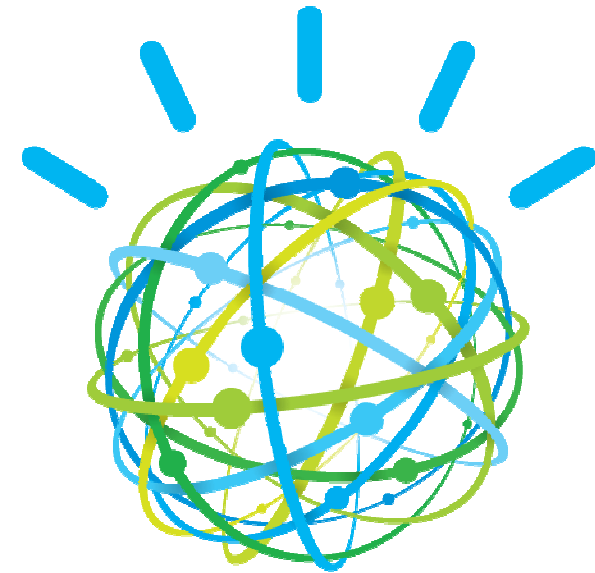# Making Cognitive Computing A Reality:
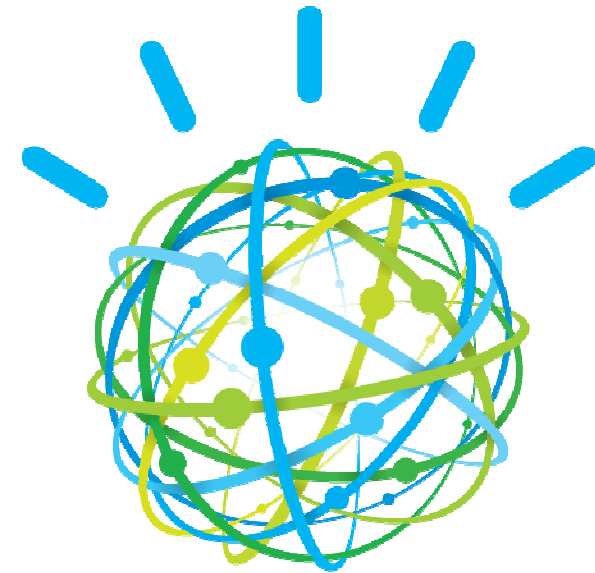
Watson's road to real world applications.

D.J. McCloskey

IBM Watson Group

What is Watson?

A Grand Challenge Opportunity

- **Drive Important Scientific Advances**
  - Envision new ways for computers to impact society & science

- **Be Relevant to IBM Customers**
  - Enable better, faster decision making over unstructured and structured content
  - *Business Intelligence, Knowledge Discovery and Management, Government, Compliance, Publishing, Legal, Healthcare, Product Support, etc.*

- **Capture the Broader Imagination**
  - The Next *Deep Blue*

On February 14, 2011, IBM Watson changed history . . .

Word spread virally of the victory with Twitter reaching
11.7M, 30,121 blog mentions, and 15,025 forum posts

Humans and our language

Je suis le guide.

L'amour aveugle le guide.

« Le président a-t-il toujours sa connaissance ? »


```
            S
          /   \
        NP      VP
       /  \    /  \
     det   N  V    NP
      |    |  |    /  \
     the  dog likes N   N
                        ice cream
```
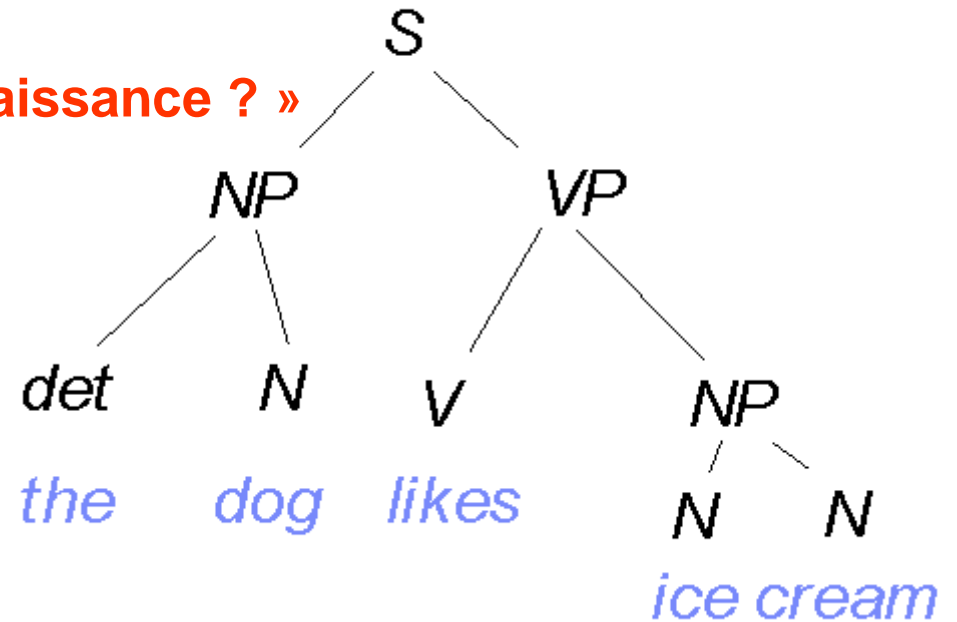
The boy saw the girl with the telescope.

Queen Mary Has Bottom Scraped
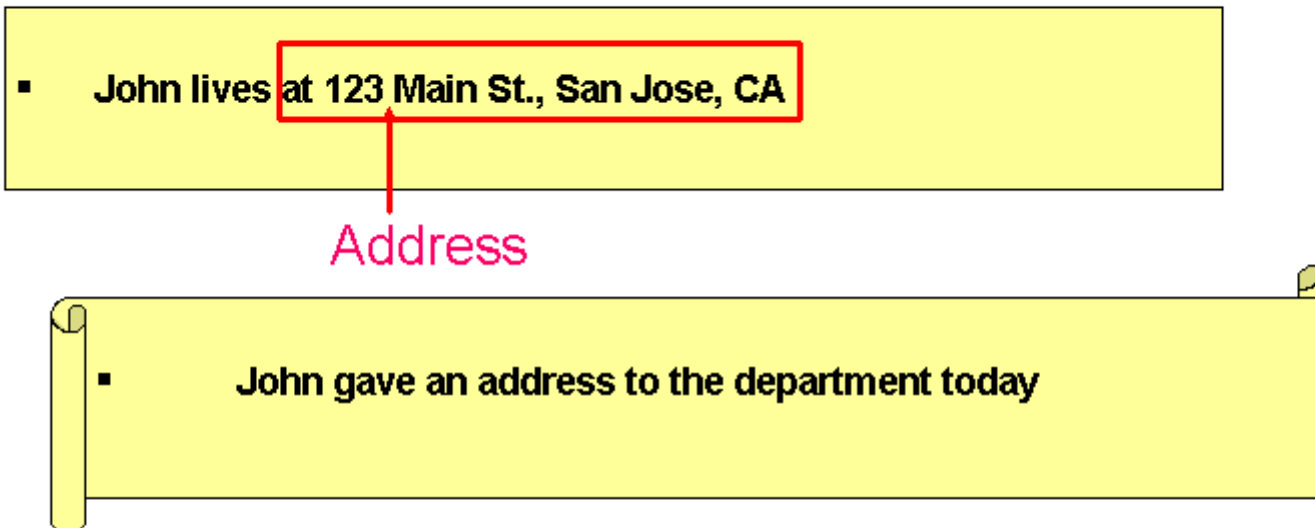
HOW WILL LOSS OF JOBS AFFECT APPLE?

Money burns up vs. houses burn down

Noses that run and feet that smell…

Iraqi Head Seeks Arms

The importance of semantic information

- John lives at 123 Main St., San Jose, CA

Address

- John gave an address to the department today

Query: *john's address*

Today, search engines will return the second document, not the first

Unstructured Data

	Structured Data		Unstructured Data
Welch ran this?	**Person**	**Organization**	*"If leadership is an art then surely Jack Welch has proved himself a master painter during his tenure at GE."*
	L. Gerstner	IBM	
	J. Welch	GE	
	W. Gates	Microsoft	

Competing against the Top Human Players
Our Analysis exposes *"The Winner's Cloud"*

Each dot – historical human Jeopardy! game

Top human players are *remarkably* good.

