Deep Learning for Business

Deep Learning Products & Services

IBM Watson

IBM Watson

Open-domain QA (Question-Answering) problem solving AI (Artificial Intelligence) system made by IBM

- Designed to receive and solve natural language questions
- Designed to answer with fast response time and precise answers based on consumable justifications with accurate confidences

Copyright © Prof. Jong-Moon Chung

IBM Watson

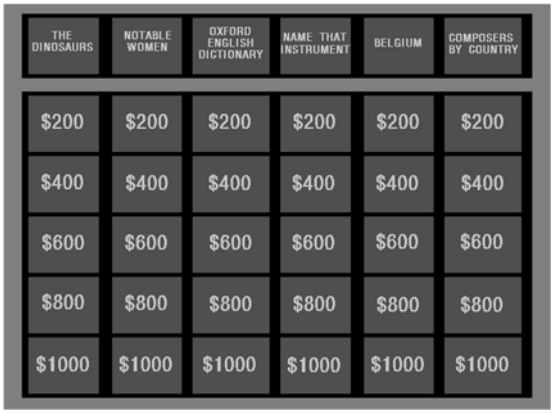
Evolution History of IBM Watson

- 2006 IBM Research Project R&D initiates
- 2011 Jeopardy! Grand Challenge
- 2011 Watson for Healthcare
- 2012 Watson for Financial Services & Industrial Solutions

IBM Watson

Watson wins Jeopardy!

- Jeopardy! is a television quiz show in the United States that debuted on March 30, 1964



https://commons.wikimedia.org/wiki/File%3AJeopardy_game_board.png

Copyright © Prof. Jong-Moon Chung

IBM Watson

Watson wins Jeopardy!

- 2011 January 14, IBM Watson beats 2 Jeopardy! top champions in a two-game competition
  - Representative example of an Open-domain QA AI system beating the best human contestants in Jeopardy!
- Over 8,000 independent experiments were iteratively processed on more than 200 eight-core servers were conducted by 25 full-time researchers/engineers for the Jeopardy! match

IBM Watson

DeepQA

- Watson uses the DeepQA architecture for QA processing
- QA system requirements
  - IR (Information Retrieval)
  - NLP (Natural-Language Processing)
  - KR&R (Knowledge Representation & Reasoning)
  - ML (Machine Learning)
  - HCI (Human-Computer Interface)

