

INTRODUCTION

Cheating in online chess is a growing concern. While engine-based cheating is difficult to detect without direct evidence, statistical and behavioural patterns can indicate suspicious activity. This project focuses on Titled Tuesday, a high-stakes, publicly accessible online tournament as an ideal dataset to investigate. Using Stockfish evaluation, timing data, and unsupervised machine learning, this project explores multiple methods to identify potential engine use.



500

Chess.com's Fair Play team bans over 500 accounts every day for cheating, including titled players.

This project investigates how subtle statistical patterns in move quality, timing, and rating discrepancies can reveal outlier performances in online chess. By analysing nearly 900,000 high-level games, it aims to reveal signs that other tools often miss.

METHODS



1. Data Collection and Preprocessing
Games were downloaded from Chess.com within 2014–2024, totalling over 880,000 games. Metadata was extracted, and clock times kept for temporal analysis. The data was filtered to reject errors.

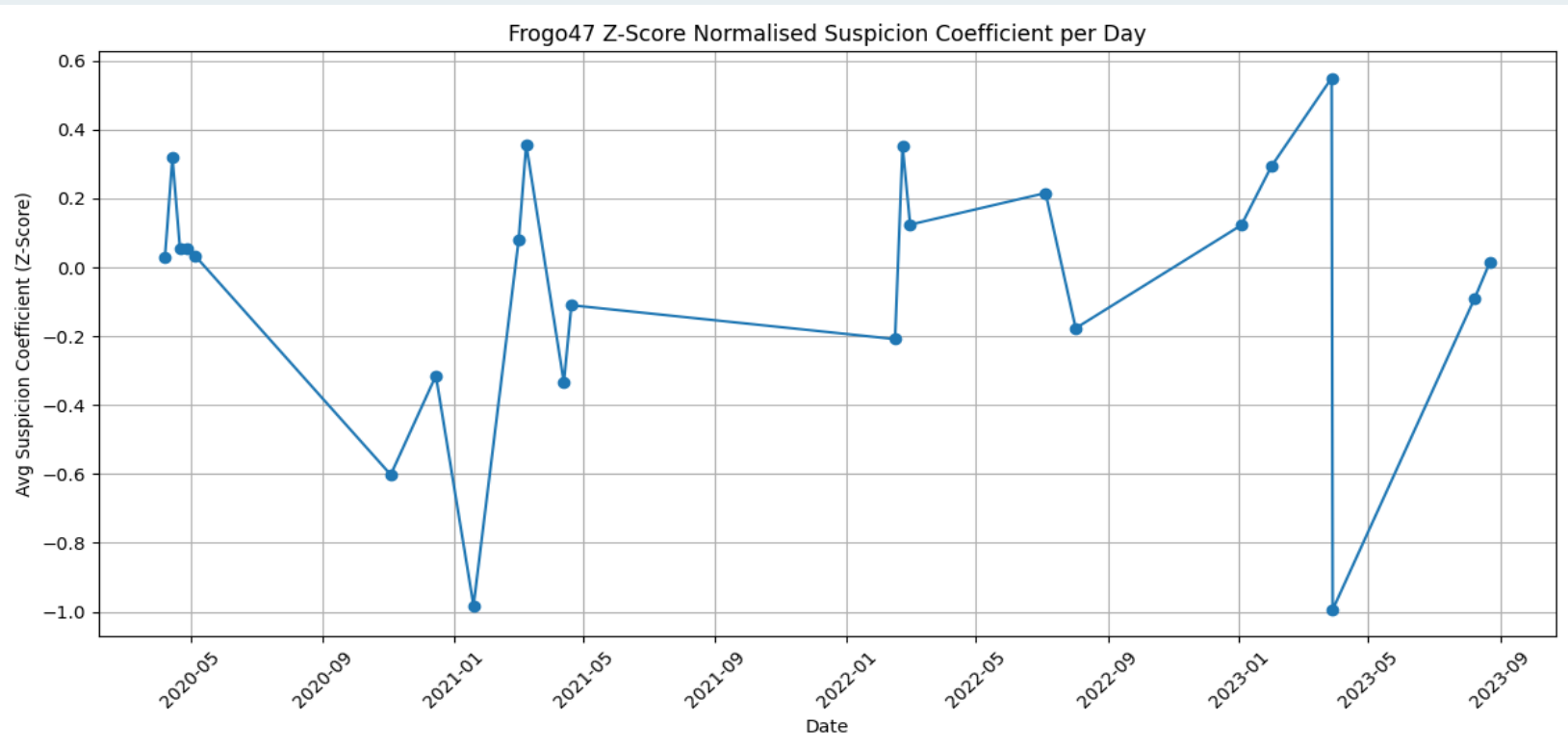
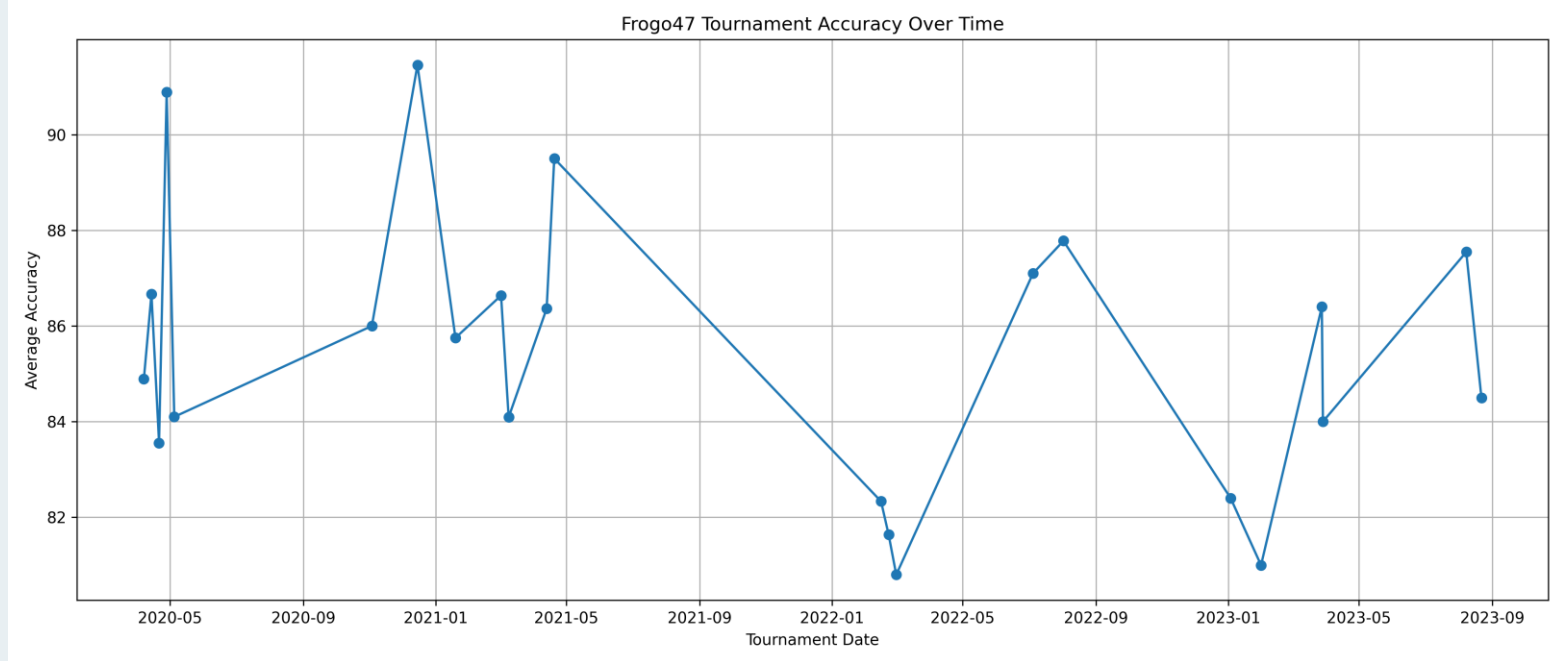
2. Stockfish Evaluation and Centipawn Loss
Each game was analysed using Stockfish at depth 13 on the university cluster. Custom engine evaluations were used to calculate centipawn loss, accuracy, and winning chances.