Precision

100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

% Answered

Winning Human Performance

Grand Champion Human Performance

2007 QA Computer System

More Confident

Less Confident
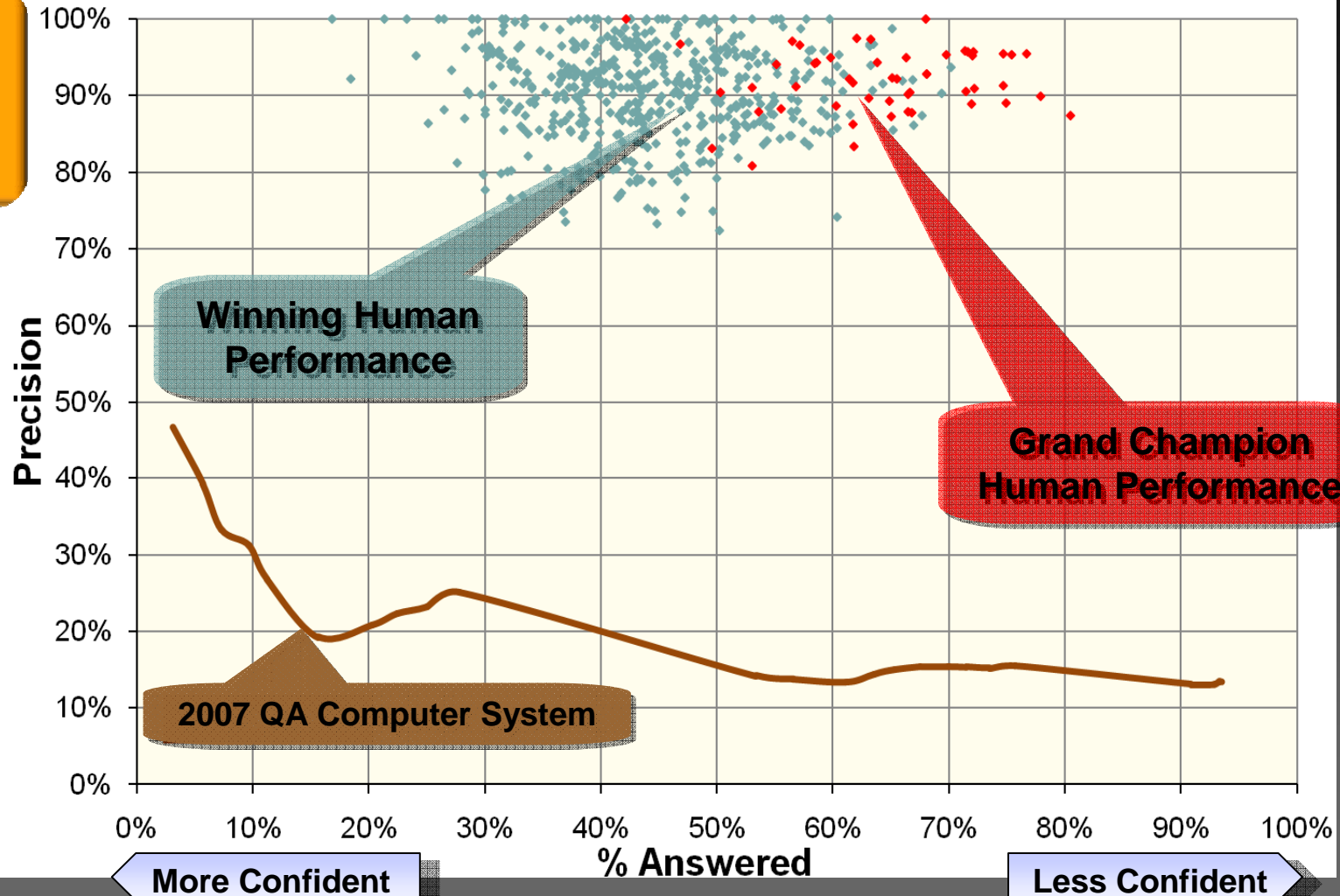
DeepQA: Incremental Progress in Answering Precision on the Jeopardy Challenge: 6/2007-11/2010

IBM *Watson*
Playing in the Winners Cloud

v0.8 11/10
V0.7 04/10
v0.6 10/09
v0.5 05/09
v0.4 12/08
v0.3 08/08
v0.2 05/08
v0.1 12/07
Baseline 12/06

Precision
% Answered

© 2013 IBM Corporation
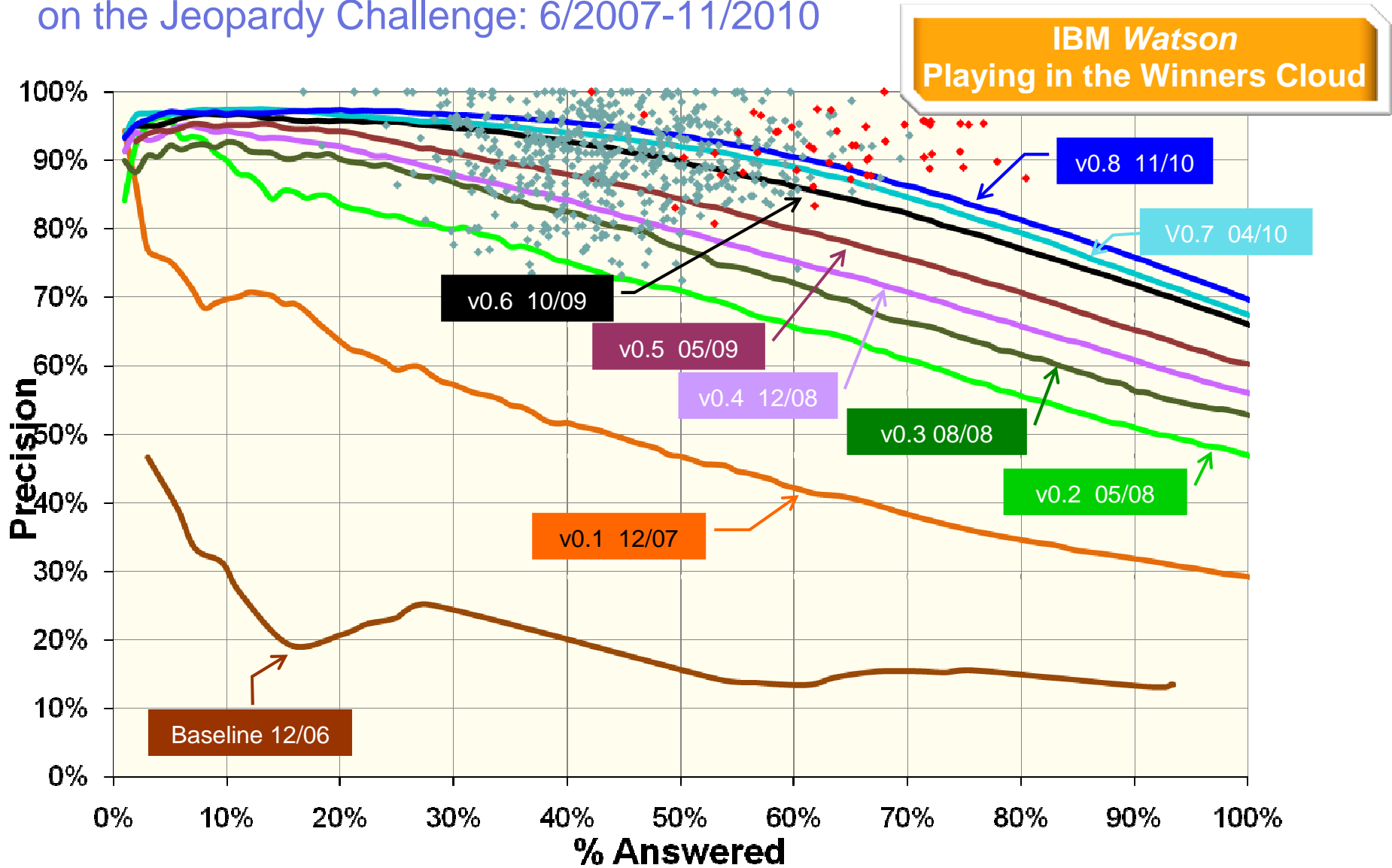
How Watson Works
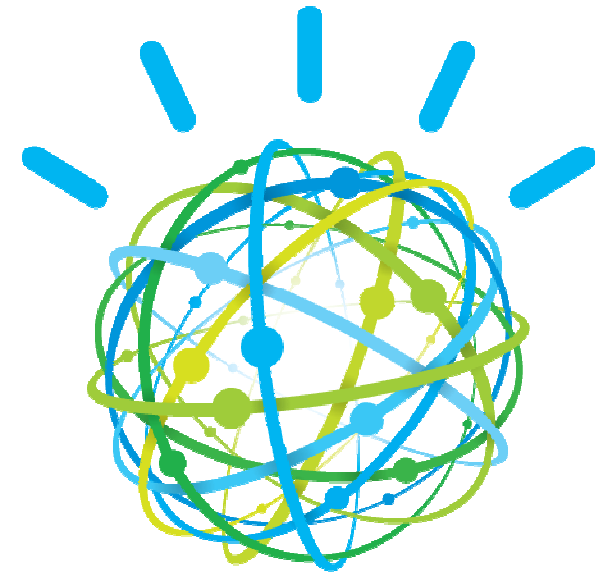
DeepQA: The Technology Behind *Watson*
Massively Parallel Probabilistic Evidence-Based Architecture

