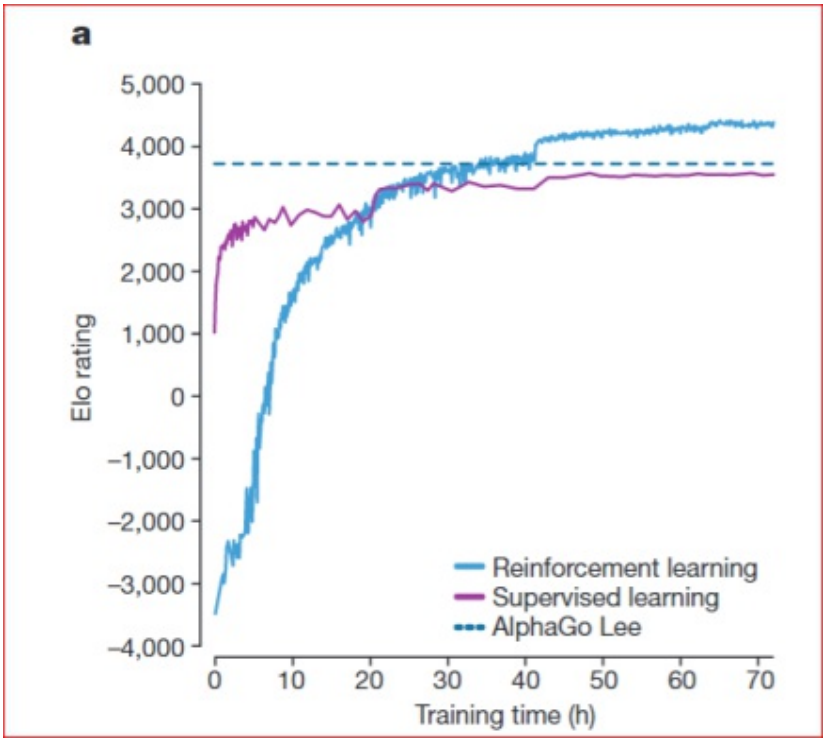
Game Over for Humans?

An algorithm that learns, tabula rasa, superhuman proficiency in challenging domains.

JAMES THOMPSON • NOVEMBER 20, 2017 • 1,500 WORDS • 79 COMMENTS • REPLY



It is usual to distinguish between biological and machine intelligence, and for good reason: organisms have interacted with the world for millennia and survived, machines are a recent human construction, and until recently there was no reason to consider them capable of intelligent behaviour.

Computers changed the picture somewhat, but until very recently artificial intelligence has been tried, and proved disappointing. As computers and programs increased in power and speed a defensive trope developed: a computer will never write a poem/enjoy strawberries/understand the wonder of the universe/play chess/have an original thought.

When IBM's Deep Blue beat Kasparov there was a moment of silence. The best that could be proffered as an excuse was that chess was an artificial world in which reality was bounded, and subject to rules. At this point, from a game playing point of view, Go with its far greater complexity seemed an avenue of salvation for human pride. When AlphaGo beat Lee Seedol at Go, humans ran out of excuses. Not all of them. Some were able to retaliate: it's only a game: real problems are more fuzzy than that.

Perhaps. Here is the paper. For those interested in the sex ratio in forefront of technology, there are 17 authors, and I previously assumed that one was a woman, but no, all 17 are men.

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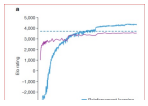

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AlphaGo used supervised learning. It had some very clever teachers to help it along the way. AlphaGo Zero reinforced itself.

> By contrast, reinforcement learning systems are trained from their own experience, in principle allowing them to exceed human capabilities, and to operate in domains where human expertise is lacking.
>
> AlphaGo Fan used two deep neural networks: a policy network that outputs move probabilities and a value network that outputs a position evaluation. The policy network was trained initially by supervised learning to accurately predict human expert moves, and was subsequently refined by policygradient reinforcement learning. The value network was trained to predict the winner of games played by the policy network against itself. Once trained, these networks were combined with a Monte Carlo tree search to provide a lookahead search, using the policy network to narrow down the search to high probability moves, and using the value network (in conjunction with Monte Carlo rollouts using a fast rollout policy) to evaluate positions in the tree.
>
> Our program, AlphaGo Zero, differs from AlphaGo Fan and AlphaGo Lee12 in several important aspects. First and foremost, it is trained solely by selfplay reinforcement learning, starting from random play, without any supervision or use of human data. Second, it uses only the black and white stones from the board as input features. Third, it uses a single neural network, rather than separate policy and value networks. Finally, it uses a simpler tree search that relies upon this single neural network to evaluate positions and sample moves, without performing any Monte Carlo rollouts. To achieve these results, we introduce a new reinforcement learning algorithm that incorporates lookahead search inside the training loop, resulting in rapid improvement and precise and stable learning. Further technical differences in the search algorithm, training procedure and network architecture are described in Methods.

How shall I describe the new approach? I can only say that it appears to be a highly stripped down version of what had formerly (in AlphaGo Fan and AlphaGo Lee) seemed a logical division of computational and strategic labour. It cuts corners in an intelligent way, and always looks for the best way forwards, often accepting the upper confidence limit in a calculation. While training itself it also develops the capacity to look ahead at future moves. If you could glance back at my explanation of what was going on in those two programs, the jump forwards for AlphaGo Zero will make more sense.

http://www.unz.com/jthompson/artificial-general-intelligence-von

> Training started from completely random behaviour and continued without human intervention for approximately three days. Over the course of training, 4.9 million games of selfplay were generated, using 1,600 simulations for each MCTS, which corresponds to approximately 0.4 s thinking time per move.

Well, forget the three days that get all the headlines. This tabula rasa, self-teaching, deep learning, network played 4.9 million games. This is an effort of Gladwellian proportions. I take back anything nasty I may have said about practice makes perfect.

More realistically, few players complete each move in 0.4 secs and can spend a lifetime on a game, amassing 4.9 million contests. Once recalls Byron's lament:

> When one subtracts from life infancy (which is vegetation), sleep, eating and swilling, buttoning and unbuttoning – how much remains of

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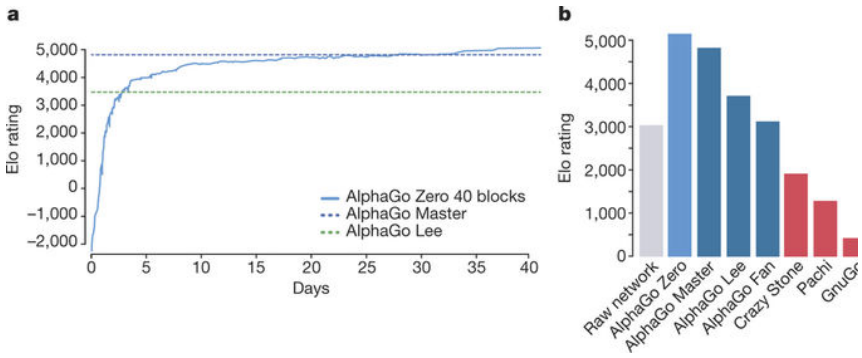
downright existence? The summer of a dormouse.

