

IBM Journal of Research and Development

Vol. 56, No. 3/4, May/July 2012

This Is Watson

In 2007, IBM Research took on the grand challenge of building a computer system that could compete with champions at the game of Jeopardy!. In 2011, the open-domain question-answering system dubbed *Watson* beat the two highest ranked players in a nationally televised two-game Jeopardy! match. This special issue provides a deep technical overview of the ideas and accomplishments that positioned our team to take on the Jeopardy! challenge, build *Watson*, and ultimately triumph. It describes the nature of the question-answering challenge represented by Jeopardy! and details our technical approach. The papers herein describe and provide experimental results for many of the algorithmic techniques developed as part of the *Watson* system, covering areas including computational linguistics, information retrieval, knowledge representation and reasoning, and machine learning. The papers offer component-level evaluations as well as their end-to-end contribution to *Watson*'s overall question-answering performance.

- 1 **Introduction to "This is Watson"**
D. A. Ferrucci

- 2 **Question analysis: How Watson reads a clue**
A. Lally, J. M. Prager, M. C. McCord, B. K. Boguraev, S. Patwardhan, J. Fan, P. Fodor,
and J. Chu-Carroll

- 3 **Deep parsing in Watson**
M. C. McCord, J. W. Murdock, and B. K. Boguraev

- 4 **Textual resource acquisition and engineering**
J. Chu-Carroll, J. Fan, N. Schlaefter, and W. Zadrozny

- 5 **Automatic knowledge extraction from documents**
J. Fan, A. Kalyanpur, D. C. Gondek, and D. A. Ferrucci

- 6 **Finding needles in the haystack: Search and candidate generation**
J. Chu-Carroll, J. Fan, B. K. Boguraev, D. Carmel, D. Sheinwald, and C. Welty

(continued on next page)

(continued from previous page)

- 7 **Typing candidate answers using type coercion**
J. W. Murdock, A. Kalyanpur, C. Welty, J. Fan, D. A. Ferrucci, D. C. Gondek, L. Zhang,
and H. Kanayama
-
- 8 **Textual evidence gathering and analysis**
J. W. Murdock, J. Fan, A. Lally, H. Shima, and B. K. Boguraev
-
- 9 **Relation extraction and scoring in DeepQA**
C. Wang, A. Kalyanpur, J. Fan, B. K. Boguraev, and D. C. Gondek
-
- 10 **Structured data and inference in DeepQA**
A. Kalyanpur, B. K. Boguraev, S. Patwardhan, J. W. Murdock, A. Lally, C. Welty, J. M. Prager,
B. Coppola, A. Fokoue-Nkoutche, L. Zhang, Y. Pan, and Z. M. Qiu
-
- 11 **Special Questions and techniques**
J. M. Prager, E. W. Brown, and J. Chu-Carroll
-
- 12 **Identifying implicit relationships**
J. Chu-Carroll, E. W. Brown, A. Lally, and J. W. Murdock
-
- 13 **Fact-based question decomposition in DeepQA**
A. Kalyanpur, S. Patwardhan, B. K. Boguraev, A. Lally, and J. Chu-Carroll
-
- 14 **A framework for merging and ranking of answers in DeepQA**
D. C. Gondek, A. Lally, A. Kalyanpur, J. W. Murdock, P. A. Duboue, L. Zhang, Y. Pan, Z. M. Qiu,
and C. Welty
-
- 15 **Making Watson fast**
E. A. Epstein, M. I. Schor, B. S. Iyer, A. Lally, E. W. Brown, and J. Cwiklik
-
- 16 **Simulation, learning, and optimization techniques in Watson's game strategies**
G. Tesauro, D. C. Gondek, J. Lenchner, J. Fan, and J. M. Prager
-
- 17 **In the game: The interface between Watson and Jeopardy!**
B. L. Lewis
-