ARC Prize: Advancing Open AGI

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What is ARC-AGI?

ARC-AGI stands for Abstraction and Reasoning Corpus for Artificial General Intelligence. It is a benchmark introduced by François Chollet in 2019 to measure AI's ability to acquire new skills on unknown tasks, aiming to assess progress toward general intelligence.

The Origins of ARC-AGI

In 2019, François Chollet, creator of Keras and AI researcher at Google, published the influential paper "On the Measure of Intelligence." He introduced ARC-AGI as a benchmark to evaluate AI systems on skill acquisition and adaptation to novel tasks, laying a foundation for progress toward AGI.

Measuring Intelligence

- Task-specific skill isn't true intelligence.

- Prior knowledge can mask a system's real capabilities.

- Intelligence is about generalization and learning new skills.

- We need benchmarks that test for novel skill acquisition.

Design of ARC-AGI

ARC-AGI tasks involve grid-based puzzles with input-output examples. Each grid cell can be one of ten colors, and grids range from 1×1 to 30×30 in size. The tasks require mapping inputs to outputs based on underlying patterns or rules.

Structure of ARC-AGI Tasks

- Each task includes several input-output pairs.

- Grids vary from 1×1 to 30×30 in dimensions.

- Each grid cell can be one of ten possible colors.

- Tasks require inferring the mapping from inputs to outputs.

How to Solve a Task

To solve an ARC-AGI task, produce a pixel-perfect output grid corresponding to the final input. Every cell's color and position must match exactly, including the correct grid dimensions. Precision is crucial.

Core Knowledge Priors in ARC-AGI

- **Objectness**

- **Goal-Directedness**

- **Numbers & Counting**

- **Basic Geometry & Topology**

ARC-AGI tasks are based on innate human knowledge priors, reflecting fundamental cognitive abilities

Objectness

Objects are consistent entities—they persist over time and don't appear or disappear without cause. Understanding objectness means recognizing that objects maintain their identity and can interact or remain separate based on context.

Goal-Directedness

Some objects are agents with intentions—they pursue goals. Distinguishing between animate and inanimate objects allows us to infer purpose and predict behavior.

Numbers & Counting

Understanding numbers allows us to count and compare objects based on attributes like shape or color. Basic arithmetic operations like addition and subtraction enable quantitative reasoning.

Basic Geometry & Topology

Recognizing shapes and spatial relationships is fundamental. Objects can be mirrored, rotated, translated, combined, or repeated. Understanding geometry and topology helps in detecting patterns and transformations.

Avoiding Cultural Biases

ARC-AGI tasks are designed to avoid reliance on language or specific cultural knowledge. They focus on innate human reasoning abilities, ensuring a fair comparison between humans and AI.

The Impact of Solving ARC-AGI

A Stepping Stone Toward AGI

Solving ARC-AGI would revolutionize programming and automation. It would enable anyone, regardless of programming expertise, to create software by providing simple input-output examples. This new paradigm could democratize software development and drive unprecedented innovation.

A New Programming Paradigm

- Build software by providing a few input-output examples.

- Empower non-programmers to create and automate tasks.

- Develop programs that self-refine as they encounter new data.

- Mimic human learning in software systems.

2024: ARC Prize Announcement

- Over $1.1 million prize pool.

- Collaboration between Mike Knoop, François Chollet, and Lab42.

- Aims to accelerate open-source progress toward AGI.

- Challenges teams worldwide to solve ARC-AGI.

Goals of ARC Prize 2024

- Increase the number of AI researchers exploring new ideas.

- Promote open-source progress toward AGI.

- Accelerate the discovery and development of AGI.

Prize Breakdown

- **Grand Prize**: $600,000 awarded to teams scoring at least 85%.

- **2024 Top Scores**: $50,000 total.

  - 1st place: $25,000

  - 2nd place: $10,000

  - 3rd to 5th place: $5,000 each

- **2024 Paper Awards**: $75,000 total.

  - 1st place: $50,000

Key Dates for 2024

- **June 11, 2024**: ARC Prize 2024 Launch

- **November 10, 2024**: Code Submission Deadline

- **November 12, 2024**: Paper Submission Deadline

- **December 6, 2024**: Winners Announced

- **Q1 2025**: ARC Prize 2025 Update

Understanding ARC-AGI Tasks

ARC-AGI tasks involve mapping inputs to outputs based on underlying patterns. Tasks are presented as grids of colored squares, represented in JSON format. Participants must deduce the transformation rules and apply them to produce correct outputs.

Data Structure

- **Public Training Set**: 400 tasks for training your algorithm.

- **Public Evaluation Set**: 400 tasks for testing performance.

- **Private Evaluation Set**: 100 tasks used for official scoring.

Understanding the datasets is crucial for developing and evaluating your solutions.

Task Difficulty Levels

The **Public Training Set** contains simpler tasks to help you get started. The **Public** and **Private Evaluation Sets** are more challenging, featuring tasks that test advanced reasoning and generalization. Be prepared for increasing difficulty as you progress.

Approaches to Consider

- **Discrete Program Search**: Systematically searching through possible programs.

- **Ensemble Solutions**: Combining multiple methods to improve accuracy.

- **Direct LLM Prompting**: Using language models to generate solutions.

Promising Strategies

> *"The next step is to augment discrete program search with deep driven intuition." – François Chollet*

Combining systematic search with AI models that guide the process can overcome combinatorial explosion. Use deep learning to prioritize promising paths in program search.

Tips for Success

- **Focus on skill acquisition and generalization**: Build systems that learn new tasks.

- **Draw inspiration from human cognition**: Leverage insights from psychology.

- **Embrace hybrid approaches**: Combine symbolic and neural methods.

- **Aim for generalizable abstractions**: Develop reusable knowledge representations.

Code Submission Guidelines

- Submit solutions through Kaggle Notebooks.

- No internet access allowed during execution.

- Meet code requirements: runtime limits and hardware constraints.

- Use permitted external data and pre-trained models.

- Submission file must be named `submission.json`.

How Scoring Works

Your score is based on the percentage of correct predictions on the private evaluation set of 100 tasks. For each task, you must produce two outputs per test input. If either matches the ground truth exactly, you receive credit for that task. The final score is the average over all tasks.

Paper Submission Guidelines

- Submit a paper linked to your Kaggle code submission.

- Follow the evaluation rubric for Paper Awards.

- Include key sections: Abstract, Introduction, Approach, Results, Conclusion.

- Be clear, concise, and focus on communicating your ideas.

- Deadline is 48 hours after code submission deadline.

Prizes Increased!

- **Grand Prize** now $600,000.

- **Paper Awards** expanded to $75,000.

- Additional incentives to encourage breakthrough solutions.

- Commitment to advancing open AGI.

Thank You for Advancing AGI

We appreciate your commitment and passion in pushing the boundaries of artificial intelligence. Together, we can achieve remarkable breakthroughs.

What's Next?

- **Continue Refining Solutions**: Keep developing and improving your approaches.

- **Stay Active**: Engage with the community on Discord and Kaggle.

- **Prepare for Future Competitions**: Get ready for ARC Prize 2025 and beyond.

Your journey doesn't end here—keep pushing forward.

Stay in Touch

- **Email**: team@arcprize.org

- **Website**: www.arcprize.org

- **Discord**: Join our server at discord.gg/9b77dPAmcA

- **Twitter**: Follow us @ARCprize

- **YouTube**: Subscribe to our channel for updates

Let's stay connected and continue advancing open AGI together.