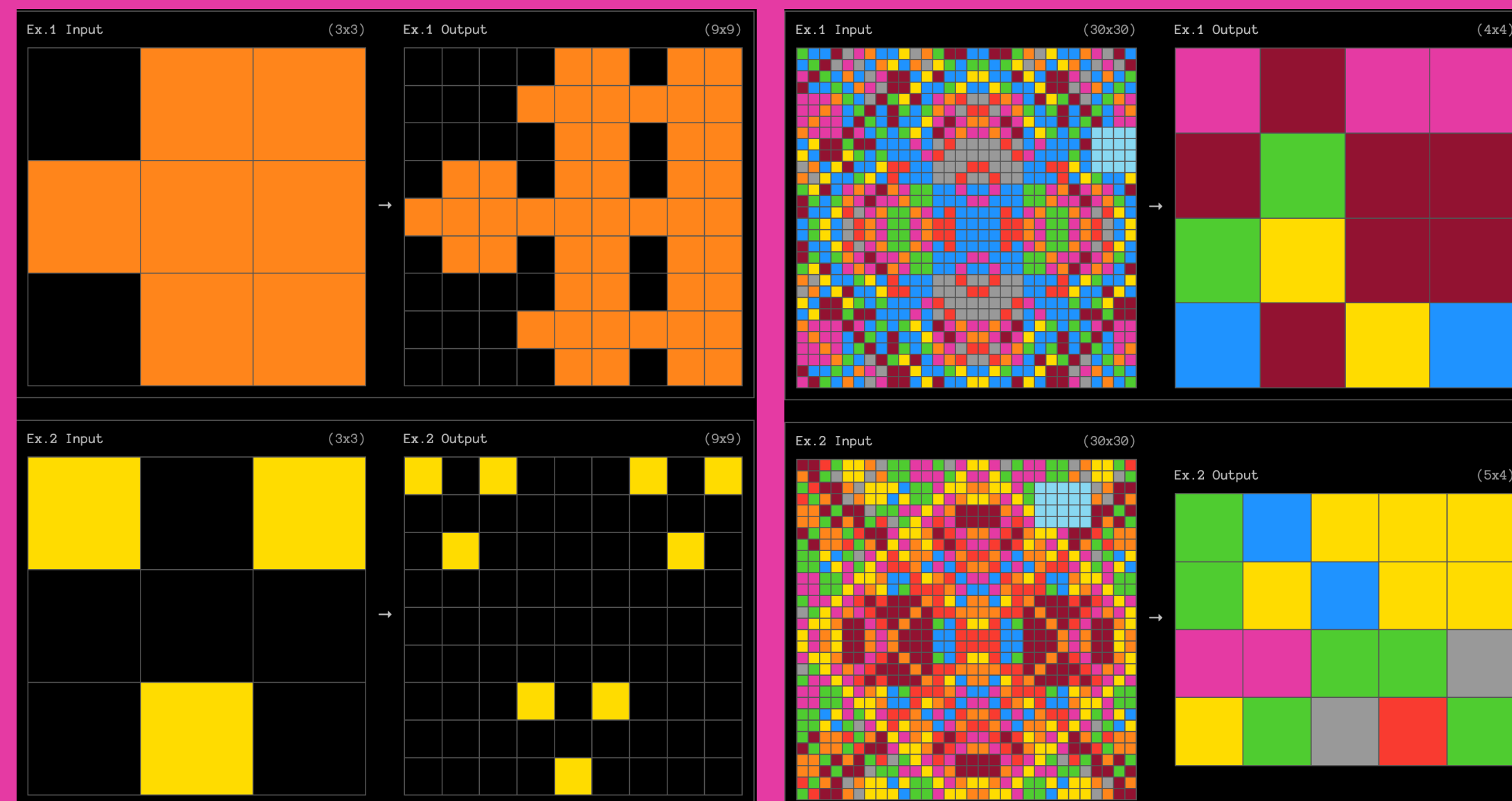


Introduction

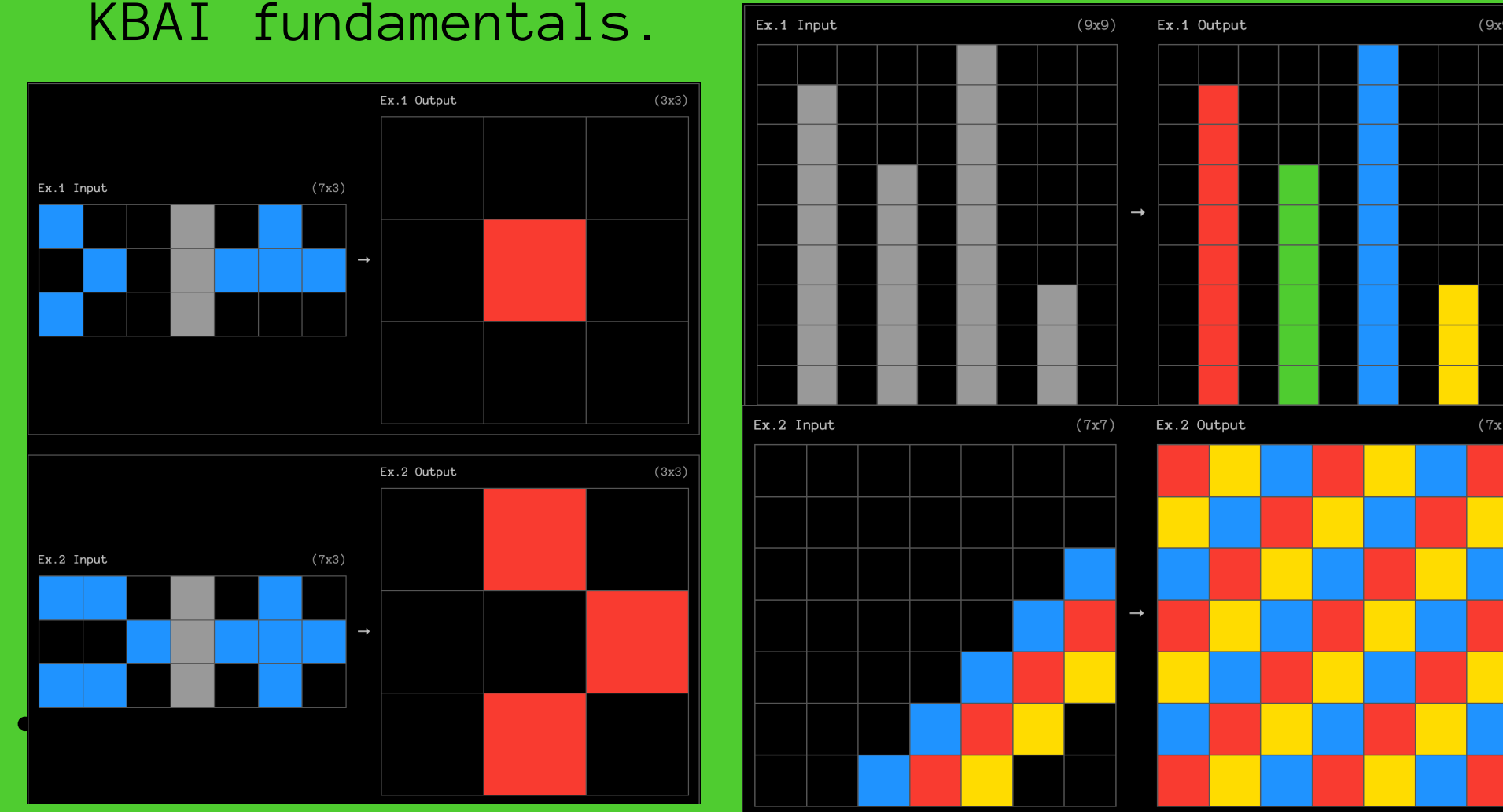
- **Focus:** Addressing the **ARC** Prize Challenge, a benchmark for AGI, requiring complex reasoning tasks.
- **Objective:** To leverage Knowledge-Based AI principles for solving **ARC** problems.
- **Motivation:** **ARC** tasks emphasize human-like reasoning, making them ideal for testing AI generalization.
- **Challenges** range from simple pattern recognition to multi-object transformations.
- **Approach:** Applying structured reasoning (e.g., pattern matching, concept learning) to tackle diverse **ARC** tasks.



