

IBM's Watson could usher in new era of ALS research and medicine

http://www.ibm.com/smarterplanet/us/en/healthcare_solutions/ideas/index.html?re=CS1



By Sharon Gaudin

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IBM's computer could very well herald a whole new era in medicine. That's the vision of IBM engineers and Dr. Eliot Siegel, professor and vice chairman of the University of Maryland School of Medicine's department of diagnostic radiology.

Siegel and his colleagues at the University of Maryland, as well as at Columbia University Medical Center, are working with IBM engineers to figure out the **best ways for Watson to work hand-in-hand with physicians and medical specialists**.

Siegel, who refers to the computer not as the champ of *Jeopardy* but as "Dr. Watson," says he expects the computer, which can respond to questions with answers instead of data and spread sheets, to radically improve doctors' care of their patients.

"There is a major challenge in medicine today," Siegel told *Computerworld*. "There's an incredible amount of information in a patient's medial record. It's in the form of abbreviations and short text. There's a tremendous amount of redundancy and a lot of it is written in a free-form fashion like a blog or text."

"As a physician or radiologist, it might take me 10 or 20 or 60 minutes or more just to understand what's in a patient's medical record," he said.

Within a year, Siegel hopes that "Dr. Watson" will change all of that. Watson is expected to be able to take a patient's electronic medical records, digest them, summarize them for the doctor and point out any causes for concern, highlighting

anything abnormal and warning about potential drug interactions.

"It offers the potential to usher in a whole new generation of medicine," Siegel said. "If all Dr. Watson did was allow me to organize electronic medical records and bring to my attention what's most important and summarize it, that would be incredibly valuable to me." "Even small things that Watson can do will change the way I, and my colleagues, practice medicine," he said.

Richard F. Doherty, research director of the analysis firm Envisioneering Group, said he's excited to have a computer organize his medical history for his physician.

"That sounds excellent," Doherty said. "I think we've all been through the situation of filling out forms for new doctors and then they don't have the time to read through it all, and they just say, 'What? You have a sore throat?' Having Watson help attend to our needs sounds like a great application of [the computer]."

But organizing and summarizing patient histories isn't all Watson is expected to do.

Siegel, who also works with the National Cancer Institute, said he's hoping that Watson will also be able to take patient and treatment information from hundreds, if not thousands, of hospitals and pull it all together.

Then when a doctor is considering treating a patient with a particular drug or treatment, they first can ask Watson how that treatment worked on patients with similar diagnoses and backgrounds.

"Watson can ingest information efficiently and rapidly," Siegel said.

"It'll have an encyclopedic knowledge and suggest diagnostic and therapeutic possibilities based on databases much larger than one physician can possibly hold in his head.

"This technology brings a potential to have a renaissance of medical diagnosis," he said. "It offers the potential for us in the next five or 10 years to routinely deploy computers when working with our patients."

Jennifer Chu-Carroll, an IBM researcher on the Watson project, said the computer system is a perfect fit for the health care field.

Electronic information out there and it's projected to continue to grow," Chu-Carroll said. "Nobody can possibly ingest all that information. Without a tool, there's no way to leverage it."

She also said she believes that at some point Watson will have the speech-recognition capability to actually go into an exam room and listen to a patient talk about their symptoms while it runs through their medical records.

"Think of some version of Watson being a physician's assistant," Chu-Carroll said. "In its spare time, Watson can read all the latest medical journals and get updated. Then it can go with the doctor into exam

rooms and listen in as patients tell doctors about their symptoms. It can start coming up with hypotheses about what ails the patient." She added: "The physician will make the decisions but Watson can help."

Doherty said having a supercomputer that can ingest and analyze loads of data and then answer questions much as a human would could radically change not only medical diagnostics, but also medical research and pandemic recognition and management.

"Spotting trends could save lives and save money," he said. "What humans can't always see, Watson may be able to."

"I think we're on the cusp of a revolution," Doherty said.

Note:

IBM didn't waste any time, announcing on Feb. 17 a collaboration with Columbia University, the University of Maryland and Nuance Communications to develop a **physicians' assistant service that can collect a patient's health information and analyze it for medical diagnosis. Other health care applications include being able to automatically identify and flag anomalies on MRIs and other images that a radiologist may miss. The speech-recognition technology from Nuance will also help **Watson hear people**, a skill it could have used during the first game.**



IBM Watson specs

IBM Watson is comprised of ninety IBM POWER 750 servers, 16 Terabytes of memory, and 4 Terabytes of clustered storage. This is enclosed in ten racks including the servers, networking, shared disk system, and cluster controllers. These ninety POWER 750 servers have four POWER7 processors, each with eight cores. IBM Watson has a total of 2880 POWER7 cores.

