**Project Title:** Chess Blunder Analysis

**Project Overview:**

Chess is booming and I’m along for the ride! Prior to 2020, I played only a handful of chess games. Then the pandemic happened, *The Queen’s Gambit*captivated the world, and suddenly, chess was everywhere. I took the plunge, signed up for a chess.com account and immediately fell in love with the game. It’s such a simple game at its heart, but the more you look at it and the more you learn, the more beautiful it becomes.

**The Problem:**

During my early days I was improving rapidly just by playing the game and watching the occasional YouTube video. I hit a progress wall, studied with a bit more intent, and continued improving again. Inevitably, I’d hit another wall, and I had to decide how much time I wanted to spend studying/analyzing my game and how much I wanted to just play.

Having reached the top 95% of Chess.com accounts, I initially spent most of my time playing. Eventually, the urge to improve hit me again and I started looking into ways to analyze my games beyond the tools available on chess.com. I wanted a way to detect trends in my performance and visualize them in an interactive dashboard so that I could identify areas for improvement.

**The Data and Dashboard:**

I started by looking into what data chess.com makes available via their API. It turns out quite a lot! You can extract all of your games in either Portable Game Notation (PGN) format or in text format – the only limitation being that you need to grab each month one by one.

This was the perfect opportunity to write a Python script that extracts multiple months at once and then merge them into a single file. To ensure I had had all of the data I could possibly want at my fingertips, I extracted both the PGN versions and the text versions of the games.

I noticed that I could easily write another script to parse through the games in the PGN file and export the data to a CSV file for analysis. However, the PGNs didn’t quite have all of the information I wanted for my analysis.

I wanted data regarding mistakes, blunders, accuracy scores, and openings. The mistakes and blunder data could only be obtained by utilizing a chess engine, such as Stockfish. The accuracy scores were in the text version of the data, but not the PGN version. And while the PGN provided a link to a description of the opening, it did not provide the opening name itself.

A simple parsing script suddenly got much more complex. First, I utilized **python-chess** to run a local instance of Stockfish, analyze the games, and extract data regarding mistakes and blunders made by each player during the game. Then, I utilized **requests**, **BeautifulSoup**, and **re** (regular expressions) to scrape the URL provided in the PGN for information regarding the mainline opening and any variation played during the game. Finally, I wrote the function to parse the PGN file while simultaneously grabbing the accuracy score for each game from the text file.

After successfully integrating the data sources (PGN files, text logs, Stockfish analysis outputs, and web-scraped opening data), all the raw information was consolidated and exported into a single CSV file. This consolidated dataset, while rich, required significant cleaning and pre-processing to ensure its quality and suitability for analysis in Power BI.

The cleaning process involved several key steps:

1. **Removing unnecessary columns** - During the early stages of my data extraction, I decided to cast a wide net to capture all potentially useful information. As I moved closer to analysis, I had a better idea about which fields would be needed. I went through and removed any columns I knew I wouldn’t be using. This helped reduce dataset size and improved processing efficiency.
2. **Correcting data types** - Some columns were not formatted correctly when I opened up the CSV file in Excel. For example the result column that displayed “1-0” for a win and “0-1” for a loss was being formatted as a date field.
3. **Addressing Null Values** - I systematically scanned columns for missing values, especially in the fields that would be important for my analysis such as “Accuracy Score”. For each piece of missing information, I carefully weighed the potential impact on dataset integrity and my analytical questions. My decision to either leave the value as null, remove the entire record, or, if possible, obtain the missing information was made on a case-by-case basis.

I started exploring trends using various visualizations in Power BI. To answer some of my questions, I needed to create calculated measures using DAX to transform the original data. My final dashboard includes the following items:

Key Performance Indicators (KPIs):

1. **Total Games** – Total games played.
2. **Current Elo** – Elo is a rating system that measures the relative strength of a player compared to other players. For more information on how Elo is calculated on chess.com, see - <https://www.chess.com/terms/elo-rating-chess>. This KPI shows my chess.com Elo after the final game played in the dataset. The higher the Elo, the better.
3. **Blunder %** - this is calculated as the number of blunders divided by the total number of moves. The lower the blunder %, the better.
4. **Average Move # of First Blunder** – The higher the move # of the first blunder, the better. Games with no blunders are filtered out.
5. **Average Accuracy Score**- When you analyze your games on chess.com, it provides you with an “Accuracy Score” that ranges from 0 to 100. The higher the accuracy score, the better.

