



# Chess Neural Network Using AI

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# Agenda

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# Aim

- The aim is to create a Chess Neural Network Artificial Intelligence.
- To develop a program/software that can train Human Mind to increase his/her IQ Level
- To search the position deeply enough beyond the abilities of humans.
- To be able to help Professional Players to improve their game even further.



# Literature Survey

Sr. No.	Title of Paper	Year	Author	Key Points	Gap identified
1	An Evolutionary Game Tree Search Algorithm of Military Chess Game Based on Neural Value Network	2020	<a href="#">Tingzhen Liu</a> College of Information Science and Engineering, Shenyang University of Technology, Shenyang <a href="#">Derun Ai</a> College of Information Science and Engineering, Shenyang University of Technology, Shenyang <a href="#">Yimin Ma</a> College of Information Science and Engineering, Shenyang University of Technology, Shenyang	military chess has high requirements for the design of the situation evaluation algorithm and the search algorithm.	To create a simulation of opponent using machine learning to help professionals to study better
2	A Middle Game Search Algorithm Applicable to Low-Cost Personal Computer for Go	2019	<a href="#">Xiali Li</a> School of Information Engineering, Minzu University of China, Beijing, China <a href="#">Zhengyu Lv</a> School of Information Engineering, Minzu University of China, Beijing, China <a href="#">Xiaochuan Zhang</a> School of Artificial Intelligence, Chongqing University of Technology, Chongqing, China	Go game is generally divided into layout, mid-game and final stage, and the mid- game has a great influence on the outcome.	considerably shortens training time and requires almost no human knowledge should be conducted which are helpful to to better understand.
3	Deep learning advancements: closing the gap	2019	<a href="#">A. Stipić</a> CITUS, Zagreb, Croatia <a href="#">T. Bronzin</a> CITUS, Zagreb, Croatia <a href="#">B. Prole</a> CITUS, Zagreb, Croatia	AI systems have been tested in chess and the same has been done to demonstrate the power of AlphaZero.	To create a simulation of opponent using machine learning to help professionals to study better

Sr. No.	Title of Paper	Year	Author	Key Points	Gap identified
4	A New AI Open Problem: WUGU Chess	2019	<a href="#">Chunxiao Ren</a> High-Tech Development Zone, Shandong Province Science and Technology Exchange Center, No. 607 Shunshua Rd, Jinan, P.R. China. <a href="#">Yuxiao Wu</a> High-Tech Development Zone, Shandong Province Science and Technology Exchange Center, No. 1768 Xinluo Rd, Jinan, P.R. China	Game is an early research topic in the field of AI, and it is also a very active and representative research direction.	To create a simulation of opponent using machine learning to help professionals to study better.
5	Application of Neurological Networks in an AI for Chess Game	2020	<a href="#">Vinay Kumar</a> Amity University Greater Noida Campus. <a href="#">Divya Singh</a> Amity University Greater Noida Campus <a href="#">Garima Bhardwaj</a> Amity University Greater Noida Campus	To create chess game that can learn using image modulation techniques and play against a real human.	To create a simulation of opponent using machine learning to help professionals to study better.

Sr. No.	Title of Paper	Year	Author	Key Points	Gap identified
6	Competing Paradigms for Machine Intelligence	17th sept 2021	<a href="#">Shiva Maharaj</a> Chess Ed <a href="#">Nick Polson</a> Booth School of business University of chicago <a href="#">Alex Turk</a> Phillipse Academy	AI , AGI , LC Zero , Bayasian , Chess , Chesss Studies , Neural Network , Plaskett's Study , Reinforcement Learning.	To create a simulation of opponent using maching learning to help professionals to study better.
7	Aligning Superhuman AI with Human Behaviour : Chess as a Model System	2020	<a href="#">Rajesh Gupta</a> <a href="#">Yan Liu</a> <a href="#">Jiliang Tang</a> <a href="#">B.Aditya Prakash</a>	To create chess game that can learn using image modulation techniques and play against a real human.	To create a simulation of opponent using maching learning to help professionals to study better.

# Motivations

- The use of Computers is increasing rapidly in the field of Chess to scan the most difficult problems using sophisticated algorithms.
- Computers have played an important and vital role in increasing the strength of a chess player.
- Advanced Technology improvements in chess will completely change the way we look into the game of Chess.
- With more than  $10^{80}$  moves possible in chess, only one is the best move. The job of the AI is to find that move.

