HealthManagement
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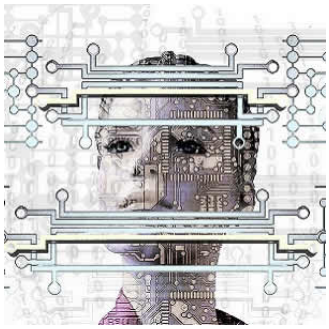
Merging biomedical imaging and AI for better diagnostic quality



The U.S. National Institute of Standards and Technology (NIST) recently hosted a two-day workshop that gathered experts from the medical imaging and artificial intelligence communities. The objective was to develop standards for a new system that is envisioned to serve as a “diagnostic cockpit”, providing clinicians with data needed to diagnose and treat patients while artificial intelligence (AI) analyses that data for informed decision making.

Such a system would leverage large volumes of data, including a patient’s genetic information, medical history and high-resolution imaging data such as CT scans and mammograms. Integrating this data with AI technology will improve diagnostic quality for everything from coronary artery disease to metastatic cancer to neurodegenerative disorders while improving patient outcomes and reducing healthcare costs, according to an NIST blog post by Denis Bergeron, a research chemist, and Michael Garris, a senior scientist, who both work at the institute.

Today, an existing standard called DICOM (Digital Imaging and Communication in Medicine) ensures that medical imaging devices' output data is in a standard format so that the images can be viewed and analysed on any workstation. Creating the diagnostic cockpit will require the development of standards for even larger and more complex data streams, according to the authors.

Healthcare already generates massive amounts of data, and the volume of that data will increase dramatically as personal genomics and high-resolution medical imaging become more widespread. Standardised data at scale will fuel machine learning and create new generations of analytic and diagnostic models.

"With AI’s ability to perform millions of incredibly complex weighing and correlation-finding calculations in a short period of time, human diagnostic teams will be able to quickly identify patterns and associations that they would otherwise miss. This will allow the human team to be more productive and effective while delivering precise and personalised treatments," write Bergeron and Garris.

Workshop participants included radiologists and other medical specialists, medical imaging device manufacturers, researchers, data scientists and representatives from several federal agencies. Discussions focused on identifying the standards needed to integrate big medical data with AI. Those standards include new data formats, imaging protocols, performance metrics, human/computer interfaces and data visualisation techniques.

NIST has a long history of helping industries create robust standards to calibrate disparate measurements and make them interoperable. "What this means in this context is that a diagnostic team will be able to prescribe tests that measure cholesterol levels, the density of breast tissue, or the uptake of a drug as revealed through medical imaging. Physical measurement standards will ensure that the data these tests generate will mean the same thing across patients, over time, and when measured using devices from different manufacturers," Bergeron and Garris explain.

The NIST workshop, according to the authors, also provided a neutral venue where companies that usually compete could collaborate on standards for the benefit of the industry as a whole. The forum provided opportunities for private industry to form working partnerships with academic researchers and government.

Workshop participants reached broad agreement on several points, including the ideal characteristics of the “use cases” that we could use to demonstrate the diagnostic cockpit concept, the authors say. Breast cancer and coronary artery disease were both identified as conditions where data streams from various sources can be combined over long periods of surveillance and integrated to inform different intervention strategies with measurable outcomes. The community is poised to tackle these important conditions and show the value of an integrated diagnostics approach.

As this work continues, the authors say NIST is ready to contribute its scientific expertise gained over its long history of supporting standards for this nationally important project.

Source: U.S. National Institute of Standards and Technology
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