Visualizations:

1. **Win/Draw/Loss** – A donut chart showing my wins, losses, and draws.
2. **Elo Over Time** – A line graph showing the progress of my Elo.
3. **Accuracy Score Over Time** – A line graph showing a five-game moving average of my Accuracy Score. Due to the potential for high variance between Accuracy Score from game to game, I used a moving average of my accuracy score to reduce noise and see if I could an overall trend.
4. **# of Games by Accuracy Score**- A column chart to identify what ranges my Accuracy Score falls in most often.
5. **Move # of First Blunder by Opening**– A bar chart to identify which openings I make blunders in most and least often. This is filtered to the top five most played openings to focus on the most impactful areas for improvement.
6. **# of Games by # of Blunders**– A column chart to identify my blunders per game. This is especially for identifying trends when filtering on openings and piece color.

All of the KPIs and Visualizations update automatically when the dashboard is filtered with any of the filters at the top.

**Key Insights:**

* **Improvement illusion**– My Elo was steadily climbing for most of this time period. It increased from 1,523 to 1,673 for an increase of 9.85%. However, the five-game moving average of my Accuracy Score remained steady over that same time period. This indicates that despite my Elo gains, I might not have improved much in terms of actual skill.
* **Black Pieces**– The black pieces are at a natural disadvantage in chess since they always go second. This results in the white pieces winning more often. However, the difference in my results appears to be a bit more extreme than expected. I’m losing just 40.16% of games with the white pieces, but 47.06% of games with the black pieces. I also blunder at a higher frequency with the black pieces (5.38% of moves compared with 3.90% of moves).
* **Long Games**– When analyzing my games using the “Total Moves” filter, I noticed that high move games are a bit of an enigma in this dataset. I win a large portion of them, but I also blunder at a higher frequency in these games. It is likely the case that these games lead to spots that are tough for both me and my opponents. This is likely due to a combination of more open positions that lead to interesting tactics and that the clock is ticking down resulting in a feeling of pressure. As a result, both players wind up blundering more than they normally would.

**Recommendations:**

Based on my analysis of the data, if I were making a recommendation to a client, I would recommend:

* **Don’t get complacent.** Even when you’re Elo is climbing, you might not be improving in terms of skill. Instead, you should focus on the Key Performance Indicators of “Blunder %”, “Move # of First Blunder”, and “Accuracy Score”. If those are stagnant, you have some work to do.
* **Dive deeper into your Pirc Defense games.** Improvement is needed with the black pieces. The Pirc is your most played opening as the black pieces, but you blunder at an even higher frequency (5.72%) than your overall frequency with the black pieces (5.38%). Interestingly, the average move # of your first blunder in the Pirc is one of the strongest across all openings. This indicates that you know the early parts of this opening very well but get lost later in the game. The Pirc leads to some very sharp and tactical positions, so you need to go through these games to analyze whether you are repeatedly falling for similar traps or tactics in the middle to late stages of the game.
* **Alternatively: Re-examine your opening repertoire as black.** If it turns out that more skilled opponents are simply able to take advantage of the Pirc Defense in the mid-to-late game, you should learn alternate openings with the black pieces as you move up the ranks.
* **Investigate longer games.**You appear to be doing better than your opponents in these spots, but if you want to improve your average Accuracy Score and sustain long-term improvements in your Elo you will need to improve your blunder rate in these longer games. One way to do this is by taking more time to focus on chess puzzles. Puzzles have been proven to improve tactical vision, pattern recognition, and calculation in mid to late game situations. Don’t just do the puzzles blindly. Take time to understand why you are solving or failing each puzzle.