

# Mastering the game of Go with deep neural networks and tree search (Cons)

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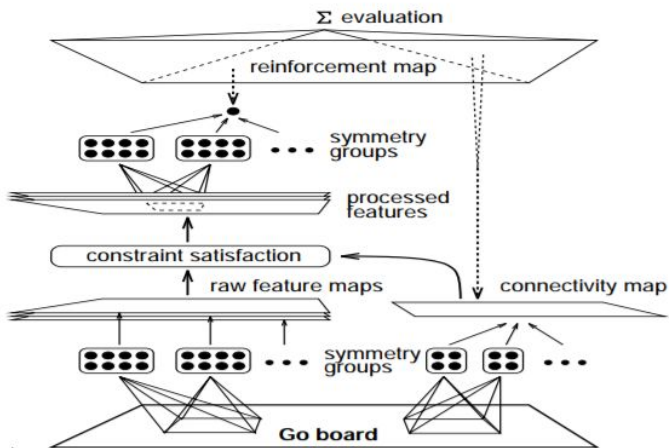
Gabriel Aptekar

# Argument Summary

- Similar work has been done, just not at this scale
- A number of complex features are used in the architecture
- It lost a match to Lee Sedol

# Combination of Old Methods

- Fuego—An Open-Source Framework for Board Games and Go Engine Based on Monte Carlo Tree Search
- Mimicking Go experts with convolutional neural networks.
- Temporal difference learning of position evaluation in the game of Go



# A Feat of Engineering

Monte Carlo Tree Search with rollout

Evaluated on 1202 CPUs and 176 GPUs

8 days of training on 50 GPUs



Google Cloud

# Why Human knowledge?

Already can train for self play

Human knowledge limits complexity

Forces hand crafted features



# Lots of Hand Crafted Features

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## Feature

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Stone colour

Ones

Turns since

Liberties

Capture size

Self-atari size

Liberties after move

Ladder capture

Ladder escape

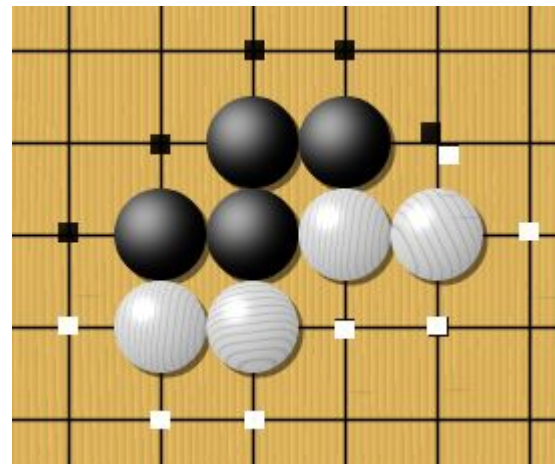
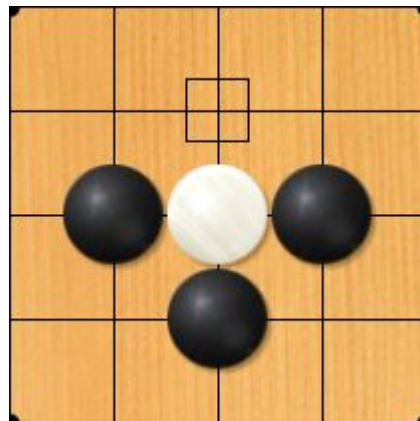
Sensibleness

Zeros

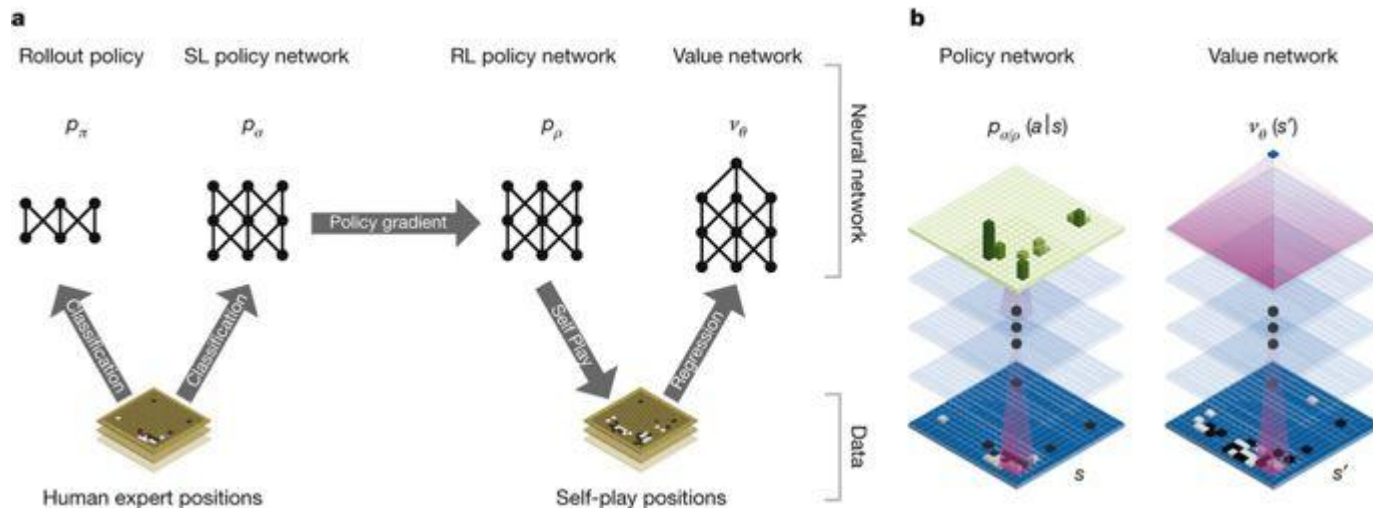
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Player color