DeepQA *generates and scores many hypotheses using an extensible collection of* **Natural Language Processing**, **Machine Learning** *and* **Reasoning Algorithms.** *These gather and weigh evidence over both unstructured and structured content to determine the answer with the best confidence.*
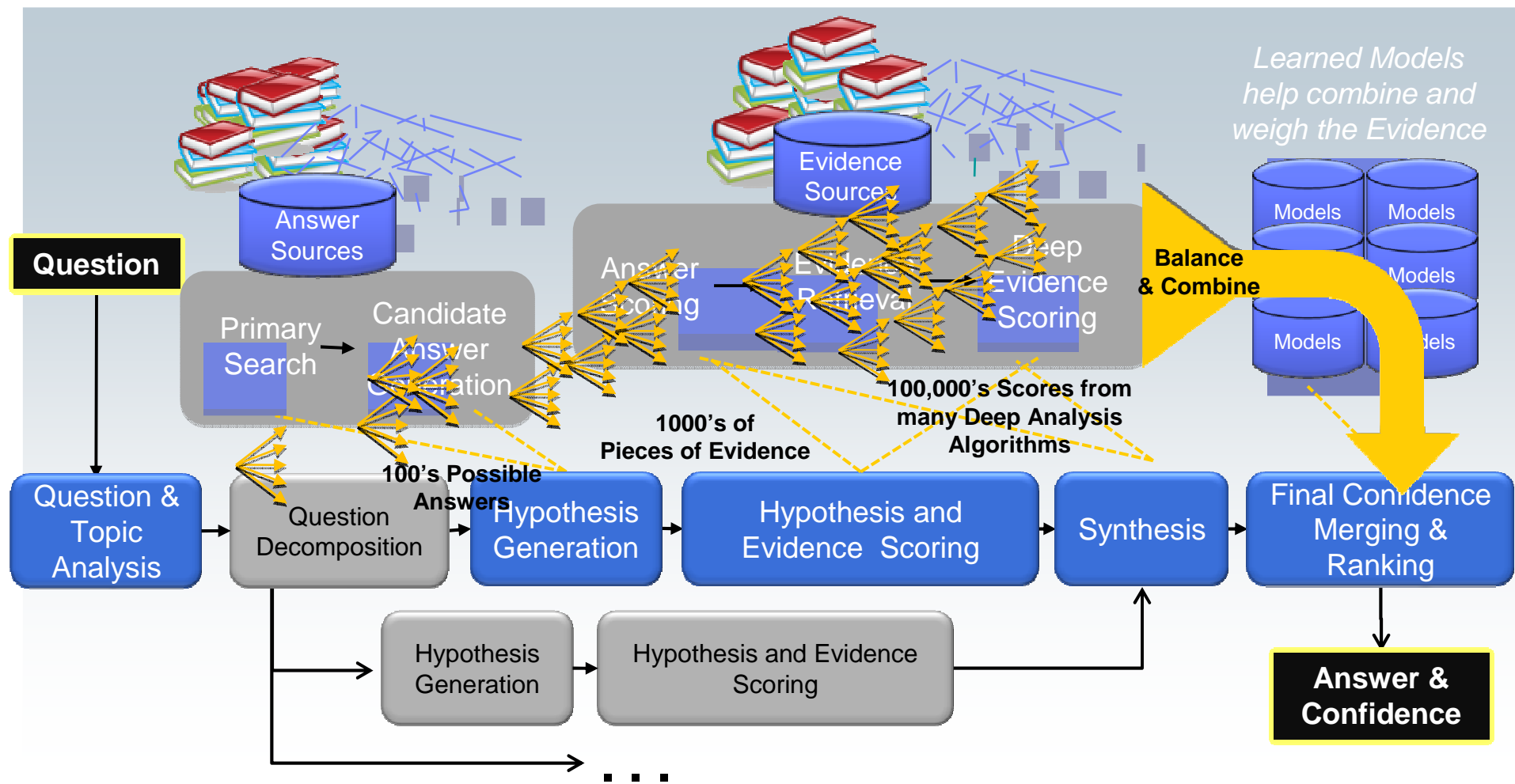
"Minimal" Deep QA Pipeline
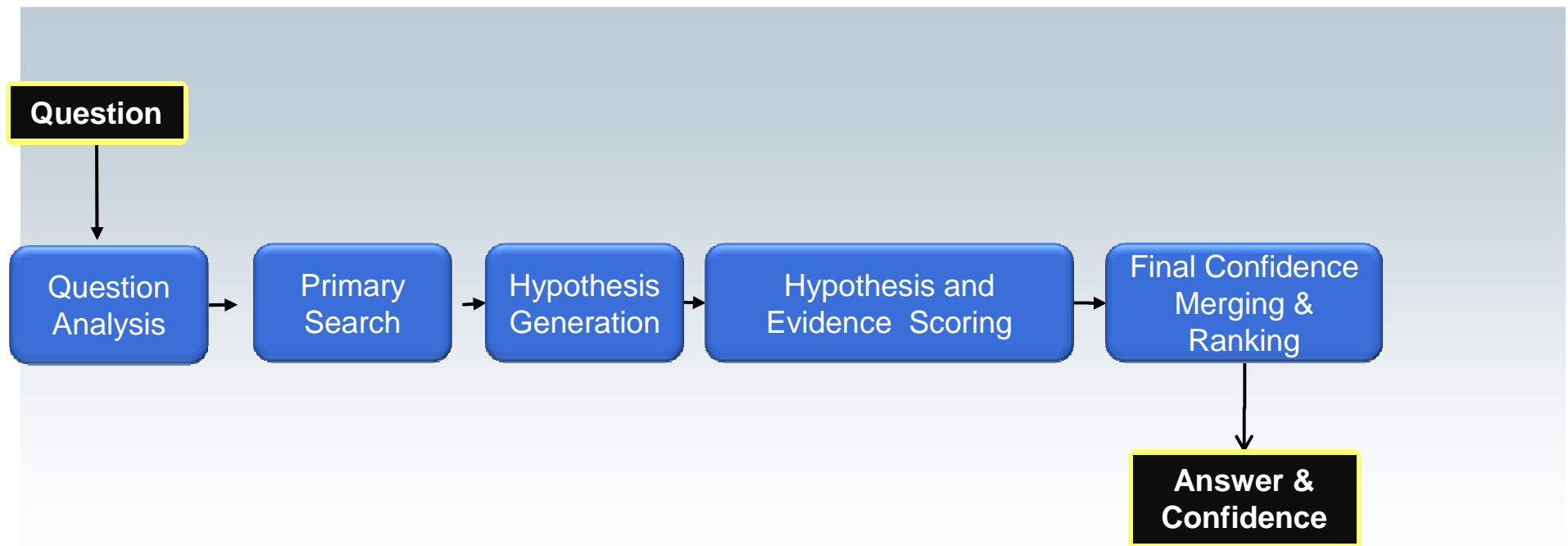
Category: MICHIGAN MANIA
Clue: In 1894 C.W. Post created his warm cereal drink Postum in this Michigan city

Question

Question
Analysis

Step 1: **Question Analysis**

IBM WATSON

Category: MICHIGAN MANIA

Clue: In 1894 C.W. Post created his warm cereal drink Postum in this Michigan city

Parsing
LAT Detection

Focus: *"this Michigan city"*
LAT: Michigan city

Keywords:
**1894
C.W. Post
created
warm
cereal
drink,
Postum
Michigan
City**
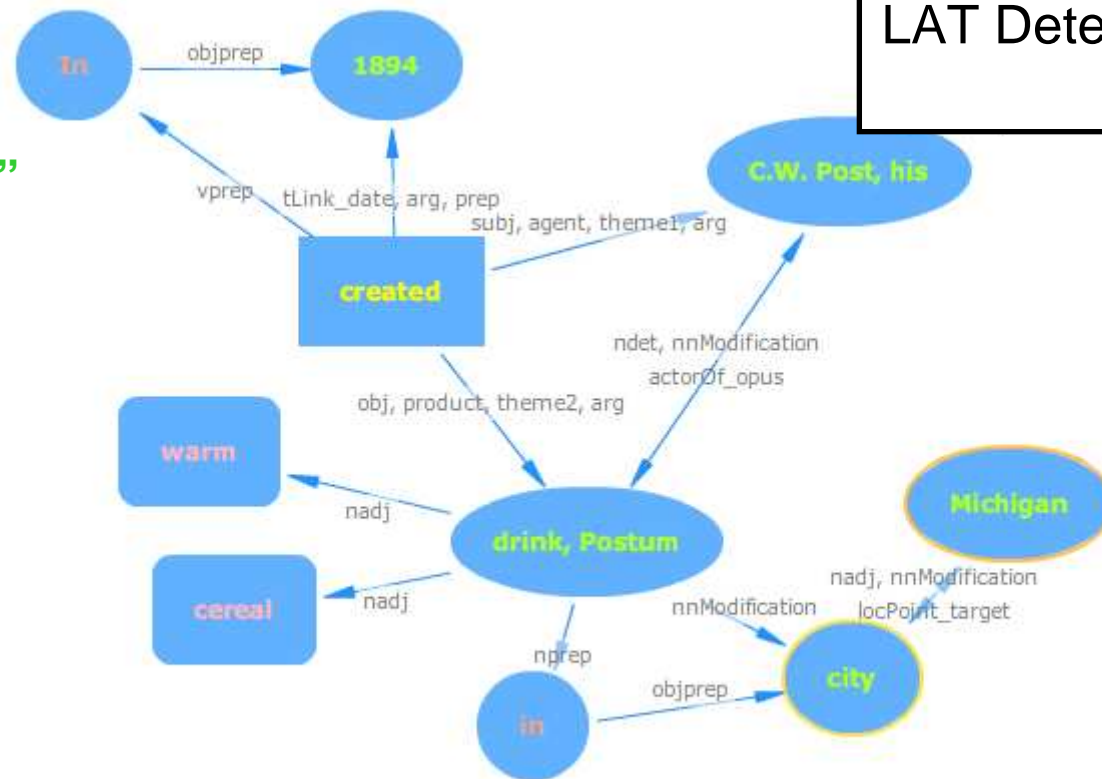
Category: MICHIGAN MANIA
Clue: In 1894 C.W. Post created his warm cereal drink Postum in this Michigan city

Question

Question Analysis → Primary Search

LAT

Mitchigan City

Step 2: Primary Search

Indri Passage Search		Passage Search Results	
Lucene Passage Search		**Rank**	**Passage**

The keywords (**1894**, **C.W. Post, created, warm, cereal, drink, Postum, Michigan, city**) are used to search over millions of documents to find relevant hits. 55 documents are found, and 30 passages are found.