Research Teams

Designing a computer system that could understand natural language was a huge undertaking, and IBMers from all over the world were involved. Read below to learn more about these researchers.



Dr. David Ferrucci

Principal investigator for the DeepQA team responsible for building Watson.

Algorithms Team

The fifteen IBMers responsible for Watson's DeepQA architecture.



Strategy Team

The group working on Watson's game play and betting strategy during a *Jeopardy!* match.



Systems Team

The team that designed the complex system of POWER7 cores that power Watson.



Speech Team

The IBM researchers who developed Watson's voice and speech recognition capabilities.



Annotations Team

The linguistics team that developed the taxonomy for Watson's search databases.



IBM Research - China

The group primarily tasked with how Watson links data from different sources.



IBM Research - Tokyo

The group that helped to develop the system Watson uses to attach meaning to the words in a question.



IBM Research - Haifa

The team responsible for optimizing the search process of Watson's DeepQA architecture.



Project Management

The team that managed the relationship between the Watson research team and the *Jeopardy!* production staff.

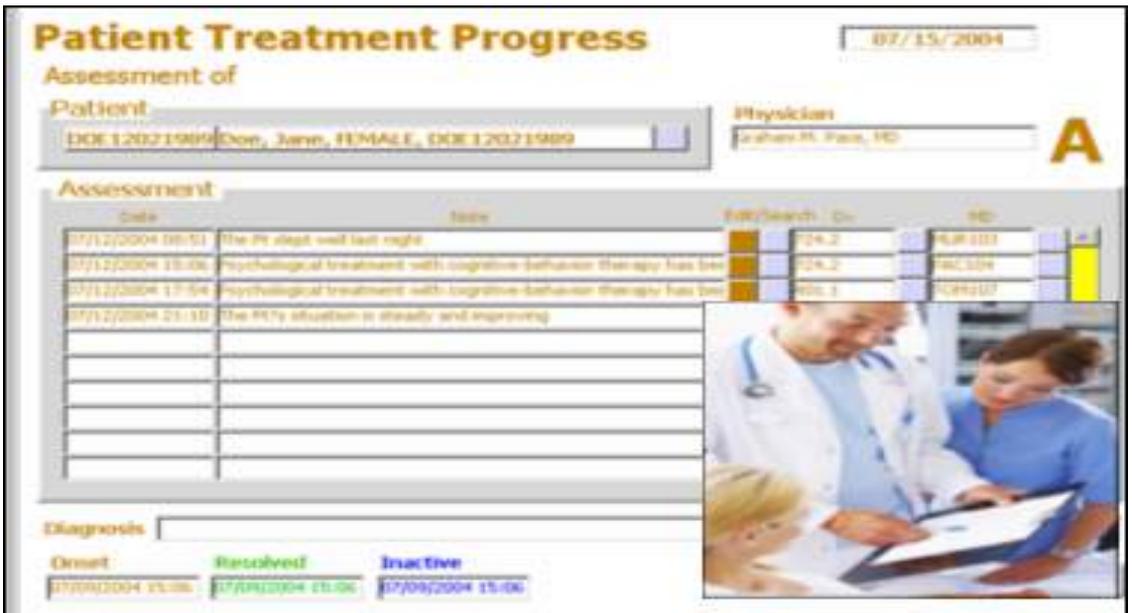


Applications Team

The team working to develop systems that apply DeepQA technology to real-world problems.



The **DeepQA project** at IBM shapes a grand challenge in Computer Science that aims to illustrate how the wide and growing accessibility of natural language content and the integration and advancement of Natural Language Processing, Information Retrieval, Machine Learning, Knowledge Representation and Reasoning, and massively parallel computation can drive open-domain automatic Question Answering technology to a point where it clearly and consistently rivals the best human performance.



Patient Treatment Progress 07/15/2004

Assessment of Patient: Physician: **A**

Assessment

Date	Notes	EM/Search	Dr.	IC
07/12/2004 09:51	The pt slept well last night	24.2	ALP101	
07/12/2004 13:06	psychological treatment with cognitive behavior therapy has been	24.2	ALP101	
07/12/2004 17:54	psychological treatment with cognitive behavior therapy has been	20.1	ALP101	
07/12/2004 21:10	The PT's situation is steady and improving			

Diagnosis:

Onset: Resolved: Inactive:



IBM says the most parallel application of that in the real world is in medicine. Imagine a day when doctors can type in their patient's symptoms, and feed it into a Watson computer that can comb through literally every medical journal ever published. Watson would be able to tell what the best course of treatment is and what the most likely diagnosis is.

