DAT410 - Design of AI systems

Mini Project Proposal
Group 58

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1 The goals and outcomes of the project

The main objective is to create an AI agent that can play the Snake game autonomously. This entails figuring out the game's rules, making decisions, and learning from its actions to improve over time. The AI's ability to learn essential game mechanics and improve its approach to score higher is a significant goal. Reinforcement learning concepts are included here, whereby the agent picks up knowledge from its surroundings through trial and error. Another goal can be to benchmark the performance of different neural network architectures against each other.

2 Motivation for selecting this project

The project offers a valuable framework for investigating reinforcement learning through various learning techniques and algorithms. It provides insight into the ways in which AI makes decisions, how it learns over time, and how it may be trained to optimize its behaviours for complex tasks.

3 Modules of the course that are relevant to the project

Module 3's deep learning. As well as Module 6's game-playing system, the concept of self-play, and Markov property.

4 Preliminary technical ideas for carrying out this project

For reinforcement learning to occur, we must define the constraints and rewards. We must also set up an environment and training for the intelligent agent. Preliminarily these are the ideas we have for each of the components:

- Constraints: Snake can only move forward, left and right. It is not permitted to go backwards or diagonally. When the head of the snake collides with any pixel in the square game border or with any pixel of its own body, the game is declared over.

- Reward: Give an arbitrary score to the agent when the tip of the snake touches the reward pixel.

- Environment: Utilize the pygame package to create the environment, i.e. the snake game.

- Model: Utilize the PyTorch package for building a neural network.

- Trainer: Utilize the PyTorch package to implement the state, actions, and rewards. As well as implementation for the optimizer and loss function.

- Agent: To implement the trainer and model. To declare the states and retain learnt information about the game (i.e. the weights to the neural network).

5   Project feasibility

The project is highly feasible as it is deemed suitable for first-timers to understand the inner workings of a reinforcement learning model. Although snake has been frequently explored for reinforcement learning, it is still somewhat open-ended as the constraints, rewards, and model architecture are parameters one could define, resulting in a very different agent.