Rank	Passage
0	C.W. Post came to the Battle Creek sanitarium to cure his upset stomach. He later created Postum, a cereal-based coffee substitute
1	The caffeine-free beverage mix was created by The Postum Cereal Company founder C. W. Post in 1895 and produced and marketed by Postum Cereal Company as a healthful alternative to coffee
2	1895: In Battle Creek, Michigan, C.W. Post made the first POSTUM , a cereal beverage. Post created GRAPE-NUTS cereal in 1897, and POST TOASTIES corn flakes in 1908
3	1854 C. W. Post (Charles William) was born. He founded the Postum Cereal Co. in 1895 (renamed General Foods Corp. in 1922) to manufacture Postum cereal beverage
4	The company was incorporated in 1922, having developed from the earlier Postum Cereal Co. Ltd., founded by C.W. Post (1854-1914) in 1895 in Battle Creek, Mich. After a number of experiments, Post marketed his first product-the cereal beverage called Postum-in 1895
5	…

Document Search Results

Rank	Title
0	General Foods
1	Battle Creek
2	Post Foods
3	Will Keith Kellogg
4	Breakfast Cereal
5	John Harvey Kellogg
6	C. W. Post
7	Kellogg Company
8	Postum
…	

"Minimal" Deep QA Pipeline

Category: MICHIGAN MANIA
Clue: In 1894 C.W. Post created his warm cereal drink Postum in this Michigan city

Question

Question Analysis → Primary Search → Hypothesis Generation

LAT

Mitchigan City

Document Search Results

R	Title
0	General Foods
1	Battle Creek
2	Post Foods
3	Will Keith Kellogg

Step 3: Hypothesis Generation

Category: MICHIGAN MANIA

Clue: In 1894 C.W. Post created his warm cereal drink Postum in this Michigan city

Candidate Answers (possible answers to the question) are identified in the search results. They are found by looking at document titles (including a variety of title variants and expansions) and possible answers in the text of the documents and passages, such as *named entities*, noun phrases, anchor text, dates, etc. The Candidate Answers are get their first evidence feature scores from their corresponding document search rank and passage search rank.

Will Keith Kellogg

Britannica Concise Encyclopedia: Will Keith Kellogg

Home > Library > Miscellaneous > Britannica Concise Encyclopedia

General Foods

From Wikipedia, the free encyclopedia

General Foods Corporation was a company whose direct predecessor was established in the USA by Charles William Post as the Postum Cereal Company in 1895. The name General Foods was adopted in 1929, after several corporate acquisitions. In November, 1985 General Foods was acquired by Philip Morris Companies (now Altria Group, Inc.) for $5.6 billion, the largest non-oil acquisition to that time. In December, 1988 Philip Morris acquired Kraft, Inc., and in 1990 combined the two food companies as Kraft General Foods (KGF). "General Foods" was dropped from the corporate name in 1995 and now exists only as part of a brand name for a flavored coffee-based beverage, General Foods International.

Contents [hide]
1 History
2 Major acquisitions
   2.1 Purchase of Birdseye
3 See also
4 Notes and references
5 Timeline of selected later events

History

[1] C.W. Post established his company in Battle Creek, Michigan, in 1891, when he was a patient at an holistic sanitarium operated by Dr. Kellogg.[2] Dr. Kellogg, with his brother W.K. Kellogg, had developed a that was part of their patients' diet. Post's first product, introduced in however, but a roasted, cereal-based beverage, Postum. Having devel coffee during his time in the sanitarium, Post positioned Postum as a advertising slogan, which he coined himself, was "There's a Reason."

Post Foods

From Wikipedia, the free encyclopedia

Post Foods, LLC, also known as **Post Cereals** (formerly **Postum Cereals**) was founded by C.W. Post. It began in 1895 with the first Postum, a "cereal beverage", developed by Battle Creek, Michigan. The first cereal, Grape-Nuts, was developed in 1897. Post has headquarters in the Bank of America Plaza in Downtown St. Louis, Missouri.[2]

The Postum Cereals company, after acquiring Jell-O gelatin in 1925, Baker's chocolate 1927, Maxwell House coffee in 1928, and other food brands, changed its name to Gene Foods Corporation in 1929. General Foods was acquired by Philip Morris Companies in 1985.

In 1989, Philip Morris merged General Foods with Kraft Foods, which it had acquired in to form the Kraft General Foods division. The cereal brands of Nabisco were acquired in 1993. In 1995, Kraft General Foods was reorganized and renamed Kraft Foods.

On November 15, 2007, Kraft announced that it would spin off Post Cereals and merge th business with Ralcorp Holdings. [3] That merger was completed August 4, 2008.[4] The official name of the company became Post Foods, LLC.

Contents [hide]
1 Cereal brands – present cereals
2 Discontinued cereals
3 External links
4 References

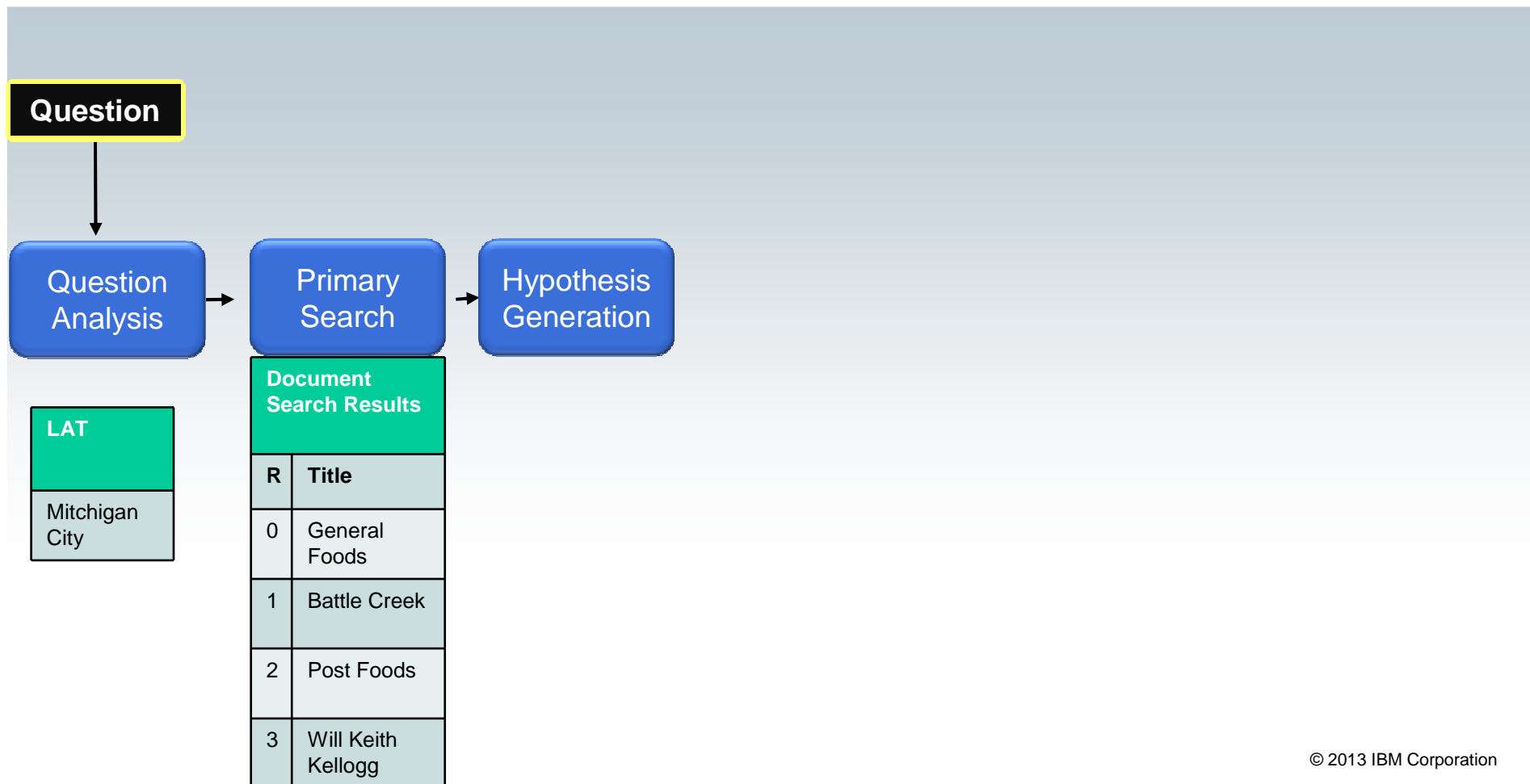### Cereal brands – present cereals

• 100% Bran - Currently Only Available in Canada
• Honey Bunches of Oats - with Real Strawberries

