CHAPTER 1

Humans or Machines?
Narrow AI or General AI?

When We Say "Artificial intelligence," What Do We Mean?[29]

Artificial intelligence is the ability to perform human cognition and to "think." This ability refers to the automation of activities that perform functions that require intelligence when performed by people. AI is the reality when a machine can absorb information from the environment, process it, and reorganize it. To "think" means that a machine can use this reorganized information in order to draw conclusions. Artificial intelligence is the breakthrough in building "thinking machines;" it is the ability of machines to learn from experience, and their ability to infer from learning to give feedback, make assumptions, and even reach conclusions.[30]

AI does not mean that a machine can really think like a human. It is the automation of activities that we associate with

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THE HUMAN-MACHINE TEAM

human thinking, such as decision-making, problem-solving, learning, and recognizing patterns. AI is the ability, for the first time in history, when machines and computers possess their own unique ways to automate functions that for people require intelligence.[31] Therefore it is possible to imagine a machine that acts *like* it has the ability to think.[32] Humans can conceptualize this "thinking" process as human-like intelligence to think, to give feedback, and to act according to these thoughts and this knowledge.[33]

For decades, computers have had the ability of calculation. People used this calculation power to solve problems that could not be solved without computers.[34] For years, machines and robots have been designed to replace people or to replace specific human actions in order to improve productivity. In all these examples, a human had the responsibility and the ability to think, and ultimately to act; the role of machines was just to increase the pace.[35]

What Has Changed?

What has changed (as well as what has *not* changed) is a primary question to enable us to understand the current age. What has changed in AI and what has changed in the DE are questions we need answered in order to build our strategy framework for the discussion in our era. There are people who answer these types of questions with an extremely black or white answer. For example, they reply that either "Nothing has changed, there is nothing new under the sun, and whatever will be again," or "Everything has changed, and machines are going to control humanity." The challenge is to discover the *unique context* and the relevant changes.[36]

What Has Changed in Artificial Intelligence over the Past Few Years?

Seventy years ago, Alan Turing, a British mathematician and computer scientist who broke the enigma code during WWII, asked the question "Can machines think?" Today is the first time in history that we can answer "Yes." In one sentence, what has changed is the ability to realize the idea of AI and to build systematic, autonomous machines that perform and represent parts of human cognition. As we discussed, people may disagree on whether machines have acted like humans since the start of the computer era. They will say that from the beginning, computers have performed a few activities and functions that require intelligence when performed by people. However, computer activities were designed to simulate human actions – but not to simulate human thinking. In addition, the activities that are associated with human thinking were basic, and the focus was to perform these basic actions faster and on a larger scale.[37]

Today, we are talking about the ability to build systematic automation that performs and represents more and more of human cognitive activities. A few examples are the ability of a machine to take a snapshot and to understand that a certain picture is of a cat; the ability of a machine to learn through

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big data from the past to the future; and the ability to draw conclusions from data to make predictions. All of these are just a few examples of how AI accelerates the building of systematic automation that mimics human cognitive activities. Furthermore, AI also provides the ability to perform cognitive activities that were previously impossible for human cognition to perform alone – for example, the ability of machine-learning to address hundreds and thousands of features and then draw conclusions from this big data to make predictions. This is a unique automation of human cognitive activities.[38]

What Has Changed in the DE That Enables This AI Revolution?

- Data
- Storage capacity
- High-performance computing
- In the future: Quantum[39]

A main factor that has changed is the development of the foundations for big data that enable us to use all of the data. These "data channels," which have been built over the past several years, allow us to take the idea of machine-learning and the innovation of neural networks (Deep Learning) and create the conditions to fulfill the concept of AI. In the DE we can discuss at least five different internal revolutions: communications, infinite amount of data, data storage, high- performance computing, and AI. The notion that a machine can perform

human activities first appeared 70 years ago, but the conditions were not yet available to realize it. One of the first steps toward fulfilling this dream was "Deep Learning" as a concept to build artificial neural networks that a machine can use to simulate part of human cognitive activities. Another step was the process of "machine-learning" from big data to make predictions. A revolution, which actually created the conditions for AI to break out, was the development of *the ability to use big data.*

This ability to use big data is a result of the development of the capability to save and to tag data, and then manipulate it through high-performance computing. The perception of the cloud is the most advanced current development of the ability for the maintenance and organization of data everywhere and all of the time. The power to use data stems from the unseen, yet indispensable "sewer lines" that make the big data neighborhood livable. Nowadays, we have enough data, and we can use all of the data that is stored and organized. In addition, we have the ability to manipulate and learn from it through high-performance computing; therefore, we can finally begin to fulfill the dream of AI.[40]

What Is Changing the DE?

