

# ATAI 2018-2019

*AI applied to Games*

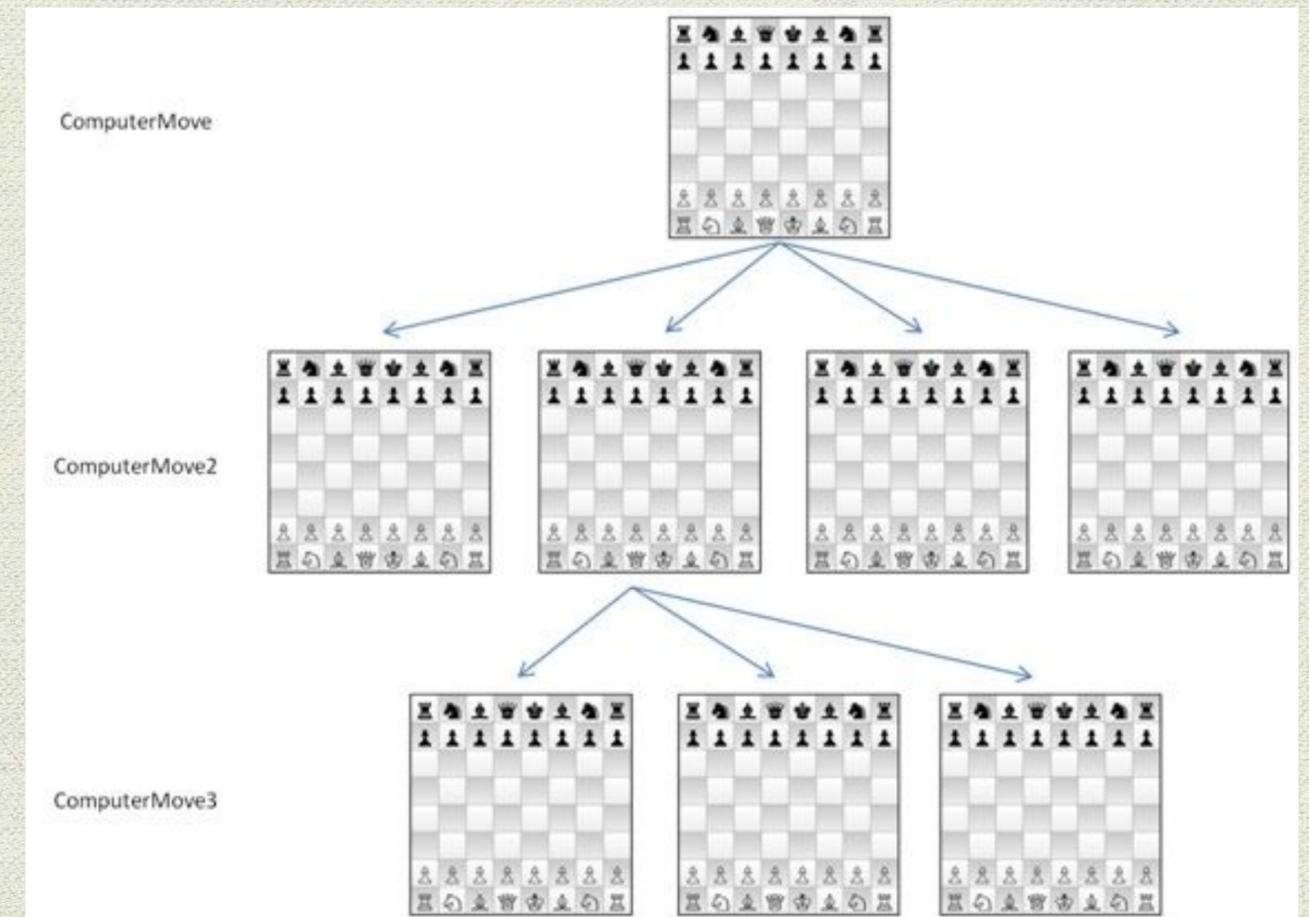
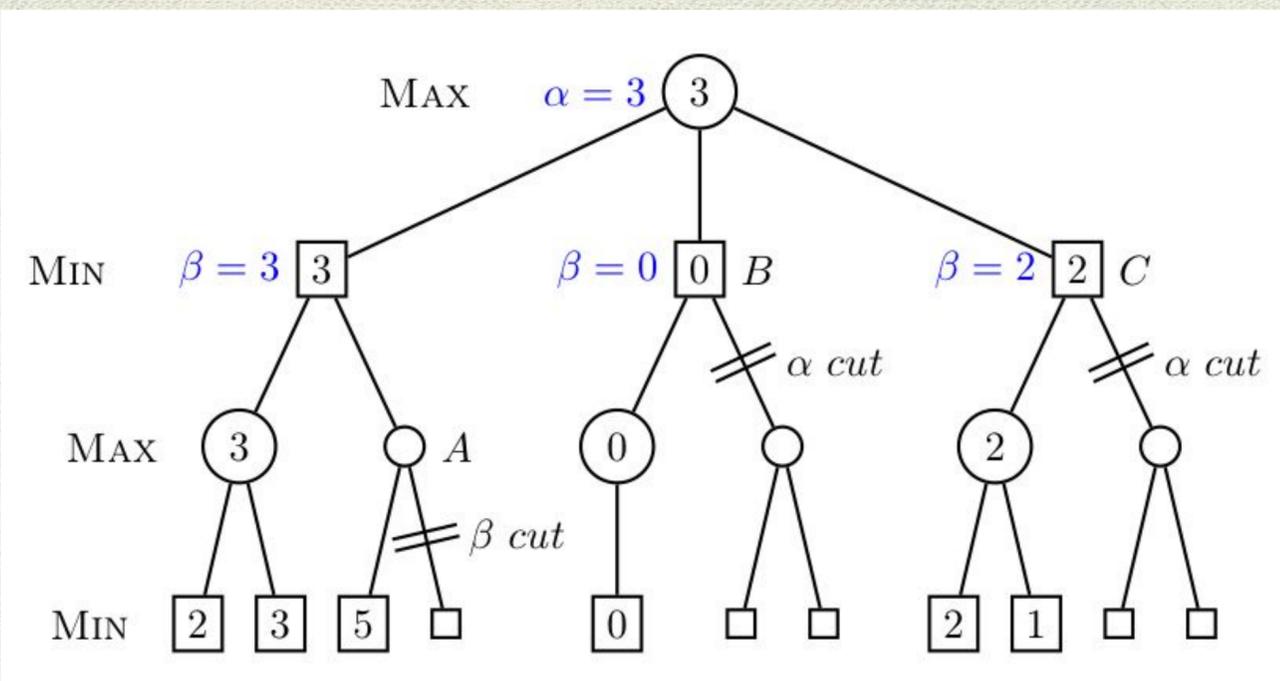
# Introduction