Candidate Answers	Evidence Feature Scores							
	Doc Rank	Pass Rank						
General Foods	0	1						
Post Foods	2	1						
Battle Creek	1	2						
Will Keith Kellogg	3							
Grand Rapids								
1895		0						

"Minimal" Deep QA Pipeline

Category: MICHIGAN MANIA
Clue: In 1894 C.W. Post created his warm cereal drink Postum in this Michigan city

Question

Question Analysis	→	Primary Search	→	Hypothesis Generation	→	Hypothesis and Evidence Scoring

LAT

Mitchigan City

Document Search Results

R	Title
0	General Foods
1	Battle Creek
2	Post Foods
3	Will Keith Kellogg

Candidate Answers

General Foods
Post Foods
Battle Creek
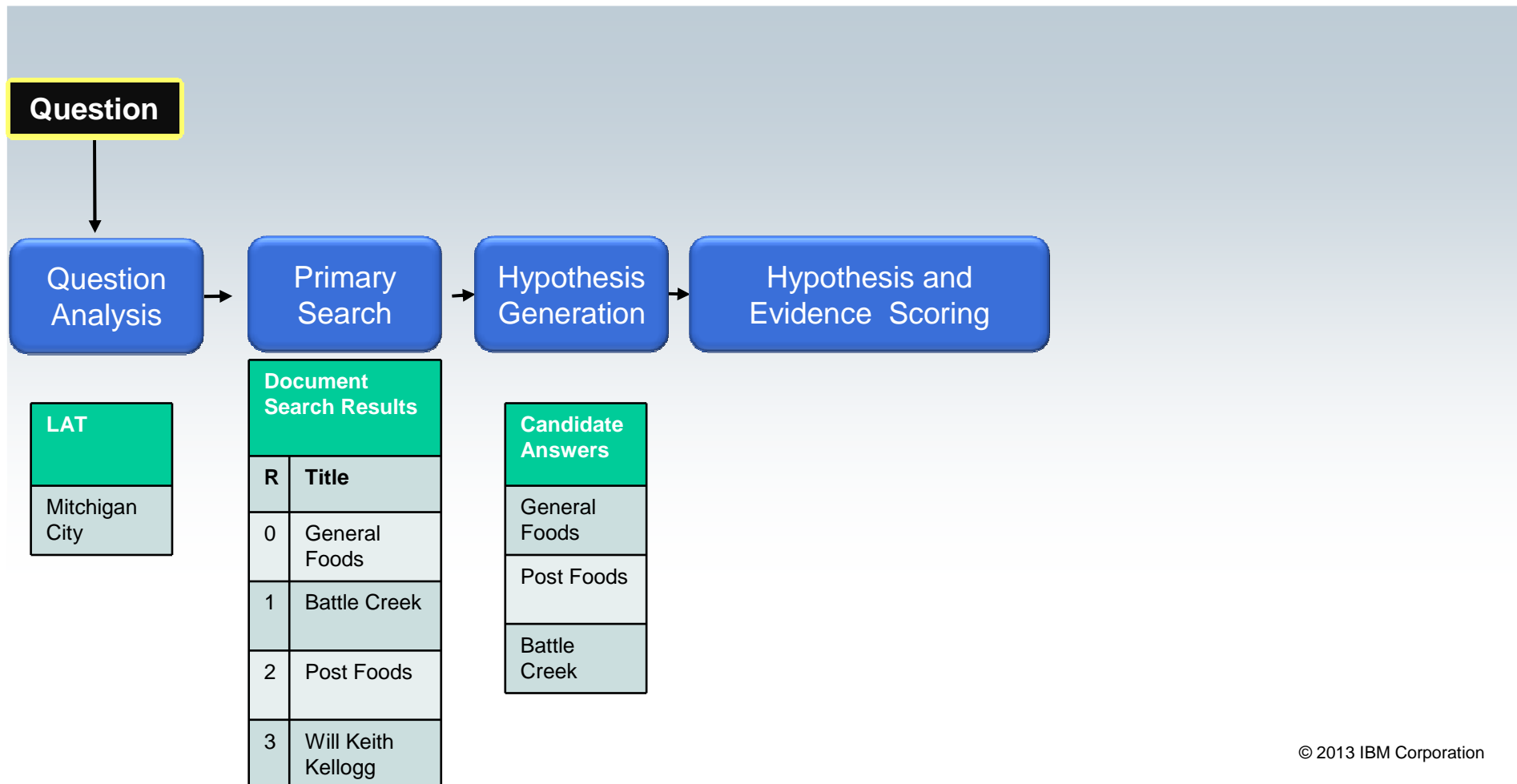
Step 4A: **Hypothesis Scoring**
(Answer Scoring Features)

Category: MICHIGAN MANIA

Clue: In 1894 C.W. Post created his warm cereal drink Postum in this Michigan city

Other Answer Scorers can be applied depending on different relations or constraints detected in the question. For example, this question focus with modifiers is "Michigan city." Watson can detect this as a geospatial relation that indicates the correct answer must be a city spatially located within the sate of Michigan.

Tycor
Temporal
Spatial
Popularity

Candidate Answers	Evidence Feature Scores (Answer Scoring + Passage Scoring)								**...**
	Doc Rank	Pass Rank	Ty Cor	Geo					
General Foods	0	1	0.1	0					
Post Foods	2	1	0.1	0					
Battle Creek	1	2	0.8	1					
Will Keith Kellogg	3		0.1	0					
Grand Rapids			0.9	1					
1895		0	0.0	0					

Step 4B: **Hypothesis Scoring**
(Passage Scoring Features)

Category: MICHIGAN MANIA

Clue: In 1894 C.W. Post created his warm cereal drink Postum in this Michigan city

In Deep Evidence Scoring, Watson retrieves evidence for each candidate answer, then evaluates the evidence using a large number of deep evidence scoring analytics. The evidence for a candidate answer may come from the original document or passage where the candidate answer was generated, or it may come from an evidence retrieval search performed by taking the keyword search query from Step 2, replacing the focus terms with the candidate answer, and retrieving the relevant passages that are found. The passages, or "context" in which the candidate answer occurs are evaluated as evidence to support or refute the candidate answer as the correct answer for the question.

Battle Creek

General Foods

Post Foods

1895: In Battle Creek, Michigan, C.W. Post made the first POSTUM , a cereal beverage. Post created GRAPE-NUTS cereal in 1897, and POST TOASTIES corn flakes in 1908

The company was incorporated in 19__ having developed from the earlier Postum Cereal Co. Ltd., founded by C.W. Post (1854-1914) in 1895 in Ba__ Creek, Mich. After a number of experiments, Post marketed his first product-the cereal beverage called Postum-in 1895

1854 C. W. Post (Charles William) was born. He founded the Postum Cereal Co. in 18__ in 19__ beve__

General Foods' products go from breakfast (Post's cereals) to warm nightcaps (Postum, Sanka), also wash the pots and pans that its foods are cooked in (S.O.S. Scouring Pads

Post Foods, LLC, also known as Post Cereals (formerly Postum Cereals) was founded by C.W. Post. It began in 1895 with the first Postum, a "cereal beverage", developed by Post in Battle Creek, Michigan. The first cereal, Grape-Nuts, was developed in 1897

__r of became General Foods. The cereal company unit was later sold off and is now Post Foods

"Minimal" Deep QA Pipeline

Category: MICHIGAN MANIA

Clue: In 1894 C.W. Post created his warm cereal drink Postum in this Michigan city

Question

| Question Analysis | → | Primary Search | → | Hypothesis Generation | → | Hypothesis and Evidence Scoring | → | Final Confidence Merging & Ranking |

LAT

Mitchigan City

Document Search Results

R	Title
0	General Foods
1	Battle Creek
2	Post Foods
3	Will Keith Kellogg

Candidate Answers

General Foods

Post Foods

Battle Creek

Evidence Features

Ty Cor	Geo
0.1	0
0.1	0
0.8	1

Step 6: Merging Candidate Answers and Scoring the Confidence

Category: MICHIGAN MANIA

Clue: In 1894 C.W. Post created his warm cereal drink Postum in this Michigan city

In the final processing step, Watson detects variants of the same answer and merges their feature scores together. Watson then computes the final confidence scores for the candidate answers by applying a series of Machine Learning models that weight all of the feature scores to produce the final confidence scores.

