MACHINE VERSUS HUMAN
– A Victory at Go

The game in Seoul, South Korea, played in March was webcast around the world. On one side was South Korean Lee Sedol. He is the world champion of the complicated and ancient game of Go. On the other side was AlphaGo, a computer program.

Go is played on a 19-by-19 grid with black and white markers. Whoever ends up with the most territory wins the game.

It was really no contest. AlphaGo, developed by the tech company Google DeepMind, won four out of five games.

"[Mr. Lee] tried so many different things," said Canadian computer scientist Dr. Martin Mueller, who watched the webcast. "Against any human something would have worked. But the program just countered everything perfectly."

Not just a game

This was more than just a win at a complex game. It was a milestone in the development of **artificial intelligence** (AI).

The idea of AI began in the 1960s. Back then, computers were already out-calculating humans in simple math. Then computers replaced people on assembly lines. Next, they explored places we couldn't. Why not create a machine that could think like humans, too?

Since then, various games have pitted machines against the best human players on the planet. In 1997, IBM's Deep Blue computer beat the world's best chess player. Then in 2011, another IBM computer named Watson beat a human on *Jeopardy*, a TV quiz show. That was a far greater challenge. Watson had to answer riddles and complex questions.

A victory at Go required even more computing **prowess**. The game can unfold in many different ways. In fact, there are more possible board positions than atoms in the universe. So this was not a problem a computer could tackle by following a simple **algorithm**. It required more than a massive number of math calculations. AlphaGo needed to come up with a different strategy.

DEFINITIONS

ALGORITHM: a set of rules for solving problems or doing calculations, especially rules that a computer uses

ARTIFICIAL INTELLIGENCE: an area of computer science that explores the ability of computers to think or have intelligence. Artificial intelligence is concerned with developing computer programs or computers that seem to use reason and make decisions.

PROWESS: great skill or ability

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ARTIFICIAL NEURAL NETWORKS

Essentially, AlphaGo trained itself on the game by playing thousands of matches with itself. This is called reinforcement learning, machine learning or deep learning. When programmed with a goal and enough data, computers can teach themselves what works.

Machine learning relies on artificial neural networks based on the way the human brain works. Your brain solves problems by using billions of interlinked **neurons**. Each neuron works separately, yet it also interacts with the neurons around it. Your brain uses any number and combination of neural pathways to arrive at a response.

Computers mimic neural networks with millions of mini-programs organized into layers. The computer sends the same input into its neural network over and over. It self-corrects each time. The more it trains, the better it gets. By using neural networks, programmers can make computers figure out complicated rules for themselves.

TAKING ON THE REAL WORLD

AI is not just for Go games. Today's machines interact with the real world. Your smartphone, bank, and house all use AI. Driverless cars are another example. The real world is hard to control, so vehicles may meet unexpected objects. These machines need to improvise or make complex decisions.

AI is now taking on tasks that computers have previously found hard. These include recognizing human emotions through facial expressions, reading handwriting, or identifying words in a spoken language.

CAN WE? SHOULD WE?

Futurists predict that in the next 25 years or so, AI machines will match human intelligence. They may even surpass it. Are we ready for this?

Some believe smart computers will extend our intellectual abilities. They compare it to the way cars or planes extend our physical abilities.

But not everyone is comfortable with super smart AI. How do we ensure we use the technology safely, responsibly, and for the good of humanity?

Companies such as Google, Facebook and Amazon are leading the AI charge. Do we really want them making decisions that could have a major impact on society?

And what if computers could design even more intelligent computers? Could we control them or ever turn them 'off?'

Nick Bostrom heads the Future of Humanity Institute at Oxford University. It's a place where mathematicians, philosophers and scientists think carefully about big questions. Dr. Bostrom says we must get AI right.

"The fate of humanity may depend on what super intelligence does," he says. "Once machine intelligence is better at inventing than we are, our efforts become **obsolete**."

The key, Dr. Bostrom says, is to have meaningful discussions at the design phase of these machines.

Geoffrey Hinton agrees. He is a Canadian expert in deep learning and neural networks.

"We need ... to figure out how this stuff is going to be used and how best to use it," he says. "When you get these wonderful new abilities, [they ought to be] good for people." ★

DEFINITIONS

NEURON: a cell that sends messages to your brain and receives messages from your brain through electrical signals

OBSOLETE: no longer used because of being replaced by something newer and more effective

ON THE LINES

Answer the following in complete sentences:

1. Explain what **artificial intelligence** is.

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2. What important artificial intelligence milestone occurred in 1997?

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3. What important artificial intelligence milestone occurred in 2011?

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4. Describe and explain the game of **Go**.

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5. Identify the two contestants that recently played this game in South Korea.

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6. What was the outcome of the five Go games in Seoul?

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7. How did the computer program teach itself to play Go?

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8. What are artificial neural networks and why are they important in AI? Explain.

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BETWEEN THE LINES

An *inference* is a conclusion drawn from evidence. *A plausible inference is supported by evidence in the article and is consistent with known facts outside of the article.*

What do you suppose life will be like if, one day, AI computers match – or in some ways surpass – human intelligence?

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JUST TALK ABOUT IT

1. As you see it, what is the significance of AlphaGo's win over Lee Sedol? Explain.

2. a) For what reasons are you in favour of the pursuit of artificial intelligence? For what reasons are you opposed to it?

b) What rules do you think should be in place regarding the continued pursuit of computers that are as smart as, or smarter than, humans? Explain.

3. Why do you suppose developers use games to test progress in AI? Explain.

ONLINE

Visit our student website at **www.news4youth.com** and click on the *What in the World?* tab to:

1. Visit the AlphaGo website to find out more about this computer and to watch a video showing the Google DeepMind Challenge Match (or visit **https://deepmind.com/alpha-go.html**).

2. Read a Maclean's interview with Geoffrey Hinton, Canada's 'neural networks' expert (or visit **http://www.macleans.ca/society/science/the-meaning-of-alphago-the-ai-program-that-beat-a-go-champ/**).

3. Read an article from The Economist called "Artificial Intelligence: The Rise of Machines" (or visit **http://www.economist.com/news/briefing/21650526-artificial-intelligence-scares-peopleexcessively-so-rise-machines**). ★