# Objectives

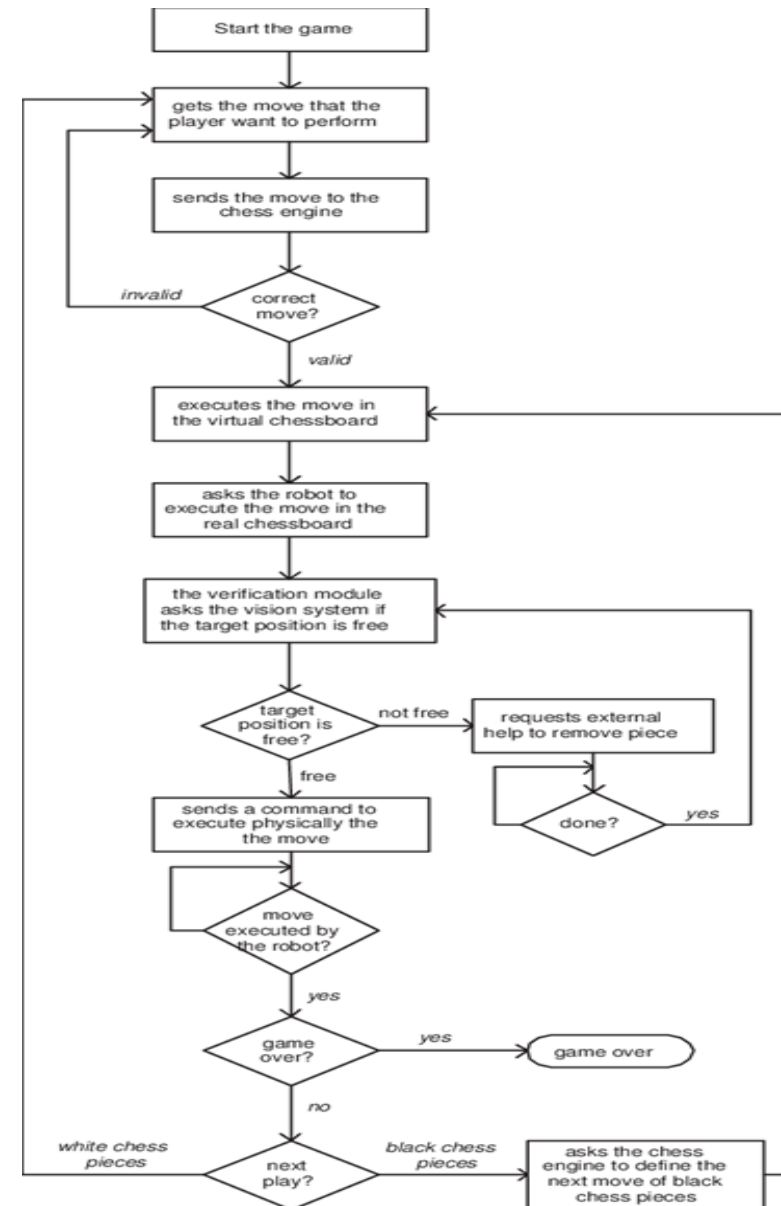
- To create an AI to scan millions of positions to find the best move.
- To create an AI that can self-adjust according to Human Thinking. The more games we feed, the better AI adjusts itself to Human Thinking.
- To help a player to increase his mental strength or IQ level.
- Professionals can improve their game by analyzing mistakes and blunders.
- To change the game of chess of how it was observed a few years back.



