

The amazing promise of artificial intelligence in health care

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Artificial intelligence can already scan images of the eye to assess patients for diabetic retinopathy, a leading cause of vision loss, and to find evidence of strokes on brain CT scans. But what does the future hold for this emerging technology? How will it change how doctors diagnose disease, and how will it improve the care patients receive?

A team of doctors led by UVA Health's James H. Harrison Jr., MD, Ph.D., has given us a glimpse of tomorrow in a new article on the current state and future use of [artificial intelligence](#) (AI) in the field of pathology. Harrison and other members of the College of American Pathologists' Machine Learning Workgroup have spent the last two years evaluating the potential of AI and [machine learning](#), assessing its current role in diagnostic testing and outlining what is needed to meet its potential in the not-too-distant future. And that potential is huge, they report.

In their article, the authors describe some amazing possibilities—from an augmented reality microscope that automatically identifies and labels important aspects in the field of view in real time to complete

diagnostic image classification systems. That type of thing has, until recently, been the domain of Tony Stark and others in sci-fi movies.

In addition to predicting what the future may hold, the authors describe potential obstacles and make important recommendations for how the health-care field can best capitalize on the technology's awesome potential.

"AI and especially machine-learning algorithms introduce a fundamentally new kind of data analysis into the health-care workflow," the authors write. "By virtue of their influence on pathologists and other physicians in selection of diagnoses and treatments, the outputs of these algorithms will critically impact patient care."

Artificial Intelligence in Pathology

Right now, pathology and other health-care applications of artificial intelligence are in their infancy. The federal Food and Drug Administration has approved only a few AI devices for pathology use, mostly for classifying cells in blood and body fluids and for screening cervical tissue, the authors report. But in research labs, scientists are using machine learning to classify and grade lung and [prostate cancer](#), predict outcomes in lung and brain cancers, measure breast cancer proliferation, predict bladder cancer reoccurrence and much more. The authors describe what they're seeing in research publications and early prototypes as "tantalizing."

"Artificial intelligence systems, especially machine learning systems that perform complex image classification, are expected to have significant impact in two areas in which images particularly important, pathology and radiology," said Harrison, director of Clinical Laboratory Informatics at UVA Health and a member of UVA's Department of Pathology. "Pathologists will likely need to choose, verify, deploy, use and monitor AI systems in the

future, and therefore they need to learn the strengths and weaknesses of these types of systems and techniques for their effective management."

In addition to projections of future applications, Harrison and his colleagues provide an overview of existing AI algorithms and discuss the development and validation of systems that use AI. Their review also discusses potential concerns about clinical implementation of the technologies, emphasizing the importance of careful validation and performance monitoring to ensure AI is used safely and effectively. The article suggests potential regulations that may be needed along the way. "Creation of a regulatory framework with defined [best practices](#) for accomplishing these goals is a necessary step for successful dissemination of machine learning in pathology and medicine," the authors write.

The article does not suggest we'll be receiving care solely from robot doctors anytime soon. Instead, it predicts that the best outcomes in the near future will come from a careful combination of human and machine capabilities. The authors agree with the American Medical Association in describing the goal as "augmented intelligence" that supplements and enhances, rather than replaces, human doctors' judgment and wisdom.

"Our article was written to introduce pathologists and other clinicians to the basics of machine learning and artificial intelligence, including how the systems work and what will be needed to manage them successfully," Harrison said. "As we begin to apply these tools more broadly, doctors will need a practical understanding of when to rely on them, when to question them and how to keep them working well."

More information: James H. Harrison et al, Introduction to Artificial Intelligence and Machine Learning for Pathology, *Archives of Pathology & Laboratory Medicine* (2021). [DOI: 10.5858/arpa.2020-0541-CP](https://doi.org/10.5858/arpa.2020-0541-CP)

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