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Opinion

Well. From Artificial Intelligence to Empathy?

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One might imagine nuclear hormone receptor signaling systems as internal machines that continuously monitor every aspect of our lives. They intelligently adapt to our environments in ways we have yet to fully understand. When things go awry we describe it as maladaptive or dysregulated; and if persistent then over time we invoke a disease, disorder or simply aging. For centuries, humans have strived for health by using traditional aides like diet, exercise, sleep, temperature and drugs. In today's medicine, we are creating external machines to intelligently monitor, interpret and sometimes mimic our internal biology. We want to understand what makes us tick, so we aim for machines that will consume personal and big data.

How much is too much? In almost every sphere of life, time and time again, we are reminded that Big Data and Artificial Intelligence (AI) efforts are moving full steam ahead - in journeys that society often embraces but to destinations that are not always appreciated. Dr. Eric Jeffrey Topol, a cardiologist from the Scripps Research Translational Institute, urges us to slow down a little to deliberate on what makes us human, and then to speed-up and change for the better [1]. It is not all pretty. Topol envisions in *Deep Medicine* how embracing artificial intelligence strategically can make healthcare human again. Ironic, isn't it? Should you buy this argument?

Deep Medicine is very timely and not like any other AI book on the shelf. In the Foreword, Dr. Abraham Verghese spells out the complexities of a doctor-patient relationship by framing why we humans are fundamentally different from animals. Simply put, we care - humanely. And we expect to be cared for - humanely in a personal manner. The plain truth - and yet, complicated.

In his argument, Topol artfully builds a bold proposal for a systemic change in healthcare. His main point is that despite massive monetary investments in healthcare, we have botched caring for each other. Declaring that it is an opportune time to implement the unique strengths of AI purposefully, Topol encourages that we jump and adapt to create better bonds of caring humans.

This is not the first time Eric Topol has writ to shake things up - and most likely won't be the last. In his first book, he prodded us to anticipate the 'digitized human' as a *Creative Destruction of Medicine* [2]. Then he railed against paternalism of the medical system and advocated for patient empowerment to the point of democratizing medicine so *The Patient Will See You Now* [3]. This time he asks us to effectively slow down and be purposeful in deep learning using AI.

Central to this thesis is the characterization of 'Deep Medicine' as having three 'deep' principal components: deep phenotyping to define each individual; deep learning of AI in pattern recognition and machine learning to integrate AI into healthcare; and deep empathy with compassion in the physician-patient relationship. We are shown the low hanging fruit of 'shallow medicine', like pattern recognition elements of healthcare that a machine can (eventually) be taught to read

with reasonable accuracy. Then we are reminded that simply feeding a computer with data is not enough to create a correct diagnosis. AI systems are not yet developed to understand what they have learned. Indeed, factual knowledge is far from deriving meaning. And therein lies the problem of liabilities - real and deep ones. A spectrum of problems so deep, that if AI runs amok it could conceivably end the human race! And so we are urged to focus on how we will use the powers of AI constructively, particularly in medicine. For example, we could arm healthcare professional with AI aides that recognize patterns in landscapes, like scans, pathology slides or eyes. Several research efforts in development are discussed with cautious optimism and the realistic acceptance that algorithms are not as smart as people in vital aspects. But there is opportunity in delegating some mechanics of healthcare to AI so as to free up a clinician's time to integrate the health chart of a patient into a caring consultation for a health plan of an individual person. The chapter on mental health is particularly poignant as it shows the power of innovation, the potential of behavioral monitoring and the integration of information - real big data. With this opportunity of studying humans in minute detail comes the fortunate interaction of person with machine, and also the unfortunate conundrum of how much of freedom and privacy a person is willing to trade for prognosis, diagnosis and treatment of mental health. This leads to the bigger issue of how implementing AI strategically will change the systems and business of health for the better, and maybe also for the worse. For research scientists, the roles and value of AI and big data in discovery and dietary intervention are a double-edged sword. Clearly, there are potential advantages to speed, automation and unbiased approach to categorizing data. However, there is also the reality that much of science, scientific publications and the scientific process are not binary systems. As a scientist, I appreciate the nuances and personalities integrated in the scientific literature, so I wonder how we will overcome the hurdle that machine learning is unable to value these aspects appropriately. While AI can input 'facts', AI systems have yet to interpret the importance of subtle expression, the unspoken words and the value of disagreements in research findings or data interpretation. Interestingly, Topol highlights some wonderful examples of bold ambitions and prospects for achievement. The Virtual Assistant is an example of how difficult (or simple) it might be to balance wants and desires from a machine helper. And therein lies a problem or advantage, depending on your perspective. The real gem of Topol's vision is the devotion to restoring connection between humans - and the use of man plus machine to equal empathy.

Perhaps the most persuasive aspect of the book is the steady undercurrent that the author himself has much at stake. He is human in all aspects: a patient, a doctor, a consumer, a businessman, a scientist, an educator, a relative, a friend, a colleague and a seasoned leader of change. He is not a technical computer scientist who can develop code of a personal bot for you, but Eric Topol will show you a

bot (or gadget) that might buy you time to be more human. Of course, you have to strategically accept AI into your life - and in many personal scenarios that trust is yours to gamble. On a global level, the fundamental system of healthcare is changing. Indeed, the FDA now regulates several mobile medical applications, genomic readouts, and AI-assisted diagnostics- a rapidly growing arsenal for personalized medicine and health monitoring (www.fda.gov/MedicalDevices/DigitalHealth/MobileMedicalApplications/ucm368784.htm). *Deep Medicine* prods us to be deliberate on our wants and to actively partake in the decisions of change so that we seize this opportunity to be more connected as humans.

In his 2011 memoir [4], Paul Allen predicted: "The digital future will belong to those who seize it." Today, in *Deep Medicine*, Eric Topol throws down the gauntlet "To restore and promote care. Period."

In such a fast-paced AI world, it seems that no book can be produced speedily enough to bring you the latest technologies or trendiest scientific discoveries. Although I hear that several twitter communities beat that drum of innovation. I recommend pondering on Eric Topol's argument of *Deep Medicine* because it left me oscillating between two familiar tunes of change:

"I really need to learn …"
- How deep is your love? (The Bee Gees)

"There's something happening here …"
- Stop! Hey what's that sound? (Buffalo Springfield).

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Competing Interests

The author declares no competing interests.

References

[1] E. J. Topol, *Deep Medicine: How artificial intelligence can make healthcare human again*, Hachette Book Group Inc., New York, 2019.

[2] E. J. Topol, *Creative Destruction of Medicine*, Basic Books, New York, 2012.

[3] E. J. Topol, *The Patient will see you now*, Basic Books, New York, 2013.

[4] P. Allen, *Idea Man: A memoir by the co-founder of Microsoft*, Portfolio, London, 2012.