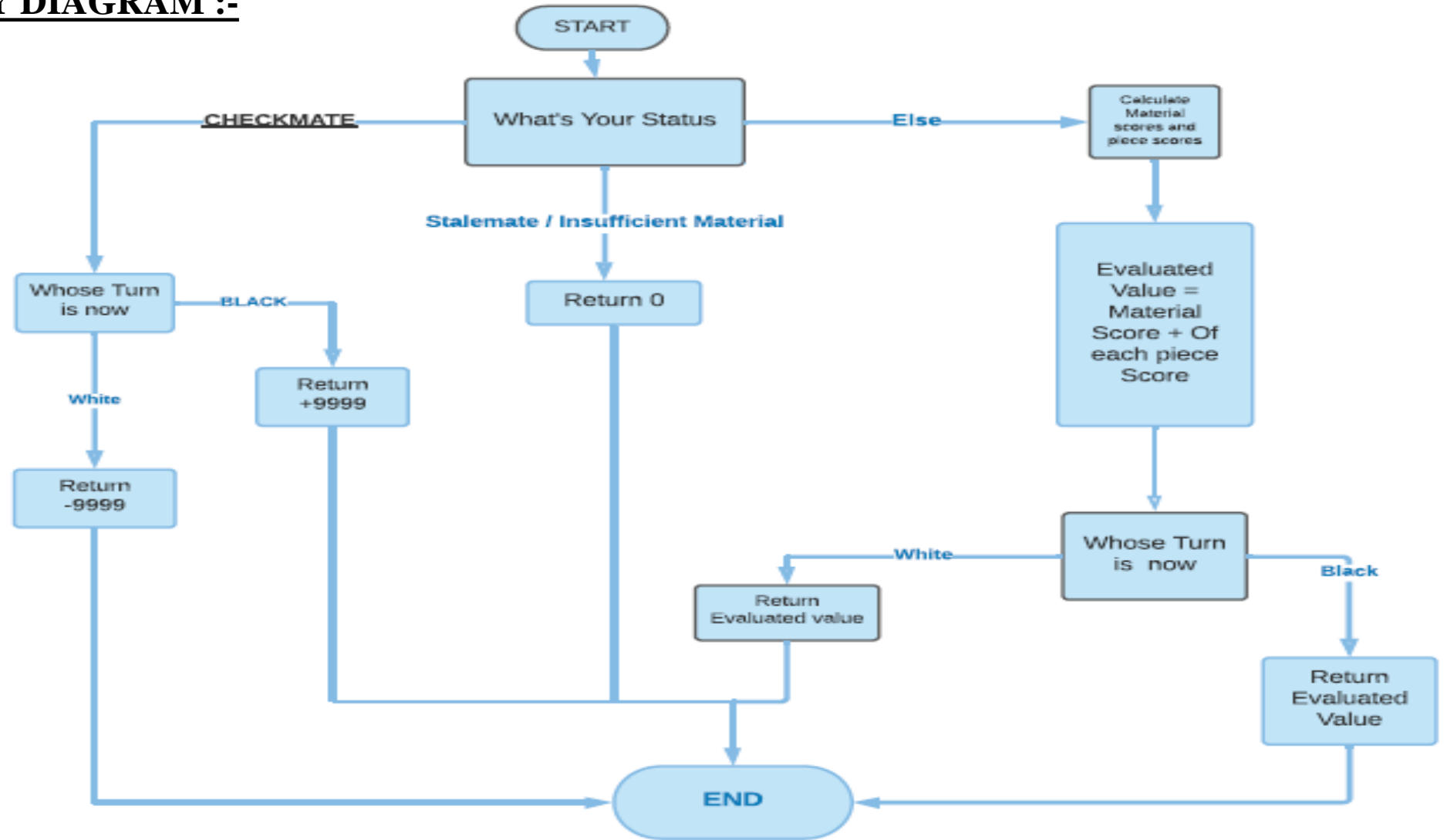
# Proposed System

## Evaluation Function

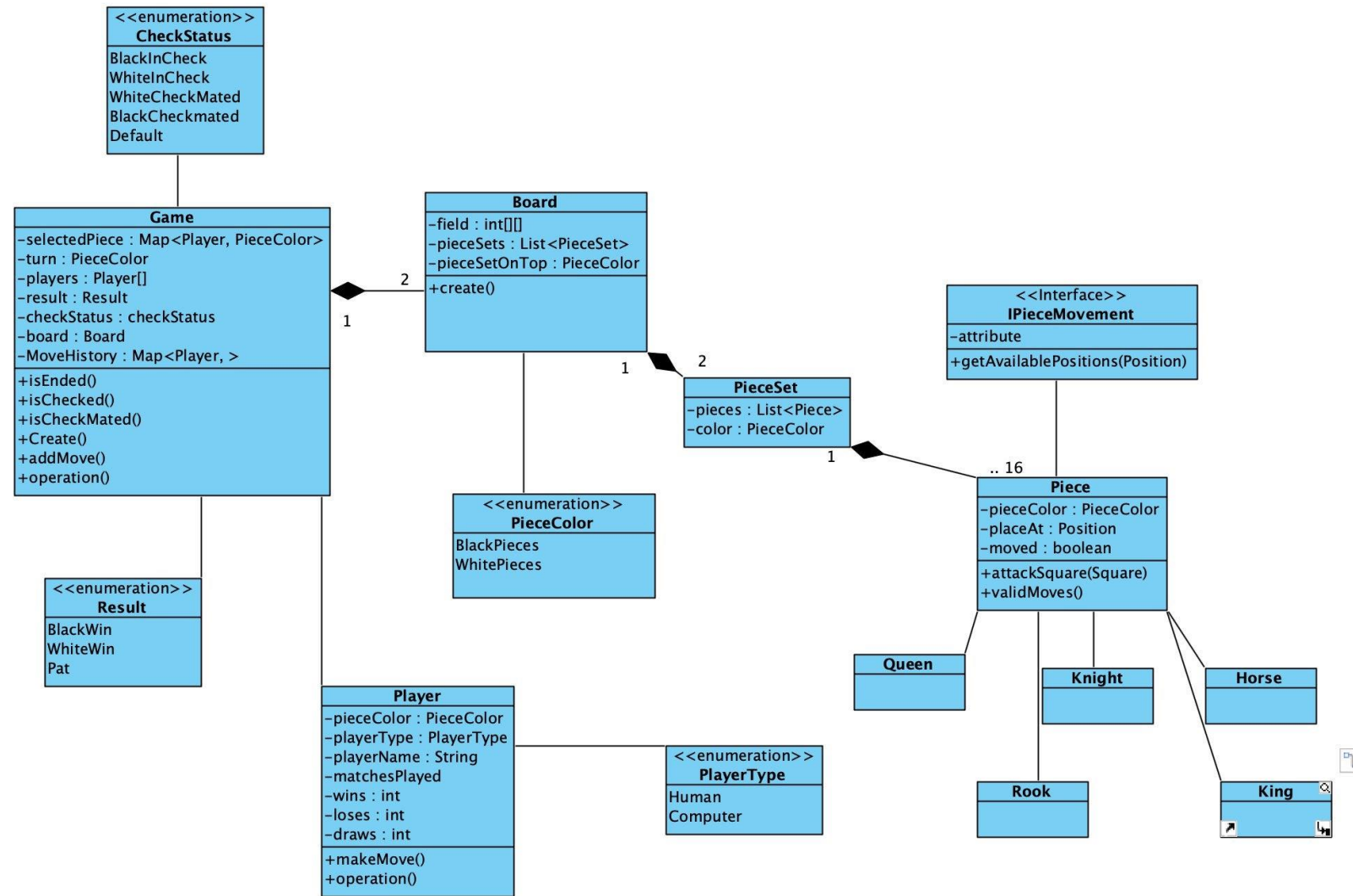
- Evaluation Function calculates the material value and piece placement score (max scope).
- It then returns the value to the evaluated position.



