

PREDICTIVE MEDICINE

ARTIFICIAL INTELLIGENCE AND ITS IMPACT ON HEALTHCARE BUSINESS STRATEGY



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*Predictive Medicine: Artificial Intelligence and Its Impact on Health Care
Business Strategy*

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Abstract

Artificial intelligence, machine learning and other new technologies are ready to revolutionize the healthcare industry. But if we want them to achieve their full potential, we'll need leaders who understand these new tools.

Predictive Medicine makes AI more accessible for healthcare practitioners without shying away from complex topics and controversial subject matter. It's a call-to-action for a new generation of health leaders and a roadmap to a brighter future.

Keywords

artificial intelligence; ai; machine learning; ml; technology; technologies; healthcare; health care; health; healthtech; health technology; natural language processing; nlp; robotics; big data; data; personalized healthcare; personalized healthcare; future of healthcare; voice; voice recognition; future; futurism; prediction; medicine; digital; digital health; venture capital; vc; digital therapeutics

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I also owe a big debt of thanks to everyone who read my first book, *The Future of Healthcare: Humans and Machines Partnering for Better Outcomes*, and in particular to those who shared feedback or recommended the book to their friends and family. You know who you are.

I would also like to thank everyone who took the time to talk to me throughout the creation of this book. Thanks also to my publishing team, starting with Dane Cobain, my editor, who helped me to shape my manuscript into the book that you are holding in your hands.

Finally, thanks to you, the reader. The future of healthcare is coming—but only if you help to make it happen.

Over to you.

Introduction

Picture the Scene: You just got home from work and your significant other is alone in the kitchen preparing dinner. You hear a command, “Alexa, open all recipes.” Your mind starts wandering: mac and cheese... pizza...chicken alfredo...too complicated. But before you’re done contemplating, a virtual assistant called Alexa casually spurts out a response: “Welcome back to ‘All Recipes.’ What do you want to search for?” To which your significant other responds: “Alexa, what can I make with chicken and mushrooms?” This is, of course, what they found in the refrigerator. Alexa then responds, “My recommendation is chicken with mushrooms. It’s 4.5 out of 5 stars with thousands of reviews and takes 45 minutes.” Forty-five minutes can seem like an eternity when you’re hungry. So, your significant other says, “Alexa, I only have 30 minutes.” To which Alexa responds, “By setting the time to 30 minutes, I found a Chicken Mushroom Dijon recipe.” Your significant other is thrilled and responds, “Alexa, perfect. Start cooking.”

If this scenario doesn’t sound familiar, then it will before you know it. Alexa is Amazon’s artificial intelligence (AI) based virtual personal assistant that interprets natural language and provides answers to questions at lightning speed. Alexa is the chef soulmate you never knew you wanted.

AI is all around us. It’s in our phones, cars, watches, banks, hospitals, home security cameras, lightbulbs, computers, shops and dating apps. As a consequence, it’s not shocking that investors, corporate executives, managers, CEOs, vice presidents, doctors, lawyers, nurses, policy makers and entrepreneurs are eager to learn about AI: they all recognize that it’s going to drastically change the way they’ve been doing business.

As a business-savvy physician, healthcare futurist, clinical trialist, entrepreneur and staunch advocate for value-based healthcare, I view the advances in AI from a unique perspective. Over the years, I’ve come to realize that there’s a huge knowledge gap in the healthcare industry, particularly when it comes to healthcare leaders and executives and their understanding of AI and machine learning. For AI to achieve its full potential in

the field of healthcare, we'll require leaders who understand the technology and have a long-term strategy in place to take advantage of it.

From an economics point of view, for an AI to deliver value in healthcare, it has to drive down costs and improve outcomes. Today, patients wait for symptoms of disease to develop before seeing a healthcare practitioner, at which point it might be too late to treat. AI opens the door to an era of predictive medicine. An era in which disease is prevented, intercepted or cured early.

Throughout my career, I've been working on disruptive new technologies and identifying ways to bring them into the healthcare industry. I've also been fortunate to engage with top AI researchers in the world such as Elon Musk's AI advisor and MIT's Max Tegmark, and I've advised many healthcare start-ups, health systems, and investors, as well as the governments of the United States, the United Arab Emirates, Rwanda, and Austria. Being so close to so many healthcare applications of AI and working for hospitals, start-ups, investment firms, and giants in the pharmaceutical industry such as Bayer, Novartis, and Johnson & Johnson has forced me to think about how this incredible technology affects healthcare business strategy. As I'll explain, AI is a prediction technology. Predictions are inputs to decision making and economics and the practice of medicine provides an excellent framework for understanding the trade-offs that underlie any decision. So, by dint of luck and some design, I find myself at the right place at the right time to form a bridge connecting technologists, hospital systems, payers, patients, pharmaceutical companies, investors, start-ups, and other stakeholders in the business of healthcare.