Candidate Answers	Evidence Feature Scores						
	Doc Rank	Pass Rank	Ty Cor	Geo	LFACS	Term Match	Temp-oral
General Foods	0	1	0.1	0	0.2	22	1
Post Foods	2	1	0.1	0	0.4	41	1
Battle Creek	1	2	0.8	1	0.5	30	0.9
Will Keith Kellogg	3		0.1	0	0	23	0.5
Grand Rapids			0.9	1	0	10	0.5
1895		0	0.0	0	0	21	0.6

Apply Machine Learning Model

Correct Answer

Final Answers	Confi-dence
Battle Creek	0.946
Post Foods	0.152
1895	0.040
Grand Rapids	0.033
General Foods	0.014

"Minimal" Deep QA Pipeline

Category: MICHIGAN MANIA
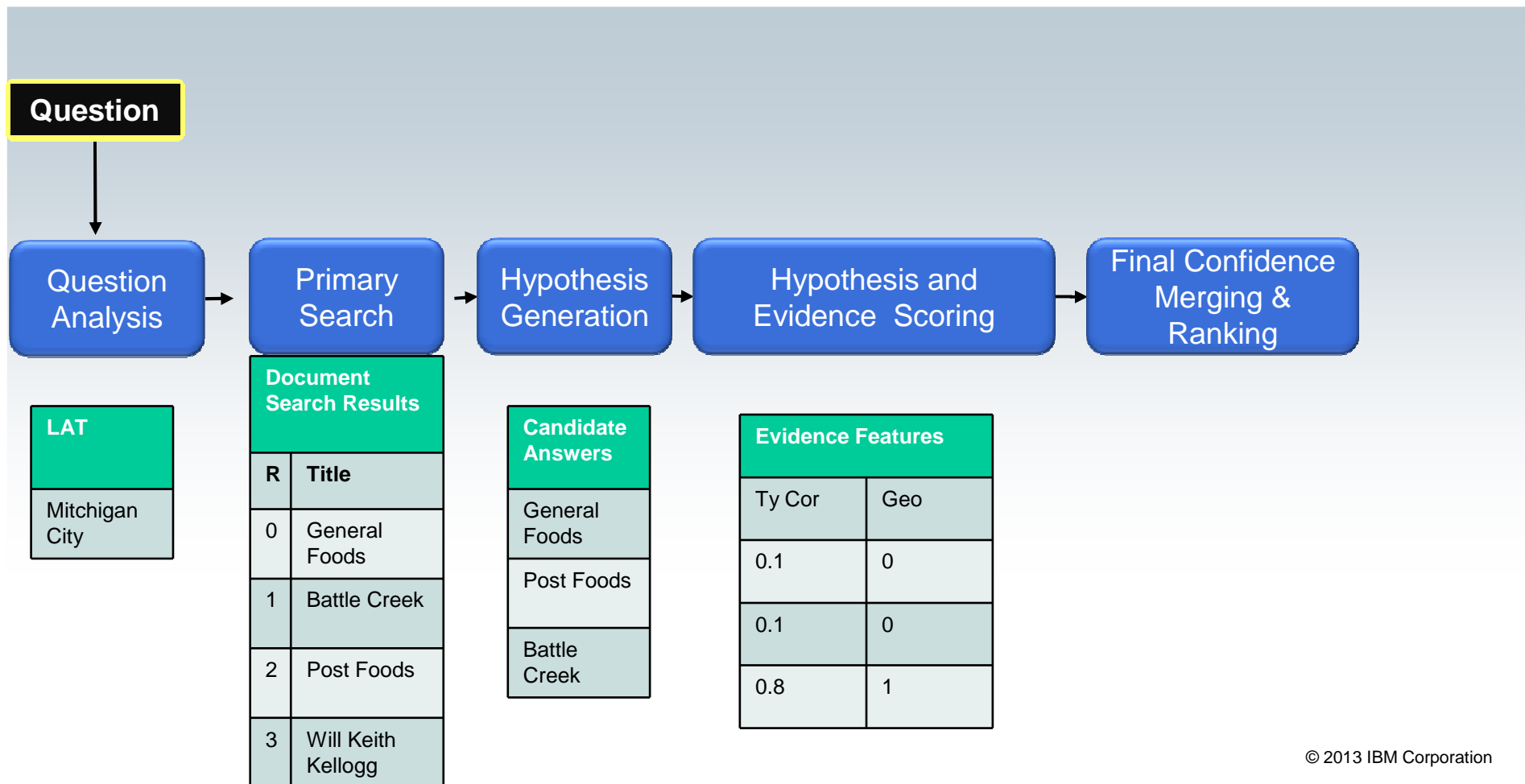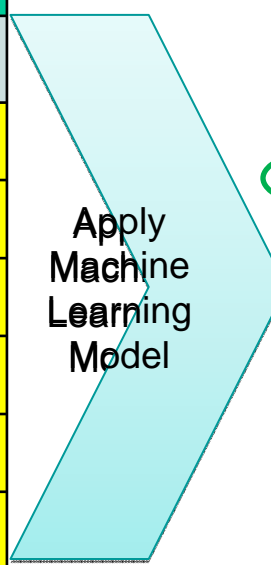**Clue: In 1894 C.W. Post created his warm cereal drink Postum in this Michigan city**

Question

Battle Creek

Question Analysis	→	Primary Search	→	Hypothesis Generation	→	Hypothesis and Evidence Scoring	→	Final Confidence Merging & Ranking

LAT

Mitchigan City

Document Search Results

R	Title
0	General Foods
1	Battle Creek
2	Post Foods
3	Will Keith Kellogg

Candidate Answers

General Foods
Post Foods
Battle Creek

Evidence Features

Ty Cor	Geo
0.1	0
0.1	0
0.8	1

Final Answers	Confi-dence
Battle Creek	0.946
Post Foods	0.152
1895	0.040
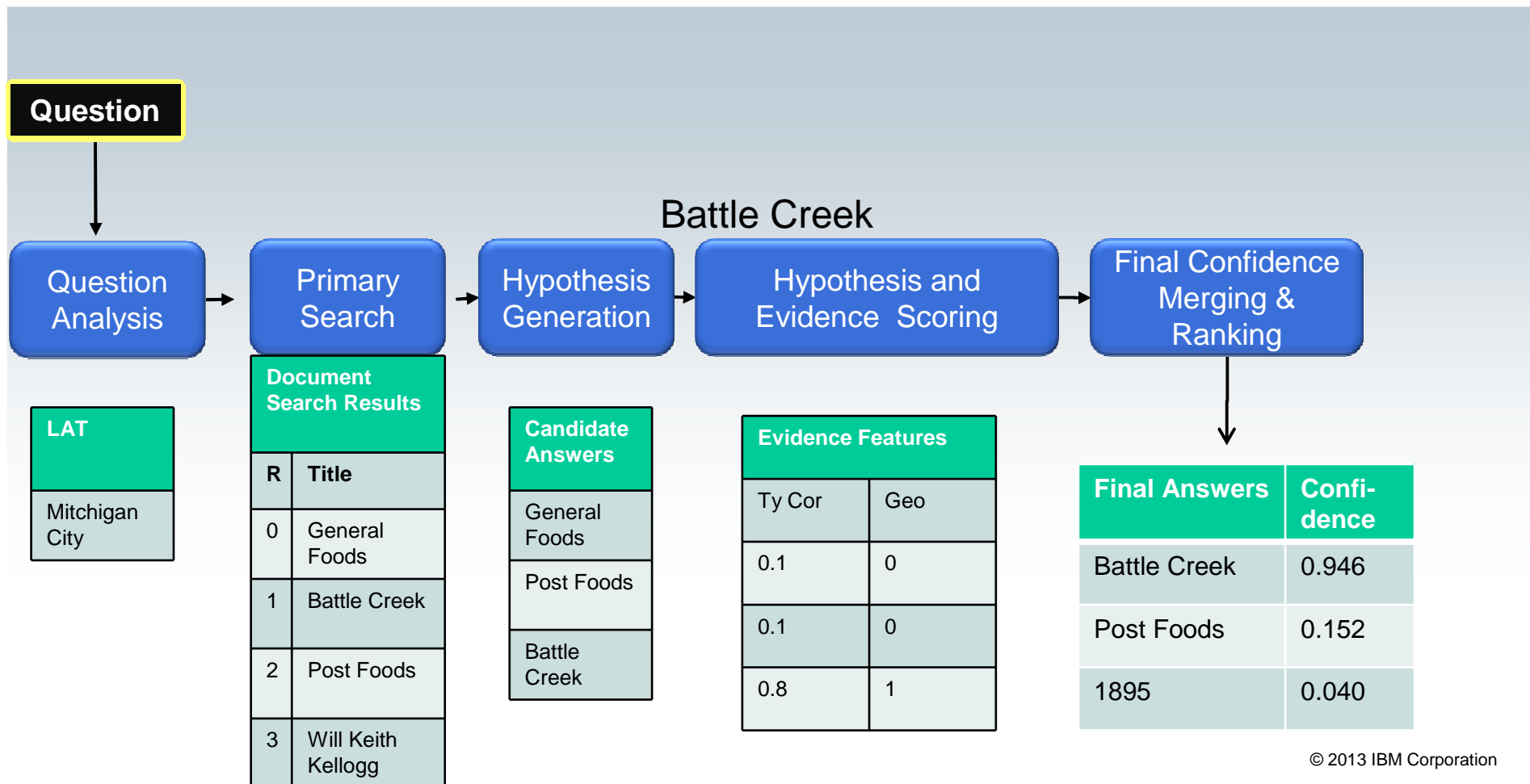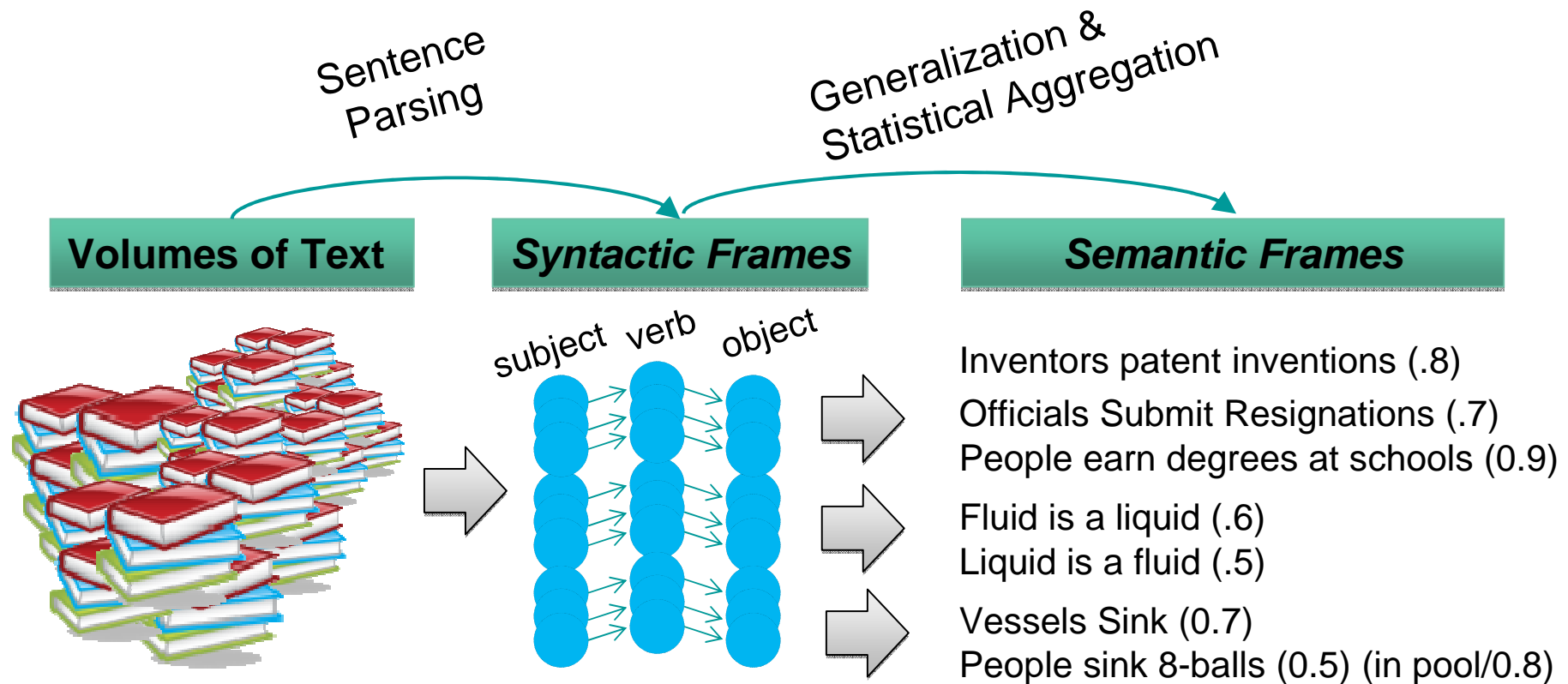
Prismatic and Tycor

