Researchers building digital pathology tools to predict cancer outcomes

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Case Western Reserve University researchers have been awarded two grants totaling $3.16 million from the National Institutes of Health (NIH) to create analytic software for managing, annotating, sharing and analyzing digital pathology imaging data.

Anant Madabhushi, a professor of biomedical engineering, will lead a seven-institute consortium to expand the capabilities of a freely-available pathology image viewer, building what they call a "pathology image informatics platform" (PIIP).

To begin, the PIIP will focus on tools for quantifying tissue-based biomarkers and disease patterns on digital images of prostate and breast cancer biopsy.

"A large number of people realize the potential clues within images," Madabhushi said. "We need to develop the right tools to unlock the data...This could help drive the precision medicine revolution."

With a $2.92 million, 5-year NIH grant, Case Western Reserve will also join the National Cancer Institute's Informatics Technology for Cancer Research (ITCR) program, and work with 14 teams from across the United States to share and jointly work on cancer informatics-related technology.

"The tools developed under this grant will be shared with other members, and we will use the tools developed by other members,"

Madabhushi said. "Think of it as an app store for digital pathology. As the community begins to use our tools for analysis, they will give back, enhancing ours and adding their own tools."

The other principal and co-investigators on the grant include: Metin Gurcan, Ohio State University; Anne Martel, Sunnybrook Research Institute; John Tomaszewski, the State University of New York at Buffalo; Ulysses Balis, University of Michigan; Michael Feldman, University of Pennsylvania; and Dan Hosseinzadeh, of Toronto-based PathCore Inc.

They will expand on PathCore's Sedeen Image Viewer, which is free pathology-image-viewing software used in more than 20 countries.

The consortium will take glass slides of prostate and breast cancers and digitize them at very high resolution. Members will develop tools that allow for automated annotation of images—currently a laborious process—and computational analysis algorithms to help determine what features can be mined to determine the aggressiveness of the cancer and predict outcomes.

Digitizing the images will not only free pathologists from the microscope, but allow them to be shared and used for telemedicine in rural areas and poorer countries.

"We will begin by focusing on prostate and breast cancers and extend the technology to other cancers," Madabhushi said.

Within the Madabhushi lab, postdoctoral researchers Jon Whitney and Yu Zhou and PhD student Xiangxue Wang will work on the project.

They will build on the work of George Lee, research assistant professor in biomedical engineering at Case Western Reserve, who was recently

awarded a 3-year, $245,000 NIH grant to combine genomics and proteomic with digital pathology images of prostate cancer.

Lee, working with guidance from Madabhushi and Sanjay Gupta, MD, a professor of urology at Case Western School of Medicine, will develop machine learning tools for combining molecular and image features for improved prediction of aggressive prostate cancers.

The PIIP will massively increase dissemination of digital pathology imaging and algorithms for research and clinical trials and help set standards for the use of digital pathology.

"Case Western Reserve's inclusion within the ITCR also nicely complements our recent inclusion into the National Cancer Institutes' Quantitative Imaging Network," Madabhushi said.

The network is designed to promote research and development of quantitative imaging methods for the measurement of tumor response to therapies in clinical trials, with the overall goal of helping doctors choose the best course of treatment for each form of cancer.

Provided by Case Western Reserve University