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# Separate Policy and Value Networks



# Imbalanced Engine Comparison

Computer Player	CPUs	GPUs
Distributed AlphaGo	1202	176
AlphaGo	48	8
CrazyStone	32	–
Zen	8	–
Pachi	16	–
Fuego	16	–
GnuGo	1	–

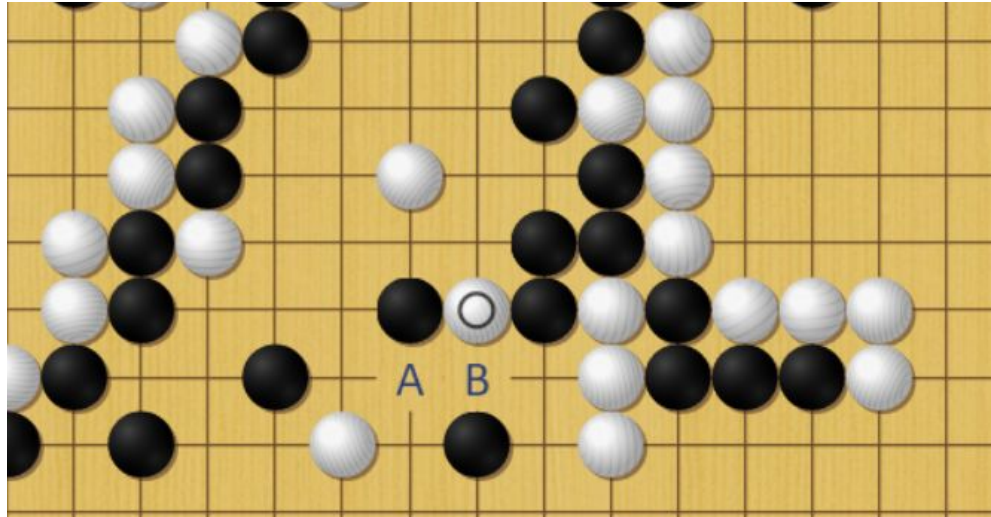


# Bad Comparison

"During the match against Fan Hui, AlphaGo evaluated thousands of times fewer positions than Deep Blue did in its chess match against Kasparov"

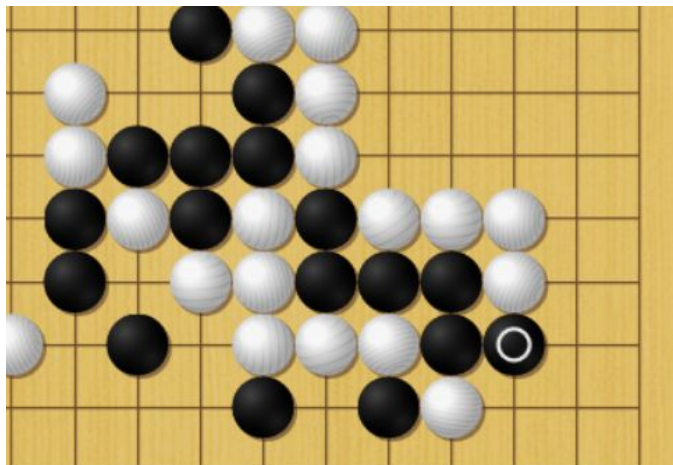


# Pruning is a Heuristic



# Pruning is a Heuristic

"Even now, we still do not know why AlphaGo lost its mind, playing senseless blunders one after another. Only one thing is certain: the original cause was the wedge at A, Lee Sedol's mystical 'divine move.' "



Thank You