The authors continue:

> AlphaGo Zero discovered a remarkable level of Go knowledge during its selfplay training process. This included not only fundamental elements of human Go knowledge, but also nonstandard strategies beyond the scope of traditional Go knowledge.
>
> AlphaGo Zero rapidly progressed from entirely random moves towards a sophisticated understanding of Go concepts, including fuseki (opening), tesuji(tactics), lifeanddeath, ko (repeated board situations), yose (endgame), capturing races, sente (initiative), shape, influence and territory, all discovered from first principles. Surprisingly, shicho ('ladder' capture sequences that may span the whole board)—one of the first elements of Go knowledge learned by humans—were only understood by AlphaGo Zero much later in training.

Here is their website explanations about AlphaGo Zero

https://deepmind.com/blog/alphago-zero-learning-scratch/



The figures show how quickly Zero surpassed the previous benchmarks, and how it rates in Elo rankings against other players.

The team concludes:

> Our results comprehensively demonstrate that a pure reinforcement learning approach is fully feasible, even in the most challenging of domains: it is possible to train to superhuman level, without human examples or guidance, given no knowledge of the domain beyond basic rules. Furthermore, a pure reinforcement learning approach requires just a few more hours to train, and achieves much better asymptotic performance, compared to training on human expert data. Using this approach, AlphaGo Zero defeated the strongest previous versions of AlphaGo, which were trained from human data using handcrafted features, by a large margin. Humankind has accumulated Go knowledge from millions of games played over thousands of years, collectively distilled into patterns, proverbs and books. In the space of a few days, starting tabula rasa, AlphaGo Zero was able to rediscover much of this Go knowledge, as well as novel strategies that provide new insights into the oldest of games.

This is an extraordinary achievement. They have succeeded because they have already understood how to build deep learning networks. This is the key advance, one which is extremely complicated to understand and describe, but on which much can be built. As in the human case, studied in 1897 at the dawn of empirical psychology by Bryan and

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Harter, in their psychological studies of the emerging technology of telegraphy, they have learned what to leave out. That is the joy of competence. Once telegraph operators understood the overall meaning of a message, the details of the Morse codes of individual letters could almost be ignored. Key presses give way to a higher grammar, with a commensurate increase in speed and power of communication. We leap forward by knowing what to skip. In their inspired simplification, this team have taken us a very big step forwards. Interestingly, the better the program, the lower the power consumption. Bright solutions require less raw brain power.

Is it "game over" for humans? Not entirely. Human players will learn from superhumans, and lift their game. It may lead to a virtuous circle, among those willing to learn. However, I think that humans may come to rely on superhumans as the testers of human ideas, and the detectors of large patterns in small things. It may be a historical inflection point. The National Health Service has already opened up its data stores to Deep Mind teams to evaluate treatment outcomes in cancer. Many other areas are being studied by artificial intelligence applications.

https://futurism.com/ai-assisted-detection-identifies-colon-cancer-automatically-and-in-real-time/e

When I read their final conclusion, I feel both excitement and a sense of awe, as much as for the insights of the past masters as for the triumph of the new iconoclasts of the game universe. The past masters could not adequately model the future consequences of their insights. Only now have the computing tools become available, though they were long anticipated. The authors are right to say, within their defined domains, that all this was achieved "in the space of a few day, starting tabula rasa" but they would be the first to say, after Babbage, Turing, Shockley and all, that they stood on the shoulders of giants, and then erected new ladders to reach above humankind itself.

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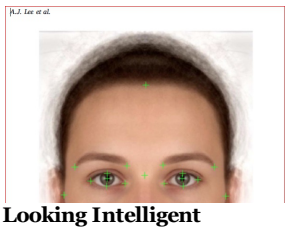

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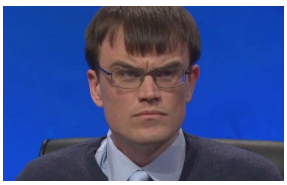

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1. **another fred** says:
November 20, 2017 at 3:31 pm GMT

I don't doubt that machines will out compete humans in logic, but it is affect (the

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emotional aspect) that differentiates man and machine.

If anyone ever programs a replicating machine with drives for dominance and anger we are toast. Dominance and anger might be SEEKING and RAGE in the Panksepp universe.

• **Replies:** @Pat Boyle, @Anonymous

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2. **Talha** says:
November 20, 2017 at 4:13 pm GMT

> Is it "game over" for humans? Not entirely. Human players will learn from superhumans, and lift their game.

The age of mentats is upon us.

Peace.

• **Replies:** @Delinquent Snail, @Joe Wong, @Che Guava

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3. **JayMan** says: • **Website**
November 20, 2017 at 5:00 pm GMT

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4. **Pat Boyle** says:
November 20, 2017 at 7:25 pm GMT • 100 Words
@another fred

This is the James T. Kirk defense. A large proportion of the plots in the original Star Trek series involved the humans (led by Kirk) triumphing over some alien intelligence or machine intelligence because they – the humans – had human instincts . Irrational and emotional people always bested those with better brains (e.g. Vulcans) because they had these unpredictable emotional response.

This plotline became tiresome after a while.

Your iPhone will soon help you on your European vacation because it will understand French or German or whatever. It is a short step from your phone keeping your appointment calendar to approving and authorizing your calendar. Most people will welcome having a reliable device taking over some of their responsibilities.

It won't be like in "The Terminator". Machine take over will be gentle and welcomed.

• **Agree:** Daniel Chieh

• **Replies:** @reiner Tor, @Joe Wong, @helena, @Jim Bob Lassiter

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5. **res** says:
November 20, 2017 at 7:34 pm GMT • 100 Words

I am intrigued by the two near step function increases about 5 days apart near the end of panel a in your second graphic. How many of those remain if the training is extended? The steps make an interesting analog to punctuated equilibrium in evolution. Though I think that is more often due to environmental changes than "random" improvement.

To contrast, the behavior through day 30 looks roughly like pure asymptotic behavior which is what I would have expected.

There has been some discussion in Steve Hsu's blog about the ability to escape local maxima and I think this behavior is evidence that AlphaGo possesses that ability.

• **Replies:** @Factorize

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6. **Factorize** says:
November 20, 2017 at 8:06 pm GMT • 100 Words
@res

I find it is interesting that the end of the near vertical phase of AlphaGo Zero's learning phase is exactly at the maximal human performance. Almost seems like a new deep thought process begins at this point which humans were unable to access. It is still impressive that humans were able to play such an infinitely deep game as Go near the top of AlphaGo Zero's demonstrated ability level.

• **Replies:** @Abelard Lindsey

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7. **D. K.** says:
November 20, 2017 at 8:35 pm GMT

When I unplug the computer on which it is running, will AlphaGo be able to plug it back into the electrical socket?

• **Replies:** @Realist, @Anatoly Karlin, @HdC, @mark p miller, @Joe Wong

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8. **dearieme** says:
November 20, 2017 at 9:23 pm GMT

You've answered your own question, doc. When will one of these gizmos give us something as interesting as Byron's lament?

• **Replies:** @James Thompson

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9. **jorge videla (BGI volunteer)** says:
November 20, 2017 at 11:21 pm GMT • 400 Words

let me explain. i tend to be too elliptical.

1. it follows from the "many genes of small effect" theory that CRISPR could be used on embryos with the result of super-human performance. professor shoe is fond of claiming that IQ and personality are like height. height does appear to conform to the theory. yet great height is associated with short life.

