Artificial Intelligence toward Personalized Medicine

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Abstract	In current medical practice when a patient feels symptoms he/she would consult the doctor. The doctor then gives medication in a one-fits-all fashion. However, recent genetics studies had shown that different genetic makeup can results in different effects on medication, so the medication should be customed for every individual. The main idea of Ã¢Â€Âœpersonalized medicineÃ¢Â€Â• is to provide the right intervention including medication to the right patient at the right time and dose. With this approach, the medication paradigm would shift from curative to preventive. The rise of personalized medicine had been possible because the information from ever-increasing biomolecular (proteomics, genomics, and other omics) and health-related data are successfully Ã¢Â€Âœminedâ€Â€Â• by Artificial Intelligence (AI) tools. In this paper, we proposed that AI systems toward personalized medicine must have acceptable performance, be readily interpretable by the clinical community, and be validated in a large cohort. We examined a few landmark papers with the keyword Ã¢Â€Âœ AI for personalized medicine applicationÃ¢Â€Â•; 1) automatic image-based patient classification, 2) automatic gene-based cancer classification, and 3) automatic health-record heart failure with preserved ejection fraction patient phenotyping. All the examples are evaluated by their performance, interpretability, and clinical validity. From the analysis, we concluded that AI for personalized medicine could benefit by five factors: (1) standardization and pooling of genetics and health data, nationally and internationally, (2) the use of multi-modalities data, (3) disease specialist to guide the development of AI model, (4) investigation of AI-finding by clinical community, and (5) follow-up of AI-finding by the large clinical trial.
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