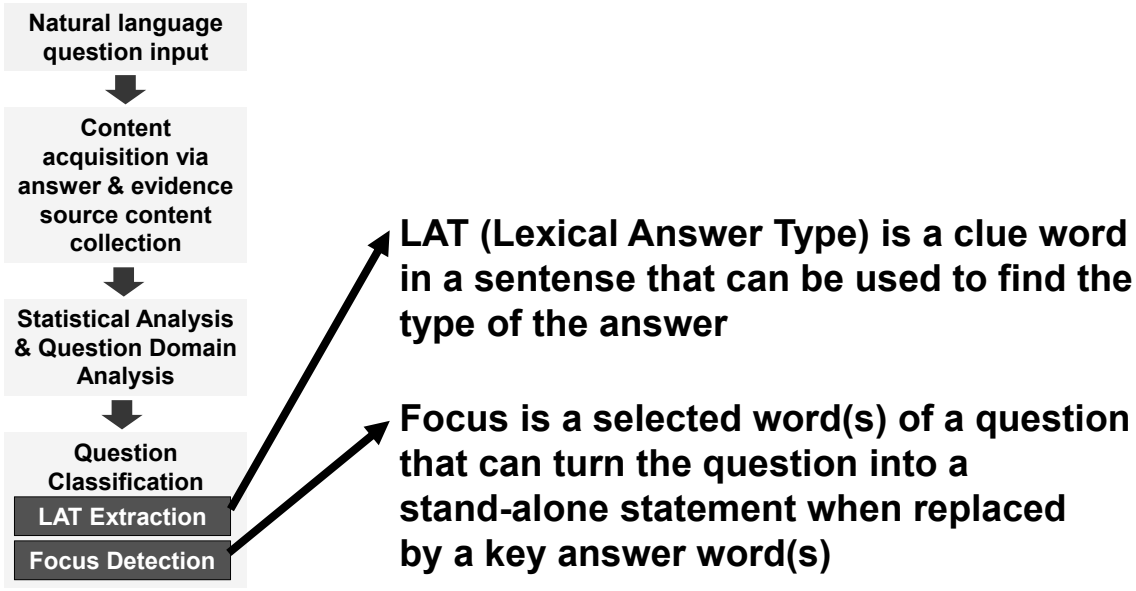
Copyright ⓒ Prof. Jong-Moon Chung

IBM Watson

DeepQA

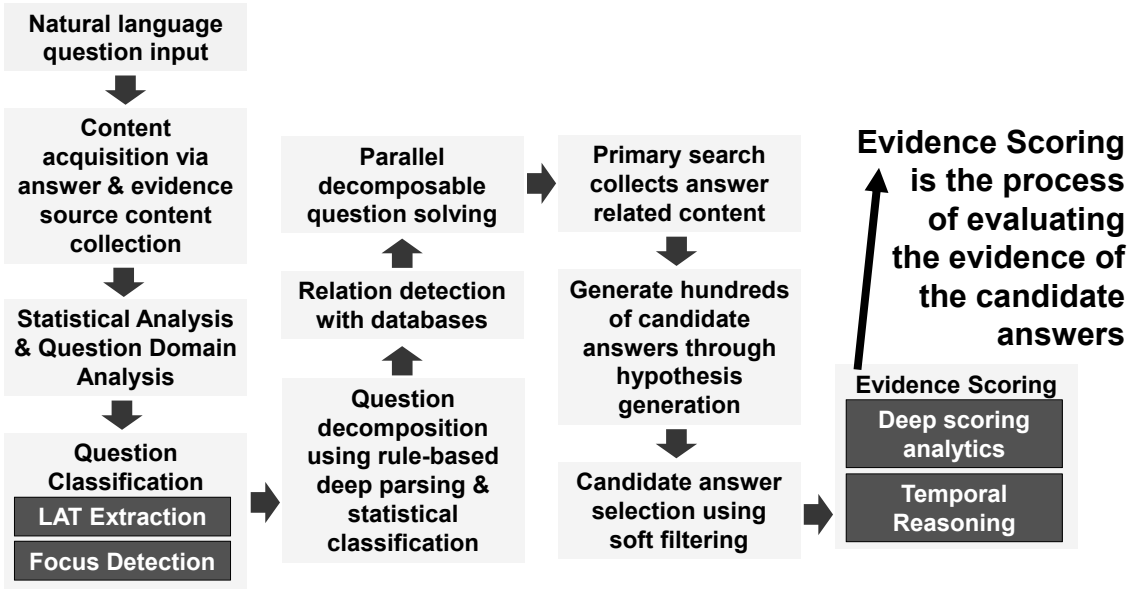
- Combination of numerous analysis algorithms
  - Type classification
  - Time
  - Geography
  - Popularity
  - Passage support
  - Source reliability
  - Semantic relatedness