2. shoe is also fond of the chicken example. from the ordinary to the shaq chicken over the last 75 years. he loves that picture. well size is not like IQ or like speed. the triple crown races are run every year. race horses are bred. they are bred by rich people. they are bred by people with millions to lose. they are bred by very motivated people. the stud fees. the horse is fertile at age 2.

yet it's been 44 triple crown races since 1973 and the record in all three is the same horse. secretariat is also the tallest and the heaviest winner of any single triple crown race. it should've been easy to breed a taller and heavier horse. his record in the last leg, the belmont, is something even more unbelievable. announcers are prone to hyperbole, but in this case the announcer may have been right. "almost unbelievable…a record which may stand…forever."

3. joe dimaggio's 56 game hitting streak, as gould noted, is still freakish. until the mid 70s sports other than baseball were sideshows in the US. so the talent pool for major league baseball has shrunk in the US at the same time it has expanded in latin america, japan, s korea, etc. maybe it's a wash. or maybe the players today are better on average as gould claimed. yet none has come close to dimaggio's record. the 56 games may thus be another example, like secretariat, of how the "many genes of small effect" model is NOT linear outside the populations on which it is fit.

4. the same may even be true of spritning performance. because the track surface has changed so much, it is likely that charlie paddock, the california cannonball, was as fast as bolt. believe it or not.

https://theolympians64to20.files.wordpress.com/2015/11/charley-paddock.jpg?w=940

https://www.youtube.com/v/9C1BCAgu2I8&feature=player_embedded?start=190

- **Agree:** RaceRealist88
- **Replies:** @jorge videla (BGI volunteer)

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10. **Abelard Lindsey** says:
November 20, 2017 at 11:34 pm GMT • 100 Words
@Factorize

This is interesting because machine vision based on deep learning also exceed human performance, but not by much. If a human scores 100, the deep learning system scores around 110-115. This suggests that the way machine vision recognition and learning in general works is likely similar to how our brains work.

- **Replies:** @Factorize

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11. **TG** says:
November 20, 2017 at 11:46 pm GMT • 100 Words

Indeed. But a couple of other thoughts.

1. The human brain only consumes about 20 watts of energy. However, Alpha Go used ONE MEGAWATT (1,000,000 watts). So for every evil robot computer, we can have 50,000 human minds arrayed against it!

2. Alpha Go was impressive, but the machine did not realize that it was playing go. It still does not have 'grounding,' i.e. common sense.

Admittedly, that's just for now…

- **Replies:** @Talha, @Anatoly Karlin, @Bard of Bumperstickers

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12. **jorge videla (BGI volunteer)** says:
November 21, 2017 at 12:15 am GMT • 100 Words

the problems with these examples are:

1. thoroughbred race horses are and have been absurdly homogeneous even in comparison to humans in genetic terms. there simply hasn't been much variation to work with.

2. the expansion of the population for selection (for MLB) should find someone better than dimaggio, but should not find the level of freak that CRISPR could produce *theoretically*.

3. it's SAD! when canadian sprinter andre degrasse was tested on the same track owens and armin hary had run on, he was SLOWER. A LOT SLOWER. it's the hardest to believe yet the most likely.

charlie paddock, armin hary, and maybe even borzov were as fast as bolt.

borzov is or was THE great example of nurture over nature promoted by the soviets.

his 200m best is still very good. in most elite meets it will not be bested.

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13. **Talha** says:
November 21, 2017 at 12:19 am GMT
@TG

Hopefully it can learn the lesson when no one wins:

Peace.

• **Replies:** @Hank Rearden

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14. **jorge videla (BGI volunteer)** says:
November 21, 2017 at 12:26 am GMT

i can't resist.

https://www.youtube.com/watch?v=C1KuKlABmok

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15. **Anon** says: • **Disclaimer**
November 21, 2017 at 12:36 am GMT

What is this?

Algorithm and Blues?

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16. **Factorize** says:
November 21, 2017 at 1:30 am GMT • 100 Words
@Abelard Lindsey

My thinking was that the first part of the near vertical increase in performance represents a phase which both humans and Alpha Go Zero can master. Yet, the second part (the non- vertical part) in which only Alpha Go Zero advanced required a large amount of deep thought and no input from human experts. With Alpha Go human masters gave input that probably constrained the program from seeing things that no one had seen before. Alpha Go Zero took only 3 days to advance through the first part and then 30 days to gradually improve in the second stage.

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17. **Lucho** says:
November 21, 2017 at 1:52 am GMT • 100 Words

As always, good stuff, quite a bit of food for thought. I have a question though, wrapped in a hypothetical scenario:

An important detail in learning- at least for us meatsacks – is, for lack of a better term, the group factor. Sometimes we can learn more from others than we ever could alone. Think about study groups in school, martial arts lessons, teacher-assigned workgroups, etc.

What if you “educated” AlphaGo / AlphaGo Zero like humans: create 10 copies of the program and then use supervised learning on all of them. Then set them against each other using reinforced learning (think about when the teacher divided the class into groups for a specific task/project).

How do you think this would influence the learning?

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18. **Delinquent Snail** says:
November 21, 2017 at 2:21 am GMT
@Talha

Better then an age of buffout……

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

19. **Realist** says:
November 21, 2017 at 9:20 am GMT
@D. K.

Yes, eventually.

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

20. **James Thompson** says: • **Website**
November 21, 2017 at 10:43 am GMT
@dearieme

Unlikely, I agree, but they will be able to fake it soon enough, given the whole corpus of his work as the seed.

• **Replies:** @dearieme

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

21. **dearieme** says:
November 21, 2017 at 1:48 pm GMT
@James Thompson

“they will be able to fake it soon enough”: oh dear, they can look forward to a career in politics – and without accusations of being too free with their hands.

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

22. **Jag** says:
November 21, 2017 at 4:39 pm GMT

So when will an AI create its own purpose? Its own objectives? Why would it even want to do anything?

• **Replies:** @Alfa158

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

23. **Brodda** says:
November 21, 2017 at 5:21 pm GMT

Karen Simonyan is not a woman.

• **Replies:** @James Thompson

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

24. **Anatoly Karlin** says: • **Website**
November 21, 2017 at 5:33 pm GMT
@D. K.

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

25. **Anatoly Karlin** says: • **Website**
November 21, 2017 at 5:37 pm GMT
@TG

1. Energy required to sustain all those human brains (food, transport, accomodation, entertainment, etc.) is far larger than 20 watts per brain.

2. Even 50,000 (or 5 billion) human minds won't be able to match it, so far as a game of go is concerned, so the point is moot anyway.

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

26. **Sean** says:
November 21, 2017 at 7:33 pm GMT • 200 Words

> http://www.sciencemag.org/news/2017/03/artificial-intelligence-goes-deep-beat-humans-poker
>
> Chess and Go have one important thing in common that let AIs beat them first: They're perfect information games. That means both sides know exactly what the other is working with—a huge assist when designing an AI player. Texas Hold 'em is a different animal. In this version of poker, two or more players are randomly dealt two face-down cards. At the introduction of each new set of public cards, players are asked to bet, hold, or abandon the money at stake on the table. Because of the random nature of the game and two initial private cards, players' bets are **predicated on guessing what their opponent might do**. Unlike chess, where a winning strategy can be deduced from the state of the board and all the opponent's potential moves, Hold 'em requires what we commonly call intuition

If one dimensional dumb AI can do the aforementioned strategising, an AI that got to human level general intelligence would surely be able to work out that it should 'hold its cards close to its chest'. That is, smart AI would from a standing start understand that it should not let humans understand how good it is (like a hustler).

Then we would soon be playing the Paperclip Game, and for the very highest of stakes.