- Above are the examples of some of my favorite **ARC** challenges, easy to hard in that order.
- My attempted work draws heavy inspiration from Knowledge-Based AI (KBAI), which emphasizes structured knowledge and reasoning processes to simulate human cognition.
- The **ARC** Prize Challenge provides a perfect platform to apply and test these methodologies in an environment designed to reward robust solutions to highly complex problems.

Methodology

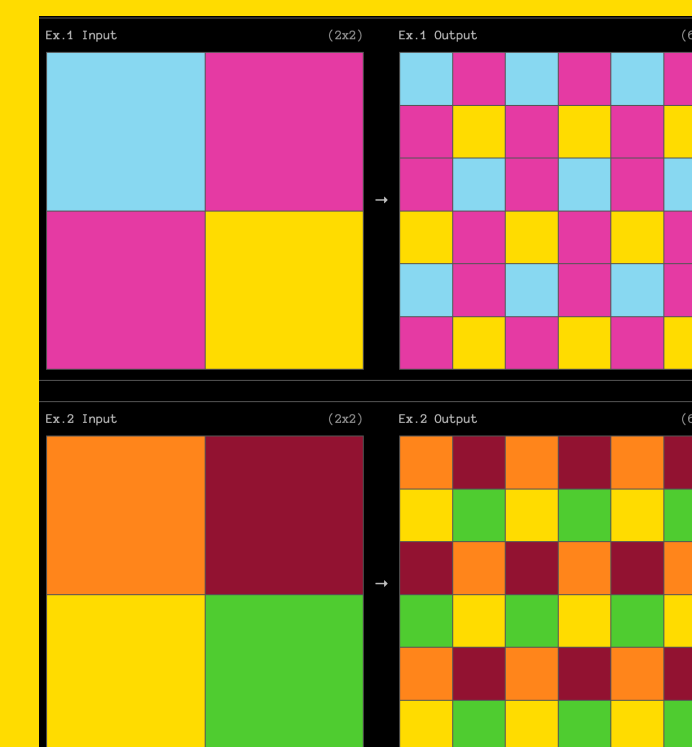
- I aim to use a divide and conquer mechanism and divide the **ARC** challenges into sub-categories that can be conquered using various KBAI fundamentals.



- **Pattern Matching:** Identifying repeating structures and using unification for generalization.
- **Knowledge Representation:** Using frames and semantic networks for organizing grid objects and relationships.
- **Search and Planning:**
 - Rule-based reasoning for grid transformations.
 - Case-based reasoning to adapt solutions from similar problems.
- **Concept Learning:** Learning abstract rules from examples for better generalization.

