Is AlphaGo intelligent like human?

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What is AlphaGo?

A program

developed by Google's Artificial Intelligence team called DeepMind

Topic

in general
Is Artificial Intelligence intelligent?

in particular
AlphaGo plays Go really like human?

A Go match was held in March 2016

AlphaGo

vs.

Lee Se-dol
South Korean Go master
18-time world Go champion

Result

AlphaGo won by four games to one

| 9 March | 10 March | 11 March | 12 March | 15 March |
| AlphaGo | AlphaGo | AlphaGo | Lee | AlphaGo |

New York Times
(9 March 2016)

Mr. Lee acknowledged defeat after 3 hours of play,

saying
at a news conference in Seoul.

I am very surprised because I have never thought I would lose.

I thought I would win 5-0.

I didn't know that AlphaGo would play such a perfect Go.

**Further sensational comments
in New York Times
on 9 March 2016**

**The match was viewed as a landmark for AI research
to come in its quest
to create machines smarter than humans.
(John Markoff)**

**It is demonstrating for the first time that machine can
truly learn and think in a human way.
(Howard Yu)**

It might be compared with the match Kasparov vs. IBM's DeepBlue in1997

DeepBlue Beat Kasparov

1996:	DeepBlue	Kasparov	even	even	Kasparov	Kasparov
1997:	Kasparov	DeepBlue	even	even	even	DeepBlue

So

**A long time human dream to create
a robot who plays chess**

had seemed to come true?

Turk
A legendary chess automaton in 18th century.
Wolfgang von Kempelen created it and
claimed it plays chess
like human.

Maria Theresa was impressed.
Napoleon played with this.
(1770)

**The secret had been perfectly kept
for more than 100 years.
It was not until Dr. Silas Mitchell fully revealed the secret in the
book
"The Last of a Veteran Chess Player" (1857)**

No one had claimed it was by human!

**A history of
man-versus-machine competitions
of board games
as a benchmark of Artificial Intelligence.**

In the late 50's, Newell, Shaw, and Simon developed the chess program.

Dreyfus (1960)
It was beaten by 10-year-old novice in 35 movements!
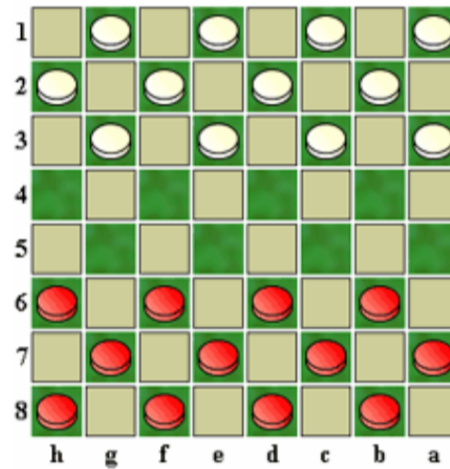**(Why it could be called intelligence?)**

Further
What they are doing is climbing a tree with an intention of reaching to the Moon!

Papert
A 10-year-old can beat the machine
but the machine beat Dreyfus!

(He is less intelligent than even the machine!
Let's neglect his opinion!)