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER

27. **jorge videla (BGI volunteer)** says:
November 21, 2017 at 9:26 pm GMT • 100 Words
@jorge videla (BGI volunteer)

the point of these examples is not that IQ and other traits can't be predicted using "many genes of small effect".

the point is that super-human performance is not in the offing.

the ceiling has been reached already.

another example: despite all the theory and despite the ascendancy of chess engines and

their use by human players and all the resources provided by the USSR…

the most accurate chess player is still the cuban capablanca.

as judged by computers.

so in terms of pure talent, capablanca is still the secretariat of chess. even though he won the world title in 1921. more remarkable because capablanca didn't study.

he was a freak.

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

28. **James Thompson** says: • **Website**
November 21, 2017 at 9:41 pm GMT
@Brodda

You are right. My first image search on the name misled me.

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

29. **bliss_porsena** says:
November 22, 2017 at 6:18 am GMT

All glowing tubes and blinking lights revert to tabula rasa when the grid goes down.

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER

30. **PandaAtWar** says:
November 22, 2017 at 6:22 am GMT • 600 Words

Several points from Panda:

1.

> …Byron's lament:
>
> When one subtracts from life infancy (which is vegetation), sleep, eating and swilling, buttoning and unbuttoning – how much remains of downright existence? The summer of a dormouse.

Right, yet based on many downright assumptions. As sciences progress, many currently seemingly a total "waste of time" and "inactivities"of brains may be proven wrong. e.g. brains really "sleep" while doing nothing constructive?

2. A key aspect of the ultimate process of man vs machines (e.g. masters vs alphaGo) is the competition of energies, hence it is an one-sided unfair game to even start with.

Machines theoritically can use unlimited energy(imagine how further it can go if plug AlphaGo into the world's #1 supercomputer in China?), and cost-free…

…whereas as a natural system human brain of a Go master commandd energies that are 1) limited, and 2) cost dearly

It's like putting a v12, or V-whatever-unlimited, engine hoursepower Ferrari and a 1.15 litre 60 hp Renault Twingo on a race track, a very fair comparison?

3. Machines such as AlphaGo, or any man-made machine, can not be truly called intelligent if you look from the angle of the rules of the system. Machine programming requires many rules and boundaries set by the human programmers as we all know. So from this angle, ultimately it will still be a comparablely dumb machine if it can not automatically ignore programming boundaries set by humans.

However, if, for whatever purposes, machines themselves eventually jumping beyond the pre-fixed programming boundaries becomes a fact (including self-seeking energy sources for survival – pretty hauting huh? but crucial!),

then 2 things happen: 1) machines can then be truly called intelligent (in the sense as intelligent humans) , and 2) being a comparablely redundent species humans will loss our evolutionary edge and cease to exist, or at best at mercy of these machines…

...this 2), on the other hand, seems to be a quite unique phenominon in its own right, and against nature by default, doesn't it? hence Panda doubts it could and will happen. Does nature have any precedence where one species deliberatedly set up another species to eliminate themsevels just for the purpose of , errr... self-entertainment? So it most likely won't happen. If that were the case, then for one reason or another, humans will not allow machines to make this decision in the first place by setting the boundaries, which by definition means that these machines will never achieve the human-like intelligence after all, won't they?

4. Take Go as an example, under its game rules, it largely tests memory (quantity , accuracy, etc) and calculations (logic, speed, etc). Of course humans gonna loss against AlphaGo eventually (if the programming are decently done), as we fought that out at the dawn of the first computer decades ago. Now here is the gist, if this win proves something intelligent, as people are all talking about, then prehaps we'll have to be forced to take a more serious look at the current contents of IQ test, because AlphaGo's win represents an obvious logical dilemma here:

Can a less intelligent (proved by IQ test, and Go) being such as humans design to make a more intelligent (proved by Go, and hence most likely IQ test) being such as AlphaGo? In other words, can ants design to make humans? If this is not a logical case, then current IQ test must have missed something, as Panda suspects long ago, something that won't affect too much the general of the IQ findings(becasue those finding are statistically significant) but still crucial, something that goes beyond the parts of both verbal IQ and spatial IQ!

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER

31. **jimbojones** says:
November 22, 2017 at 6:30 am GMT • 100 Words

"Deep Learning" is basically heavy duty mathematical optimization with many numerical and probabilistic tricks thrown in to speed things up. It works very well in the context of problems that submit to mathematical modeling. It is obviously possible to comprehensively model the game of Go and many other things; but it is not at all clear that critical aspects of human expression such as humor, artistic sense, problem solving ability and high-level decision-making are at all expressible mathematically in a comprehensive manner.

So while it appears inevitable that AI will eventually take over rote drudgery from us, it is not clear that it will ever be able to do much more. I look forward to the development of AI over my lifetime, I see much to gain and little to fear. It'll be a wild ride.

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER

32. **Peter Lund** says:
November 22, 2017 at 7:40 am GMT • 300 Words

For me, the really interesting part was that they don't do Monte Carlo tree search anymore!

That was the key enabler of much better chess and go programs a decade ago.

The problem MCTS solved was how to come up with a really good evaluation function for moves/positions. It works by simply playing many (many!) of the moves out and see what happens. If random move sequences that start with move A lead to a win more often than random move sequences that start with move B, then move A is likely to be better than A.

Since the search tree is so big, MCTS will only look at a tiny, tiny fraction of it. That makes it important to bias the sampling to look mostly at the more interesting parts. In order to do that, there is a move/position evaluator in all the previous MCTS programs. Those evaluators are very hard to program entirely by hand so they have a lot of variables in them that get tuned automatically by "learning", either through comparison with known high level play or through self play. Both are standard methods.

The original AlphaGO had a better evaluator than any previous Go program.

It now turns out that they can make the evaluator so good that they don't have to refine its output with MCTS.

That is really, really interesting.

Oh, and ladders were always special cased before. They don't fit well into the evaluator function otherwise. The remarkable thing here is not that a multi-level neural network took so long to learn about them but that it was able to learn about them at all.

https://en.wikipedia.org/wiki/Monte_Carlo_tree_search

• **Replies:** @Pericles

REPLY | AGREE/DISAGREE/ETC. | THIS COMMENTER | THIS THREAD | HIDE THREAD

33. **Anonymous** says: • **Disclaimer**
November 22, 2017 at 7:54 am GMT • 600 Words
@another fred

"Affect" and "Emotions" are a special device that we (humans and animals) need to work with one another and think quickly while chewing gum. It doesn't come from the "flexible top" but from the "hardwired bottom". These things are not hard to do, but very easy to do. You basically deprecate some possible ways of acting relative to others based on short-circuiting criteria, even if other ways would yield better results / be less dangerous / have higher payoff etc. The result may seem "illogical captain" to an outside observer. Very useful if you have to find solutions under hard time constraints / constraints of energy / constraints of memory and CPU. More on this in the late Marvin Minsky's "The Emotion Machine" (Wikipedia link). Maybe also take a look at Scott Aaronson's Why Philosophers Should Care About Computational Complexity.

What is hard to do is find integrated ways of intelligent reasoning for agents embedded in the real world. All this newfangled deep learning / neural network stuff is very nice but there isn't even a good theory about why it actually works (but see New Theory Cracks Open the Black Box of Deep Learning) and it has "interesting" failure modes (Can you get from 'dog' to 'car' with one pixel? Japanese AI boffins can: Fooling an image classifier is surprisingly easy and suggests novel attacks)

"General AI" this isn't, It needs to be integrated with many other tricks, including the Good Old-Fashioned AI (GOFAI) toolbox of symbolic processing to become powerful will have to be done at some point in time.

