

Objective

- To train robust agents for the Overcooked-AI environment using Multi-Agent Proximal Policy Optimization (MAPPO).
- Focus on generalization across different layouts and partner behaviors.

Methodology

- Implemented a MAPPO agent with a centralized critic.
- **Multi-Layout Training:** Agent trained on a random selection of layouts.
- **Partner Generalization:** Agent trained with a stochastic partner to improve adaptability.

Key Results & Findings

Single Layout Performance

- Agents successfully mastered individual layouts, with emergent specialized strategies observed in layouts like `asymmetric_advantages`.

Multi-Layout Generalization

- The agent performed well on layouts it was trained on and showed some generalization to structurally similar unseen layouts.
- Failed to generalize to more complex, fundamentally different layouts.

Partner Generalization

- Training with a stochastic partner forced the agent to learn more robust strategies.
- On layouts encouraging specialization (e.g., `asymmetric_advantages`), the agent struggled to adapt, showing that overcoming ingrained strategies is a major challenge.

Conclusion

- MAPPO is effective for learning cooperative tasks in Overcooked.
- Layout Generalization is Limited: While agents can adapt to structurally similar unseen layouts, they struggle with fundamentally different ones, indicating some overfitting.
- Agents can be trained to handle unpredictable partners, but this often comes at the cost of optimal performance in layouts that require tight, specialized coordination.