In 1962, Samuel's checker-playing program defeated
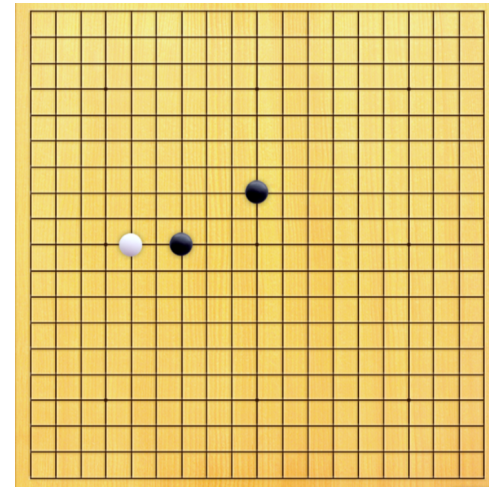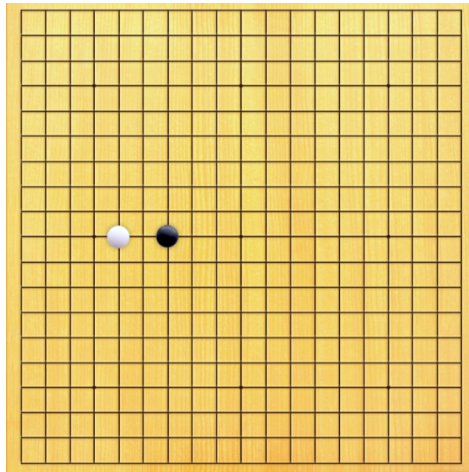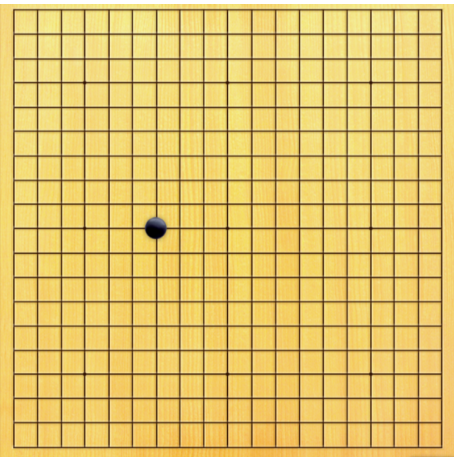# a self-proclaimed master player!

Checker and Chess were already solved!
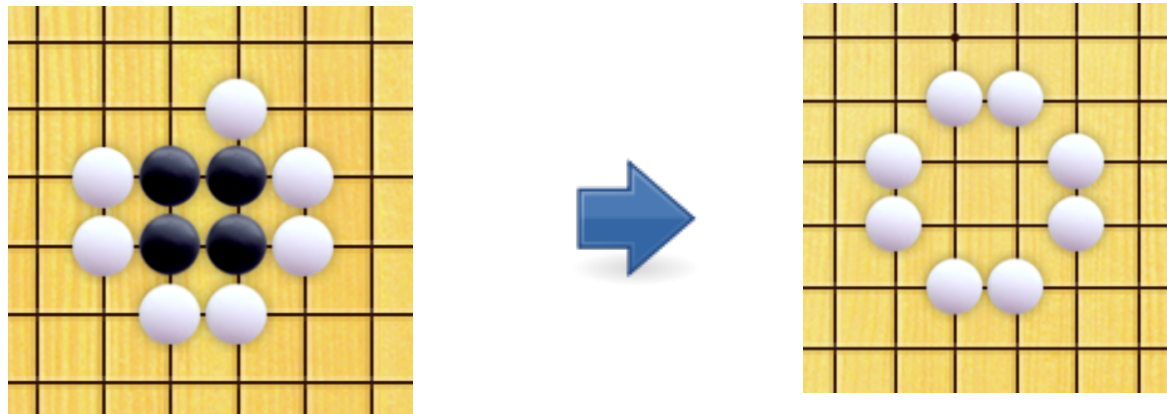
Then what about Go?

How we play Go?

Two players,
one with black stones while the other with white stones
take turns
placing their stones
on a 19x19 grid

Rules

**Stone can be put any point if it's empty.
(How about chess?)**

**When stones are surrounded on all four sides by those of the opponent, they are removed from the board.**

The player with more surrounded territory at the end wins.

With such a very simple rule
we could, even just now, try to play Go
without bothering to learn its rule.

We want a complexity measure of a game for comparison.

