



T.C.

MARMARA UNIVERSITY

FACULTY of ENGINEERING

COMPUTER ENGINEERING DEPARTMENT

CSE4197 Engineering Project I Proposal

Title of the Project

DeepCheckers

Group Members

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1. Aim of the Project

Scientists have always been intrigued by games of different sorts, especially board games. This is not coincidental, as board games stimulate and broaden the mind. Board games like checkers, chess and go have a reputation for being both challenging and complex. These games are played for centuries and still attracting scientists. Especially checkers is one of the world's oldest game. Due to it has been played for a long time, it has been influenced by all kinds of cultures and a new variants of game play style for specific to each region has emerged i.e. Turkish checkers, English checkers, Russian checkers and so on.

A milestone (and at the time considered the ultimate) battle between man and machine took place in 1997 between Deep Blue and the world chess champion Gary Kasparov and for the first time machine prevailed marking a new era. Many argue that this success is not due to commonly known "intelligence" but to enormous computational power. In games like checkers positions and available moves grow exponentially so it's nearly impossible to search through the whole game tree to find the (eventually) best move.

Since we are also fan of Turkish checkers, also known as Dama, we decided to implement a learning system for playing that game from scratch using AlphaZero. AlphaZero is a software developed by AI research company DeepMind. It replaces the handcrafted knowledge and domain-specific augmentations used in traditional game-playing programs with deep neural networks, a general-purpose reinforcement learning algorithm, and a general-purpose tree search algorithm.

2. Methodology

The solution generated for the problem will be provided in the form of creating a new approach using monte carlo tree search and convolutional neural network in the python development environment.

MCTS Technic:

MCTS is a game AI technique that works well for games with a high branching factor and has dominated the field of Go game programs. It is easy to create a basic implementation of this algorithm that will work well for games with smaller branching factors and can be built on relatively simple adaptations and developed for games like Checkers, Chess or Go. It can be configured to stop at the end of the desired time, and longer durations result in stronger play.

3. Software/Hardware Requirements

The software and hardware requirements of the project will be given. It is also important to specify how to use the specified software and hardware. Other tools that are planned to be utilized in the project (if exists) will be listed.

- Jupyter notebook, jupyter lab, google colaboratory to develop project
- Cloud computing system (like AWS, Azure, etc.) is necessary for data processing and model training
- Minimum 16gb ram and gpu computer for computing
- Ide to developing at local machine (Pycharm, Spyder, Visual Studio etc.)
- Some library for python code developing and python packages (pip, anaconda, sklearn, pandas, numpy, tensorflow, keras, pytorch, etc.)
- Maybe some simulation application or framework for board representation

4. Draft Time Plan

First Semester:

- Specifying requirements
- For the research phase analyzing given articles and resources given by the advisor
- After having the deep understanding of the concepts, creating environments required for the project implementation

Second Semester:

- Implementation & Testing
- Preparing required documents to finalize project
- Poster presentation, video and CV preparation

5. References

- https://www.researchgate.net/publication/242405861_Reinforcement_learning_project_AI_Checkers_Player
- <https://kstatic.googleusercontent.com/files/2f51b2a749a284c2e2dfa13911da965f4855092a179469aedd15fbe4efe8f8cbf9c515ef83ac03a6515fa990e6f85fd827dcd477845e806f23a17845072dc7bd>
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- <https://deepmind.com/blog/alphago-zero-learning-scratch/>
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- https://www.youtube.com/playlist?list=PLqYmG7hTraZDNJre23vqCGlVpfZ_K2RZs