

**Raymond D. Aller, MD, and Hal Weiner**

### **How software sent to the ocean floor is aiding cancer cell detection**

When you try to imagine where a pathologist might look for assistance in teaching a computer to visually identify cancer cells, it's a fair bet the first thing to pop into your mind will not be the Office of Naval Research.

Nonetheless, in the past two years ONR software developed to differentiate undersea mines from fish, clumps of seaweed, rocks, or anything else in the ocean, has been revolutionizing an automated image-analysis software tool kit called Fluorescence Association Rules for Quantitative Insight, or FARSIGHT.

Until the ONR software was added, FARSIGHT, which is funded by the National Institutes of Health and Defense Advanced Research Projects Agency, had a less than stellar record of identifying cells based on a subset of examples labeled by a physician. "I would roughly say that the FARSIGHT program, before the active-learning software was in it, could have been missing as many as half the endothelial cells that an expert pathologist would have said were there," says William Lee, MD, associate professor of medicine, hematology, and oncology at the University of Pennsylvania. Dr. Lee leads a research project at Penn that involves examining cancer-nourishing endothelial cells with FARSIGHT. False-negative rates for the project were about 25 percent before the ONR's active-learning algorithms were added.

These error rates occurred, in part, because pathologists interacting with the system couldn't understand what FARSIGHT's software program found confusing about some of the cells it was analyzing. The mine-searching software, on the other hand, queries investigators when it needs assistance identifying endothelial cells.

With the ONR software algorithm added, FARSIGHT identifies endothelial cells with 95 percent accuracy, a number roughly equivalent to the disagreement margin of two pathologists looking at the same image, Dr. Lee says. Furthermore, the false-negative rate has dropped to 10 percent.

Besides being more accurate, FARSIGHT now performs analyses with a rapidity that, for pathologists, would lie somewhere between exhausting and debilitating. It could take weeks for a pathologist to identify epithelial cells in a sample, says Dr. Lee, but FARSIGHT, with its active-learning add-on, can perform the same analysis overnight.

While looking for undersea mines and looking for cancer may seem wildly different, the question of how to teach a computer to differentiate one object from another is the same in both areas, says Larry Carin, PhD, professor of electrical engineering at Duke University and developer of the ONR software. Dr. Carin gave a speech about the software at a Defense Advanced Research Projects Agency meeting in 2011. Listening to that speech was Badri Roysam, PhD, chair of the Department of Electrical and Computer Engineering at the University of Houston and the chief researcher on FARSIGHT.

Dr. Roysam realized almost immediately that the ONR software could benefit FARSIGHT. The active-learning algorithm could choose the "most informative cells," allowing FARSIGHT to more quickly and accurately determine the nature of other cells that resemble them, he explains. That minimized the false-positive/false-negative issue that plagued earlier versions of FARSIGHT.

"While a cancer cell is a cancer cell, when you look at it through a microscope or a sensor, it isn't just a cancer cell," Dr. Carin says. "Rather, it's all kinds of tissue cluttered around, and what you see doesn't necessarily look like a cancer cell." Not to mention the fact that not all types of cancers look alike. "The mine problem is very much the same," he adds. "If you have a mine completely in isolation, you can easily say it's a mine. But something you put at the bottom of the ocean is never in isolation, and when you have all these rocks and fish, then identification is a much harder problem."

Another inducement to meshing the two technologies was that the ONR software is open source, so it could be accessed and adapted freely by the developers of the open-source FARSIGHT software. Yet FARSIGHT must still overcome obstacles, Dr. Roysam says. To use it, laboratories need access to expensive, multi-spectral microscopes, a technology owned primarily by large cancer centers. They also need access to multiplex immunolabeling protocols, which are complex and expensive. Pathologists must be comfortable interacting with smart digital-imaging software. And providers must convince insurance companies to pay for this type of pathological examination.

"I don't think it will ever replace pathologists because if there is something in a data set which is slightly different than what the computer has been trained on, it [the software] will fail," says Michael Feldman, MD, PhD, director of the Division of Pathology Informatics at the University of Pennsylvania and a user of FARSIGHT.