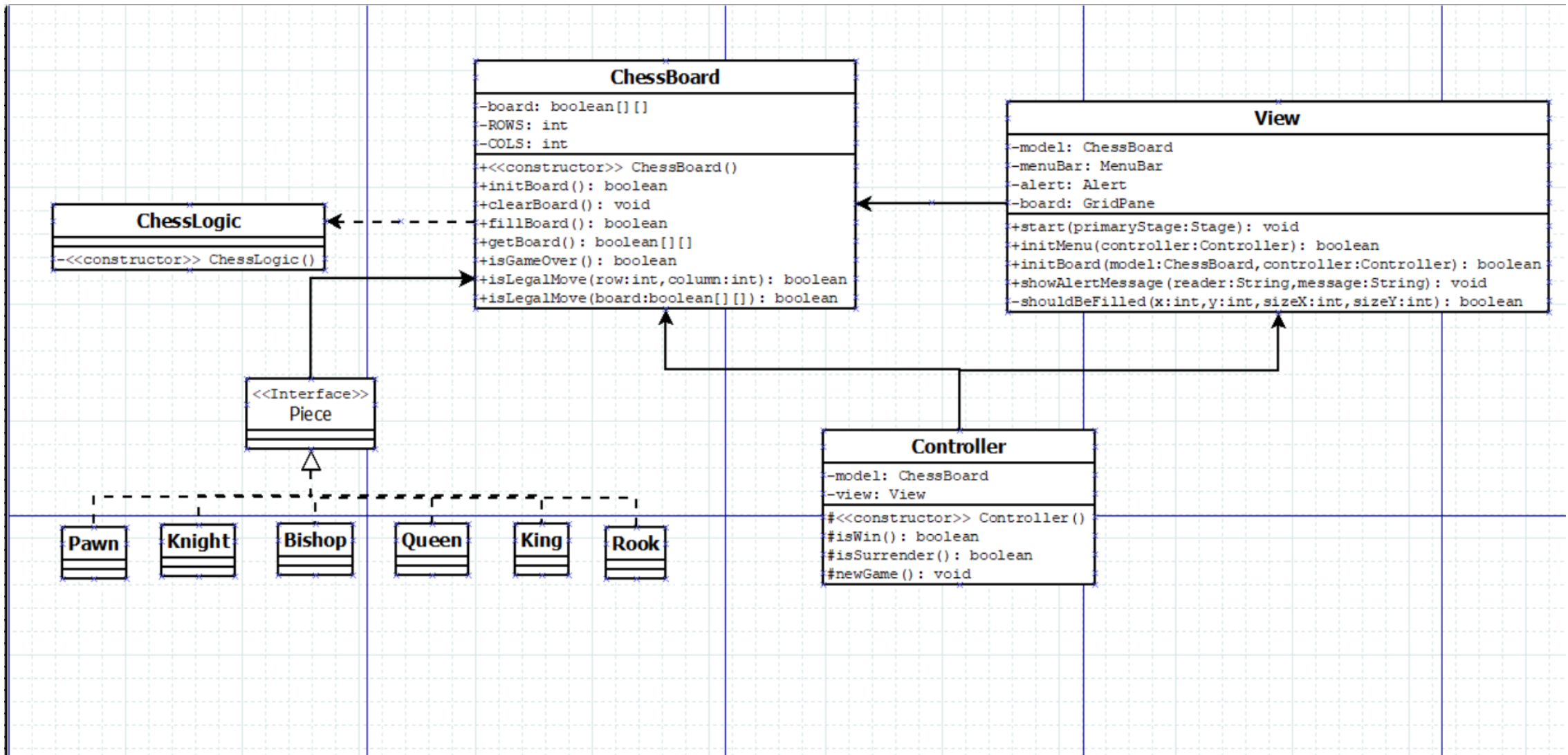
## ACTIVITY DIAGRAM :-



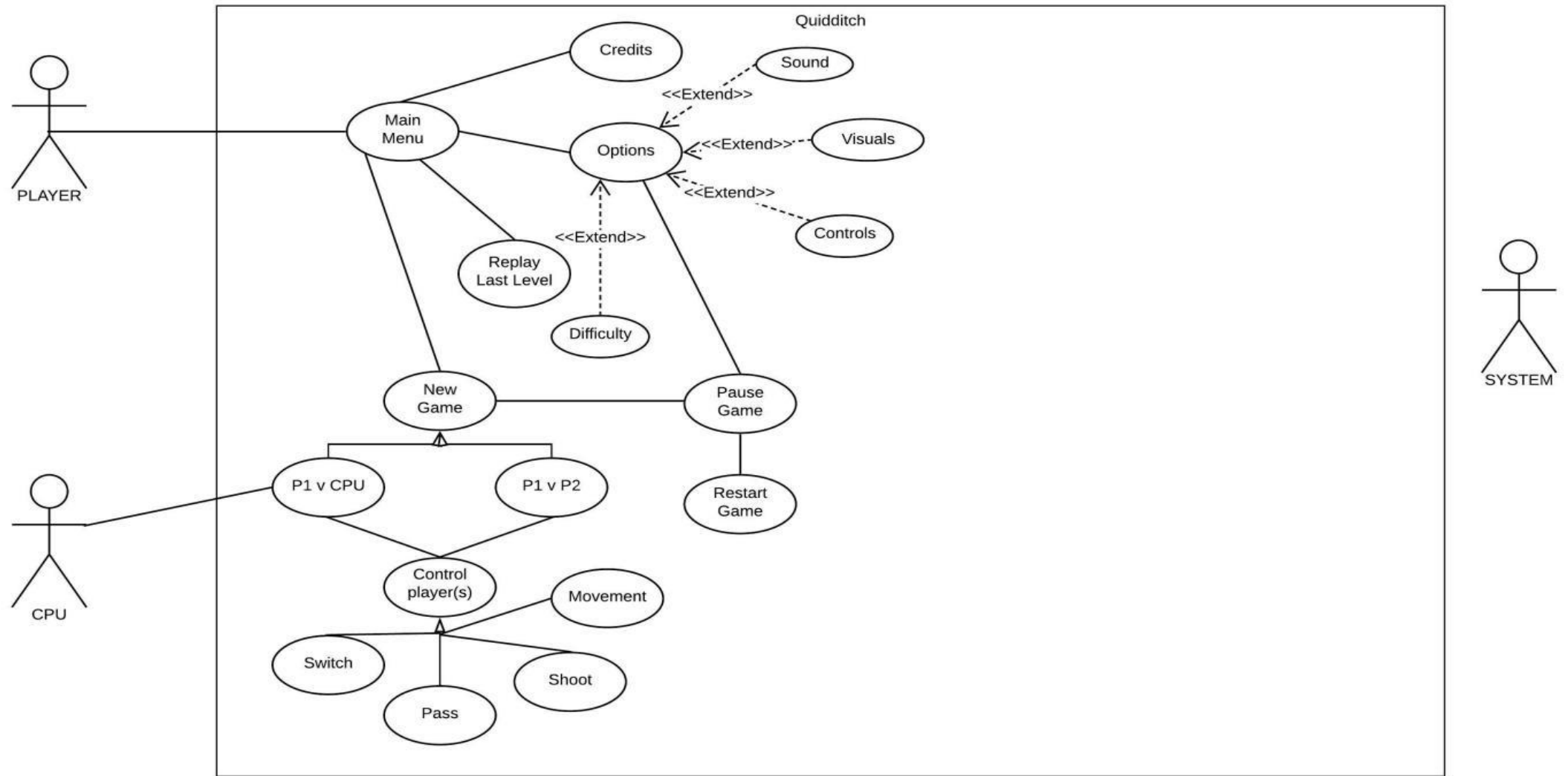
