

Eye-tracking technology: tomorrow's tool to train pathology residents?

May 2020—Imagine the potential educational benefits of pathology residents being able to see the precise path that the eyes of experienced pathologists take as they scan a whole slide image.

Preliminary research has suggested that showing residents visual representations of a pathologist's eye-tracking movement overlaid over a whole slide image can impact how they learn, says Sharon E. Fox, MD, PhD, a pathologist at the Southeast Louisiana Veterans Healthcare System and associate director of research and development, Department of Pathology, Louisiana State University Health Sciences Center. "If [residents] are given instruction that includes some of those videos showing eye tracking and where the eyes of their instructor are moving on the image, they tend to develop a pattern that is similar to the instructor," adds Dr. Fox, who gave a presentation on eye tracking at the Digital Pathology Association's Pathology Visions 2019 conference last fall.



Dr. Fox

Among early findings about the technology, summarized by Dr. Fox and Beverly Faulkner-Jones, MD, PhD, in *Frontline Learning Research* (2017;5[3]:43-54), were that eye-tracking "fixations"—the fractions of a second when a viewer's eyes fixate on points in an image—show that pathology trainees and expert pathologists exhibit significantly different gaze patterns. "Trainees may actually get the answer or diagnosis correct, but typically they are using far more fixations," explains Dr. Fox. "They may spend proportionally the same amount of time on the different parts of tissue, but they are spending far more time [overall] and far more fixations than an expert would need to." Therefore, she adds, eye-tracking technology ideally will become an instructional aid for residents and practicing pathologists who want to hone their skills.

"It seems a lot of pathologists would be interested in seeing how [the experts] are approaching images and would find it useful that they could be shown that in an electronic format," she says.

Dr. Faulkner-Jones, dermatopathologist and podiatric pathologist at Quantum Pathology, Waltham, Mass., and Dr. Fox's collaborator on the 2017 eye-tracking article, has also found residents to be eager for visual guidance. Therefore, "we need to have objective measures of how we interact visually with an image," and eye tracking could be one of those measures, adds Dr. Faulkner-Jones, who, for several years, taught dermatopathology to pathology and dermatology residents using digital pathology.

When teaching, "I would pan through a digital image, talk about what I was looking at, and then zoom in on the areas and features in the tissue that I thought were the most important diagnostically," she says. "Residents expressed how useful it was to have a walkthrough of the image."



Dr. Faulkner-

In addition to viewing eye tracking as a tool to train residents, Dr. Faulkner-Jones considers the technology “a tool to work out how best to present tissue for teaching and diagnosis, [such as] working out the ideal number of tissue pieces and their orientation and distribution on a slide.”

Eye-tracking technology should also be used to inform artificial intelligence, says Dr. Fox, who is collaborating with members of Tulane University’s bioengineering and computer science departments to explore this application. Digital pathology image files are big and take a long time for computer algorithms to scan, she explains. Therefore, using eye-tracking technology to map the areas pathologists fixate on when they look at an image could “teach” computers to efficiently scan only those areas of the slide relevant to the pathologist.

“The question is, how is human vision and computer vision the same and different, and can human vision be used to reduce the number and types of images that go into an AI algorithm to make it faster and more efficient?” she says. Answering these questions could lead to eye-tracking technology being used as widely in pathology as in radiology, or even marketing and gaming.

Getting to this point, however, will require “quite a bit of background and training” on the technology, says Dr. Fox, who uses a device from the Swedish technology company Tobii to track eye movements. The device, which sits at the bottom of the pathologist’s computer screen, uses infrared light to record a reflection off the cornea of the eye. The viewer is told to look at certain spots on the screen before the session begins, and the eye tracker is calibrated to that person’s eyes and the screen being viewed, she explains.

The post-processing step, in particular, is complex, Dr. Fox says. Eye-tracking data, she explains, are a separate file overlaid on the image being viewed. Therefore, the user must have basic training in the technology to understand if or how the eye-tracking data file can capture a visual field.

Consequently, incorporating eye tracking into the traditional pathology workflow has been challenging, says Dr. Fox, noting that it is more difficult to use the technology to create accurate visual field images when eye movements occur through a microscope. However, she adds that, “We are already seeing increased adoption of digital pathology technology as both pathology practice and education have rapidly moved to remote diagnostic formats as a result of the COVID-19 pandemic.”

To this end, Dr. Fox, through her collaboration with Tulane University bioengineers and computer scientists, is using new three-dimensional tissue imaging techniques to better understand the disease process affecting the lungs of those with severe COVID-19. “Three-dimensional structures open up a whole new range of questions about how pathologists learn to render diagnoses from novel image formats,” she says. “And we are interested in using eye tracking to understand how three-dimensional analyses may differ from our traditional two-dimensional slide analyses.”

“Digitizing images,” concludes Dr. Faulkner-Jones, “is going to make the whole application of eye tracking easier.”

□—*Renee Caruthers*

CDC introduces COVID-19 case reporting app

The Centers for Disease Control and Prevention announced plans to introduce an app this month to accelerate the electronic case reporting of COVID-19 data to public health agencies.

