FINAL YEAR PROJECT PROPOSAL

A CHESS ENGINE FOR GENERATING GAME DATA TO TRAIN DEEP LEARNING CHESS NEURAL NETWORKS

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IN PARTIAL FULFILMENT OF THE REQUIREMENTS FORTHE AWARD
OF A BACHELOR OF SCIENCE DEGREE IN COMPUTER SCIENCE
(B.Sc. COMPUTER SCIENCE)

JUNE, 2018

CHAPTER ONE

1.0 INTRODUCTION

Games have been one of the most visible areas of progress in the AI space in the last few years. Chess, Jeopardy, GO and, very recently, Poker are some of the games that have been mastered by AI systems using breakthrough technologies. From that viewpoint, the success of AI seems to be really tied to the progress on game theory.

While games are, obviously, the most visible materialization of game theory, it is far from being the only space on which those concepts are applied. From that perspective, there are many other areas that can be influenced by the combination of game theory and AI. The fact is that most scenarios that involve multiple “participants”, collaborating or competing to accomplish a task, can be gamified and improved using AI techniques [1]. Even though the previous statement is a generalization, I hope it conveys the point that game theory and AI is a way to think and model software systems rather than a specific technique.

1.1 BACKGROUND OF THE STUDY

Chess is a game that requires so much creativity and sophisticated reasoning that it was once thought of as something no computers will ever be able to do (Matthew Lai, 2015) [2]. It was frequently listed alongside activities like poetry writing and painting, as examples of tasks that can only be performed by humans. While writing poetry has remained very difficult for computers to this day, we have had much more success building chess-playing computers (Matthew Lai, 2015).

In 1997, IBM’s Deep Blue defeated the reigning World Chess Champion, Garry Kasparov, under standard tournament rules, for the first time in the history of chess (Matthew Lai, 2015). In the ensuing two decades, both computer hardware and AI research advanced the state-of-art chess-playing computers to the point where even the best humans today have no realistic chance of defeating a modern chess engine running on a smartphone (Matthew Lai, 2015).

Although they differ in implementation, almost all chess engines in existence today (and all of the top contenders) implement largely the same algorithms. They are all based on the idea of the fixed-depth minimax algorithm first developed by John von Neumann in 1928 [3], and adapted for the problem of chess by Claude E. Shannon in 1950 [4].

1.2 PROBLEM STATEMENT

Training data for deep learning chess engines are rare to come by. Some of these datasets are collated manually from tournaments played by humans and artificial intelligence (AI). These datasets are entered into online repositories for referencing.

Generating the data needed for the "training" of this new breed of "intelligent" game engines automatically, is the focus of this study.

1.3 AIM AND OBJECTIVES

The aim of this project is to build a chess that produces data for training neural networks in **deep learning** chess engines.

The proposed system has the following objectives:

1. To design and model a chess engine that enables **AI to AI** gaming.
2. To implement a chess engine model that provides data for training deep learning networks based on chess game.

1.4 METHODOLOGY

- System requirement analysis was done with review of literature on chess engines
- Design will be done using data flow diagrams, use case model, entity-relationship model and entity-relationship diagrams.
- Coding will be done with the python programming language with plain text data in portable game notation (PGN).
- Testing and Maintenance would be done deployment on a desktop computer with the command line as its interface.

1.5 SCOPE OF THE STUDY

The proposed system aims to provide a game engine that provides data for deep learning chess engines. The system is designed to be extendable, with the implementation of other evaluation functions supported, but that is beyond the scope of this project.

1.6 JUSTIFICATION OF THE STUDY

In the development of chess engines, the vast majority of engines use brute force-linear algorithms. In recent years, there has been a push to make chess engines smarter by “teaching” them to play. This is a new area of artificial intelligence research that uses neural networks and deep learning to “teach” a computer to play chess.

In this study the aim is to implement a system that provides the data necessary to train these neural networks.

1.7 DEFINITION OF TERMS

Deep learning: (also known as deep structured learning or hierarchical learning) is part of a broader family of machine learning methods based on learning data representations, as opposed to task-specific algorithms.

1.8 REFERENCES

[1] Game Theory and Artificial Intelligence – Jesus Rodriguez – Medium. https://medium.com/@jrodthoughts/game-theory-and-artificial-intelligence-ee8a6b6eff54

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[3] J v Neumann. Zur theorie der gesellschaftsspiele. Mathematische Annalen, 100(1):295-320, 1928.

[4] Claude E Shannon. Xxii. programming a computer for playing chess. The London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science, 41(314):256{275, 1950