# UML Class Diagram :-



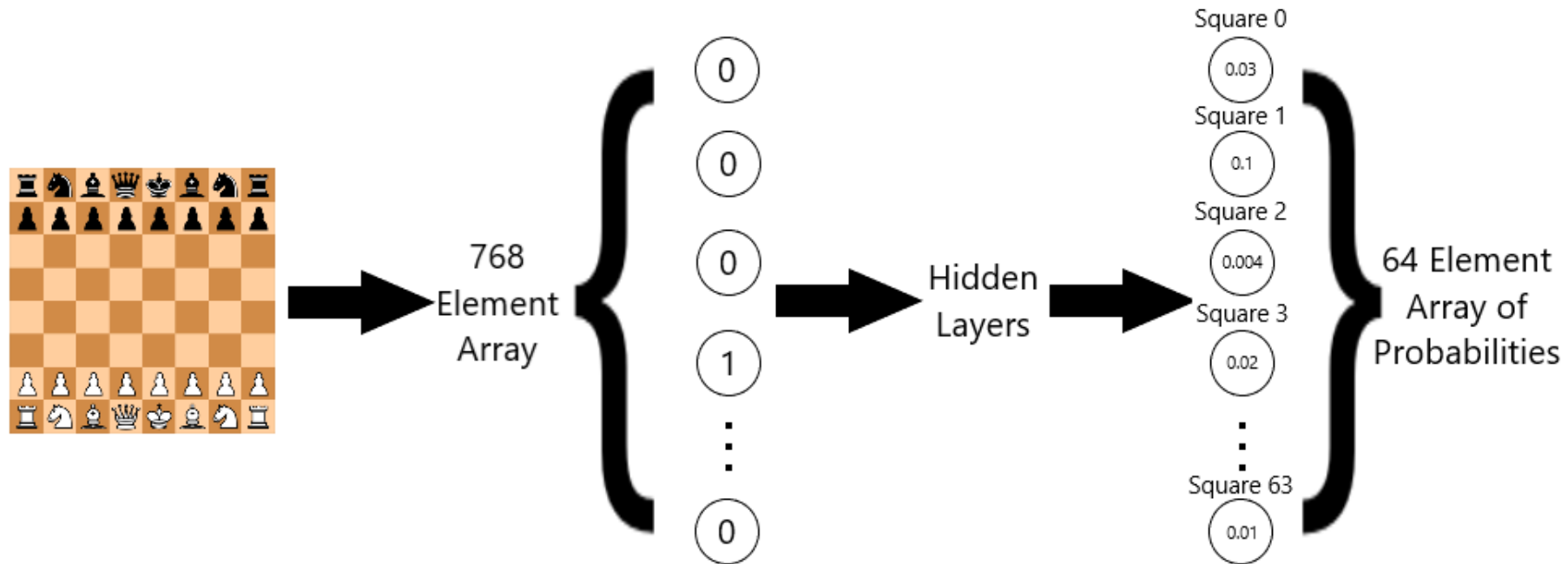
## COMPONENT DIAGRAM :



