

AI: Machine Learning

Watson

- Question Answering "pipeline"
 - Question analysis
 - Type of answer (person, place, ...)
 - Type of question
 - Is the question really two or more separate questions
 - Search
 - Find data relevant to the question
 - Answer selection
 - Rank proposed answers



Watson

- Gathers evidence for each answer
- Scores each piece of evidence
- Produces a model based on sample questions and their answers (machine learning)

Watson

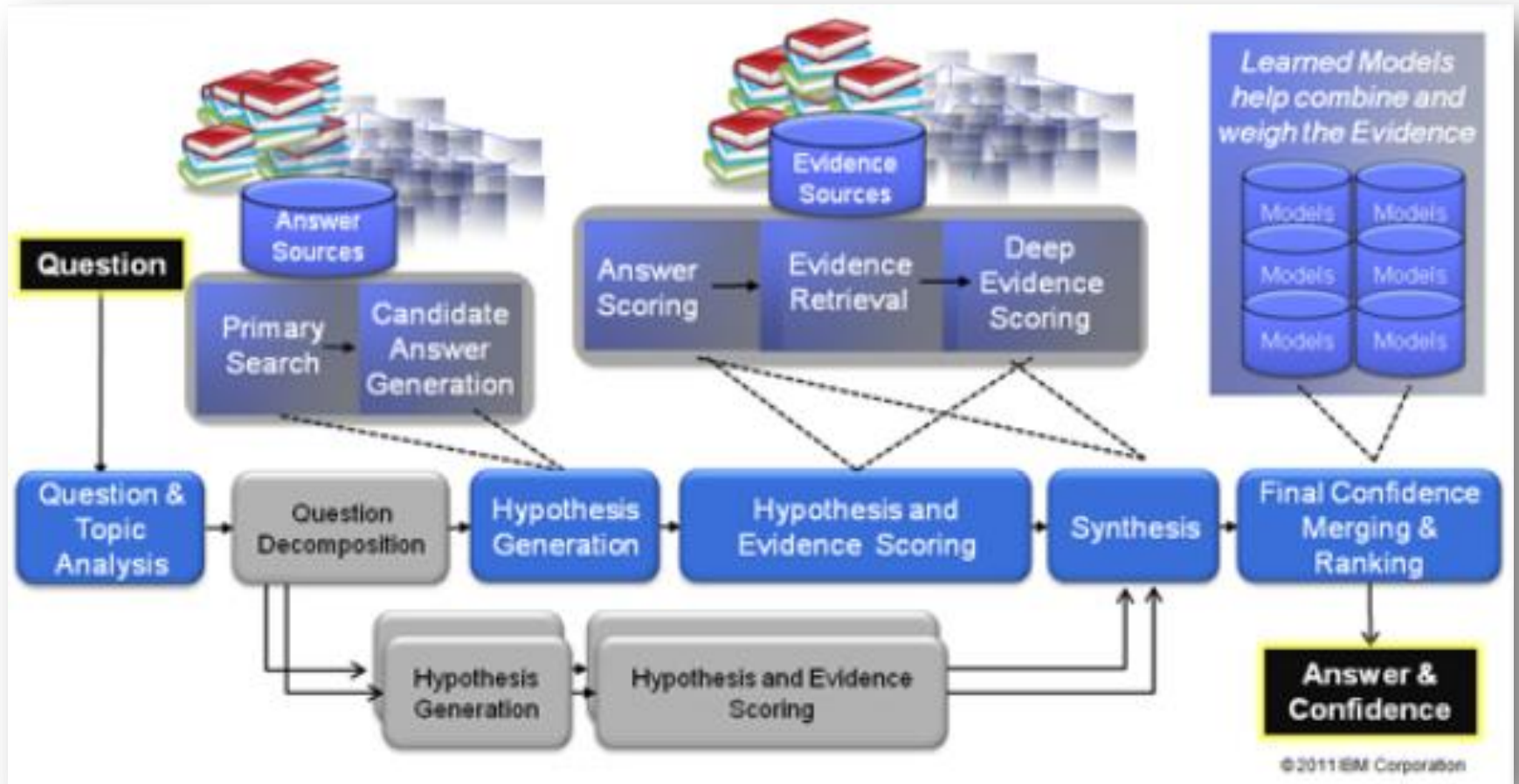
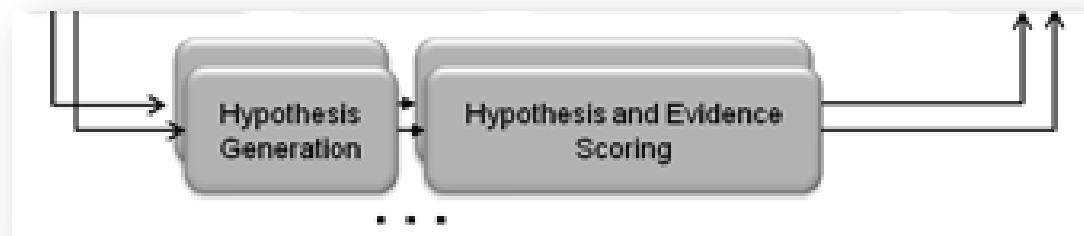


