# Sentence-level Sentiment Analysis of Chess Moves Discussed in Chess Teaching Textbook

## Introduction

A textbook is a knowledge acquisition and learning source, and chess grandmasters have produced, and continue to produce, chess-teaching textbooks that share their practical knowledge of strategies. Unstructured in nature, chess-teaching textbooks comprise a substantial knowledge source amongst many others (e.g., game commentaries). Chess players continuously use these sources to grasp the knowledge of strategies and tactics, and to improve their skills (Ross, 2006).

Therefore, we are introducing a new task in the game-playing domain that is underpinned by NLP: information extraction for unlocking the otherwise hidden knowledge of chess master players from unstructured data.

The scope of this work is to extract the evaluation function of the moves from the unstructured data "natural language" description in chess-teaching textbooks that evaluate a move. In this ongoing work, our first step is aiming to bridge the gap in a chess agent's understanding of this description during decision-making processes.

## Task Description

Each move can either increase the player's score, which is a positive outcome of playing the move or decrease the player's score, which is a negative outcome of playing the move. Traditionally, search algorithms based on tree structure (e.g., alpha-beta pruning) are used to evaluate **a move** based on a **State$_S$**, which determines which move should be played. Here, we hypothesise that it is possible to infer the move evaluation by analysing the text description of the move's effect using sentiment analysis. A textbook's sentences usually are descriptive text that describes and explains the rationale behind playing a move (or not) from tournament games, rather than a direct instruction of playing a move, or not. This way, a reader can understand the logic of the discussed game and how almost every move affected the overall game, either positively or negatively.

Figure 1 shows an example sentence and how it can be analysed and understood by a chess agent. The example sentence explains **why** Black needs to play "the exchange" on the seventh move "round", which is **(exd4)**, rather than directly instructing to **play it**. The sentence shows that in this current board state, it is the chance for the player (Black) to play "the exchange **(exd4)**" because later on Black's Knight on c6 will be taken by White Bishop "Bxc6", and Black Pawn will also be lost later. The sentence explains that for Black to delay the move "the exchange **(exd4)**" after losing its Knight might not be possibly "threatened" because the White's move "Bxc6" would create a more difficult board state for Black to play the exchange and will lose a Pawn.

The outcome of a move is usually described in the textbook to either have a negative, positive or neutral effect on the player. The example sentence in Figure 1 clearly highlights the outcome of playing "the exchange" is positive for Black in this turn "is compulsory" by explaining that a Black Knight and Pawn will be lost later. From the players' scores perspective, the need for the move "the exchange **(exd4)**" is to increase the Black's score, because later on the score will decrease after losing his Knight and a Pawn.

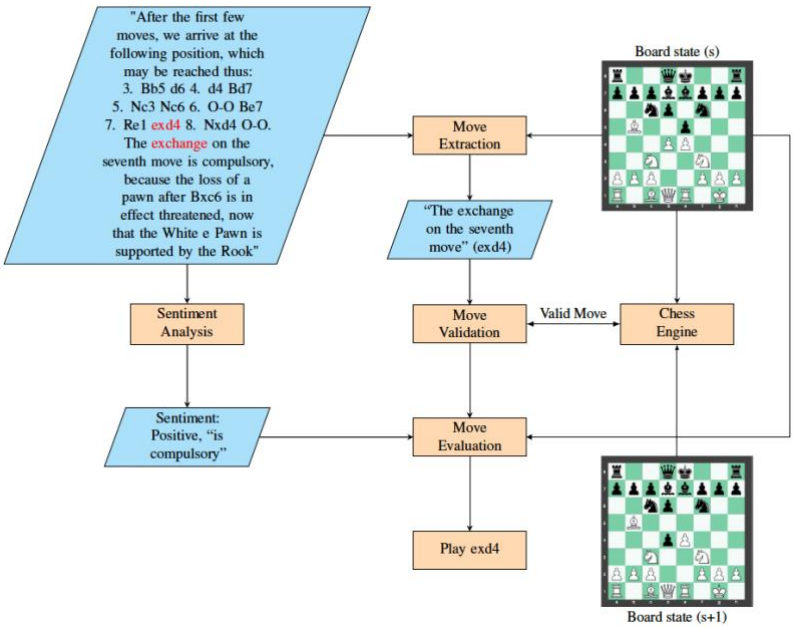


*Figure 1: An example sentence from a chess-teaching textbook shows the steps required in analysing it to enable a natural language-based chess agent to understand the discussed moves and evaluate them accordingly.*