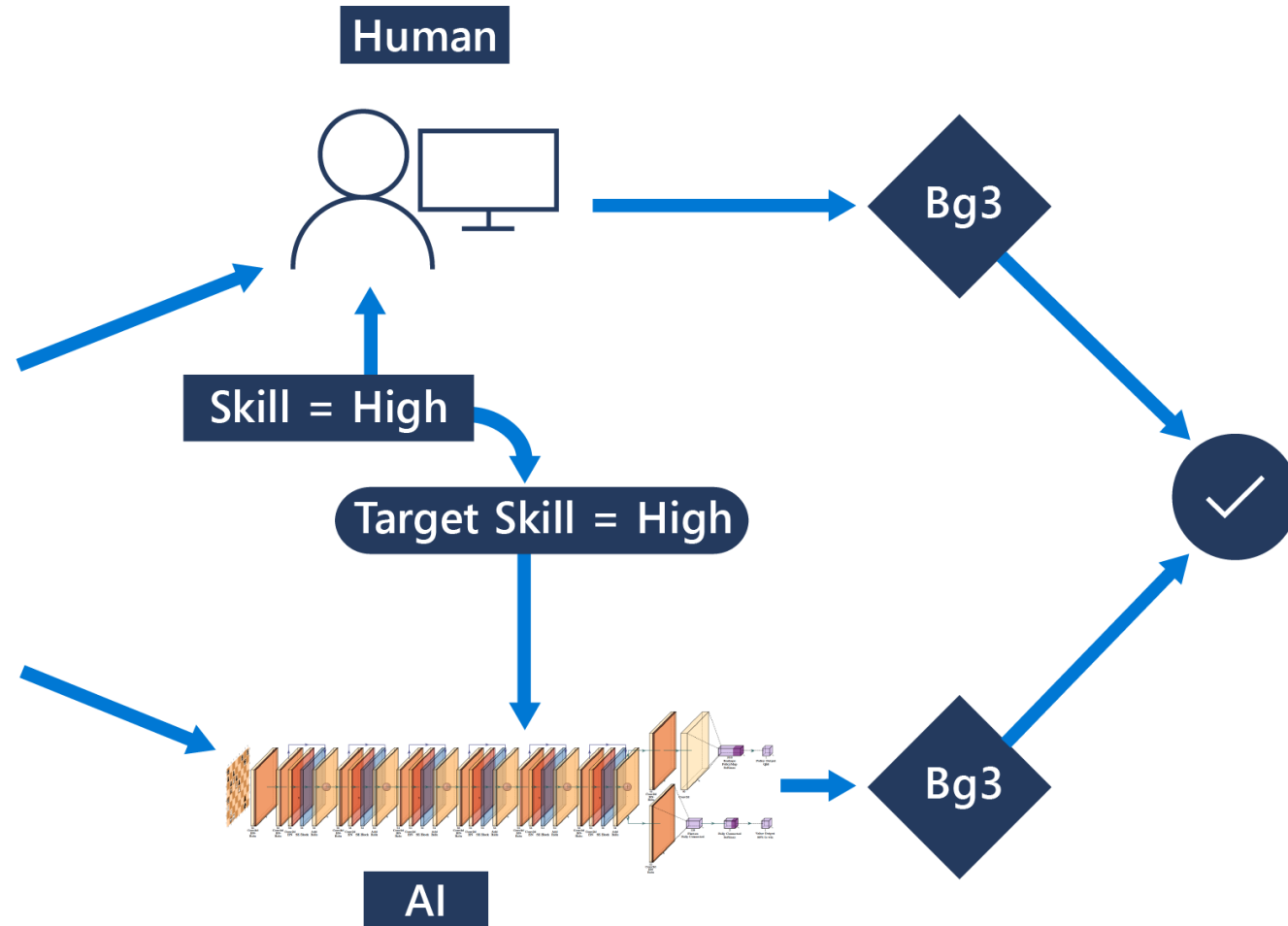
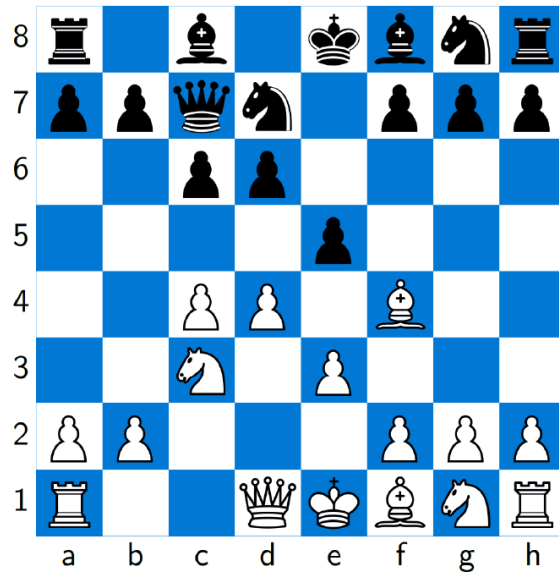
## USER CASE DIAGRAM :-