It's worth understanding that artificial intelligence doesn't actually bring us intelligence but is instead a critical component of intelligence-prediction. In our earlier scenario, what Alexa was doing when your "significant other" posed a question was taking the sounds it heard and then predicting what information the words were looking for. Alexa doesn't know what Chicken Mushroom Dijon tastes like. However, she's able to predict that when someone asks such a question, they're looking for a specific response: a recipe that includes the words "chicken" and "mushrooms." Every decision in healthcare—or in any other business—is based on making the most of a better prediction. Companies

such as Brendan Frey's Deep Genomics bring value to medicine by predicting what will happen in a cell when DNA is altered. The Apple Watch improves healthcare by being able to predict the risk of atrial fibrillation or stroke on the wearer, thereby calling for early medical intervention. This adds value to healthcare and all stakeholders stand to benefit. I've also worked on projects in which we were able to successfully predict the risk of suicide and depression based on an individual's voice and to diagnose variations of multiple sclerosis based on changes in MRI imaging over time coupled with changes in activity and sleep.

There's never been a more opportune time for us to tap into the capabilities of artificial intelligence. After all, the healthcare industry is at risk of buckling under its own weight, and patients are expressing their unhappiness with the current system. This is highlighted in *The Employee Experience* by Jacob Morgan, where the author explains, "A survey by PwC of more than 2,300 healthcare patients found that only half were satisfied with their overall experience as healthcare consumers. Ominously (for insurance companies, anyway), many were willing to try nontraditional sources for health insurance, including large retailers (40% of respondents) and digital companies like Amazon (37%)."¹

For anyone well versed in the world of digital health and innovation, it will come as no surprise that despite the buzz around artificial intelligence in the healthcare industry, business leaders and investors struggle to identify the right business strategy. That's why I decided to write *Predictive Medicine: The Economics of Artificial Intelligence and Its Impact on Healthcare Business Strategy*, which brings together my experience in AI, data science, business, medicine, clinical research, and the healthcare industry. This book is a call-to-action for a new generation of health leaders and a roadmap to help them usher in a brighter future.

When writing this book, my goal was to create a resource to help healthcare industry leaders understand artificial intelligence (AI) and the way it can be used to revolutionize healthcare. As AI technology develops, you can expect to see plenty of new revenue opportunities in the healthcare market, and I like to think of it as a win/win situation. It can make

¹ See: <http://amzn.to/employeeexperiencebook>

money for investors, entrepreneurs, and corporations whilst simultaneously helping patients to live better, healthier lives.

I've tried to make artificial intelligence more accessible for healthcare stakeholders without shying away from complex topics and controversial subject matter. This book doesn't pull any punches. Instead, it aims to be a valuable resource for the years to come.

If you're a business leader, this book aims to provide you with an understanding of the impact of AI on healthcare management and strategy. If you're a student or a recent graduate, this book will give you a framework or roadmap for thinking about the evolution of jobs and future careers in the healthcare industry. If you're an angel investor, analyst, or venture capitalist, this book offers a solid foundation upon which you can build your investment hypothesis. If you're a health policy leader, this book serves as a roadmap for understanding how AI is likely to transform the healthcare environment and how policy could mold those changes for the better.

I hope by the end of this book, you'll be a different person in a number of ways. First, you'll know a lot more about AI in the healthcare industry. You'll be able to describe a number of applications of AI, including machine learning, robotics, and natural language processing. You'll also be able to describe some of the technical, strategic, and other factors to consider when deciding where different kinds of AI applications would be appropriate in the business of healthcare. Moreover, you'll have several ideas and a solid plan for how your own organization or some other entity could leverage AI to gain a strategic advantage.

Secondly, you'll know more about AI generally. I hope that you'll share my view that AI, in the next decade or three or more, won't resemble the scary robots of science fiction. That most kinds of artificial intelligence generated in the near future won't be AI alone, but humans and machines partnering for better outcomes—*augmented intelligence*. I also hope to convince you that AI won't take away your job and if it does, you'll most likely get a more rewarding one. Last but not least, if you're terrified of AI now, my hope is that by the end of this book, you won't be any longer.

To get the most out of this book, I recommend gathering your team together to discuss your AI strategy and ensuring that every team member understands how this exciting new technology will affect their job, the

company, and the industry as a whole. But before you get carried away, remember to ask yourself: What problem am I trying to solve and is AI the right tool? AI isn't the solution to every business problem, but it's an incredible tool to have when solving the right business problem. Feel free to share your copy of the book with team members (or better still, buy a copy for each of them) and make sure that it's always available as a reference tool in the workplace.

In the meantime, settle in, get comfortable, and prepare to see the future. It might not be as far away as you think.



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