

c o n t e n t s

“Computers will overtake humans with AI at some point within the next 100 years. When that happens, we need to make sure the computers have goals aligned with ours.”

—STEPHEN HAWKING

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ARTIFICIAL INTELLIGENCE GUIDEBOOK

OVERVIEW BY FORESIGHT EDITORS LEN TASHMAN AND HOLLY LANCASTER

INTRODUCTION

Artificial intelligence (AI) is the name commonly given to the capacity of machines for mimicking the human aptitude to reason, solve problems, and learn from experience. The impact of exponential advances in AI and robotics on future employment prospects is a huge concern with profound implications, and it will almost certainly disrupt forecasting roles. This *Foresight* Guidebook examines how AI will affect organizations, jobs, forecasting, and planning.

Chapter 1, from **Owen Davies**, sets the stage by postulating that AI will be neither the dystopia that pessimists fear, nor will it be a human/machine paradise. Rather, we can expect a mix of benefits and liabilities, and making sure that the former outweigh the latter is the difficult challenge that we face.

Chapter 2 is the first of six contributed by **Spyros Makridakis**. Here he reflects on his earlier predictions (made in 1995) about the progress of the Digital Revolution—noting how he dramatically underestimated the emergence of new technologies—and presents what he now sees as the forthcoming advances in AI. His major objective is to consider how companies can reap benefits from AI while avoiding the dangers that lurk ahead.

In my opinion, the forthcoming technologies of the AI Revolution and their impact over the next 20 years will probably be many times the magnitude of those of the Digital Revolution from 1995-2015, and probably even greater than those of the Industrial Revolution with its beginnings in the early 18th century.

Chapter 3 describes “four scenarios of possibility” for the future impact of AI technology: those of the Optimists, the Pessimists, the Pragmatists, and the Doubters.

The majority of views about the future implications of AI are negative; however, there is a small contingent of experts...whose view is that we could learn to exploit the power of computers to sharpen our own skills but always stay a step ahead of AI, using it to augment our own capabilities.

In **Chapter 4**, Makridakis focuses on four dominant technology firms—Amazon, Apple, Facebook, and Google—considering why they have been successful to date and whether they can continue to dominate the technological landscape 20 years from now. He also compares the employment and wealth impacts of AI between developed and developing countries and predicts a worsening of work and wealth inequalities.

In **Chapter 5**, **Ira Sohn** presents a disconcerting picture for job markets overall. Highlighting two cautionary books on the subject, *Rise of the Robots: Technology and the Threat of a Jobless Future* by Martin Ford, and *Humans Need Not Apply: A Guide to Wealth and Work in the Age of Artificial Intelligence* by Jerry Kaplan, Sohn delivers this warning:

Major adjustments will be needed in our economic systems to mitigate the impacts of AI on employment and income inequality.

In **Chapter 6**, Makridakis describes blockchain technology and its integration with AI.

The chapter also takes us down the road to intelligence augmentation (IA).

IA can amplify human intelligence by exploiting AI's considerable tactical benefits and people's strategic intelligence.

In **Chapter 7**, Makridakis presents his vision of the emerging and long-term future of AI in the form of 10 technological trends that can profoundly affect our work and our lives. These include trends in supercomputing, nanotechnology, genomics, renewable energy, autonomous transportation, and augmented reality.

The effects of a few of these trends are already being felt in our day-to-day affairs, while others might seem to have sprung from the imaginations of the most audacious science-fiction writers. One thing appears certain: the challenge will continue to be that of predicting forthcoming technologies without falling into the trap of shortsightedness, which has plagued so many of the previous forecasts.

In **Chapter 8**, Owen Davies bookends Makridakis's chapters with his own commentary:

We simply need better ways to project technology more than a few years ahead—and we will need them ever more urgently as AI becomes more powerful and its applications more widespread.

Davies boosts key predictions from Makridakis on employment impacts, blockchain, IA, and the art of technological forecasting with the expert opinions gathered in Tech-Cast's Delphi forecasts.

In **Chapter 9**, **Larry Vanston** presents another voice on predicting AI's impact with his own insights into AI performance forecasts, AI's impact on employment, and its dangers. He also details areas where he disagrees with Makridakis's forecasts: brain-computer interfaces, blockchain, and AI for forecasting.

Chapter 10 gives Spyros Makridakis an opportunity to respond to Vanston's points.

The final two chapters address the techniques and impacts of "deep learning" (DL), which is often used as a synonym for AI. While the term has only been coined in the last few years, the techniques it refers to have been in development since the 1950s, namely artificial neural networks (NN). DL has scored major successes in image recognition, natural language processing (e.g., machine translation and speech recognition), and autonomous agents such as Google DeepMind's AlphaGo. **Chapter 11** is a tutorial on the basics of DL through NNs with illustrations of how NNs have been applied at Amazon for forecasting product sales and other variables. In conclusion, **Chapter 12** explores current trends in the use of NN, summarizes the pros and cons of forecasting through NNs, and discusses ongoing research designed to improve the application of NNs for forecasting.

We hope that this compilation gives you a comprehensive view of AI's current and future impact on the world and how forecasters can predict, plan, and prepare for the AI revolution.