3. Temporal Analysis with Standard Deviation
For each player, the standard deviation of time per move was computed. A new metric called ANTSC (Average Normalised Time Suspicion Coefficient) was developed to flag players whose move times were unnaturally consistent.

4. Machine Learning with Isolation Forest
An Isolation Forest model was trained on Elo-relative performance and move count. It identified the top 1% of anomalous games. A suspicion rate was calculated for each player.

RESULTS

High-Accuracy Game Filtering
Analysis found the top 100 highest-accuracy games, but many were under 20 moves. The code was adjusted to include only games between 25 and 100 moves, removing miniatures and excessive endgames. After filtering, 100 games remained, which all displayed extreme accuracy. Drawn games were also removed to focus on suspicious decisive results.



Time-Based Suspicion Analysis
For some of the players flagged through accuracy metrics, a time-based analysis was performed. The standard deviation of move times per game was calculated and then used to generate a suspicion coefficient (ANTSC). Players with low variability in timing stood out, suggesting potential engine usage.

CONCLUSION

1	Player	Suspicious_Games	Mean_Elo_Flagged	Total_Games	Suspicion_Rate
2	Stup_achello123	1	2324	1	1
3	ochukov	1	2068	2	0.5
4	Gougoune25	1	2223	2	0.5
5	WendyTheTing	1	1940	2	0.5
6	P4AD	1	2648	3	0.333333333
7	ChessCoachRachel	1	1956	3	0.333333333
8	gauranga	5	2019.6	17	0.294117647
9	shepi13	2	1993.5	7	0.285714286
10	KikaLaurincova	2	1975.5	7	0.285714286
11	MrHenriksson	5	2017.8	18	0.277777778
12	BlackSwan13	3	2176.666667	11	0.272727273
13	punkmonkZ	2	1952.5	8	0.25
14	monika84	2	2038	8	0.25
15	demonodom	1	2075	4	0.25

Key Findings
1.) Multi-faceted detection combining Stockfish accuracy, temporal analysis, and machine learning can successfully isolate anomalous chess games.
2.) High-accuracy outliers showed unusual consistency effectively, in both move quality and time usage.
3.) Time-based metrics, ANTSC, were effective in flagging players who may be using assistance.

DISCUSSION AND ACKNOWLEDGMENTS

Limitations & Future Work
• The engine was run at depth 13, which, while fast, is less accurate than deeper analysis. Running deeper evaluations would provide even more reliable accuracy.
• Temporal analysis could have been analysed over the entire dataset
• The Isolation Forest model is unsupervised. Future projects could benefit from a labelled cheating dataset
Research Contributions
• Developed a custom Stockfish analysis pipeline for over 880,000 games
• Proposed ANTSC as a time-based suspicion metric
• Validated effectiveness of unsupervised machine learning in chess cheating detection

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