image source:

http://researcher.watson.ibm.com/researcher/view_group_subpage.php?id=2159

Concurrency in Watson

- Early single processor version: 2 hours to answer a question.
- Naturally decomposes into parallel processes



Excluded question types (by agreement with game producers)

- Audio visual questions
 - *Picture This* (Contestants are shown a picture of a B---52 bomber)
- Special instruction questions
 - Decode and postal codes
 - We're going to give you a word comprising two postal abbreviations ; you have to identify the states.

Watson is Multiple

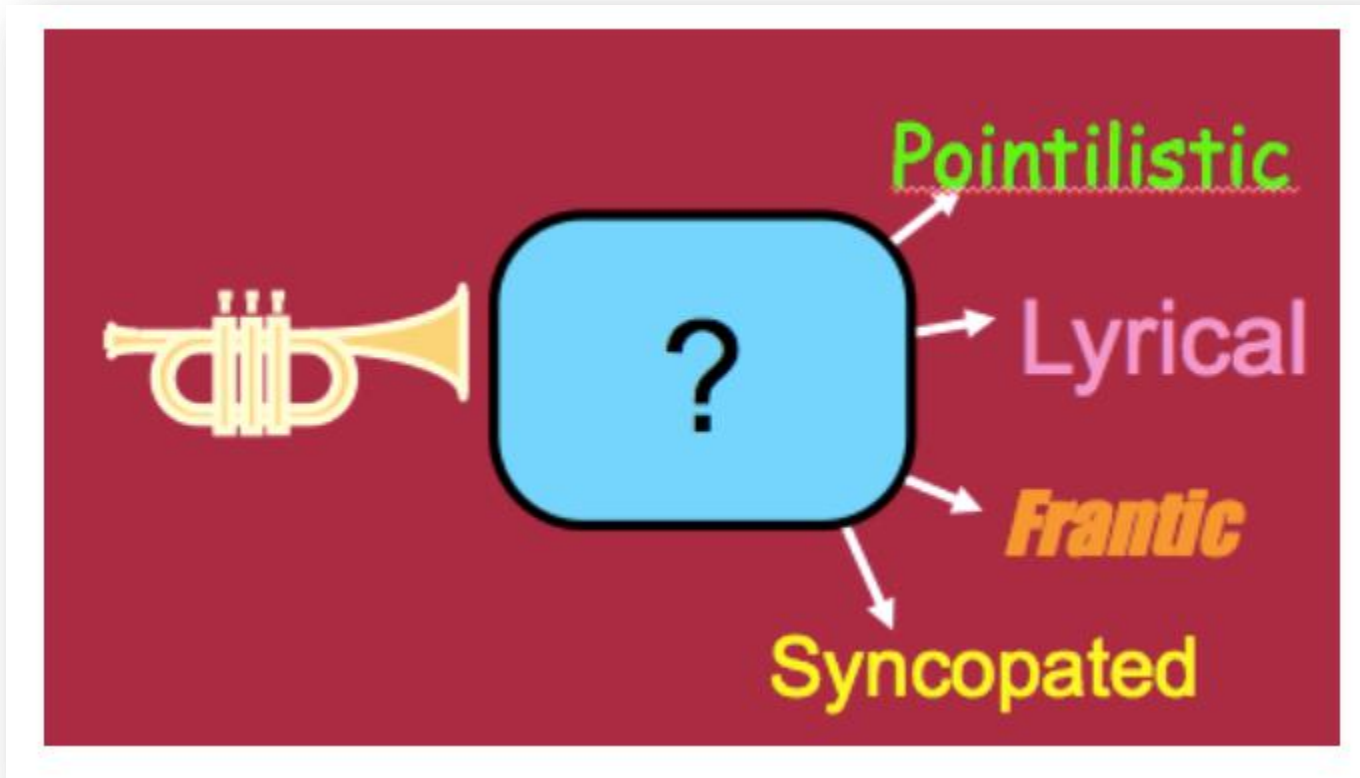
- Different kinds of data sources
 - Wikipedia, encyclopedia, ...
 - Structured data (databases, ontologies, taxonomies)
- Various algorithms
 - search evaluation
 - Learning combining and filtering results
- Goal is not to play, but develop an architecture for Q/A in serious domains such as medical diagnosis.

