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DATA OVERLOAD

Artificial intelligence in medicine can still cause pain

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Artificial intelligence involves computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making and language translation. There are countless potential uses for AI in medicine, but the two most promising, and potentially problematic, are machine vision and clinical-decision support.

Machine vision applications are those in which software and hardware provide operational guidance to dedicated devices, based on the capture, processing and interpretation of images. Medical applications include interpretation of radiology images and biopsy samples.

Clinical decision support systems analyze all of a particular patient's data and then bring to bear massive amounts of other health data, journal articles, etc., to arrive at a diagnosis or treatment recommendation.

To create an effective AI system, developers must feed it data. The first data set is usually labeled or annotated in a way that it is already recognizable to the algorithm. When the developers believe they have exposed their device to enough data points and labels, they begin to analyze performance by inputting test data or questions to which they already know the solution or answer.

Using the testing results for guidance, the developers will then adjust the algorithm or add more data. As additional, unstructured data is added to the system, it begins to "learn" and make connections on its own.

A number of medical machine vision systems utilizing AI have demonstrated impressive performance in clinical diagnostic capabilities in image-intensive specialties such as radiology, pathology, ophthalmology and dermatology.

In 2018, researchers in Seoul, South Korea, reported their deep learning-based automatic detection system performed better than physicians in radiographic classification and nodule detection for malignant pulmonary nodules on chest x-rays. When used as a second read, the system also improved physician performance.

IBM's Watson is one of the better-known clinical decision support tools, though its fame outside of medicine is likely primarily due to its vanquishing two "Jeopardy!" champions in 2011. According to IBM, Watson is an advanced question-answering computer system that can be used by clinicians to assist in making decisions about diagnoses and treatment options.

Watson uses a number of AI approaches, including information retrieval, semantic analysis, natural language processing, automated reasoning and machine learning.

Massive amounts of structured and unstructured data are fed into Watson's voracious database, including clinical literature and millions of health records and test results. Then a particular patient's records, history and test results are inputted followed by a physician query.

The system first analyzes the patient-specific information to identify the relevant data from the medical and family history and then compares it to the reams of other data at its disposal to form and test hypotheses and provide a list of individualized recommendations for diagnosis or treatment.

There are a number of ways in medicine, however, that the promise of AI can lead to pain, for both patients and physicians, because artificial intelligence does not mean perfect intelligence.

A system is only as good as its data. In a recent interview in *Forbes* magazine, law professor W. Nicholson Price discussed the leak in 2018 of documents from a major player in health-care AI which revealed that its algorithms had produced incorrect and unsafe cancer treatment recommendations.

The company determined that engineers had used "synthetic" (hypothetical) data to train the system instead of real-world cases.

Another potential patient-safety concern is the relative opacity of the AI decision-making process. AI-driven health-care tools are often described as "black boxes." They spit out an answer but cannot explain their work. This poses a problem for clinicians because interpretability of the computational method is important to provide evidence that the model is behaving as intended.

Some commentators have opined that physicians relying on tools such as Watson would have a powerful defense if the physician and Watson both arrive at the same wrong diagnosis. But you can't cross-examine a machine. If a reasonably careful physician should have made the right diagnosis, it does not matter how many machines would have also been wrong, especially if no one can explain how the algorithm arrived at the answers.

AI's true potential lies in catching difficult to recognize patterns or images indiscernible to the human eye and, therefore, may actually raise the standard of care. If AI-based tools can pick up some of the rare or obscure diagnoses humans "non-negligently" miss, then missing those diagnose may become negligent. CL

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