Disease Prediction in the Digital Age: Collaborative Learning and Rule-based Methods

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Abstract

Technologies such as genomics, imaging, smartphones and wearable devices, have been digitalizing healthcare and transforming it from episodic, reactive care for patients to timely disease prevention and health improvement of individuals and communities. Correspondingly, risk prediction has become a foundational pillar in this new vision of healthcare and taken up a new character. In this talk, I will use Type 1 Diabetes as an example and give a historic account of this journey working with many of my students and collaborators on two methodological frameworks to build a new generation of disease prediction models: the collaborative learning (for personalization and diversification of the models) and rule-based methods (for discovery of novel, multi-modal biomarkers to enrich the models). Our recent results also show how to extend these methods to respond to emerging AI ethics issues such as interpretability, disparity, fairness and equity. I will conclude my talk with some future research directions, inspired by the still largely untapped potential of this ongoing digital transformation of healthcare and some recent experimental applications such as digital twins and metaverse in mental health and cancer that have been attracting people to reimagine the future of healthcare in this digital new world.

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