



“The Cognitive Era and the New Frontiers of Information Technology”

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Abstract:

Ever since humans began trading, and consequently, adding and subtracting numbers, they perceived a need for mechanical assistance to help them keep track of their transactions. Thus, the earliest computers were born. In fundamental ways, and although the mechanisms of how we perform calculations have profoundly changed over the millennia, we have been building calculators ever since. But something fundamental is changing now. For the first time, we are capable of building *learning* systems that can be deployed at scale. The web and the Internet of Things are providing us with vast amounts of digitized knowledge, knowledge that is being used to train machine-learning algorithms. The power of these algorithms is their ability to learn from data, rather than follow only explicitly programmed instructions. And thanks to our powerful computers, the algorithms now operate at the scale and speed required to tackle really complex problems. Robotics, self-driving cars, speech and image recognition, medical diagnosis; the applications will reach as far as there are patterns to be discovered. The future of knowledge and expertise is a collaborative relationship between humans and computers that we call Cognitive Computing. Cognitive systems can make sense of the 90 percent of the world's data that computer scientists call “unstructured.” This enables them to keep pace with the volume, complexity, and unpredictability of information and systems in the modern world. None of this involves either sentience or autonomy on the part of machines. Rather, it consists of augmenting the human ability to understand – and act upon – the complex systems of our society. This augmented

intelligence is the necessary next step in our ability to harness technology in the pursuit of knowledge, to further our expertise, and to improve the human condition. That is why it represents not just a new technology, but the dawn of a new era of technology, business, and society: The Cognitive Era.

In parallel with the fundamental shift of traditional computing to Cognitive Computing, an intensely promising and radically new way of computing is also emerging: Quantum Computing. While Cognitive Computing systems are built on the same types of silicon transistors that have underpinned traditional computing for half a century, Quantum Computing harnesses the unique and non-intuitive properties of quantum devices to compute in entirely new ways that will allow us to solve problems that would be otherwise intractable. While quantum technology is still nascent, it is now in an exciting and formative stage that is simultaneously pushing the boundaries of both physics and information technology.

Together, Cognitive Computing and Quantum Computing represent new frontiers of information technology and promise to usher in an era of unprecedented advances in the power of technology to tackle the world's toughest problems.

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