FISCHERGPT: FINE-TUNING A PRETRAINED LANGUAGE MODEL WITH STOCKFISH ANALYSIS FOR INTERACTIVE CHESS MOVE EXPLANATIONS

Jay Lalwani (nkr4rj@virginia.edu)
University of Virginia, CS 6501

ABSTRACT

We propose a hands-on, interactive project that fine-tunes a pretrained language model to generate dynamic chess commentary. Our system integrates Stockfish outputs—including evaluation scores, principal variation lines, and chain-of-thought prompts—into the model's input to provide rich, context-aware explanations for moves. Moreover, at test time, users can ask follow-up questions about specific moves, and the model responds with detailed reasoning, thereby bridging the gap between engine-level analysis and human-understandable commentary.

1 INTRODUCTION

Chess commentary has traditionally relied on either rule-based systems or static natural language generation, limiting interactivity and depth. In this project, we aim to create an interactive chess commentary assistant by fine-tuning a pretrained language model (e.g., a distilled GPT-2 variant) on annotated chess commentary data. At test time, we provide the model with a prompt that combines the current board state (e.g., via FEN notation), the latest move in standard algebraic notation, and Stockfish analysis (evaluation score and principal variation). We also employ chain-of-thought prompting to encourage the model to articulate intermediate reasoning steps. This enables users not only to receive automatic commentary but also to ask follow-up questions (e.g., "Why was that knight sacrifice effective?") and receive tailored, detailed answers.

Our tentative timeline is as follows:

- **Weeks 1-2:** Data collection and preprocessing of annotated chess commentary and Stockfish outputs.
- **Weeks 3-5:** Initial fine-tuning of the language model for chess commentary generation.
- **Weeks 6-9:** Iterative improvements through multi-task training—integrating interactive Q&A capabilities and chain-of-thought reasoning.
- **Week 10-11:** Refinement and final adjustments to the model based on evaluation feedback, ensuring robust performance in both move explanation and interactive dialogue.
- **Week 12:** Development of an interactive web interface and integration of the final model for real-time inference.

2 RELATED WORK

Existing systems such as DecodeChess and Chessify have demonstrated the potential of converting engine evaluations into natural language commentary (Sto). However, these systems typically provide static outputs without interactive follow-up. Recent advances in chain-of-thought prompting (Wei et al., 2022) and interactive dialogue systems (e.g., Sanh et al., 2020) motivate our approach to combine fine-tuning with auxiliary Stockfish data (Sto). Foundational work in deep learning (Goodfellow et al., 2016), scalable learning algorithms (Bengio & LeCun, 2007), and efficient neural computation techniques (Hinton et al., 2006) further inform our methodology. Our work extends prior art by enabling real-time, interactive Q&A that explains both tactical and strategic aspects of moves.

REFERENCES

Stockfish chess engine. https://stockfishchess.org/. Accessed: February 2025.

Yoshua Bengio and Yann LeCun. Scaling learning algorithms towards AI. In *Large Scale Kernel Machines*. MIT Press, 2007.

Ian Goodfellow, Yoshua Bengio, and Aaron Courville. *Deep Learning*. MIT Press, 2016.

Geoffrey E. Hinton, Simon Osindero, and Yee Whye Teh. A fast learning algorithm for deep belief nets. *Neural Computation*, 18:1527–1554, 2006.

Victor Sanh, Lysandre Debut, Julien Chaumond, and Thomas Wolf. Distilbert, a distilled version of bert: smaller, faster, cheaper and lighter. *NeurIPS Workshop*, 2020.

Jason Wei et al. Chain-of-thought prompting elicits reasoning in large language models. In *Proceedings of the 2022 Conference on Empirical Methods in Natural Language Processing*, 2022.