Health care institutions that do not have the capability to automatically send COVID-19 case reports from their EHRs will be able to send information through the app, called eCR Now. The app is designed to deliver data on COVID-19 to public health agencies in real time, increasing case management and contact tracing while easing the reporting burden on health care providers.

The app is based on Fast Healthcare Interoperability Resources, or FHIR, standards.

Hc1 establishes COVID-19 lab testing dashboard

The bioinformatics company Hc1, in collaboration with the private sector-led COVID-19 Healthcare Coalition, has developed the CV19 Lab Testing Dashboard.

The laboratory analytics tool displays COVID-19 testing rates; de-identified test results, which list the SARS-CoV-2 virus as detected, not detected, or inconclusive; and such demographic filters as age and gender for the population that has been tested. The information is generated by more than 20,000 testing sites nationwide and available in real time.

"The CV19 Lab Testing Dashboard is available as a public health service to individuals directly involved with policies and programs to mitigate the spread of COVID-19 and health care providers who are delivering care to help those who are impacted," according to a statement on the dashboard website, <https://cv19dashboard.org>.

[Hc1](#), 317-219-4646

LigoLab waives fees for labs performing COVID-19 tests

LigoLab has announced that it is temporarily waiving fees for implementing, hosting, and licensing its laboratory information system for any laboratory that performs COVID-19 testing. For current clients, the company has waived fees to integrate the LIS with FDA-approved or laboratory-developed test instruments in an effort to increase testing capacity.

The LigoLab operating platform, which is installed in more than 100 facilities nationwide, has been interfaced with instruments from Roche, Thermo Fisher Scientific, Qiagen, Bio-Rad, and Hologic.

"The successful integration of the LigoLab interface with these instruments means [LigoLab's clients] can now run thousands of automated COVID-19 tests per day," said LigoLab CEO Suren Avunjian, in a press release. "They can also track the specimens using our barcoded specimen tracking system and . . . validate and distribute the reports quickly."

LigoLab will deploy its LIS at no cost until the end of June for laboratories that perform COVID-19 testing. Those laboratories have the option of licensing the product for a fee after that time or cancelling the service at no charge and receiving an export of the data.

[LigoLab Information Systems](#), 800-544-6522

Xifin operating COVID-19 laboratory resource center

Xifin has launched an online COVID-19 laboratory resource center, which provides the latest information on commercial and government payer guidelines and codes.

"With information changing frequently, Xifin is in daily discussions with each of the major payers to confirm billing code assignment, any billing specific requirements, and reimbursement information. We will continue to provide live updates as we receive them," the company posted on its resource center site, www.xifin.com/resources/covid-19-laboratory-resource-center.

The site also features other COVID-19-related announcements and documents from the Centers for Medicare and Medicaid Services, medical associations, and other entities.

Xifin is a health information technology company that specializes in laboratory information systems and revenue cycle management solutions.

[Xifin](#), 858-793-5700

Alliance seeks laboratory contributions to international COVID-19 data repository

The Alliance for Digital Pathology, a voluntary and temporary initiative formed by various stakeholder groups, is asking for assistance in developing an international pathology data repository of digital images of tissue specimens from COVID-19 patients.

Under the stewardship of the World Health Organization, the alliance is collecting data in a standardized format from pathology institutions worldwide to share with other medical institutions and scientific bodies around the globe. The repository is intended to be a global resource that pathologists and researchers can use to gain an understanding of the pathophysiology of COVID-19 and establish histopathologic diagnostic criteria for the disease.

“As a proof of principle, the goal is to establish a standard data repository of digital images of postmortem lung specimens together with relevant metadata and make these data sets available to pathologists and scientists around the world,” according to a post from the alliance’s standards working group. To this end, the alliance is developing a standardized autopsy protocol and data submission form based on autopsy guidelines of the College of American Pathologists and Royal College of Pathologists. It is also establishing standards for structured reporting and for communicating digital images and related information to ensure that the information collected can be reliably exchanged, interpreted, and used regardless of language spoken or other potential barriers.

The alliance requests that laboratories worldwide contribute to the repository by completing a two-minute online questionnaire (<https://digitalpathologyalliance.org/covid19>) to assess current practice and capabilities for performing autopsies in a safe manner and for digitizing autopsy tissue specimens. The group is also asking institutions with access to COVID-19 tissue samples and the ability to digitize such samples via whole slide imaging or secondary capture to please contact the alliance at data-repository@digitalpathologyalliance.org.

“We have already made significant strides in working together at the international level to establish a worldwide digital repository,” says Markus D. Herrmann, MD, PhD, co-chair of the standards working group and director of computational pathology at Massachusetts General Hospital/Harvard Medical School. The alliance held a webinar late last month, shortly after announcing plans for the repository, that was attended by more than 100 participants representing over 20 countries from five continents. “The collaborative spirit has been truly amazing, and we are very appreciative of the feedback and support,” he adds.

The alliance is made up of academic medical centers, vendors, professional societies and associations, regulatory bodies, and other stakeholder groups working to advance the field of digital pathology.

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