**The state space complexity
is
the number of legal positions
that can be reached from the initial position.**
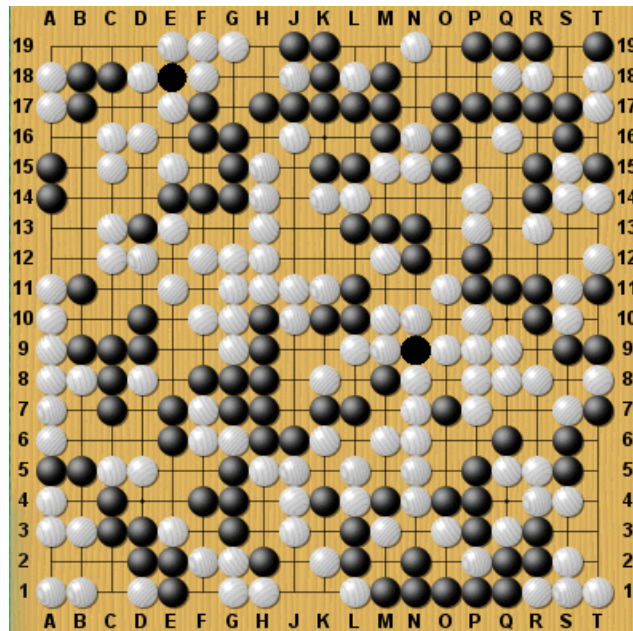

