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Graph database technology: what it can do given the chance

In “Last Week Tonight with John Oliver,” the comedian makes a damning observation: How is the Domino’s Pizza delivery app better able to discern a customer’s location than the technology used by 911 dispatchers?

A similar comparison may be drawn between social media and health care information systems. While both hold massive amounts of personal data, websites like LinkedIn and Facebook make eerily accurate guesses about users’ relationships and preferences. Health care providers, on the other hand, sometimes lack essential knowledge about patients—a problem that may be addressed by applying to health care the same database technology that powers social media networking.

This technology, known as a graph database, uses graph theory to store information about relationships as data points. “The underlying premise of a graph database is there’s a lot of value in the knowledge of connections between data points and that value should be accessible in real time,” says Utpal Bhatt, vice president of marketing at Neo Technology. An early pioneer of graph technology, Neo Technology produces the Neo4j database, which is used by such companies as Walmart and eBay.

Like all data, Bhatt explains, health care data are highly interconnected. And graph database technology can provide a complete and real-time view of this interconnected information—the providers, health events, medications, and other relevant data linked to a patient.

Available in commercial form since the late 2000s, graph technology differs markedly from the relational databases health care organizations typically employ. “Relational databases store data in a tabular form, with foreign keys used to define how a record in one table relates to a record in another table,” explains Kevin Schmidt, director of product management at the health care data-management company NextGate. “Graph databases allow relationships to be modeled in a more flexible way.”

One benefit of this flexibility is enhanced performance and efficiency. Graph databases scale more naturally to large data sets and require shorter query times, presenting an advantage for anyone who wants to ask complicated questions of a health care data set. “Neo4j, for example, is a native graph database, which means . . . it actually stores data as a graph,” says Bhatt. “The relations between data points are treated as first-class objects [rather than as meta-data], which optimizes the database to answer questions about relationships.” Many Neo4j users are in health care analytics, Bhatt adds, citing as an example a customer who collected historical data from clinical trials to analyze the effects of pharmaceuticals on various patient populations.

Schmidt, however, contends that hospitals won't be adopting graph database technology en masse any time soon. "Health care provider organizations typically don't have big IT budgets, so they tend to use what they have as long as it's still working," he says.

Rather, private companies, such as data-management vendors and analytics startups, are using graph technology to build ready-made solutions for health care providers. NextGate, for example, offers the iDAS intelligent data aggregation server, which contains an event registry module that can give providers a real-time view of a patient's every interaction within or across health care systems.

"An EMR or a lab system can use a relational database and do its job very well, but each one of these systems is a silo," Schmidt explains. "The event registry plugs into the stream of events that are being transmitted as HL7 messages and derives information to be stored in the graph as the events come through. With this graph-based network view, providers across health care systems have a much more complete picture of what's going on with a patient at any stage in their care."

Graph technology can also improve patient care in a critical scenario, Schmidt says, such as when a test result requires immediate action and the ordering physician isn't available.

"Since the information from all the events associated with this patient visit has been captured by the event registry, there's a record in the graph database of who the patient's primary care or attending physician is, what facility they [the patient] are at, and what room they're in. The event registry can also be integrated with a hospital's scheduling system and include contact information for each of the patient's providers and where they are at any time of day," he explains. "Applications like this can ensure that critical results are routed to the correct provider much more quickly than they might be otherwise."—*Charna Albert*

Group seeks participants to help foreign labs meet needs

At the recent AACC annual meeting, an informal gathering of pathologists and other laboratorians representing various charitable organizations and companies shared the details of their lab-improvement projects in limited-income countries. The group members—who, despite years of work in the field, had never met one another—focused on leveraging their collective experience and expertise to aid lab services in dozens of low-income nations.

The participants recognized that there are numerous other charitable groups and companies, as well as individuals acting independently, that are dedicated to the same mission, and they invite them to join their effort to strengthen laboratories in limited-income countries.

The discussion at the AACC meeting emphasized the importance of training, not only to maintain systems and equipment, but also to inform hospital administrators. It also addressed how implementing laboratory information systems, even in very basic laboratories, consistently improves the quality of laboratory results.

If you would like to contribute your expertise to the group, now called the Global Laboratory Improvement Advisory, send a description of your area of specialization, contact information, and the names of the low-income countries in which you have an interest to Carla Orner at carla.ornor@hearttoheart.org and Raymond Aller, MD, at raller@usc.edu. —*Raymond Aller, MD*

ONC tool grades C-CDA documents for interoperability

The Office of the National Coordinator for Health IT has released a tool to help providers and developers identify and resolve interoperability issues involving Consolidated Clinical Document Architecture documents in their health information systems.

The ONC scorecard, available as a beta release on the HHS website, scores documents submitted by providers and

developers in two ways: by granting a pass or fail grade based on whether the documents meet the requirements of the 2015 Edition Health Information Technology Certification Criteria for transitions of care and by assigning the documents a letter grade of A+, A-, B+, B-, C, or D based on Health Level Seven interoperability rules. The tool, which uses open-source technology, focuses on C-CDA 2.1 documents.

The higher the grade, the more likely it is that information is coded with the appropriate structure and semantics under HL7 and, therefore, is interoperable with disparate systems, according to the ONC.

The ONC deletes the C-CDA files submitted by users of the tool from the server as soon as the files are processed, the ONC reports. Yet it advises providers not to include protected health information or personally identifiable information in C-CDA file submissions.

BBCS releases new version of ABO Express

Blood Bank Computer Systems' ABO Express version 2.0.0 blood bank management software is available for general distribution. The product received FDA 510(k) clearance in July.

This latest version of ABO Express has a user-friendly graphical user interface that is accessible through a Web browser. In addition, it seamlessly integrates with the company's ABO Wheels blood collection application.

In fixed-site mode, donations that have been completed in ABO Wheels are immediately available for component processing in ABO Express. Donation records are uploaded automatically.

[**Blood Bank Computer Systems**](#), 888-738-2227

Prototype device provides fast bacterial infection diagnosis

Researchers at Massachusetts General Hospital have developed a point-of-care device that may shorten the time required to rapidly diagnose pathogens responsible for health care-associated infections from days to hours and cost less than \$2.00 per assay.

Using the prototype system, dubbed PAD for polarization anisotropy diagnostics, bacterial RNA is extracted from a sample in a small, disposable plastic cartridge and subjected to polymerase chain reaction amplification. The material is then loaded into a 2-cm plastic cube containing optical components that detect target RNAs based on the response to a light signal of sequence-specific detection probes. The optical cubes are placed on an electronic base station that transmits data to a smartphone or computer, where results can be displayed.

The development team has designed probes for more than 35 bacterial species and virulence factors.

Voicebrook announces software installation

Voicebrook has reported that the Brooklyn (NY) Hospital Center recently became the 400th site to acquire its VoiceOver pathology reporting solution. The community hospital is expected to go live with the speech-recognition software this fall.

[**Voicebrook**](#), 866-864-2397

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