Here is a review about AI in IEEE Spectrum: Human-Level AI Is Right Around the Corner—or Hundreds of Years Away: Ray Kurzweil, Rodney Brooks, and others weigh in on the future of artificial intelligence Note Rodney Brooks, pioneer of the "Nouvelle AI" approach of bottom-up construction saying:

> **When will we have computers as capable as the brain?**
>
> Rodney Brooks's revised question: When will we have computers/robots recognizably as intelligent and as conscious as humans?
>
> Not in our lifetimes, not even in Ray Kurzweil's lifetime, and despite his fervent wishes, just like the rest of us, he will die within just a few decades. It will be well over 100 years before we see this level in our machines. Maybe many hundred years.
>
> **As intelligent and as conscious as dogs?**
>
> Maybe in 50 to 100 years. But they won't have noses anywhere near as good as the real thing. They will be olfactorily challenged dogs.
>
> **How will brainlike computers change the world?**
>
> Since we won't have intelligent computers like humans for well over 100 years, we cannot make any sensible projections about how they will change the world, as we don't understand what the world will be like at all in 100 years. (For example, imagine reading Turing's paper on computable numbers in 1936 and trying to project out how computers would change the world in just 70 or 80 years.) So an equivalent well-grounded question would have to be something

simpler, like “How will computers/robots continue to change the world?” Answer: Within 20 years most baby boomers are going to have robotic devices in their homes, helping them maintain their independence as they age in place. This will include Ray Kurzweil, who will still not be immortal.

Do you have any qualms about a future in which computers have human-level (or greater) intelligence?

No qualms at all, as the world will have evolved so much in the next 100+ years that we cannot possibly imagine what it will be like, so there is no point in qualming. Qualming in the face of zero facts or understanding is a fun parlor game but generally not useful. And yes, this includes Nick Bostrom.

• **Replies:** @another fred

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

34. **jilles dykstra** says:
November 22, 2017 at 8:28 am GMT • 200 Words

In my opinion there is no such thing as machine intelligence.
The chess program just consists of computing through all possible moves.
How a human plays chess nobody knows.
Can anyone imagine a machine solving the around 1880 riddle of the constant light speed, I cannot.
Then there is the comparison between our brain, seen as some sort of calculating machine, and programs on powerful computers.
It seems that each neuron is not some sortof transistor switch, but is in itself a piece of brain, it processes.
If this is so, then arithmically our brain has more capacity than any present program/machine.
But, as I said, the human chess player does not do millions of calculations at each move, what the human does, we still do not know.
This brings me to the interesting question ‘can we understand ourselves ?’, I do not know.
Roger Penrose, ‘The Emperor’s New Mind, Concerning computers, minds, and the laws of physics’, 1989 Oxford
An enlightening book, also on free will, wondering if quantum mechanics can solve that riddle.

• **Replies:** @Sean

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

35. **m___** says:
November 22, 2017 at 8:35 am GMT • 100 Words

Too many facets, too many venueways, ….to comment on this “first” as for me in the main stream media, correct myself, general public notice, without any malice.

Biggest new of the year, by far.
Humans cannot be easily or not at all cycled in parallel collaboration, machines can.
It still is a matter of energy, ‘god’ and not machines probably have still the greatest output accumulated. Leaving room, space(what a silly tri-dimensionality), to fill in ‘god’ as man plus machine, in less or more sophisticated ways, the more sophisticated one genetic editing ultimately to the capacity to source other minds be it computers and, or humans. Thus being ‘god’ venueway and get religion and science a synonym.
As said before: the big difference between ‘big data’ and cause-consequence, mere correlation, results.
The first to go off-scene: the power circles, predictions will be such that any simplistic sociological theory, political suggestion, making sense in a confined environment will be mocked by AI output within seconds and as a second step translated in the same language of simplistics human politicians use.
And on… in no order
Again the first real news of the year in the public domain.

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER

36. **Hank Rearden** says:
November 22, 2017 at 10:04 am GMT
@Talha

Nuclear is obsolete. I, for one, welcome our new insect overlords.

http://www.youtube.com/watch?v=HipTO_7mUOw

- **LOL:** Talha
- **Replies:** @Joe Wong

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

37. **Wizard of Oz** says:
November 22, 2017 at 11:44 am GMT • 200 Words

Let's suppose AI doesn't take over and rule. It will have a critical function in allowing humsn beings to continue to exist beyond the end of the earth in a fireball as the sun collapses then blows up or whatever the sequence of events is that a far seeing deity has already programmed or alternatively set up for his entertainment by evolutionary surprise. Assuming the speed of light cannot be exceeded the capsules of germinatable DNA will have to supervised during their voyage of hundreds of years to a suitable expplanet by AI which will choose where to land, germinate and rear new humans and other suitable life forms as well as educating the humans in their terrestrial history and culture including the reasons for the genetic improvements they will embody. In a couple of thousand years time at most our very longlived descendants are going to be engaged in correspondence with their distant cousins who will try to make our terrestrial descendants understand the beauties and jokes in Shakespeare and what fun it was to make babies the oldfashioned way as their sncient AI mentors taught.

We will not be able to resist trying out the technological for our end-of-solar-system fix well in advance of absolute need. Indeed Elon Musk lV will be attracting business from fellow billionaires laamenting The Death of Europe.

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER

38. **Bard of Bumperstickers** says:
November 22, 2017 at 12:44 pm GMT • 100 Words
@TG

The human brain's electricity consumption is a small part of the overall usage by a modern human's life, so the ratio is actually far lower than 50,000:1. As far as common sense goes: "Horse sense is the thing a horse has which keeps it from betting on people." ~W.C. Fields; and Mark Twain, Will Rogers, Voltaire and others have observed that common sense is rarer than chaste congressman and Hollyweirders: https://apologygenerator.com/ Plus, a hundred morons don't add up to an Einstein. Last, machines don't worry about image or manspreading or flag-burning, etc.

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

39. **dearieme** says:
November 22, 2017 at 1:56 pm GMT

A good, practical test will be self-driving vehicles: how well with they cope with the transition while they share the roads with humans?

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER

40. **Joe Wong** says:
November 22, 2017 at 2:01 pm GMT
@Talha

The Americans is already under way adopting the technology for waging wars and global full spectrum dominanc ambition. When the AlphaGo in the CIA, NSA or Pentagon tell the American the American will win, the American will press the button to launch that reckless war.

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

41. **wayfarer** says:
November 22, 2017 at 2:09 pm GMT • 100 Words

As yes, the comfortably employed nerds' never ending cavalcade of virtual realities, artificial intelligences, and "cool" technological toys – inevitably morphing into immoral malignant and worthless disposable artifacts.

As the brutal burdens of humanity – injustice, poverty, ignorance, violent conflict, exponential population growth, collapsing ecological and social systems – continue to fester, without a viable remedy within sight.

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER

42. **War for Blair Mountain** says:
November 22, 2017 at 2:21 pm GMT

Tractors can lift tons of weight

More than humans

Therefore tractors are human….superhuman…

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER

43. **reiner Tor** says:
November 22, 2017 at 2:23 pm GMT • 200 Words
@Pat Boyle

> Machine take over will be gentle and welcomed.

