AAIPL: Intelligent Q-Agent & A-Agent

Autonomous Logical Question Generation and Solving

Team Whoop

AMD AI Premier League Hackathon

February 15, 2026

Team Details

- **Team Name:** Whoop...
- **Team Members:**
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Problem Statement

- Design autonomous agents that can:
  - Generate high-quality logical reasoning questions
  - Solve those questions accurately
  - Follow strict JSON output formats
- Constraints:
  - Limited inference time
  - No external retrieval (No RAG)
  - Strict format validation

System Architecture

- Our system follows a multi-stage reasoning pipeline:
  - Dataset Creation
  - Supervised Fine-Tuning (SFT)
  - GRPO Optimization
  - Self-Play Training
- Each stage improves:
  - Logical depth
  - Format consistency
  - Answer accuracy

Dataset Creation

- Curated diverse logical reasoning datasets:
  - Blood Relations
  - Seating Arrangements (Linear & Circular)
  - Alphanumeric Series
  - Syllogisms
- Synthetic data generation enabled:
  - Controlled difficulty scaling
  - Reduced memorization
  - Improved generalization

Supervised Fine-Tuning (SFT)

- Separate fine-tuning for:
  - Q-Agent (Question Generator)
  - A-Agent (Answer Generator)
- Prompt engineering ensured:
  - Strict JSON compliance
  - Elimination of chain-of-thought leakage
  - Concise explanations

GRPO Optimization

- Used GRPO to refine model behavior:
  - Enforced output format correctness
  - Penalized invalid or hallucinated outputs
  - Improved logical correctness
- Continuous validation using structured filters

Self-Play Mechanism

- Q-Agent generates challenging questions
- A-Agent attempts to solve them
- Feedback loop improves both agents
- Result:
  - Increased difficulty
  - Reduced trivial patterns
  - Higher robustness

Performance Highlights

- Average question generation time: **¡ 10 seconds**
- High format accuracy across all outputs
- Robust logical reasoning under constraints
- Optimized for AMD MI300X GPU

Conclusion

- Built an end-to-end autonomous reasoning system
- Ensured strict format compliance and correctness
- Scalable architecture for future reasoning tasks

Thank You!