To date, Dr. Feldman is right—the new and improved FARSIGHT is being used primarily for clinical research at the University of Pennsylvania and the University of Pittsburgh. Both institutions are employing the tool kit to analyze endothelial cells, as well as breast and kidney cells. Yet Dr. Lee envisions cancer biopsies being aided, if not entirely conducted, by FARSIGHT in the near future.

## **Lab interoperability white paper addresses interface issues**

The College of American Pathologists has released the white paper "Laboratory Interoperability Best Practices." The document, developed by the CAP Diagnostic Intelligence and Health Information Technology Committee, provides an overview of 10 common issues that arise when establishing and maintaining laboratory interfaces, as well as approaches to mitigating these challenges.

"Pathologists can play a crucial role in planning and validating these [electronic] connections," the College reports. "The white paper serves as a resource to CAP members and laboratory professionals" to help them anticipate and solve laboratory interoperability challenges.

The document is available at [www.captodayonline.com](http://www.captodayonline.com) under "CAP TODAY Recommends."

## **NovoPath launches batch sign-out module for AP software**

NovoPath has introduced a batch sign-out module for its NovoPath anatomic pathology software.

The module's case-preview and write-back functionality work together to allow users to immediately view a text-only version of a patient report, edit the report, and then save the changes and electronically sign the report in one click of the mouse.

The batch sign-out module is optional with the latest release of NovoPath. It can also be purchased as an add-on for NovoPath version 8.0 or higher.

**NovoPath**, 877-668-6123

## **Atlas Medical releases functionality designed to boost lab revenue**

Atlas Medical is offering advanced revenue cycle management features that integrate with third-party billing solutions and services. The company also announced that it has entered into a strategic alliance with Xifin, a cloud-based accounts receivable and financial management systems vendor, that allows Xifin to employ the new functionality.

Atlas' advanced RCM features include real-time 270/271 eligibility checks, advanced billing field validation and issue reporting, and the ability to view and collect patient balances at patient service centers. These features can be applied to orders entered via the Atlas LabWorks portal or other physician portals or that are received via an electronic medical record interface.

Atlas recently integrated the new features with Xifin's iNet internal IT Web services.

**Atlas Medical**, 800-333-0070

**Xifin**, 858-436-2995

## **Thermo Fisher Scientific introduces tool for cloud-based communication**

Thermo Fisher Scientific has launched LabLink xL Cloud Communicator to transfer quality control data from Data Innovations' Instrument Manager middleware to its LabLink xL software.

The Web-based LabLink xL quality assurance software is used in conjunction with Thermo Scientific's MAS quality controls. With automatic QC data transfer, users have instant access to real-time QC data in LabLink xL for interlaboratory comparison and day-to-day QC review.

Thermo Fisher developed Cloud Communicator in partnership with Data Innovations.

**Thermo Fisher Scientific**, 800-232-3342

## **PathCentral forges alliances via new digital pathology network**

PathCentral has announced that Massachusetts General Hospital recently joined the PathCentral Pathology Network, the online information exchange and digital consultation forum that it introduced in March. PathCentral also reported that MLabs, a full-service reference laboratory of the University of Michigan Health System, will participate in the network.

The network allows physicians to upload case files using digital images so pathologists can render and review critical consulting diagnoses remotely on a global and domestic real-time basis. It incorporates social media tools, providing pathologists worldwide with the ability to post information, share cases, ask questions, and expand professional relationships, in addition to performing consults.

**PathCentral**, 855-557-7501

## **Data Innovations marketing enhanced version of Instrument Manager**

Data Innovations has released version 8.12.20 of its Instrument Manager middleware.

This latest version expands the moving averages solution by allowing nine algorithms to be added to the three algorithms in the moving averages module. The new algorithms include moving medians and eight transformed moving medians/moving averages algorithms using natural log and square root.

With this latest product release, Instrument Manager supports fully automated quality control bracketing, which determines if a group of specimens should be released based on the evaluation of a pair of QC events.

The new version also increases the number of specimens that can be processed per hour on Instrument Manager.

**Data Innovations**, 802-264-3470

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