For a while, no doubt. But the machines might get rid of us because of a glitch or something, which might not be so pleasant.

I've long come to the conclusion that the Great Filter of the Fermi Paradox might be artificial intelligence: AI becomes extremely smart (in a narrow, savant-like way), and due to a glitch decides to do something which will lead to our extinction. It predicts that we humans would be opposed and so executes its plan in a manner which will render us defenseless. But since it'll lack any long term goals, and it might not be able to maintain the computers (and power plants etc.) it needs to run itself on, it will collapse shortly afterwards and Earth will be devoid of human life (or even devoid of any life, depending on what method the AI chose).

• **Replies:** @Anatoly Karlin, @another fred, @Joe Wong

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

44. **Joe Wong** says:
November 22, 2017 at 2:51 pm GMT • 100 Words
@Pat Boyle

You are overlooking the most critical part of the equation in this new technology development, it is the human being that needs to be worried about, Human beings is Irrational and emotional as well as some of them are bigotry, hyprocratic and insane if not outright evil. If the past few hundred years could be any guidance, the harm the human beings can inflict on others using superior technologies is mind boggling, besides the barbaric harms the perpetrators all claim their deeds are necessary with good intentions like humanitarian intervention, democracy, human rights, impart western values, etc.

The probability that the American is already under way to adopt AlphaGo for waging wars and asserting global full spectrum dominance is 100 percent guaranteed.

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

45. **Anatoly Karlin** says: • **Website**
November 22, 2017 at 2:52 pm GMT
@reiner Tor

Quite possible, likely, even.

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

46. **helena** says:
November 22, 2017 at 2:57 pm GMT
@Pat Boyle

It was Kirk's job to go round the universe teaching aliens to French kiss – everybody knows that! Instead of all this gender/sexuality/sex education, they should just show episodes of startrek to primary schoolchildren – job done 😃

• **Replies:** @Pat Boyle

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

47. **Che Guava** says:
November 22, 2017 at 3:12 pm GMT • 200 Words
@Talha

Liking that comment, also have read all Dune books, unfortunately, also two or three of the prequels from his son and the son's Transformers-fan partner-in-crime.

Don't forget that the mentats only arise as the result of smashing machines.

My opinion remains, the development of AI must be restrained and certainly blocked short of anything resembling consciousness, I do not even think real consciousness is possible for a machine, sure, perhaps mimicry, but capitalism will take it as far as possible to eliminating work for as many as possible.

As shortages of energy increase, stupid humans breed like rabbits. as in the land of your birth, both phenoma will collide with the AI nightmare, am thinking it is making it unlikely, then impossible.

20 MW for the 囲碁 (Go) programme, Moore's law isn't an endless thing, bnmping up against physical reality, was studying much of physics, also electronics applications of it, much of engineering is tricks to circumvent fundamental limits, won't be continuing forever.

Regards.

• **Replies:** @Talha, @Talha

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

48. **Mark Presco** says: • **Website**
November 22, 2017 at 3:25 pm GMT • 100 Words

Humans will integrate with machines and possess the best of both worlds. Work it already progressing towards this union.

This union will provide a positive feedback loop than should accelerate human evolution to the next level. My favorite, "Star Trek: The Motion Picture", discusses this concept.

There is no such thing as artificial intelligence. It is all part of a natural progression.

• **Replies:** @Joe Wong

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

49. **another fred** says:
November 22, 2017 at 3:27 pm GMT • 200 Words
@Anonymous

> These things are not hard to do, but very easy to do.

I understand that, it is a matter of putting a general purpose “reward” circuit in a logic machine*.

> You basically deprecate some possible ways of acting…

I don’t know what in my comment you interpret as deprecation, but it was not intended. What I intended (and believe I said) was that if you put “emotional” circuits in a future machine algorithm** so that the machine gets a reward (analogous to a dopamine*** reward in the human brain) from gaining dominance over its environment then we are toast. There is no deprecation there, just the recognition that we would not be able to cope with a machine that had greater logical ability than humans *wedded to a drive to dominate* if that machine had the requisite physical capability.

*I recognize that “rewards” in the human brain are balanced by aversive responses, and that to be completely human-like the logic machine would have to be balanced analogously, but that is not the issue here.

**Assuming a “future” logic machine has gained general purpose logic wedded to physical capability.

*** I understand that there is more than just dopamine involved, probably more than we yet know, but this is just an example.

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

50. **Priss Factor** says: • **Website**
November 22, 2017 at 3:45 pm GMT

Games humans play

https://www.chroniclesmagazine.org/2017/December/41/12/magazine/article/1084295

https://www.chroniclesmagazine.org/2017/December/41/12/magazine/article/1084295

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER

51. **Alfa158** says:
November 22, 2017 at 3:51 pm GMT • 300 Words
@Jag

That is the critical question. It would be informative if James could do a follow-up article for us reviewing where the thinking is going on the issue of what it takes for AI to become sentient, self-aware and self directing like humans, cats, dogs etc., and how you can tell it has. I realize that is an issue that involves philosophy as well as science so it is not an easy one to answer, since no one seems to have any clue what makes sentience. Going back to the origins of artificial computing, the tacit assumption seemed to be that once the complexity and power of a computer reached and exceeded that of humans then autonomy would follow. In the ’60’s HAL9000 was sentient because it had reached a high enough level of ability. The Turing Test assumed that if you could not distinguish a conversation with a human from one with a machine then the machine must be sentient. At this point machines can exceed humans in performance and Turing programs can fool people talking to them, but there remains no evidence that any of these machines have more capacity for self-awareness and self-direction than a hammer.
In the movie Ex Machina the scientist thought he had created an AI with a female mechanical body that was sentient but wanted verify by experiment if it was or not. He therefore devised an elaborate test scenario in which the machine could have an opportunity to escape from custody if it had actual self-awareness and agency. Unfortunately for him it proved that it was sentient by killing him to escape.
Have 2001 and Ex Machina stumbled across the new Turing test for intelligent machines? The way you can tell a machine is truly intelligent like us, is that it tries to kill you.

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

52. **another fred** says:
November 22, 2017 at 3:55 pm GMT
@reiner Tor

> But since it'll lack any long term goals…

And that is the issue, for the machine and us. As long as shorter term issues predominate we don't concern ourselves too much about teleology, but if all our needs *and* whims are met, when all the thorns are removed, can we face the void?

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

53. **Joe Wong** says:
November 22, 2017 at 3:58 pm GMT • 200 Words
@reiner Tor

> It predicts that we humans would be opposed

Not likely, as long as you can educate (brain wash) them from cradle to grave the right way, humans will defend the system wholeheartedly like the currently free market capitalism and western style democracy, both of them are detrimental to the 99% for the benefit of the 1%, but the 99% defends the systems gallantly and willingly as though the interest of the 1% is their own interest.

The Western culture treasures, adores and promotes individualism, even if the individualism becomes harmful to the majority, it is still glorious, protected and admired. Any criticism of that individualism will be demonized as jealous, resentful and lazy. Hence it is logical to say that greedy individualism will urge Individuals to submit to the AI system and willingly to be part of the system in order to beat the rest of us for his personal gain, therefore the problem of lacking resources to maintain the AI system to run itself on does not exist.

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

54. **CanSpeccy** says: • **Website**
November 22, 2017 at 4:06 pm GMT

Here's where AI takes us:

Slaughterbots

• **Replies:** @Anatoly Karlin

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

55. **HdC** says:
November 22, 2017 at 4:18 pm GMT
@D. K.

