# Beyond the Oracle: Introducing Alexander, the Chess Engine That Thinks with You

## Introduction: The Two Minds of AI Chess

The history of artificial intelligence applied to chess isn't a linear progression toward ever-increasing playing power, but rather a fork in two distinct philosophical paths. On one side, there are engines built on human logic, which rely on "exhaustive research and handcrafted logic" to evaluate a position.[1]On the other hand, there are systems that rely on machine-learned intuition, using pattern recognition to emulate a sort of chess instinct.[1]This divergence has reached its peak in the modern era, defining the landscape of tools available to gamers around the world.

The evolution of Stockfish, the world's leading stock market data engine, serves as a microcosm of this broader trend. It began as a purely classical engine, using a meticulously programmed hand-crafted evaluation (HCE) function.[2]Stockfish dominated the scene for years. However, in 2020, it underwent a radical transformation with the introduction of a hybrid system that integrated a neural network that was efficiently upgradeable (NNUE).[2]This innovation, based on the work of shogi programmers, proved a stunning success: version 12 of Stockfish, equipped with NNUE, won "ten times more games than it lost" against its previous incarnation.[2]The pinnacle of this evolution was reached in July 2023, when, with version 16, the classic valuation function was completely removed, establishing Stockfish as a pure neural network engine.[2]

This progress has produced engines of unprecedented power, surpassing the 3,500 Elo rating threshold and leaving the best human Grandmasters hundreds of points behind. However, this race for computational power has come at a cost not measured in Elo points: transparency. The abandonment of human-encoded chess principles in favor of machine-learned patterns has widened the gap between superhuman computation and human understanding. A "pedagogical debt" has arisen: engines have become infallible oracles that provide correct answers, but have lost the ability to teach the reasoning behind them. It is in this void that a

new need emerges, a new paradigm for human-machine collaboration.

## Section 1: The Age of the Black Box - The Paradox of the Modern Chess Engine

The technological triumph of NNUE engines ushered in what could be called the "black box era." Unlike their classical predecessors, which evaluated a position by summing the values of explicit parameters, neural network engines like the current Stockfish or Leela Chess Zero (Lc0) interpret the chessboard holistically.[1]They perceive abstract concepts like “control, initiative, and space” instead of simply calculating material exchanges.[1]This approach, based on pattern recognition learned from millions of games, is immensely powerful, but inherently opaque to the human user.

This opacity manifests itself in a phenomenon widely documented within the chess community: the "alien" nature of the moves suggested by the engine. High-level players have observed that "half the moves made by a 3500+ Elo AI [...] are completely alien even to a super GM like Nakamura or Carlsen."[5]This isn't just a problem for beginners; even world-renowned Grandmasters have expressed their "astonishment" at engine choices that "no human would ever consider in that position."[5]For the amateur player, the problem is even more acute, with suggestions that are often "incomprehensible below GM level, if at all."[6]

The reason for this incomprehensibility lies in the divergence of optimization objectives. While human players reason using established concepts such as tempo, color dominance, outposts, and positional safety, superhuman AIs "don't use these concepts" in the same way.[5]Their algorithm is optimized for a single purpose: maximizing the probability of victory. This can lead to "odd-looking moves" that defy traditional human heuristics, such as seemingly unjustified sacrifices of material or maneuvers that appear to violate fundamental strategic principles.[5]The result is a paradox: players have access to the most powerful analysis tools in history, but the logic behind their recommendations is often an unfathomable mystery. The market has redefined the concept of "better analysis" by equating it with "more accurate valuation."[7], neglecting the user's fundamental need for an analysis that is also and above all understandable.

**Table 1: A comparative analysis of chess engine philosophies**

| Characteristic | Neural Network Engines (e.g. Stockfish 16) | Alexander (Classic Evaluation) |
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| **Evaluation Method** | Neural network trained on millions of positions. | Craft function based on chess principles. |
| **Fundamental Principle** | Pattern Recognition and Learned Intuition | Weighted Logic and Heuristics |
| **Human Comprehensibility** | Low ("Black Box"). The moves may seem "alien". | High ("Glass Box"). The reasoning is clear. |
| **Primary Learning Output** | The "best" move or variation. | The "best" move*and*its logical justification. |
| **Analogy for the User** | The Inscrutable Oracle | The Expert Mentor |

## Section 2: The Human Cost of Incomprehensibility

The move to "black box" engines isn't just a technical issue; it has profound practical consequences for how players learn and improve. The core problem is that a modern engine "won't help you translate its lines and evaluations into human logic; that's your job."[8]This turns post-game analysis from a learning opportunity into a frustrating exercise in decoding an alien intelligence.

