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Healthcare AI, Radiology solutions

Re-imagining radiology workflows with language understanding and AI

Nuance Communications

February 28, 2019

The cloud, context-aware language understanding and AI help to advance the practice of radiology and improve the quality, outcomes, and costs of healthcare.

This content was also published in Health Data Management on November 28, 2018 and is co-authored with Dr. William Boonn, CMIO, Nuance Healthcare.

As healthcare's technology pioneers, radiologists are following the ongoing development and design of artificial intelligence (AI) models to detect abnormalities in diagnostic images with a mix of anticipation and uncertainty. It's increasingly clear what AI can do to improve patient outcomes and healthcare costs. What's less well understood is how radiologists will be able to use the technology in ways that complement, rather than complicate, their existing workflows.

While published results have demonstrated the high degree of accuracy and specificity of various AI image characterization algorithms, behind-the-scenes work has focused on integrating a range of AI-powered capabilities into radiology workflows. That's crucial in order to realize the benefits that radiologists envision for the technology.

For example, widely used speech recognition technology with nearly 100% accuracy is indispensable for reporting findings and follow-up recommendations, but how can radiologists use it to improve workflow efficiency and reporting accuracy? How can care teams easily access the wealth of diagnostic information and follow-up recommendations contained in the unstructured text within radiology reports? While AI shows tremendous potential to manage workloads, act as a diagnostic assistant, and automate reporting,

how can those algorithms become a seamless part of the workflow without adding more screens and mouse clicks?

Adding urgency to those questions is an increase in workload and a simultaneous shift in reimbursements from the volume of radiology services to the value of the documented outcomes of those services. That's led to a dramatic increase in physician burnout caused by the billing and reporting burdens that take doctors away from patient care.

The cloud, context-aware language understanding and AI

A combination of cloud connectivity, significant advances in speech recognition, and mechanisms that enable uncomplicated access to diagnostic algorithms and clinical decision support information is making it possible to integrate AI into radiology workflows.

Today's speech recognition systems have a very high rate of accuracy in converting speech into text for radiology reports. But the text is unstructured narrative – just words and numbers on a screen or printed page – that doctors must manually read to extract relevant clinical information. By using computational analysis within the cloud, it's now possible to train speech recognition algorithms using continuous, real-time input from thousands of radiology users. The result is a context-aware language-understanding system that converts the radiologist's previously unstructured narrative into a layer of structured data, essentially pairing the words with their clinical meaning. It does that as the radiologist speaks without any extra steps or input.

Instead of being confined to a standalone textual report, the radiologist's findings and recommendations become discrete data that can be integrated with related clinical intelligence and shared with the patient's electronic medical record (EMR). For example,

Because the system understands a radiologist's finding of the location, size, and surface characteristics of lung nodules on a CT, it can match those findings to current clinical best practices for consistent, evidence-based follow-up recommendations. That combined structured information also can be shared with the EMR system, making it readily accessible to primary care physicians monitoring a patient's condition.

That same data enables quality checking to ensure report accuracy and consistency. For example, it can highlight errors in laterality or gender, or prompt for required information such as the Hounsfield Units value in a CT scan.

Workflow efficiency, report automation and improved patient outcomes

Image characterization algorithms and structured data can be leveraged throughout the radiology workflow for worklist triage, efficient communication of findings to care teams, and to improve patient outcomes.

For example, an AI model identifies a potential pulmonary embolism on a CT angiogram and prioritizes the study on the worklist. The doctor begins dictating the report using visualization tools to validate the algorithm's findings. Instead of requiring the radiologist to fill in a blank template, the algorithm prebuilds the report with findings, measurements, and evidence-based recommendations for review and expedited forwarding to the care team.

Accessibility Is key

While there are a growing number of radiology algorithms in development, there needs to be a mechanism to ensure straightforward access to them from within the normal workflow. One approach now in operation creates the equivalent of an App Store for radiology with an expanding library of workflow, detection, and other models contributed by commercial vendors, data scientists, and physicians. Hospitals and radiology practices can purchase and subscribe to specific AI models to improve the accuracy and efficiency of many common image interpretation and reporting tasks.

One such example comes from Aidoc, an Israeli developer of AI-based radiology workflow optimization solutions. The company recently received U.S. Food and Drug Administration (FDA) clearance for an AI triage model that identifies acute intracranial hemorrhages in head CTs and flags those studies for immediate attention. The University of Rochester (NY) Medical Center has successfully used Aidoc's AI models for worklist prioritization.

A path to greater value & information sharing

Using language understanding to generate structured narrative data opens up entirely new opportunities for intelligent information exchange with EMR systems, picture archiving and communication systems (PACS), imaging modalities, and other systems. This will require standards for consistent language and terms used in radiology reports. There is ongoing collaboration between healthcare technology vendors, the American College of Radiology, the American Society of Neuroradiology, the Radiological Society of North America, and other governing bodies to develop Common Data Elements (CDE), essentially a dictionary of terms, data types (e.g, number or text), allowable values, and other attributes used in reporting. As described by the RSNA, CDE can standardize the recording of findings such as anatomic location, shape, and dimensions to create reports that contain "not only words, but also context, meaning, and relationships."

AI offers tremendous promise to advance the practice of radiology, and improve the quality, outcomes, and costs of healthcare. Cloud-powered, context-aware language understanding to structure the narrative data in radiology reports, and the integration of powerful AI-powered diagnostic and clinical intelligence tools within radiology workflows provide the essential technical and practical means to realize those benefits.

For more information, visit nuance.com/go/aimarketplace.

Tags: Speech recognition, AI Marketplace, Radiology workflows