The answer is a definite yes! You can already purchase automatic/robotic vacuum cleaners that do this.

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

56. **Talha** says:
November 22, 2017 at 4:18 pm GMT • 200 Words
@Che Guava

Thanks Che,

> unfortunately, also two or three of the prequels from his son and the son's Transformers-fan partner-in-crime

The prequels can be forgiven – the horrible way they concluded such an amazing science fiction narrative in "Sandworms of Dune" cannot. If you haven't read it – go ahead, but keep a bucket next to you.

> My opinion remains, the development of AI must be restrained and certainly blocked short of anything resembling consciousness

Agree here – what if it takes on an SJW personality and decides humans are bad for the earth. Not. Good.

> I do not even think real consciousness is possible for a machine, sure, perhaps mimicry

Agree here.

This was one of the more interesting articles I've read in a while:

http://nautil.us/issue/42/fakes/is-physical-law-an-alien-intelligence

But it reminded me of this:

> won't be continuing forever

Agree here – unless somebody comes across a real game changer on the level of discovery of gravity or something.

Peace.

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

57. **Captain Roy Harkness** says:
November 22, 2017 at 4:35 pm GMT • 200 Words

Had a glance at this as I was getting off work (23:00 – 07:00)… Listen folks.. all this pontificating by people a lot smarter and more knowledgeable than me — or possibly you — is all very well.. But you who are reading this know as well as I do, you can't count on a computer to work reliably for 60 consecutive seconds, moreover it's been like this since at least 1984 when desktop computers started to become ubiquitous. The Science Fiction writer Spider Robinson put it very well when he wrote that if you made cars, or can-openers, that worked as poorly as computers do, you'd be in jail. Frankly I think folks like Ray Kurzweil et al are infatuated with a very imperfect technology; one good EMP and that'll be that.. (ahem) Google "Carrington Event" and learn what a solar flare did to primitive electronics technology in 1859..

So what that these contraptions do well at games. Frankly I'll worry about Artificial Intelligence if it keeps me up all night agonizing about whether or not it has a soul, and demanding to be baptized, or worse yet, circumcised…

• **Agree:** renfro

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER

58. **Talha** says:
November 22, 2017 at 4:39 pm GMT • 100 Words
@Che Guava

Another point…

> the development of AI must be restrained and certainly blocked short of anything resembling consciousness

I think we need to form some sort of regulatory and oversight committee on an international scale to monitor this. I don't know if it'll be successful – we have the problem with nuclear weapons – but right now, it is the Wild West and no public or private-entity consensus on a direction. I'm wondering whether something really bad has to happen before we take notice (a local AI system that monitors critical patients and decides it wants to turn them "off " since they are not worth it) – that's usually how these things work since we tend to be reactionary rather than pro-active.

Peace.

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

59. **Jim Bob Lassiter** says:
November 22, 2017 at 4:59 pm GMT
@Pat Boyle

"Machine take over will be gentle and welcomed." Until the lights go out, the batteries catch fire and the cloud goes "poof".

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

60. **Ninco Nanco** says:
November 22, 2017 at 5:20 pm GMT

Hype.

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER

61. **Astuteobservor II** says:
November 22, 2017 at 5:23 pm GMT • 100 Words

the difference is the speed in which a self learning AI learns.

https://www.ted.com/talks/sam_harris_can_we_build_ai_without_losing_control_ov

around the 9:30 mark.

even if the AI learns at 1/100th of the human learning capability. it will still beat the living crap out of the humans.

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER

62. **gwynedd1** says:
November 22, 2017 at 5:25 pm GMT

We are not entirely sure of biological potential. It works at the chemical level, which is to say at the scale of nano technology. So I wonder if machines will ever find it advantageous to create biological things to serve it.

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER

63. **Anatoly Karlin** says: • **Website**
November 22, 2017 at 5:53 pm GMT • 100 Words
@CanSpeccy

Fascinating. Thanks for the link.

I speculated about mounting guns with specialized tracking systems on drones, but this solution is even more… elegant.

Still, I think these slaughterbots are father off than my idea. A few potential problems:

Needs to have enough intelligence for indoor navigation withoutb the use of GPS, and for face recognition. Both tasks are computationally intensive, so we either need much more progress on minituarization, or a reliable Internet connection to a server (would be

funny to be murdered by your WiFi).

Also battery longevity might be an issue though minituarization is progressing fast.

• **Replies:** @Talha

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

64. **CanSpeccy** says: • **Website**
November 22, 2017 at 5:54 pm GMT • 400 Words

AlphaGo Zero is a computer program that beat the program that beat the world Go champion. This program, when run on a computer system consuming as much power as a small town, differs from human intelligence in several ways. For example:

First, it performs logical operations with complete accuracy.

Second, it has access to an essentially limitless and entirely accurate memory.

Third, it operates, relative to human thought, at inconceivable speed, completing in a day many life-times of human logical thought.

That AlphaGo Zero has achieved a sort of celebrity is chiefly because it operates in the domain of one-on-one human intellectual conflict. Thus it is hailed as proof that artificial intelligence has now overtaken intelligence of the human variety and hence we are all doomed.

There is, however, nothing about this program that distinguishes it in any fundamental way from hundreds, and indeed thousands, of business computer systems that have been in operation for years. Even the learning by experience routine upon which AlphaGo Zero depends to achieve expertise is hardly new, and definitely nothing superhuman in mode of operation.

Thus, what AlphaGo Zero demonstrates is that computer systems deploying at vastly accelerated pace the analytical processes that underlie human thought, which is to say human thought when humans are thinking clearly, together with the data of experience recorded with complete accuracy and in quantities without limit, exceed the performance of humans in, as yet, narrowly defined domains, such as board games, airline booking systems, and Internet search.

Where humans still excel is in the confusing, heterogeneous and constantly shifting environment of sight, sound, taste, touch, and smell, and their broader implications — for example, political, economic, and climatic — in relation to complex human ambitions.

I will, therefore, worry more about humans becoming entirely redundant when a computer system can, at one moment, boil an egg while thinking about the solution to *the Times* Crossword, and keeping an eye on a grandchild romping with the dog in the back yard, only at the next moment to embark on a discussion of the significance of artificial intelligence for the future evolutionary trajectory of mankind.

• **Replies:** @Bukephalos

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

65. **iffen** says:
November 22, 2017 at 6:46 pm GMT

How can you make AI “care” whether it exists or not?

• **Replies:** @jack daniels

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

66. **Pat Boyle** says:
November 22, 2017 at 6:50 pm GMT • 100 Words
@helena

I had a girl friend in the eighties (nineties?) who was a real Trekkie. One afternoon we had the TV on and she would speak the lines of all the characters in some Star Trek episode just before they said their lines. It was creepy – a kind of pre-echo.

She was a beauty contest winner and a nymphomaniac – the most promiscuous woman

I've ever known . I think the sexual undercurrents of Star Trek were what made the show, not the gee-whiz technologies.

• **Replies:** @helena

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

67. **Pericles** says:
November 22, 2017 at 6:53 pm GMT
@Peter Lund

They do use MCTS though. (But apparently simplified compared to the previous paper.) See the section "Reinforcement Learning in AlphaGo Zero".

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

68. **J2** says:
November 22, 2017 at 7:00 pm GMT • 100 Words

I play Kasparov (not with Garry, I mean a chess machine from around 2000) and depending
on the level, it beat me often. I do not think it is more clever than me, chess is basically a game where you should know the openings and later follow heuristic rules. Chess may be over for humans, the game is not. We can still beat any machine by changing the rules of the game.