IBM Watson's DeepQA Operations

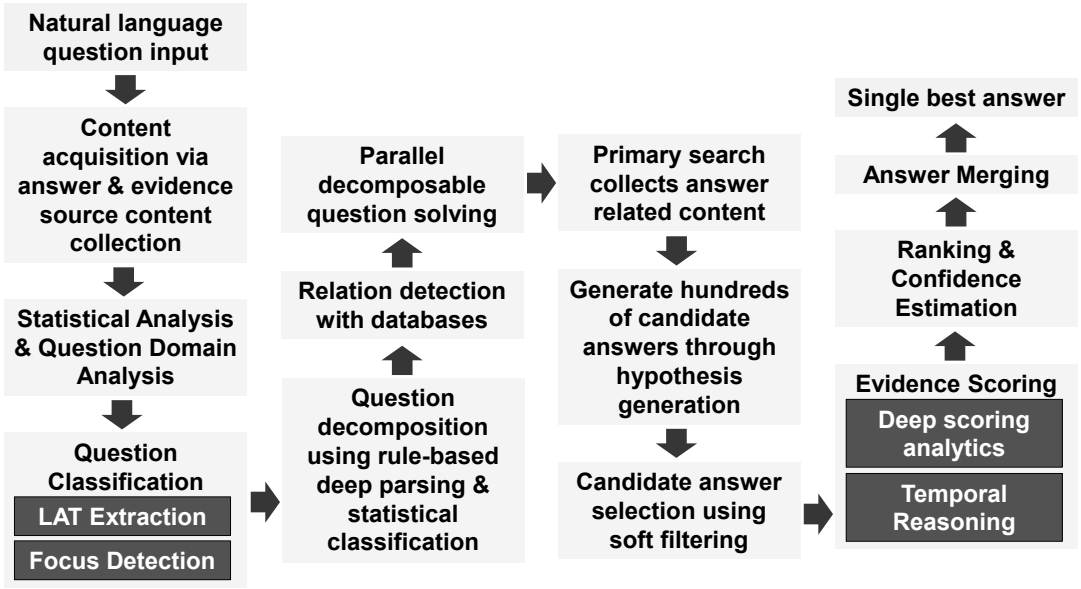


Copyright ⓒ Prof. Jong-Moon Chung

IBM Watson's DeepQA Operations



IBM Watson's DeepQA Operations



Copyright ⓒ Prof. Jong-Moon Chung

IBM Watson

AdaptWatson

- Underlying AI algorithm used in Watson
- Developed from integrating over 100 core algorithmic components dealing with
  - Question understanding
  - Candidate answer searching
  - Evidence collection
  - Answer & evidence scoring
  - Confidence production
  - Result merging & ranking

IBM Watson

IBM Watson's new applications

- Healthcare
- Legal research
- Chatbot
- Teaching Assistant
- Weather forecasting
- Financial services

Copyright © Prof. Jong-Moon Chung

IBM Watson

Watson for Oncology

- Physician assisting system for cancer diagnosis and treatments based on individual patient characteristics
- Patient symptoms, medical records, and genomics data are analyzed
- Creates plans for cancer diagnosis and treatment
- Reduce diagnostic and administrative errors while informing new treatment methods

IBM Watson

Concordance Rate of Watson

- Diagnosis trials conducted at the Manipal Comprehensive Cancer Centre in Bangalore, India
  - 96% with 112 lung cancer patients
  - 81% with 126 colon cancer patients
  - 92.7% with 124 colorectal cancer cases

Copyright © Prof. Jong-Moon Chung

Deep Learning Systems & Services

IBM Watson

References

References

- David A. Ferrucci, “Introduction to “this is watson”,” *IBM J. Res. Dev.*, vol. 56, no. 3.4, pp. 1:1-1:15, Apr. 2012.
- David Ferrucci *et al*., "Building Watson: An overview of the DeepQA project," *AI Mag.* vol. 31, no. 3, pp. 59-79, 2010.
- IBM Watson - Build Your Cognitive Business with IBM [Online]. Available: https://www.ibm.com/watson/
- Deborah DiSanzo, “IBM Watson Health: Empowering Heroes. Transforming Health,” 35th Annu. J.P. Morgan Healthcare Conf., San Francisco, CA, Jan. 2017 [Online]. Available: https://www.ibm.com/investor/att/pdf/JP-Morgan-Healthcare-Conference-Charts-January-2017.pdf
- IBM Watson Health - IBM Watson for Oncology [Online]. Available: https://www.ibm.com/watson/health/oncology-and-genomics/oncology/
- IBM Unveils New Watson Oncology Data at ASCO 2017 [Online]. Available: https://www.rdmag.com/article/2017/06/ibm-unveils-new-watson-oncology-data-asco-2017
- Jeopardy! logo, by Sony Pictures Television - http://www.13wmaz.com/news/story.aspx?storyid=114631, Public Domain, https://commons.wikimedia.org/w/index.php?curid=18551818
- Jeopardy! image, by SethAllen623 - Own work, Public Domain, https://commons.wikimedia.org/w/index.php?curid=21700144
- Wikipedia, www.wikipedia.org

Copyright ⓒ Prof. Jong-Moon Chung