Perspective

AI in oncology: when science fiction meets reality

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You might have watched terminator series, yes, I am talking about the movie franchise that foreseen the ultimate war between artificial intelligence (AI) and its creator- human beings. The first movie was actually released in 1984, when personal computer industry just started to thrive. An iconic event was that at the same year, Apple debuted the Macintosh personal computer product line. More than three decades have passed, now Apple becomes the biggest company in the world and AI is not a fiction anymore. We are now in an era that AI has penetrated into every corner in the world; even before the real "Skynet" awake, our life has seemingly started to be dominated by AI.

Take traffic for example, according to a recent report [1], working hour commute times have been steadily increasing for the past decades, resulting an estimated $160 billion lost in productivity. To solve this problem, AI is helping people re-organize the everyday commute in many ways. Google map collects anonymous traffic information and utilizes AI-powered algorithm to present you the best route. Ridesharing apps like Uber and Lyft are using AI to predict user needs to further meet the traffic demand in busy hours/areas. When autopilot car just started to hit the road, AI autopilots in commercial airlines has been a predominant practice now [2].

In March 2017, AlphaGo, the AI powered program created by google, beat Lee Sedol, previous world champion, winning four out of five matches [3,

4]. Later the same year, the updated program challenged more Go masters, including the current world champion Jie Ke, in an international Go online community, with a series of consecutive wins. Yet, the iconic "human intellectual" game once considered impossible to be conquered by machines has officially been managed by AI [5].

Back to the 1950s, when the term "AI" was just created, one of the scientific outlook at the time was that AI ultimately will be able to pass as so called "Turing test", which was developed by a computer science pioneer, Alan Turing. This program tests of a machine's ability to exhibit intelligent behavior equivalent to, or indistinguishable from, that of a human. With the deep learning technology nowadays, various form of AI had passed Turing test (albeit with certain limitations) and there is unlimited potential of what utilization AI can assist us to do [6].

AI has stepped into so many fields, health care is no exception. Recently, a report indicated that AI quickly and accurately diagnosed eye diseases and pneumonia [7]. Using AI and machine learning techniques, researchers at Shiley Eye Institute at UC San Diego Health and University of California have developed a new program to screen patients with common but blinding retinal diseases; the work was published on the top-tier journal Cell this year. Notably, according to their study, their program was compared with diagnoses from five ophthalmologists who reviewed the same scans. You would be amazed that the machine performed similar, if

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not better, to an experienced ophthalmologist, with more than 95 percent accuracy.

What about oncology? Cancer is a significant global health issue and is the leading cause of death worldwide. Every year about 8 million patients lost their lives because of cancer and its related complications. Cancer research has evolved so much in the last few decades with the advances of next generation sequencing, targeted therapy and immune therapy. However, apart from the research, the diagnosis and treatment of cancer is still extremely complicated, and the quality of care varies a lot across the state, let along the world. IBM is a pioneer in AI technology and luckily, they have some pretty good news to share with us for the AI application in oncology. IBM had created an AI powered program called "Watson diagnostic", which harbors the library of huge cancer research data (over 20 million papers for now and increasing every minute) and steadily being fine-turned by real doctors to help it make precise diagnosis and suggestive treatment. Watson is already in the clinic now. As a reference, in Tokyo, Watson diagnosed a 60-year-old patient's rare form of leukemia within 10 minutes, a disease that doctors had struggled to correctly locate for months, even with her genetic information in hand. More recently, a research led by Dr. Sebastian Thrun from Stanford Artificial Intelligence Laboratory, reported that their AI powered deep convolutional neural network algorithm out performed board-certified dermatologists at diagnosing skin cancer [8]. Using data from nearly 130,000 medical images of skin diseases, they developed a novel AI algorithm that can recognize subtle visual cues of malignancy. They compared the algorithm's performance and that of 21 board-certified dermatologists for 3 diagnostic tasks: melanoma classification, carcinoma classification, and dermoscopic melanoma classification. The algorithm matched the dermatologists' performance in all 3 areas. As the first authors of this study, Dr. Andre Esteva, indicated "It is projected that 6.3 billion smartphone subscriptions will exist by the year 2021 and can therefore potentially provide low-cost universal access to vital diagnostic care". If more AI algorithms like those programs enter into market, the cost and efficiency of clinical cancer diagnosis and related care will be largely improved. Moreover, the quality of care will be more standardized across different regions, especially in those countries where high quality health care is beyond affordable.

Scientific communities are generating numerous new data and creating new ideas every day. There is still no designated journal that specialized in AI and oncology yet, which is an urgent and clear market need. Within a year, the skin cancer diagnosis Nature paper by Dr. Sebastian Thrun group has been cited for over 500 times, a number that is 10 times higher than the journal's already-high annual citation index. Here we are excited to debut the first journal that elaborately report the advances focus on AI and oncology. We welcome all researchers and clinicians to communicate and share their work, ideas as well as perspectives in this field. It is not a secret that in the near future, AI will be an inseparable significant part of our health care system, just like in every other field in modern world. We are thrived to be part of it!

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