Machine learning

- Statistics / probability
- Decision trees
- Neural networks
- Learning to classify (Classifiers)
 - Features
 - Training data
 - Mathematical formulas
- Many others

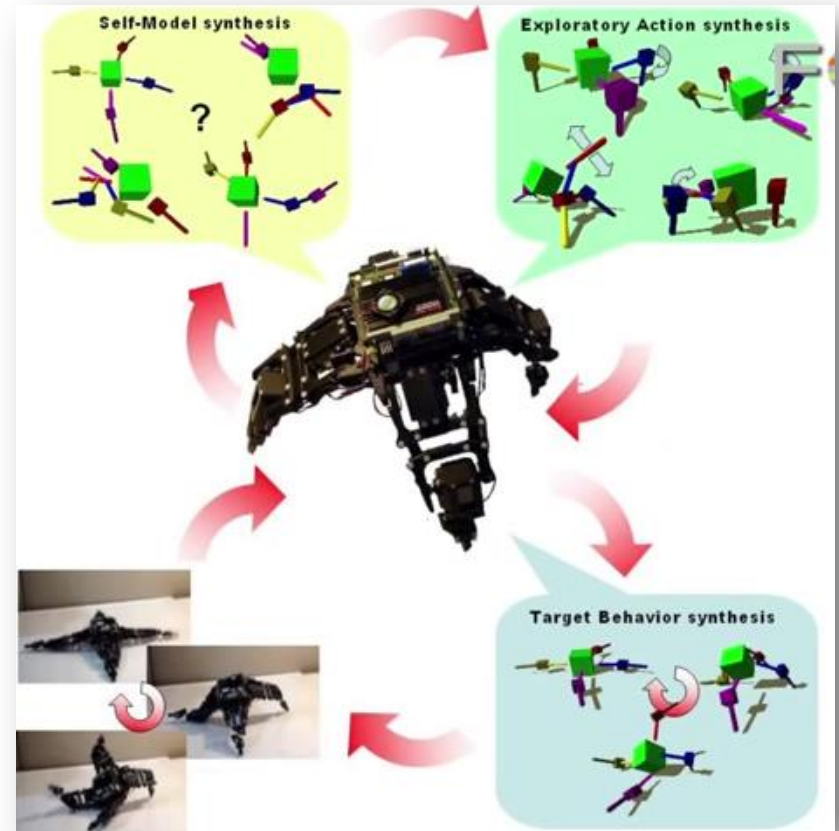
Classification Example

- <https://www.youtube.com/watch?v=LLBBvHYBbW0>



Robot Learning to Walk

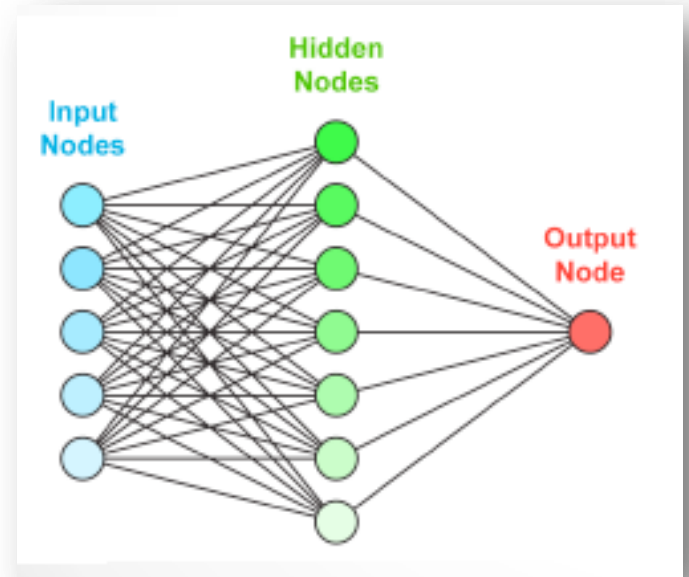
This video shows a robot “learning” a model of its own “body”.



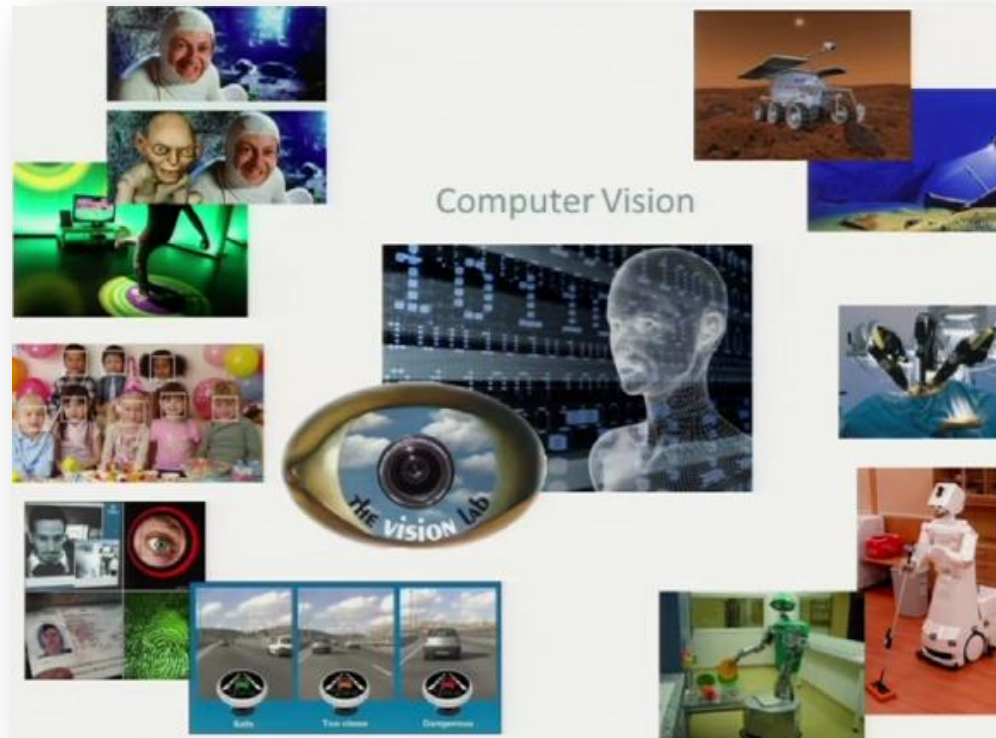
https://www.youtube.com/watch?v=iNL5-0_T1D0

Artificial Neural Network

- Biologically inspired but not nearly as complex as real neurons
- Highly parallel (concurrent)
- Can learn classifiers from features (someone has to choose features)
- Uses weights, numerical multipliers that adjust relative importance



How to teach computers to see



Min.
3:50
8:40
10:15
14:00

[http://www.ted.com/talks/fei fei li how we re teach
ing computers to understand pictures?language=en](http://www.ted.com/talks/fei_fei_li_how_we_re_teaching_computers_to_understand_pictures?language=en)