Semantic Type Disambiguation:

The Thunder outscored opponents by 8 points per game.

- Is *Thunder* a TEAM or a SOUND?
  - Hypothesis 1: Thunder is a TEAM
    - Frame: "TEAM outscore opponents" → 1182 occurrences

  - Hypothesis 2: Thunder is a SOUND
    - Frame "SOUND outscore opponents" → 0 occurrences

Prismatic and Tycor

- What are the common relations between PERSON and TEAM, between TEAM and TEAM?

Frequency	Subj Type	Verb	Obj Type
1446	TEAM	play	TEAM
1204	TEAM	beat	TEAM
1115	TEAM	defeat	TEAM
556	TEAM	face	TEAM
196	TEAM	host	TEAM
192	TEAM	sweep	TEAM

Frequency	Subj Type	Verb	Obj Type
5168	PERSON	lead	TEAM
2586	PERSON	coach	TEAM
2367	PERSON	join	TEAM
2260	TEAM	sign	PERSON
2212	TEAM	draft	PERSON
2096	TEAM	trade	PERSON

Watson in the real world
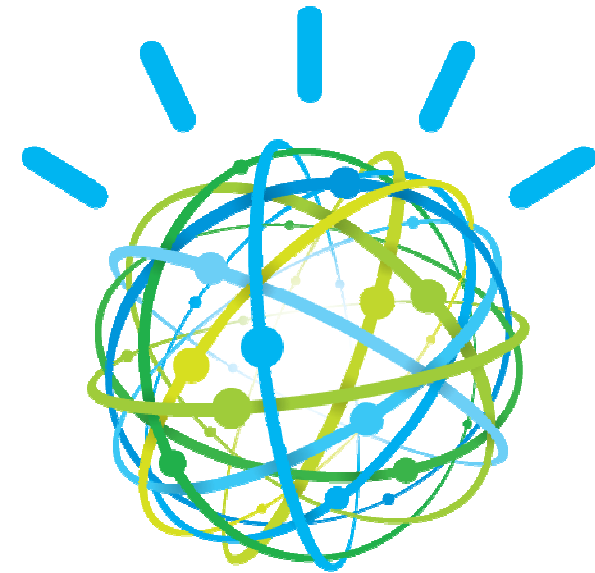
Healthcare is "dying of thirst in an ocean of data"

"Medicine has become too complex. Only about 20% of the knowledge clinicians use today is evidence-based."

Steven Shapiro
Chief Medical & Scientific Officer
University Pittsburgh Medical Center

Medical info is doubling every 5 years

81% of physicians spend < 5 hrs / month reading medical journals

1.5M errors in the way medications are prescribed, delivered and taken

$750B, or 30 cents of every dollar, is wasted in US alone

Trend in PubMed Articles

Trend in PubMed Articles Published
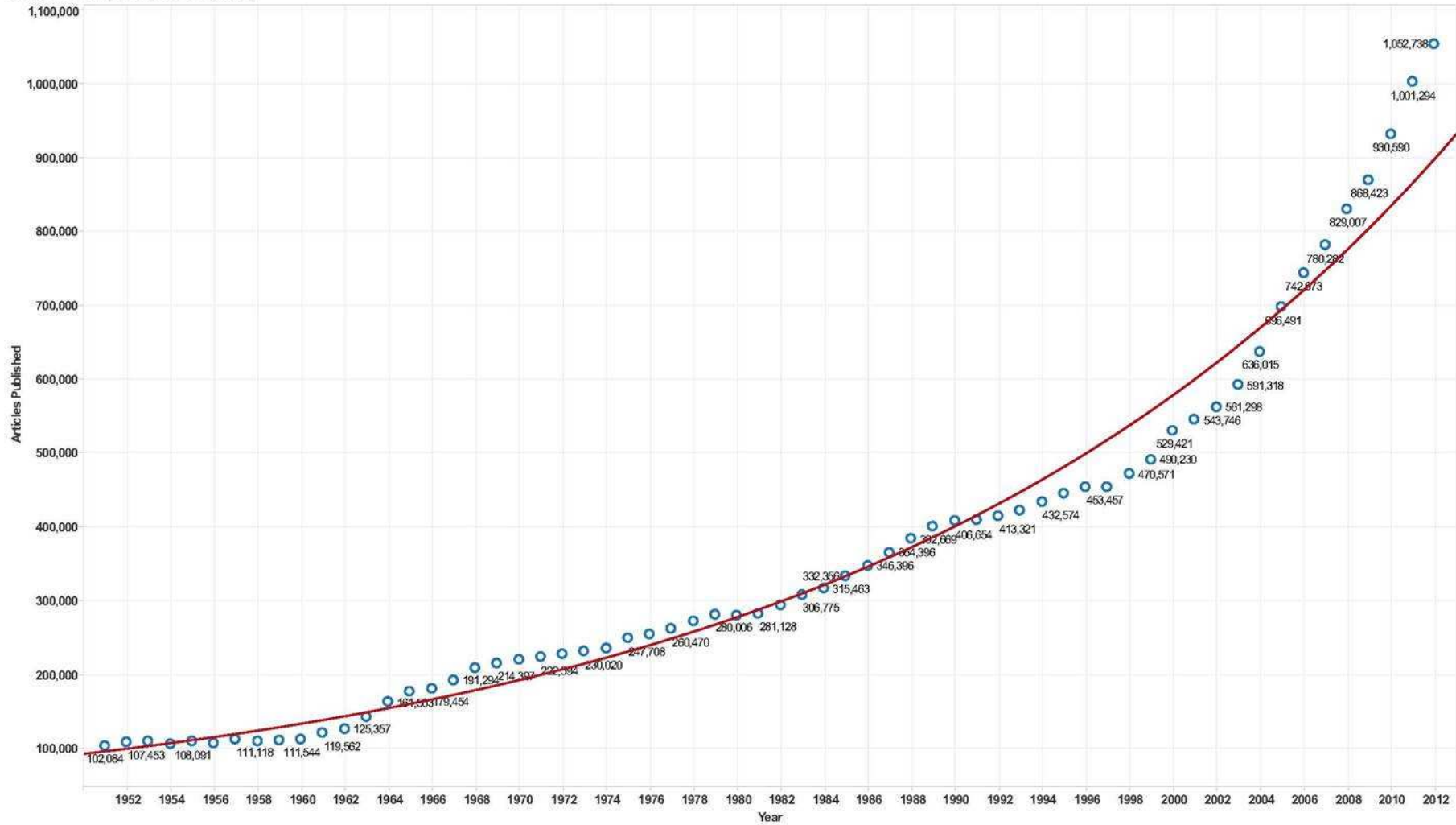
Year vs. Articles Published. The marks are labeled by sum of Articles Published.