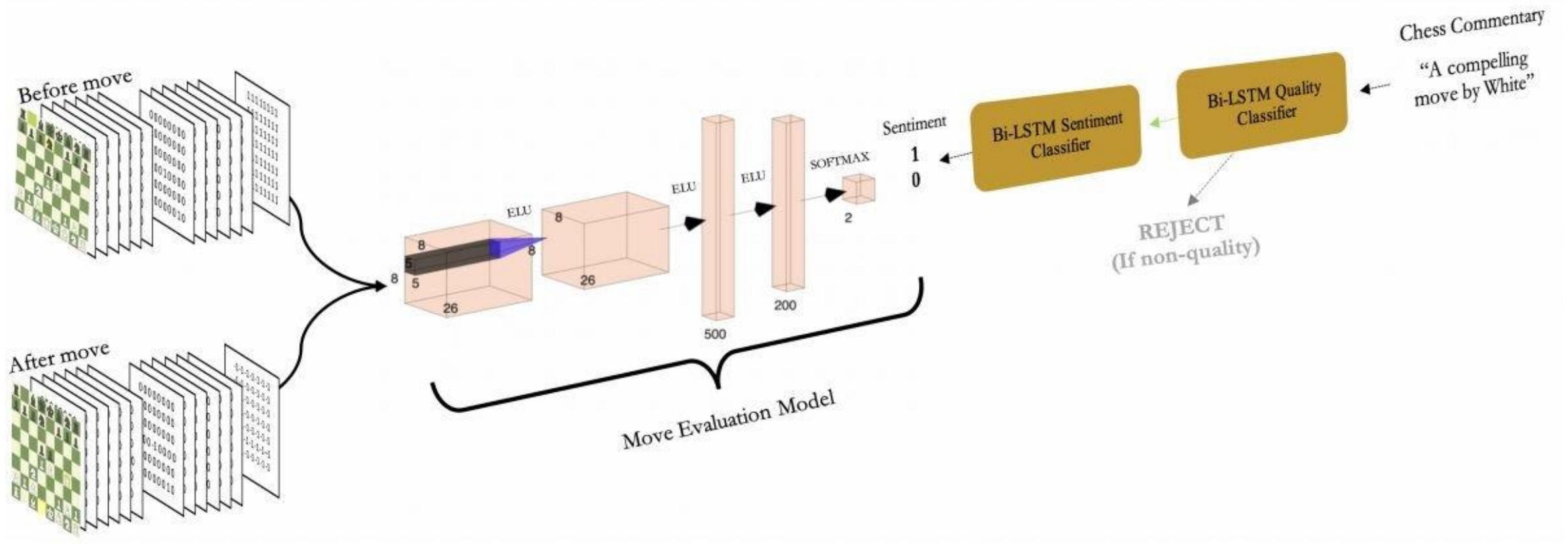
## DFD\_0 :-



## DFD\_1 :-



## DFD\_2 :-





# Algorithms

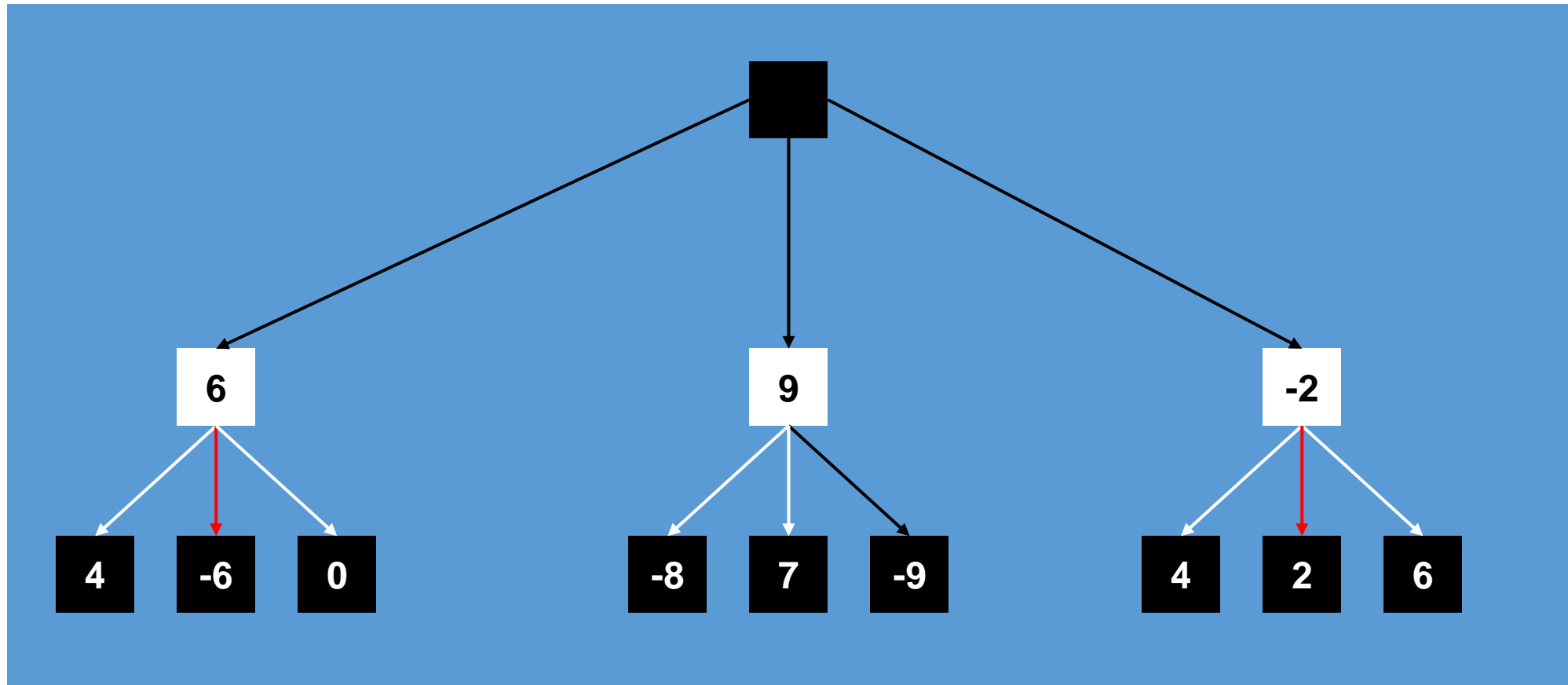
- **Pure Minimax Search**
- **+ Alpha-beta Pruning**
- **Move Ordering**
- **Naïve Pattern Searching**
- **Greedy Algorithm**
- **Zobrist Hashing**

