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Publication

Artificial intelligence, physiological genomics, and precision medicine

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Big data are a major driver in the development of precision medicine. Efficient analysis methods are needed to transform big data into clinically-actionable knowledge. To accomplish this, many researchers are turning toward machine learning (ML), an approach of artificial intelligence (AI) that utilizes modern algorithms to give computers the ability to learn. Much of the effort to advance ML for precision medicine has been focused on the development and implementation of algorithms and the generation of ever larger quantities of genomic sequence data and electronic health records. However, relevance and accuracy of the data are as important as quantity of data in the advancement of ML for precision medicine. For common diseases, physiological genomic readouts in disease-applicable tissues may be an effective surrogate to measure the effect of genetic and environmental factors and their interactions that underlie disease development and progression. Disease-applicable tissue may be difficult to obtain, but there are important exceptions such as kidney needle biopsy specimens. As AI continues to advance, new analytical approaches, including those that go beyond data correlation, need to be developed and ethical issues of AI need to be addressed. Physiological genomic readouts in disease-relevant tissues, combined with advanced AI, can be a powerful approach for precision medicine for common diseases.

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