The chess community and coaches agree that best practice for using engines involves a two-step process: first analyzing the game yourself, and only then using the engine to check your work and identify errors.[8]Opaque engines severely compromise the second and crucial stage of this process. Instead of confirming or correcting the*reasoning*For a player, they simply provide a new, equally inexplicable line. This can lead to a dangerous addiction, stifling the development of critical thinking and independent analytical skills.[10]The player, instead of being the "boss" who guides the analysis, becomes the engine's "assistant", a mere executor of moves he does not fully understand.[11]

This problem has been formalized in the academic field under the umbrella of Explainable AI (XAI). Research in this field has concluded that current chess AI programs "do a poor job of teaching" because they provide the best move "without context," preventing players from absorbing the fundamental concepts that should guide their improvement.[13]Education, as these studies argue, is not about winning, but about understanding. Thus, the need for a new generation of tools emerges that can "illuminate the building blocks of chess strategy,"

transforming AI from a simple analysis tool to a true mentor.[13]

The incomprehensibility of neural network engines also creates a "trust deficit." Players are told to trust the engine's evaluation, but when the suggested moves are profoundly counterintuitive, cognitive dissonance arises. This leads to two negative outcomes: either players blindly memorize lines they don't understand, rendering them fragile and unusable in a real game, or they discard valuable engine insights because they appear too strange. Alexander, by demonstrating his evaluation process, allows the user to critically evaluate the engine's judgment. If a high score is due to a specific term like "King's Safety," the player can trust that the engine sees a real attack, thus building trust based on understanding rather than blind faith.

# Section 3: Alexander – A Return to Clarity and Logic

In a market dominated by opaqueness, Alexander emerges as the solution, offering a return to clarity, logic, and understanding. As a derivative of Stockfish, Alexander inherits a top-notch search algorithm and formidable playing power, clocking in at around an Elo of 3100 [User Query]. This power, however, is coupled with a deliberate and distinctive philosophical choice: the preservation and refinement of a classic, handcrafted evaluation function (HCE). This isn't obsolete technology, but a superior design choice for an engine that places the human user at the center of its mission.

## The "Glass Box": Deconstructing Alexander's Assessment

Unlike the black box of a neural network, Alexander's evaluation function is a "glass box." Its decision-making process isn't based on abstract patterns, but on a linear combination of explicit and understandable chess principles, the same ones every player studies in books and learns from the masters.[15]Alexander's rating is the weighted sum of hundreds of terms, which can be grouped into the following basic categories:

- **Material:**The base value of the pieces, which forms the basis of any evaluation, with adjustments for material imbalances (for example, three minor pieces against a queen).[4]
- **Mobility:**A measure of the range of pieces, calculated as the number of legal or safe squares they can reach. Greater mobility translates into greater options and offensive potential.[15]
- **King's Security:**A complex set of bonuses and penalties related to the king's vulnerability. It includes factors such as the strength of the pawn shield, the proximity of

attacking enemy pieces (the king's tropism), and control of critical squares around the monarch.[4]

- **Pedestrian Structure:**The backbone of the position. Alexander applies penalties for weaknesses such as doubled, isolated, or backward pawns, and assigns bonuses for strengths such as passed, connected, or phalanxed pawns.[4]
- **Positional Factors:**It includes a wide range of strategic concepts, such as control of the center, positioning pieces on safe outposts, domination of open files by rooks, and the advantage of the bishop pair.[4]

This transparent architecture ensures that every evaluation Alexander produces is rooted in classical chess theory, making it inherently understandable to a human.

### Spotlight: Alexander's Track – A Window into the Engine's Mind

Alexander's true innovation lies not only in its classic evaluation function, but in the way it makes it accessible to the user. Through a sophisticated evaluation trace (accessible via the eval command), Alexander offers a revolutionary "thinking system" [User Query].

This track doesn't just provide a single number (e.g., $+0.75). Instead, it offers a complete and detailed breakdown of that score, showing the contribution of each individual category and, for advanced users, each specific sub-term. For example, a rating might look like this:

Rating: +0.75 (Material: +0.00, Mobility: +0.25, King's Safety: +0.40, Pedestrian Structure: +0.10,...)