But Watson doesn't just spit out one thing. It's able to display, in a user-friendly way, every possible diagnosis with a confidence level for each. Doctors could relay that information to their patients.

IBM has announced a joint partnership with Nuance Healthcare to add its medical technology solutions to the Watson program to assist in diagnosis and treatment.

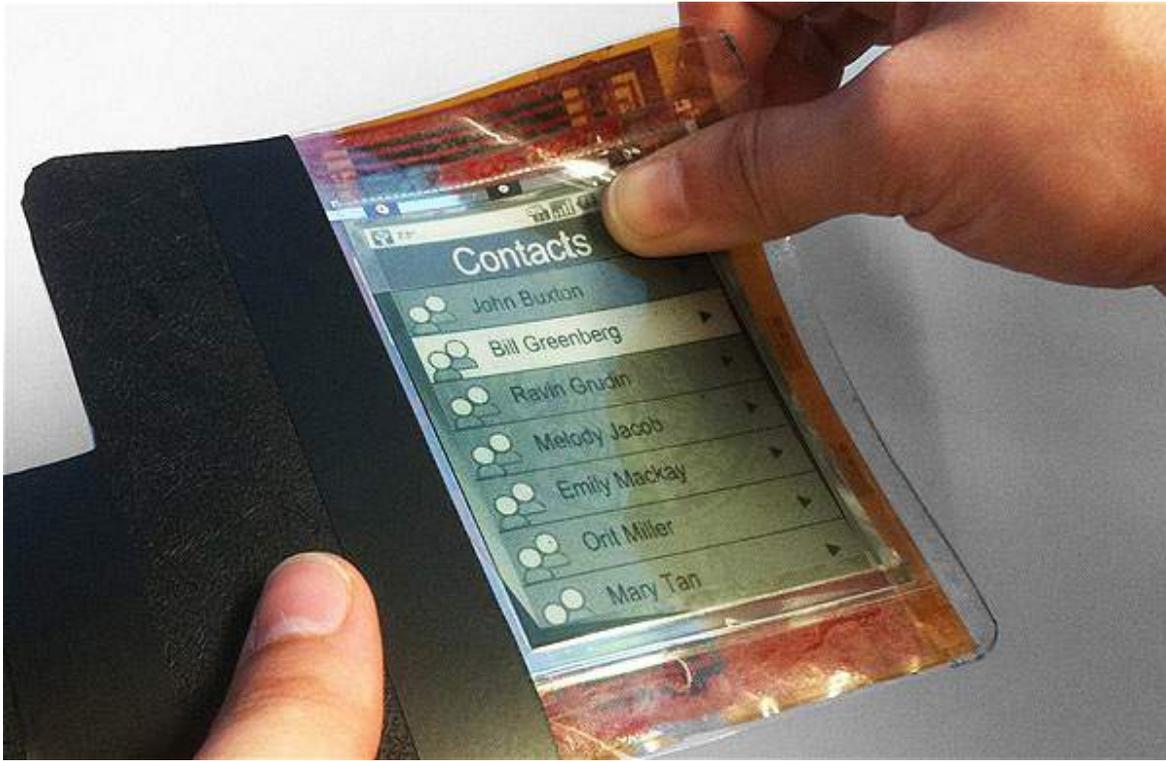
Of course, this is far different from something ultimately trivial like a game show. People's lives are at stake here, but IBM thinks its technology can live up to the challenge.

No other solution like this is available for the health care industry, and it is potentially revolutionary. **It may be some time before physicians feel confident enough to rely on such an emerging product, but if it continues to improve as it did during the lead up to the Jeopardy challenge, it may only be a matter of time.**



Researchers demonstrate flexible epaper phone

A smartphone made from electronic paper has been demonstrated by researchers in Canada.



The PaperPhone lets people make calls by bending the epaper
The PaperPhone is flexible and can be controlled by being bent, written on or used as a touchscreen.

The PaperPhone, built to determine how people use a flexible device, is a collaboration between researchers from Queen's University in Kingston, Canada, Arizona State University, USA, researchers from the E-Ink Corporation.

"This is the future. Everything is going to look and feel like this within five years," Roel Vertegaal, director of the human media lab at Queen's, said. "This computer looks, feels and operates like a small sheet of interactive paper."

The epaper sheet, which uses the same e-Ink technology found in the Amazon Kindle e-reader, is just millimetres thick and can be used to make phone calls, read ebooks and play music.

The researchers say that this technology could eventually mean the end of paper and printers. Dr Vertegaal said: "The paperless office is here. Everything can be stored digitally and you can place these computers on top of each other, just like a stack of paper."