

Smart Chess Tournament Management: An AI-Enhanced System for Detecting Repetitions, Illegal Moves, and Predicting Missing Moves

W.M.W.D Weerakoon* and R.D.N Shakya

Department of Information and Communication Technology, Faculty of Technology, University of Ruhuna

*dilanthaweerakoon@gmail.com

Abstract

This study introduces an innovative Artificial Intelligence (AI)-based system designed to address the challenges encountered in Sri Lankan school-level chess tournaments, which are often overseen by teachers or non-FIDE titled arbiters. The primary objective of this system is to automate the detection of threefold repetitions, illegal moves, and missed moves, thereby enhancing decision-making accuracy and promoting fairness in tournament play. To achieve this, the system utilizes custom rule-based algorithms that achieve 100% accuracy in detecting illegal moves and threefold repetition, alongside a trained Convolutional Neural Network (CNN) developed from a dataset of 176,998 unique chess positions across 10,000 games to predict missing or incorrect moves in the sequence, facilitating effective record sheet correction. Arbiters can input move sequences using algebraic notation, enabling efficient processing by the system. The system significantly reduces the time required for arbiters to adjudicate complex situations, minimizing decision-making errors that could impact tournament outcomes. Furthermore, the system cultivates a respectful and rule-abiding competitive environment, contributing to equitable decision-making in tournaments. Limitations of the research include the reliance on a specific dataset for move prediction, which may affect the generalizability of results. The implementation of Optical Character Recognition (OCR) for scanning record sheets could further enhance efficiency compared to manual entry. Additionally, sufficient hardware performance is required to operate the CNN effectively, particularly in offline contexts. Future research may explore the integration of this technology in resource-constrained environments and the development of low-cost alternatives to improve accessibility and implementation. In conclusion, this AI-driven system enhances the accuracy, fairness, and organization of chess tournaments, alleviating the burden on arbiters and leading to improved competitive outcomes. The findings hold potential for broader implications in chess tournament management, ensuring more reliable and efficient decision-making processes.

Keywords: *Fair decision-making, Record sheet correction, Sri Lankan school chess, Threefold repetition, Tournament management*