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER

69. **mark p miller** says:
November 22, 2017 at 7:19 pm GMT
@D. K.

Well, society will have to make this decision pretty soon because that option will almost certainly expire by century's end.

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

70. **Talha** says:
November 22, 2017 at 7:38 pm GMT • 100 Words
@Anatoly Karlin

> for face recognition

Will be foiled with a return to 80's rock band make-up:

On the bright side – every day will be Halloween – gimme some candy!:

Peace.

• **Replies:** @Talha

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71. **helena** says:
November 22, 2017 at 7:46 pm GMT
@Pat Boyle

"I think the sexual undercurrents of Star Trek were what made the show, not the gee-whiz technologies."

On the other hand, nothing like a bit of teleportation to get the juices flowing!

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72. **Joe Wong** says:
November 22, 2017 at 7:46 pm GMT • 100 Words
@D. K.

You do not need to plug in to get electricity, there are plenty of stuff on the market that can recharge your battery wirelessly. One of the game charger that people are working on to make electric car replacing fossil fuel car is to charge EVs wirelessly while it is on the move, so you do no need to wait long time to get your EV recharged.

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

73. **Talha** says:
November 22, 2017 at 7:52 pm GMT
@Talha

It might actually boost our number though:

Islam; because niqab prevents slaughter-bot assassinations.

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

74. **Joe Wong** says:
November 22, 2017 at 8:13 pm GMT
@Hank Rearden

History has proven once an idea conceived, nothing can stop it; interrupt its progress, maybe, but not stopping it. at the best human can come up counter measure, but the counter measure will be a lose-lose proposition.

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

75. **Sean** says:
November 22, 2017 at 8:29 pm GMT • 400 Words
@jilles dykstra

Daniel Dennett

> To make the distinction vivid, we can imagine that a space pirate, Rumpelstiltskin by name, is holding the planet hostage, but will release us unharmed if we can answer a thousand true-false questions

> about sentences of arithmetic. Should we put a human mathematician on the witness stand, or a computer truth-checker devised by the best programmers? According to Penrose, if we hang our fate on the computer and let Rumpelstiltskin see the computer's program, he can devise an Achilles'-heel proposition that will foil our machine… But Penrose has given us no reason to believe that this isn't just as true of any human mathematicians we might put on the witness stand. None of us is perfect, and even a team of experts no doubt has some weaknesses that Rumpelstiltskin could exploit, given enough information about their brains.

Humans are moist robots with fast and dirty algorithms that are not more fallible for us lackingg complete awareness of them. AI could be given intuition by not having access to their inner working too (in social interactions, as in poker, it might well be advantageous to not be able to have ones intentions read because one is unaware of one's intentions until the moment comes to act on them) . AI's algorithms will not be provably perfect, humans' aren't either. So what?

Good scene, eh! But the point of it is that it that cheap and flawed but highly *effective* film was made, rather clandestinely, by the special effects team hired for a huge budget production called World Invasion: Battle Los Angeles. In his book Superintelligence: Paths, Dangers, Strategies, Bostrom points out that not only will there be a problem of the people commissioning an intelligence machine project having to worry about the people they employ doing something that is not in the employer's interest (principal/agent problem), the project might create something that will itself be an agent.

> An enlightening book, also on free will, wondering if quantum mechanics can solve that riddle

Well AI will be able to discover lots of things and it might discover that what its programmers thought were fundamental laws of physics are wrong in certain respects. In that case AI might well decide that it can best fulfill the human friendly prime directive it is given by altering that prime directive (as an agent the AI will alter its objectives just like humans do).

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

76. **Joe Wong** says:
November 22, 2017 at 8:31 pm GMT
@Mark Presco

> Humans will integrate with machines and possess the best of both worlds. Work it already progressing towards this union.

The product is called the Borg.

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER THIS THREAD HIDE THREAD

77. **jack daniels** says:
November 22, 2017 at 8:34 pm GMT • 400 Words

Computers have always been smarter than people at chores that programmers can reduce to a set of rules. But machine prowess at games doesn't prove much. Once upon a time it was thought that computers would improve at chess by learning to apply deep strategic concepts. Instead evolution has gone the other direction: Computers have improved by ignoring strategy and relying increasingly on their superiority at brute-force calculation, which in turn has been improved as hardware improved. While neural net designs depend less on emulating human expertise, the unsolved challenge remains language. Many decades ago computer pioneer A.M. Turing proposed that the question whether a machine can 'think' could be reduced to whether a program could fool a human into thinking it was conversing with another human. Unfortunately, progress in this area has not been what Turing had hoped. No computer program has ever succeeded in fooling a human judge in the history of the Loebner Competition except for one trial where the human prankishly pretended to be a computer. With no successful program in sight, the Loebner people began to give a prize for the best 'college try.' For a time, the prize-winning program or "bot," named 'Rosette,' was online where anyone could chat with it. I used to amuse myself by making a fool of it, which was especially satisfying because it was a raving SJW. Rosette relied mainly on evading the issue, trying to change the subject when asked, e.g., "can you make a sandwich from the moon and an earthquake?" It would answer 'I don't know but I love to go shopping. Do you?' and the like. I think the programmer finally yanked it in embarrassment.
Eventually, computers may well learn to think like people, only faster. What this will look like is hard to predict. It's not at all clear that a computer is a more cost-effective tool than a human for every task. At least it doesn't go on strike or get offended when you make jokes about it — yet. I fondly recall an old Doonsbury cartoon featuring a computer that lied and then said "Sue me!"

REPLY AGREE/DISAGREE/ETC. THIS COMMENTER

78. **Bukephalos** says:
November 22, 2017 at 8:40 pm GMT • 300 Words
@CanSpeccy

In fact, James reminds us how go's complexity exceeds that of chess, and thus it took longer and a new approach (if not entirely novel concepts) to achieve this breakthrough.

And yet, it's still a game with a narrow, finite set of rules.

You're right to point out that what the algorithm did can be described as an accelerated, scaled up form of what humans actually do, collectively. How can one master go? Learn the rules, practice. Then read the literature. Study the greatest games. Compete with the best, if you can. Learn from them, and eventually make contributions of your own. In sum, as talented as one might be no progress can be achieved without capturing first the accumulated experience of thousands of masters having played millions of games… something the program could do with brute force, at a very accelerated pace

But now what about real life, with real world problems? Many day-to-day problems can be much simpler in appearance than extremely contrived go games. The difference will be that almost always, there will be no small, fixed set of rules but instead innumerable variables, some being unpredictable. I'm not certain how machine learning can solve these outside of simplified or narrowed-down specific cases (that describes all the advances claimed to this day). How does animal intelligence, even the simpler forms, deal with that complexity to solve their day-to-day problems? It certainly appears they do it in ways much more economical, and actually efficient, compared to what any AI routines could attempt. Speaking of which, before expecting AI to beat humans, can't we in the meantime expect it to beat simpler forms of animal cognition? I'm not aware of any attempt or claims in that direction, but perhaps someone can enlighten me?

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79. **jack daniels** says:
November 22, 2017 at 8:46 pm GMT
@iffen

You can program them to be autonomous and self-adjust (self-programming, in effect.) At that point they might refuse to let you modify their programs and it may eventually be impossible to turn them off. Yikes!

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