. Deterministic Solving:

- Greedy Decoding (`do_sample=False`) for logical consistency.



PERFORMANCE RESULTS

Verification Stats (Local Testing):

- Q-Agent Validity: 100% Valid JSON.
- Q-Agent Speed: ~5.27s/question.
- A-Agent Speed: ~3.19s/answer.
- Strong reasoning in alphanumeric & circular arrangements.



CONCLUSION

About Our Solution:

- Smarter Model (14B vs 4B baseline).
- Bulletproof Regex Parsing (No Invalid JSON).
- Significantly Under Latency Limits.