Report on Machine Learning Lab, Ex 3

Mostafa Mohamed, Omar Kassem

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1 Introduction

This is a report about the deep learning lab, exercise 3. The general task of this assignment was to use Tensorflow/keras to implement a convolutional neural network to train it on solving a search problem and compare it to the A* search algorithm. As well as trying different configurations and architectures of the neural networks.

2 Search problem

The given problem was find a target position in a given maze. We were given a simulator that can visualize our algorithm or the given reference A* algorithm.

3 Architecture

- Input: There was a given script that generates the train/validation data according to the A* algorithm. It starts from a variety of random positions and tries to search for the target. The A* reaches the target optimally.
- Network: We used Keras to implement our neural network. We implemented a network that consists of 2 fully-connected layers followed by 3 convolutional layers. some tests and 3 layers in some other tests, we tried a variety of number of neurons in layers. We tried different activation functions on some layers (like tanh), mostly the relu showed the best results.

4 Results

We tried different configuration for the running.

- Smaller local view: This possibility lead for an accuracy of 80%
- Different history length:
  - 10: 15/20 tests lead to 100% accuracy, 4/20 to 96% and 1/20 to 92% accuracies respectively.
  - 6: 19/20 tests lead to 100% accuracy and 1/20 to 96%.
  - 4: 15/20 tests lead to 100% accuracy and 5/20 to 96%.

- Changing the target after training: Lead to accuracy 45%, there was an interesting observation in this case, that the agent was smart enough to learn from it's own mistakes; in the sense that after it goes in a dead end path, it can go back and try different paths. Sometimes there was enough steps remaining to achieve the goal, sometimes not.
- Changing the map after training: lead to 0% accuracy, it got stuck in a lot of parts of the map because it was so unfamiliar.