

# Machine learning 101: Promise, pitfalls and medicine's future

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You've heard the term "machine learning" as it's becoming recognized as a valuable tool to help physicians in diagnosing and managing patients, as well as other aspects of medicine.

But do you understand what that buzzword really means?

Two experts recently explained the fundamentals of machine learning, what it means in the clinical setting and the possible risks of using the technology during an education session—"Machine Learning: An Introduction and Discussion of Medical Applications"—that took place during the June 2021 AMA Sections Meetings and was hosted by AMA Medical Student Section.

## What is machine learning?

In machine learning, algorithms are used to model data. The machine then identifies patterns in the data and it uses the patterns to create a model.

There is rich patient data in EHRs that can be used for these purposes in health care.

**Diagnosis:** A classification algorithm can help identify whether a patient is likely to have a disease or not likely to have a disease. For example, machine learning may be able to identify multiple sclerosis early.

**Management:** A prediction algorithm allows machine learning to look at different factors to help predict how a patient's disease might progress. For example, looking at calcium, hemoglobin and other numbers can help predict whether a patient with chronic kidney disease will need dialysis in five years or looking for key words in the notes in a patient's chart can be predictive of suicidal risk.

**Discovery:** A clustering algorithm can help lead to discoveries. For example, identifying various subgroups of patients with endometriosis so that you can tailor management.

A key aspect of machine learning is that it continuously improves the model by weighing the data with minimal human interaction, explained Herbert Chase, MD, MA, professor of clinical medicine in biomedical informatics at Vagelos College of Physicians and Surgeons at Columbia University.

It may be able to pick up nuisances leading to disease that a physician does not. For example, people who all worked in a factory that had heavy metals in the atmosphere or people in the same zip code are experiencing the same thing. People with a certain disease are taking the same vitamins or they all had a previous surgery.

“The EHR has hundreds of different attributes, thousands of different values that can be mined. This is classic data mining in an unsupervised way to make the prediction model better and there are many examples in the literature now of how this approach has dramatically improved the prediction for coronary artery disease, heart failure and many other chronic conditions,” Dr. Chase said.

Machine learning is one kind of augmented intelligence (AI), often called artificial intelligence. Learn how the AMA is committed to helping physicians harness AI in ways that safely and effectively improve patient care.

## Be mindful of pitfalls

While machine learning can help medicine in tremendous ways, physicians must also be mindful that bias in machine learning is a problem, Ravi Parikh, MD, MPP, assistant professor of medical ethics and health policy and medicine at the University of Pennsylvania, explained during the educational session.

There are three distinct things you need to specify for a supervised machine-learning algorithm. You start with a population. A series of variables is derived from the population. Those variables are then used for a predictive algorithm to predict an outcome.

“Any amount of those three steps could be biased and could generate bias in the context of the algorithm,” Dr. Parikh said.

So, how can bias be addressed? Dr. Parikh said physicians can:

- | Identify bias and potentially flawed decision making in real time.
- | Use unbiased data sources.
- | Track algorithm outputs continuously to monitor bias.

## **Machines won't replace physicians**

Drs. Parikh and Chase said physicians don't need to worry about machine learning eliminating physicians' jobs.

"The workforce will just be the same as it always has been ... but you will be operating at a higher level and I think that will make the profession to some extent more interesting," Dr. Chase said.

Read about seven tips for responsible use of health care AI.