# Algorithms

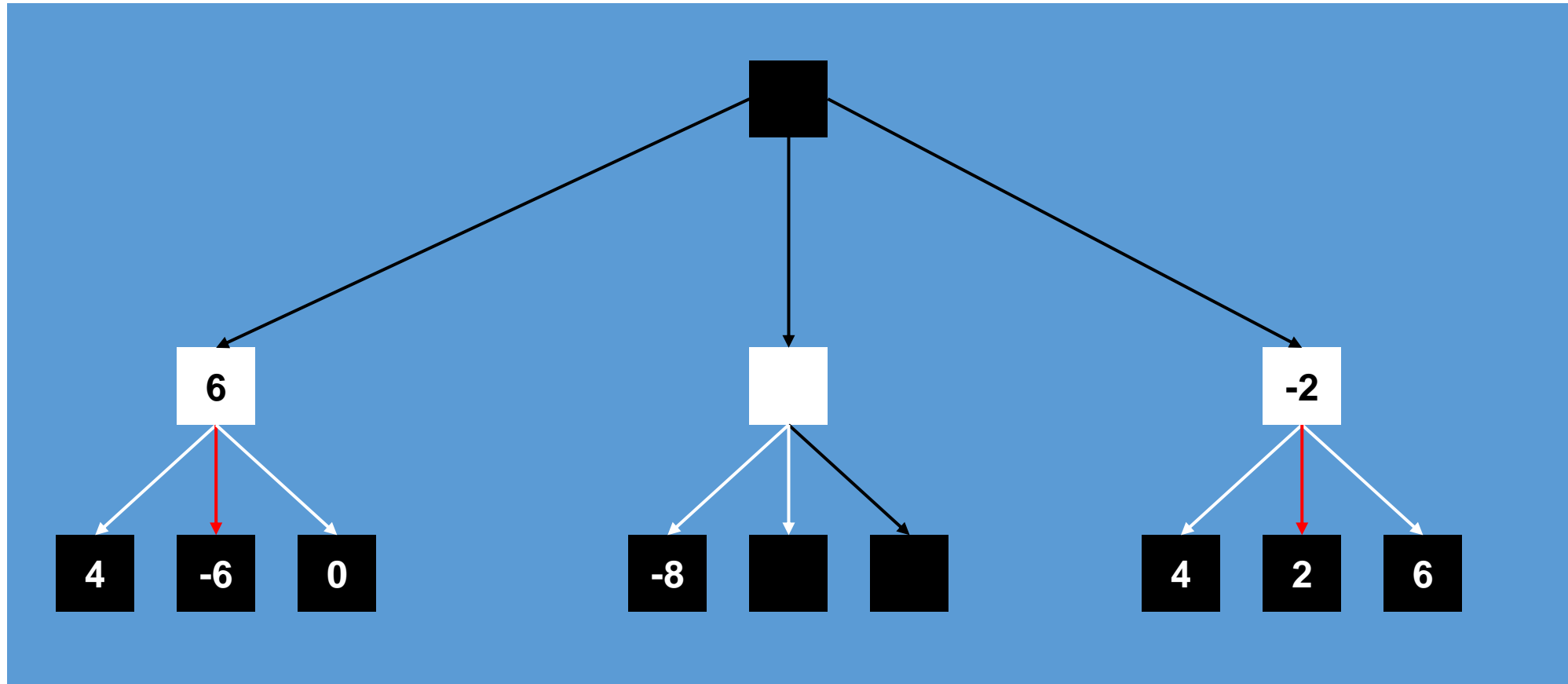
**Pure Minimax Search** is based on a recursive algorithm for choosing the next move.

- A value is associated with each position of the game is calculated by the Evaluation Function.
- According to the minimax algorithm, a tree of all possible moves is generated until the depth is defined.
- At the depth, millions of positions are scanned and each position is given an evaluation.
- Based on the final evaluation, the evaluation of the upper node is defined.
- The Upper node is given a number based on the best possible reply of the opponent and the best possible choice.

## Pure Minimax Search



+**Alpha-beta Pruning** is an optimization that reduces the search and the scan time.



**Naïve Pattern Searching** is used for searching the position of pieces from the Forsyth-Edwards Notation (FEN) string.

**Zobrist Hashing** is used to generate the FEN String and it is stored in the transposition table. If the same position is encountered again, we simply retrieve the stored value from the transposition table.

**Move Ordering** is an optimization to eliminate the searching of moves with the same positions that occur through transpositions.

**Greedy Algorithm** is used to compare the evaluation of all the next possible moves and it gives the upper node a number based on the best possible choice or best possible reply.

# H/W and S/W to be used & Cost Requirement:

Software	Hardware
Unity	Intel i3 Processor / Ryzen 3
C#	4GB Ram
Python	Laptop / PC
PGN Viewer	Mouse

**Cost Required : Open Source Project**

# Schedule Of Project :

1	Task Name	Aug				Sep				Oct				Nov				Dec				Jan				Feb				Mar			
2		w1	w2	w3	w4	w1	w2	w3	w4	w1	w2	w3	w4	w1	w2	w3	w4	w1	w2	w3	w4	w1	w2	w3	w4	w1	w2	w3	w4	w1	w2	w3	w4
3	Project Start																																
4	Basic Research of Project																																
5	Documentation Efforts																																
6	Synopsis & Literature Survey																																
7	UML Diagrams																																
8	Preliminary Reports																																
9	Learning Technology																																
10	Learning basics of Python																																
11	learnig basics of c#																																
12	learning basics of unity																																
13	Learning NLP																																
14	Learning & Development of GUI Application Module																																
15	Learning GUI modules																																
16	Development of GUI components																																
17	Creating sample application interface for application																																
18	Development of Authentication module																																
19	Creation of Database for application																																
20	Development of Registration module																																
21	Development of Login module																																
22	Development for server application module																																
23	Development of server module																																
24	Integration server module for proper request and response																																
25	Integration of all module																																
26	Integration of all modules in application																																

# Risk Involved

- Chess is a board game. Playing, analyzing, and spending too much time in front of a computer screen (Chess AI) can cause eye problems and mental health.
- Playing and losing against a Chess AI frequently can affect the player both emotionally & psychologically.
- Simulation of the opponent using a Chess AI doesn't guarantee a 100% chance of winning against the opponent in a real game. You may even lose a game if the opponent's recent data is not fed correctly.



# Social Aspect

- Chess AI is beneficial as people will be able to increase their mental IQ when they play and practice against the AI.
- Top players around the world can use Chess AI to understand the game of their opponents much better.
- Anyone can play virtually against their favorite chess players by feeding their games into the Chess AI. Chess AI will simulate according to their playing style.

# Conclusion

Chess is a game with infinite possibilities. And in some positions, it becomes almost impossible for Humans to calculate what's the current scenario.

With the growth of technology & Artificial Intelligence, computers and AI can do extremely difficult calculations that can unlock the ultimate beauty of this Game.

Chess Neural Network AI can scan millions of positions to generate the best variation out of millions of possibilities. It can calculate beyond the abilities of a human.

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