AI is increasing and accelerating the great revolution of the DE.[41] The potential of AI to perform human cognitive activities, including those that humans cannot perform by themselves, is beginning to change the basic rules. AI has the potential to improve healthcare, national security, personal security, and

many other critical areas of our lives. Problems that human beings did not know how to solve in the past, AI has the potential to solve in the future. Challenges that people did not even know how to address years ago can now be examined with AI. Therefore, we are at the threshold of the acceleration of the Digital Era Revolution.[42]

Narrow or General?

Many people are at one of the extreme positions. On the one hand, there are people who claim that "This is the end of human history. Machines are going to replace people. If AI doesn't have feelings today, it will have them tomorrow. AI is the next developmental level of evolution. In the future, *homo sapiens* will be just part of a distant history." On the other hand, there are those who insist that "Nothing has changed. We have had computers for many years. AI is just mathematics and algorithms and not really anything new." Supporters of the former talk about General AI, sometimes called Artificial General Intelligence, or AGI. This means a machine that can replace the entire human being. General AI refers to a notional future with an artificial intelligence system that exhibits intelligent behavior, feelings, and context, at least as advanced as a person across the full range of cognitive tasks. Supporters of the latter talk about narrow AI, which refers just to specific capabilities and not to a new reality that changes the whole system.[43]

I don't agree with either viewpoint. It is not the ability to replace the entire human being, and it is not just another

algorithm. It is not about a dystopian future in which machines can control people or make strategic decisions, and it is not just about a new emerging theology.[44] Artificial intelligence is about the ability to perform human cognition similar to part of the ability to "think."[45] It is the ability to give feedback, the ability to learn, and the ability to act.[46] It is not about the overall ability to control, and not about the overall ability to understand the mental action or the process of acquiring knowledge and understanding through thought and senses. AI is also not about the ability of a machine to have feelings or exercise ethics.

Humans or Machines?

In other words, I'm not contemplating a world out of Arnold Schwarzenegger's *Terminator*. I'm referring to a new relationship between people and machines made possible by AI. One of the starting points for AI was the game of chess. The first time that machine-learning succeeded in beating Garry Kasparov was a tipping point in the ability of machines to "think." The human brain invented this game. For many years, computers could not beat the chess masters. It was difficult for computers to plan a few steps ahead and to know which move would be better; today, computers can beat every chess player. An even better example is when an AI machine beat the "Go" champion.[47] Compared to chess, Go is very complex and has both a larger board with more scope for play, as well as longer games. On average, there are many more alternatives to consider per move (the lower boundary on the number of legal board

positions in Go has been estimated to be 2 x 10^{170}). In October 2015, for the first time, the AlphaGo program beat a human Go champion.[48] However, we do not yet have a machine that can invent a game like chess or Go. We still need the human brain and creativity to invent the game, and then the machine can learn the game and beat us. *Humans invented the machine that can beat them.*[49]

We can imagine a situation in the future when AI as machine-learning will build various options for games, but we will still need the human brain to make decisions about the rules. Even in unique situations that require a new strategy, such as whether to seek peace or go to war in a specific situation, we can imagine machine-learning that has the ability to give us different options about how to act. However, even then we will need the human brain to make the decisions. One human characteristic is the ability to think together with other humans. Mutual learning is one of the "magic secrets" of the development of human knowledge. Human abilities enable group thinking. AI is the ability of a machine to perform functions that are possible for people when they think, but without the ability to think together as mutual learning. AI-enabled machines can receive information from other AI- enabled machines, but they cannot enable group thinking *between* AI machines. Therefore, I'm not talking about a fantasy world in which machines can understand complex and unique situations that have not taken place in the past.[50] Machine-learning acts as an assistant to the human. The ability to think, to give feedback and to do things that people cannot do by themselves are really changing us

as human beings. Rather than prioritizing between humans and machines, I'm talking about The Human-Machine Team as "super-cognition." [51]

WE ARE HERE ➡

ARTIFICIAL INTELIGENCE

USE THE DATA (ORGANIZE-COMPUTING)

BIG DATA

COMMUNICATE 24/7 (INTERNET)