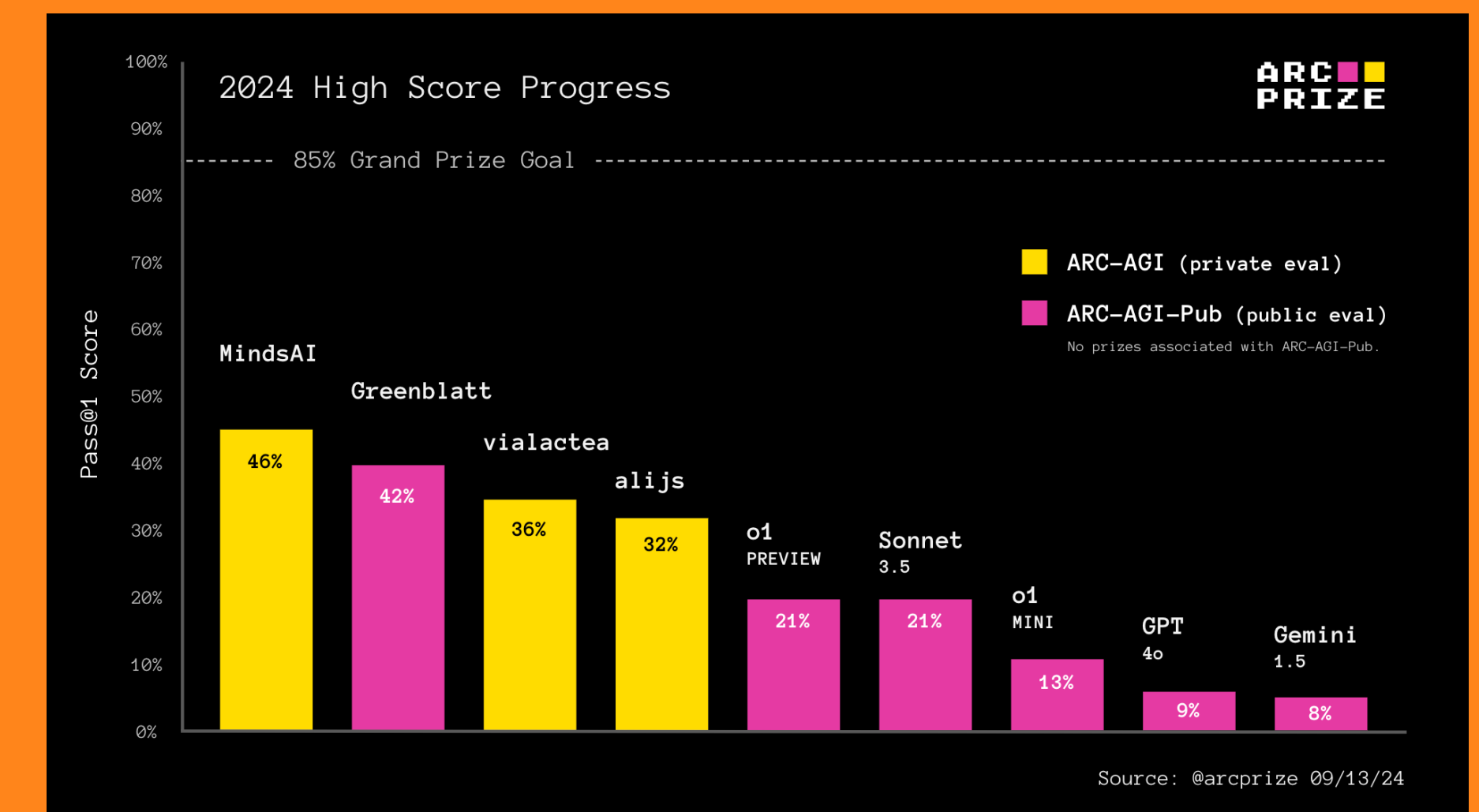
Results

- Successfully solved simple pattern-matching tasks, such as replicating patterns and flipping grid colors.
- Struggled with complicated tasks.
- Gradescope score – 1/400



Future Work

- Refine the divide-and-conquer framework for better handling of diverse **ARC** task types.
- I also want to experiment with advanced KBAI techniques, such as Hierarchical Task Networks.



- With LLMs I want to try pre-training and fine-tuning techniques to conclude if the modern day LLMs can reach an accuracy score of 50%+.
- I plan to try different techniques, hyperparameter settings, and divide the **ARC** dataset into an appropriate train-validation-test split to get the best results.

References

1. **ARC** Prize official Site – <https://arcprize.org/>
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4. J. C. Min Tan and M. Motani, "LLMs as a System of Multiple Expert Agents: An Approach to Solve the Abstraction and Reasoning Corpus (**ARC**) Challenge,"
5. Kaggle submission – <https://www.kaggle.com/code/minseo14/arc-with-rnn>