

Introduction to AGI: Neural Networks, Transformers, and Multimodal Systems

Project Title & Description:

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This project is an exploration of neural networks, the transformer architecture, and the application of multimodal systems towards solving challenges in AGI. With a focus on visual reasoning and intuition, students will investigate the ARC AGI Challenge dataset, develop and evaluate neural network models, and design systems architectures that contribute to AGI research in a structured and exploratory manner.

Objectives To Be Met:

1. Neural Network Fundamentals

Complete Andrej Karpathy's "Neural Networks: Zero to Hero" lecture series to master core concepts in neural networks, including backpropagation, modern architectures, and practical implementation. This includes focused study and experimentation with the transformer architecture, as well as exploration of its applicability to AGI-relevant tasks.

2. Visual Reasoning and Intuition

Design and experiment with neural network systems that address visual reasoning tasks, emphasizing the integration of multimodal inputs (e.g., image and text) to develop intuitive and transferable reasoning systems. Insights from these experiments will inform broader applications to AGI research.

3. Systems Thinking and Architecture Development

Apply design and systems thinking to prototype architectures integrating transformers and multimodal neural networks. Focus on reasoning capabilities, scalability, and feedback loops to explore practical pathways toward generalized cognitive systems in AGI research. Emphasize iterative design processes and the development of skills to structure and refine complex systems effectively.

4. ARC Challenge Submission

Develop and submit a comprehensive and innovative solution to the ARC AGI Challenge. The submission will synthesize concepts and techniques from the lecture series, coursework, and independent research, showcasing a practical application of advanced neural network architectures to reasoning-based tasks.

Evaluation of Objectives:

1. Final ARC Submission (55%):

Graded on meeting the ARC AGI Challenge submission requirements and ensuring acceptance. Accompanied by a comprehensive writeup detailing learnings, methodologies, and system design insights, along with submission of the final Notebook code.

2. Weekly GitHub Repository Updates (30%):

Regular updates to a GitHub repository, including well-documented code implementations and experimentation, as well as synthesis reports reflecting weekly progress and AGI-relevant insights.

3. Synthesis Reports (15%):

Embedded within weekly GitHub updates, these reflective reports analyze connections between lecture material, experimentation, and findings, focusing on critical insights and their applications to AGI research.