This system transforms the engine from a declarative tool ("This is the best move") to a dialectical one ("This move is the best, and this is my reasoning. Do you agree?"). It allows the user to ask and answer critical questions. "Why is this position better for White?" Alexander's track answers: "Because, although the material is equal, White has a significant mobility advantage, and Black's king is becoming exposed."

Furthermore, this system is designed to adapt to the user's playing level [User Query]. A beginner can focus on the main categories to grasp the general concepts, while an experienced player can analyze the finer details, such as the bonus for a "pawn storm" or the penalty for a trapped piece. This creates an interactive feedback loop that actively teaches the user positional tradeoffs, a concept extremely difficult to learn from a black-box engine.

## Section 4: A new era of human-machine collaboration:

# practical applications

Alexander's transparency isn't just a technical quirk; it unlocks practical applications that redefine the relationship between the player and the chess engine. It transforms analysis from a monologue to a dialogue, with tangible benefits for every segment of the chess community.

## For the improving player (under 2200 Elo)

For amateur players, the biggest obstacle in using engines is understanding*come*learn from them.[21]Alexander solves this problem by turning post-game analysis into an interactive lesson. Instead of simply identifying oversights, the player can use Alexander's trail to understand the*nature*of their mistakes. Was a mistake a tactical oversight or the result of a slow positional decline? The track can pinpoint the exact moment when the "Pedestrian Structure" or "Space" assessment began to deteriorate, providing specific and actionable feedback.[12]This allows you to correct not only the wrong move, but the faulty thought process that generated it.

## For the advanced player and coach (2200+ Elo)

Grandmasters and top-level players use engines primarily for opening preparation, looking for novelty and checking the solidity of their lines.[26]Often, however, they must "drive the engine, not the other way around," using their deep positional understanding to guide the analysis.[11]Alexander is a very powerful tool in this process. When faced with two opening lines that a neural network engine might evaluate similarly (e.g. $+0.30$ vs $+0.35$), Alexander's trace can reveal a crucial difference in the*character*Positional. One line might derive its advantage from a complex tactical sequence, while the other builds a sustained positional advantage based on a superior pawn structure. This information is invaluable for choosing a line that suits a human player's style and for preparing for positions one can confidently manage.[29]

## For the chess enthusiast

Many enthusiasts feel that AI has "damaged chess," turning it into a memorization exercise.[31]Alexander offers a way to rediscover the logical beauty and depth of the game. Users can analyze the historical games of past grandmasters and, for the first time, witness a superhuman intelligence explain the positional genius of champions like Capablanca or Petrosian in terms they themselves would have understood. This allows them to appreciate not only the correctness of a move, but also its strategic elegance.

Alexander also helps solve the problem of "practicality" of engine moves. Engines often suggest lines that, while objectively better, are incredibly difficult for a human to play.[12]Analyzing with Alexander, a player might compare two moves: Move A, valued at $+1.0$, whose advantage is based on a complex 15-move tactical sequence; and Move B, valued at $+0.7$, whose advantage comes from simple and enduring positional factors. For a human, Move B is often the superior practical choice. Alexander is the only engine that provides the user with the information needed to make this critical distinction, bridging the gap between objective truth and human playability.

## Conclusion: Beyond the Best Move – The Quest for Better Understanding

The ultimate goal of chess improvement is not simply to find the best move, but to understand*Why*It's the best. As academic research suggests, education is about "understanding," not just winning.[13]In an age when chess engines have become inscrutable oracles, Alexander represents a fundamental paradigm shift, realigning the power of AI with the needs of human learning.

Alexander's unique value proposition is its ability to offer both superhuman gameplay power, comparable to the world's best engines, and human-level transparency. It's not just another powerful engine; it's a teaching tool designed to foster a deep and intuitive understanding of the game. It's the "Expert Mentor" who explains its reasoning, not the "Inscrutable Oracle" who pronounces final verdicts.

The launch of Alexander isn't just the introduction of new software, but a call to the chess community to demand more from their tools. It's a call to move beyond the passive consumption of engine evaluations and embrace a new era of active, collaborative learning with a machine partner that speaks the same language. Alexander isn't just a new engine; it's a new way of thinking about chess.

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