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0 0 0 0 2 2 2 0 1 1 0 0 2 0 1 1 1 0 1
2 1 1 2 1 2 0 0 2 1 2 1 0 0 0 2 2 0 2
2 1 0 0 2 1 0 1 1 1 1 1 0 1 1 1 1 1 2
0 0 2 2 0 1 1 0 2 0 0 1 2 1 0 2 0 1 0
1 0 2 0 2 0 1 2 0 1 1 2 2 1 0 0 1 2 1
1 0 0 0 1 1 1 2 0 2 2 0 0 0 2 0 1 2 2
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2 1 0 0 2 0 2 2 2 2 1 0 0 2 1 1 1 2 1
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2 2 0 2 1 0 2 2 0 0 2 1 1 1 1 1 2 2 2
```

The first possible position where stone can be put is 19 x 19

What about chess?

The state complexity

Go

$$3^{19 \times 19} \sim 2.9 \times 10^{170}$$

while

Checker 10^{20}

Chess $10^{43} - 10^{50}$

That's why
checker and chess have been able to
be solved!

And as such

DeepBlue was able to choose
one of the best next moves which will lead to a victory
by evaluating ALL the possible following paths.

That is,
Deep Blue won by using
a brute force.

The DeepBlue might have appealed
computer became better than humans at chess.

But so what?
A machine could run faster than humans,

which wouldn't surprize us!

Human could play Go not that very well
but
intelligently.

A brute force would not be possible with Go!

$$3^{19 \times 19} \sim 2.9 \times 10^{170}$$

**more than the total number of atoms
in the entire universe.**

far bigger number than astronomical!

Instead

AlphaGo's decision in each step is by a neural network which has learned through tens of millions of past Go matches.

As such
Even developers cannot explain its each movement.

The developers said,
"Although we have programmed this machine to play,
we have no idea what moves it will come up with.

Its moves are an EMMERGENT phenomenon from the training."

This reminds us of

Polanyi's paradox
"We know more than we can tell."

One of the requirements to be a human-like intelligence.

AlphaGo
seems to fulfill this feature of human intelligence!

The seemingly requirements for human intelligence

other than
Polanyi's Paradox
"It should know more than it can tell."

It should be spontaneous!

It might make mistakes from time to time!

It should be flexible!

It should be emotional!

etc.

Human Intelligence should be spontaneous!

Intelligence avoids a similar behavior!

E.g. "I beg your pardon?"

**Intelligent people try a different explanation
for an easier understanding**

**while
others just repeat the same expression, maybe louder.**

Then
Is AlphaGo spontaneous?

Lee said
*"Its style was different, and it was such an unusual experience
that it took time for me to adjust."*

*"I lost the match after
AlphaGo made so unexpected and unconventional
that I thought it was impossible to make such a move."*

"It DIDN'T play Go as a human does."

So far so good!

Human intelligence is even erroneous sometimes.

Frosini
constant presence of inconsistencies
in our thoughts is
the necessary companion of intelligence

Turing's suggestion
that
machine's deliberate mistakes
are encouraged in order for the machine
to pass the Turing test

**Then
does AlphaGo make a mistake from time to time?**

**Kim Sung-ryong, another Go master in South Korea
said
"AlphaGo made a clear mistake early on**

**while
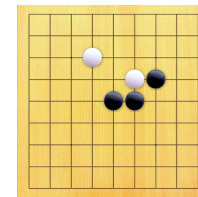unlike most human players, it did not loose its cool."**
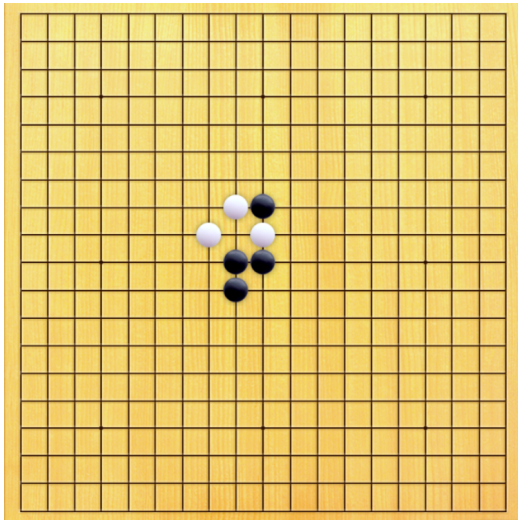
Still good!

Intelligent human is flexible!

**Intelligent human tend to
make an action even in a similar situation!**

**E.g.
Imagine go for a walk every morning!**

Then
is AlphaGo flexible?

Could AlphaGo play Go on, say, 9x9 board under the same rule?

Maybe not
while human could!

Human Intelligence should be emotional!

Maureen Dowd
(Pulitzer Prize-winning journalist)

wrote

"When I say about human levels, I'm talking about
emotional intelligence,
the ability
to tell a joke, to be funny, to be romantic, to be loving,
to be sexy,
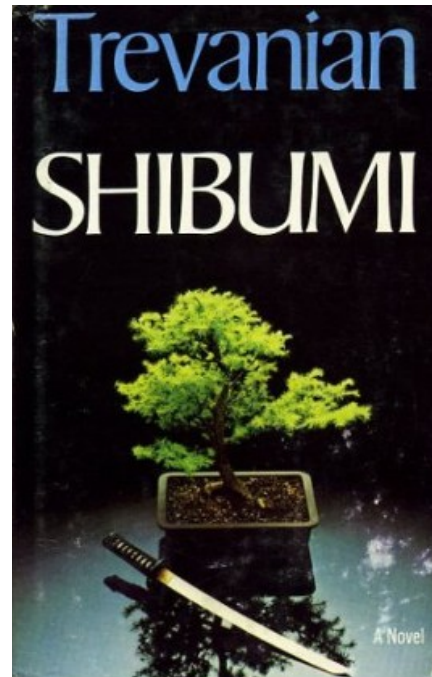*is the cutting edge of human intelligence."*

(Editorial in NYT on 09 July 2014)

Then
could AlphaGo understand its beauty of the game?

Lee said
It will never understand the beauty of the game
in the same way that
we intelligent humans do.

Is Go beautiful?

**To know the beauty of Go
Shibumi (1979) by Trevanian would be encouraged.**

**A spy called Nikolai had learned Go, and
became admiring its beauty!**

In conclusion

**Google's AI team has done an excellent job
towards
creating a real human like artificial intelligence**

**but
still far away to be really human like!
from the level that NYT wrote**

Further research is still awaiting us!

Thanks