- IBM's Deep Blue - Chess. Won to the world champion Garry Kasparov
- AlphaGo - Go. Won to the world champion Lee Sedol



# Deep Blue

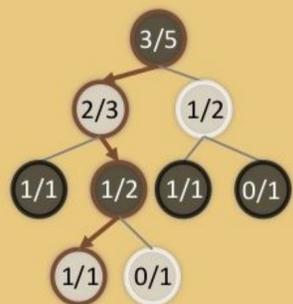
- Model - Search Tree
- Evaluation function - (Chess mate position best value)
- Algorithm - MiniMax
- Optimizations - Alpha-Beta pruning



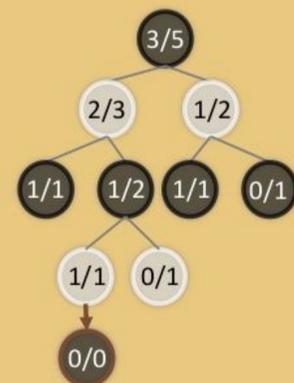
# Deep Blue

- Monte Carlo Search Tree
- Spread the tree until reach a win/loss/draw position.
- Backpropagation with best movements weights.
- ML techniques and Convolutional Neural Networks

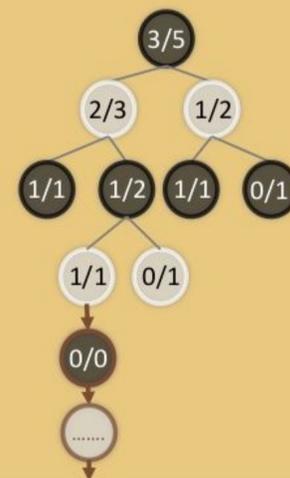
Selection



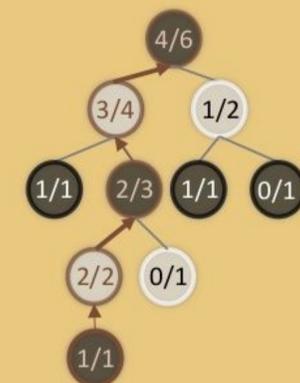
Expansion



Simulation



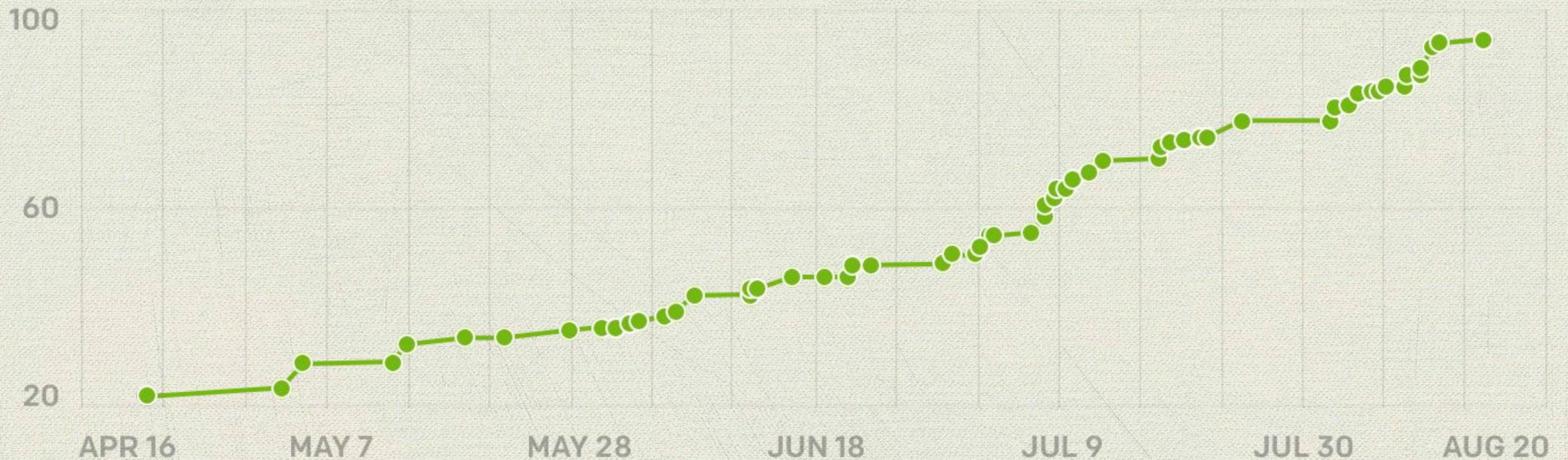
Back-Propagation



# OpenAI Five

- It is a AI compose by five neural networks.
- Reinforcement Learning
- Plays against itself what would take 180 of games to a human per day.
- Each NN represents a hero represented by LSTM Network (Long-Short Term Memory) .
- No human data.
- Learns recognizable strategies.
- From far below human performance to superhuman performance.

# OpenAI Five evolution



True skill rating through the time, Microsoft matchmaking ranking.

# OpenAI Five rules

- Observations. The bot can observe same features that human can do.
- Operations. The amount of movements of characters is limited.
- Feedback. The bot receives incentives for winning and basic metrics like health and last hits.