## Annotation Guideline

Textbooks contain different types of sentences, such as introductory or conclusion sentences of a topic, or sentences to describe the rules of playing a chess game. Both types of sentences are not relevant to our task. In our task, we focus on sentences that discuss moves in an evaluation way of the move, the outcome of playing the move; ideally considering the outcome toward the player who played it. Thus, we followed a similar approach for sentiment annotation as in (Toprak et al., 2010; M.hlum et al., 2019) to annotate the corpus with a topic (move) relevancy on a sentence level. Then, those relevant sentences are annotated with one of the sentiment labels as an evaluation of the move.

**Topic-relevance sentence labelling:**

A sentence is considered relevant only if it discusses a move, or a sequence of moves, as a topic of the sentence in an evaluative form. An example of a relevant sentence is "To convert it into a win by queening the extra pawn is only a matter of time." This sentence is considered to be relevant because it mainly discusses the move "queening the extra pawn".

Any sentence that describes or discusses a topic other than a chess move, or a sequence of moves, is considered to be an irrelevant sentence. An example of an irrelevant sentence is "We have now seen how the possession of open files reacts on the mobility of the opposing forces, forever increasing their difficulties until the positional advantage is converted into material gain.". This sentence fails to discuss or evaluate any specific move, rather than a conclusion sentence on the topic "open files".

**Sentiment Analysis labelling:**

We can cast the move evaluation process as the sentiment analysis of a move towards the player making the move. A positive sentiment indicates that playing the move would likely have a positive effect on its player. This can be explicitly stated, such as "it is best to play move

X", or implicitly derived from the move outcome as in the example above. A negative sentiment indicates a negative effect of the move on the player: either explicitly, such as "it is best to avoid playing move X", or implicitly as in "playing move X will help the opponent player to progress".

Each sentence labelled as relevant is annotated with one sentiment label with the aim of evaluating the move it discusses. For this task we followed the “simple sentiment annotation schema” described in (Mohammad, 2016), applying it at the sentence level. We define the sentiment labels as follows:

- Positive: The sentence expresses a good outcome of playing a move for the player who is playing the move. An example sentence, "But White can, by a simple sacrifice, bring the slumbering R at a1 into sudden action: 1. ... Nxe4 2. Re1 Bf5 3. Nc3 Nd6 4. Rxe4 Nxe4 5. Re1 and White wins two pieces for his Rook.". The sentence explains that for White moving the piece “Rook” from “a1 – e1” will lead to a positive outcome for White by winning two pieces with his Rook.
- Negative: expresses a negative outcome of playing a move for the player. An example sentence, "An example of this is found in Diagram 6; Nxe4 fails on account of Rxc6; this leaves the Knight unprotected, and White wins two pieces for his Rook."
- Neutral: a sentence does not express any explicit outcome of a move. An example sentence is, "It is Black's move, and we will suppose he wishes to play e5."
- Uncertain (not sure): when the outcome of a move is difficult to identify, or it is difficult to identify an explicit move. An example sentence, "In both cases, White has an easy development, whilst Black has no convenient square for his Queen's Bishop."

We consider negation in a sentence if it has a direct effect on the sentiment or effect of a move. For example, “Black **cannot** very well **exchange the pawns**, leaving the King's file quite exposed, and must submit to White playing cxd5 maintaining the pawn at e4 and preventing Black's d5 for some time to come.”. The negative polarity here implies negative sentiment toward the move “exchange the pawns”.

## Annotation format

The annotator will be given a spreadsheet with textbook sentences, each sentence should be first labelled based on topic relevancy:

- 0 for non-relevant sentences.
- 1 for topic-relevant sentences.

If a sentence is labelled as a “topic relevant sentence”, then it should be annotated with one of the sentiment labels:

- 0 for negative.
- 1 for neutral.
- 2 for positive.
- 3 for not sure.

The sentiment should be annotated based on the outcome or effect of playing the move toward the player as much as possible.