Living in Exponential Times
The Mystery of Go, the Ancient Game That Computers Still Can’t Win

BY ALAN LEVINOVITZ  05.12.14 | 6:30 AM | PERMALINK
‘I’LL SEE A MOVE AND BE SURE IT’S THE RIGHT ONE, BUT WON’T BE ABLE TO TELL YOU EXACTLY HOW I KNOW. I JUST SEE IT.’

The trouble is that identifying Go moves that deserve attention is often a mysterious process. “You’ll be looking at the board and just know,” Redmond told me, as we stood in front of the projector screen watching Crazy Stone take back Nomitan’s initial lead. “It’s something subconscious, that you train through years and years of playing. I’ll see a move and be sure it’s the right one, but won’t be able to tell you exactly how I know. I just see it.”
“We know more than we can tell”
- Michael Polanyi
Why Go Still Foils the Computers

Facebook and Google are working to enable computers to play Go, an especially complex game that dates back more than 2,500 years.
Google Parent Claims Artificial-Intelligence Victory in Go Game Win

Alphabet’s AlphaGo beats top human player of Go game on full board, a milestone challenge
Mastering the game of Go with deep neural networks and tree search

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American Go E-Journal

AlphaGo vs Lee Sedol: Match schedule and details
Tuesday March 8, 2016

The much anticipated five game match between Lee Sedol 9P and Google DeepMind's AlphaGo begins this week, Wednesday, March 9 (March 8 for American viewers). Here is the match schedule, along with details of how you can watch the games and timezone conversions, courtesy Go Game Guru.

The first game in the Lee Sedol-AlphaGo match will be Tuesday, March 8, 8p PST (11p EST). The match will be livestreamed on DeepMind's YouTube channel with English commentary by

DeepMind
Google's AlphaGo AI beats Lee Se-dol again to win Go series 4-1
Why is This Happening Now?
Second Half of the Chessboard

In technology strategy, the second half of the chessboard is a phrase, coined by Ray Kurzweil, in reference to the point where an exponentially growing factor begins to have a significant economic impact on an organization's overall business strategy.

While the number of grains on the first half of the chessboard is large, the amount on the second half is vastly (2^{32} > 4 billion times) larger.

The number of grains of rice on the first half of the chessboard is 1 + 2 + 4 + 8... + 2,147,483,648, for a total of 4,294,967,295 (2^{32} - 1) grains of rice, or about 100,000 kg of rice (assuming 25 mg as the mass of one grain of rice). India's annual rice output is about 1,200,000 times that amount.

The number of grains of rice on the second half of the chessboard is 2^{32} + 2^{33} + 2^{34} ... + 2^{63}, for a total of 2^{64} - 2^{32} grains of rice (the square of the number of grains on the first half of the board plus itself). Indeed, as each square contains one grain more than the total of all the squares before it, the first square of the second half alone contains more grains than the entire first half.

On the 64th square of the chessboard alone there would be 2^{63} = 9,223,372,036,854,775,808 grains of rice, or more than two billion times as much as on the first half of the chessboard.

US BEA starts tracking IT

1958 + 32 * 1.5 = 2006

Moore’s Law doubling period (years)

We enter second half of the technology chessboard?
A Change in Approach
Solar on Fire
As prices have dropped, installations have skyrocketed.

Price of a solar panel per watt

Global solar panel installations

*Estimate. Sources: Bloomberg, Earth Policy Institute, www.earth-policy.org
Google's Tensor Processing Unit Could Advance Moore's Law 7 Years Into The Future
from the Moore's-Law dept.

An anonymous reader writes from a report via PCWorld:

Google says its Tensor Processing Unit (TPU) advances machine learning capability by a factor of three generations. "TPUs deliver an order of magnitude higher performance per watt than all commercially available GPUs and FPGA," said Google CEO Sundar Pichai during the company's I/O developer conference on Wednesday. The chips powered the AlphaGo computer that beat Lee Sedol, world champion of the game called Go. "We've been running TPUs inside our data centers for more than a year, and have found them to deliver an order of magnitude better-optimized performance per watt for machine learning. This is roughly equivalent to fast-forwarding technology about seven years into the future (three generations of Moore's Law)," said Google's blog post. "TPU is tailored to machine learning applications, allowing the chip to be more tolerant of reduced computational precision, which means it requires fewer transistors per operation. Because of this, we can squeeze more operations per second into the silicon, use more sophisticated and powerful machine learning models, and apply these models more quickly, so users get more intelligent results more rapidly."

The chip is called the Tensor Processing Unit because it underpins TensorFlow, the software engine that powers its deep learning services under an open-source license.

Posted by BeauHD May 18th, 2016 8:10PM

Tags: court, google, gpu, graphics, hardware

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Postwar Trends in the US Economy

Corporate Investment in Software

Z score (scale removed)

Source: research.stlouisfed.org
Postwar Trends in the US Economy

Corporate Investment in Software

Corporate Profits (% of GDP)

Z score (scale removed)

Source: research.stlouisfed.org
Postwar Trends in the US Economy

Z score (scale removed)

Corporate Investment in Software

Corporate Profits (% of GDP)

Labor Share of Income

Source: research.stlouisfed.org
Implications for the planet
Dematerialization (bits for atoms)
Use of Basic Commodities in the US, 1900-2013

Source: Ausubel, “The Return of Nature”
“We have tremendous challenges ahead of us. We have to improve the human condition around the world as the population grows while at the same time learning to tread more lightly on our planet. The only way we’ll meet them – and I’m confident that we will – is with a combination of technological progress, innovation, markets and goodwill.”

LEARN MORE IN:
‘Intelligent assets: Unlocking the circular economy potential’

AVAILABLE TO DOWNLOAD NOW FROM:
www.ellenmacarthurfoundation.org/publications/intelligent-assets

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