# Conclusion

- Big gap between years
- Software and hardware performance
- Superhuman performance on single task performance

# References

- OpenAI reinforcement videos: <https://sites.google.com/view/multi-agent-competition>
- Multiagent competition code: <https://github.com/openai/multiagent-competition>
- Dota2 new:  
[https://www-theverge-com.cdn.ampproject.org/v/s/www.theverge.com/platform/amp/2018/8/23/17772376/openai-dota-2-pain-game-human-victory-ai?amp\\_js\\_v=0.1#amp\\_tf=From%20%251%24s&ampshare=https%3A%2F%2Fwww.theverge.com%2F2018%2F8%2F23%2F17772376%2Fopenai-dota-2-pain-game-human-victory-ai](https://www-theverge-com.cdn.ampproject.org/v/s/www.theverge.com/platform/amp/2018/8/23/17772376/openai-dota-2-pain-game-human-victory-ai?amp_js_v=0.1#amp_tf=From%20%251%24s&ampshare=https%3A%2F%2Fwww.theverge.com%2F2018%2F8%2F23%2F17772376%2Fopenai-dota-2-pain-game-human-victory-ai)
- OpenAI - More on Dota 2: <https://blog.openai.com/more-on-dota-2/>
- OpenAI Five: <https://blog.openai.com/openai-five/>
- Proximal Policy Optimization: <https://blog.openai.com/openai-baselines-ppo/>
- Understanding LSTM Network: <http://colah.github.io/posts/2015-08-Understanding-LSTMs/#lstm-networks>
- AlphaGo: <https://deepmind.com/research/alphago/>
- Reinforcement Learning:  
<https://aithority.com/gaming/reinforcement-learning-really-works-for-ai-against-pro-gamers-openai-trailblazer-says/>

# Questions