Financial services firms face complex information challenges

Reuters publishes the equivalent of 9000 pages of financial news every day[1]

Five new research documents come out of Wall Street every minute[1]

Asset managers receive up to 1,000 e-mails daily[1]

Only 1/3 of the ~10,000 US public companies are covered by meaningful Wall Street research [1]

Productivity: Top traders can do $4M/hour in trades [2]

2011 NYSE average: 4.3M shares traded per minute [3]
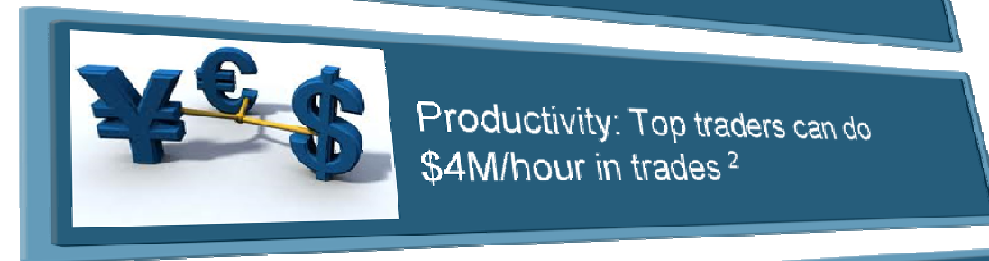
"The sheer amount of newsflow has made it difficult for people to take positions confidently" [4]

-Adam Margolis, Citi trader

Sources: 1 - www.financial-domain.info/integrating-qualitative-and-quantitative-information/
         2- IBM Client experience with ForEx traders
         3 – Derived from NYSE data
         4 - http://www.marketoracle.co.uk/Article31954.html

Beyond Jeopardy!: A new set of Challenges…

Watson at Play		Watson at Work
1 User	→	10s of thousands concurrent users
Max. input was two sentences	→	Pages of input (e.g. medical record)
Input perfect prose	→	Noisy text with errors and shorthand
5+ days to retrain	→	Dynamic content ingestion
Evidence not present	→	Supporting evidence integral
Text-only input	→	Text, tables and images as input
Q&A model	→	Both Q&A + Conversation model
Basic security	→	High security (e.g. HIPAA)

Beyond Jeopardy!

IBM WATSON

Hardware and Performance Details

(Then...)

2880 Processing Cores

90 IBM P750 Servers

16 Terabytes Memory (RAM)

20 Questions / min

(And Now...)

64 Processing Cores

1 IBM P750 Server

512 GB Memory (RAM)

50 Questions / min

NLP   x10 faster using x50 less RAM

What kind of Data?

- **Real world knowledge**
  - Deeply encoded
  - Unstructured data

- **Many forms of Unstructured Data**
  - Well formed grade level prose
  - Semi/ Explicitly structured
  - Ambiguous
  - Ungrammatical
  - Domain specific language
  - Scanned hand-written notes (OCR)

- **Required technology often exists!**
  - Not integrated well
  - Not scalable, or evolved

IBM WATSON

	BMD	T-score	Z-score
LWK (L1-L4)	: 0.69 g/cm2	-3.2 (66%)	-3.1 (67%)
Femurhals links	: 0.75 g/cm2	-0.9 (88%)	-0.9 (88%)

```
<Claim>
<ClaimNumber>1</ClaimNumber>
<AccidentDate>30/05/2004</AccidentDate>
<ReportDate>06/06/2004</ReportDate>
<CloseDate>19/01/2005</CloseDate>
<ClaimHistory><CreateDTM>07/06/2004</CreateDTM>
<NoteSubject>016</NoteSubject>
<NoteID>3620034694854</NoteID>
<NoteText>"ICP 1 Assist (Saddlebrook/Christina Shamas) Clt
known with known injures....clt has 30 stitches in his nose.
Discussed claim with T/M Rita Ryan
Assigned task to Maureen Nugent to investigate
```

Tamoxisen is an **etcelleut** treatment for **bneast** cancer.

in patients over **GO** years of **aye**.

earch team led by
containing the

01232 456 7123
291271
23 Cleveland Drive, Fareham   4235671
Graham Knowles   Peterlee   2741567
Further items discovered during the raid were 3 forged driving
licenses with the following names and numbers:
John Smith   2234 1212 1211VT
Brian Smythe   5643 7382 9234ZX
John Guest   2763 9012 6572AB

Case Information

The IBM Watson case information does not obviate the need to review the EMR record in detail

PATIENT	DEMOGRAPHICS	CURRENT CONDITION
Lin J. Yamato	Gender: Female	DX: Lung Adenocarcinoma
Patient ID: 000-0000	DOB: Jan 15, 1975 (37)	Smoking History: Never smoker
Provider ID: 00-0000-0	Place of Birth: Osaka, Japan	

Key Points

2/16/12 – Pathology report from CT biopsy of right adrenal gland: Metastatic adenocarcinoma; morphologically consistent with specimen 312-647

EMR   EVIDENCE

2/07/12 – CT chest/abdomen/pelvis with contrast: 1.7 cm lesion right adrenal gland suspicious for a metastatic deposit

EMR   EVIDENCE

2/05/12 – CT chest without contrast: 3.1 cm lesion right upper lobe of lung suspicious for neoplasm

EMR   EVIDENCE

2/03/12 – PCP visit note: dry cough - labored breathing

EMR   EVIDENCE

Information Needed

Has the patient experienced any hemoptysis?

EMR   EVIDENCE

Does the patient have normal hearing?

| Case Information | Test Options | Treatment Options | | IBM **WATSON** |

Test Options to Consider

WATSON:

Test options are identified based on information available.

Request Pre-auth

Type of Disease Evaluation

☑ Molecular pathology panel

EVIDENCE

Extent of Disease Evaluation

☑ MRI of the brain

EVIDENCE

Pre-treatment Assessment

☑ Baseline EKG

EVIDENCE

☑ Hepatitis B test

EVIDENCE

☑ Pregnancy test

EVIDENCE

Case Information   **Test Options**   **Treatment Options**

IBM **WATSON**

Patient Details

Treatment Options to Consider

? ⌄

WATSON:

Treatment options are listed based on the information available.

Request Pre-auth

	Treatment Plan	Confidence	Patient Preferences Match	
◉	**Treatment plan 1** **Systemic Chemo:** Cisplatin, Pemetrexed, Bevacizumab	**95**%	**Acceptable** match with patient preferences	EVIDENCE
●	**Treatment plan 2** **Systemic Chemo:** Carboplatin, Paclitaxel, Bevacizumab	**45**%	**Unnaceptable** match with patient preferences	EVIDENCE
●	**Treatment plan 3** **Systemic Chemo:** Erlotinib	**8**%	**Preferred** match with patient preferences	EVIDENCE
	Radiation and Surgery are unlikely to be appropriate.			EVIDENCE

Case Information   **Test Options**   **Treatment Options**   **IBM WATSON**

Treatment Options to Consider

⌄

WATSON

Treatment op
are listed bas
information a

Request Pre-

Treatment plan 1

Supporting Evidence

References

Stage IV disease requires systemic therapy. Since the tumor harbors EGFR TKI resistant mutation, the recommended treatment is Cisplatin, Pemetrexed, and Bevacizumab.

Surgery: not recommended for this patient due to the presence of metastatic disease.

RT: not recommended for this patient due to the presence of metastatic disease.

Of the medically appropriate regimens, this treatment is least likely to cause alopecia.

Usage Statistics:
This treatment plan has been selected 154 times out of 257 similar patient cases.

NCCN Guidelines™ Version 3.2011
NSCL-14: Adenocarcinoma, Large Cell, NSCLC NOS: EGFR mutation negative OR unknown

➤ VIEW

✖ REMOVE

Wu et al. Lung Cancer with Epidermal Growth Factor Receptor Exon 20 Mutations is Associated with Poor Gefitinib Treatment Response. *Clinical Cancer Research*. 2008 14:4877-4882

➤ VIEW

✖ REMOVE

Wu et al. Effectiveness of tyrosine kinase inhibitors on "uncommon" epidermal growth factor receptor mutations of unkown clinical significance in non-small cell lung cancer. *Clinical Cancer Research*. 2011 Jun 1; 17(11): 3812-21.

➤ VIEW

✖ REMOVE

Scagliotti et al. Phase III Randomized Trial Comparing Three Platinum-Based Doublets in Advanced Non-Small-Cell Lung Cancer. *Journal of Clinical Oncology*. 2002 Nov 1;

➤ VIEW

Case Information   **Test Options**   **Treatment Options**   IBM **WATSON**

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Subject: Functional Endoscopic Sinus Surgery (FESS)	
Guideline #: CG-SURG-24	**Current Effective Date:** 10/08/2013
Status: Revised	**Last Review Date:** 08/08/2013

Description

This document addresses the use of functional endoscopic sinus surgery (FESS), an endoscopic surgical procedure used to treat various conditions of the nasal sinuses, including but not limited to chronic sinusitis.

Note: Please see the following document for related information:

- SURG 00089 Balloon Sinus Ostial Dilation
- SURG.00096 Surgical Treatment of Migraine Headaches

Clinical Indications

Medically Necessary:

Functional endoscopic sinus surgery (FESS) is considered **medically necessary** for the treatment of sinusitis, polyposis, or sinus tumor when **any one** of the following circumstances is present:

- Suspected tumor seen on imaging, physical examination, or endoscopy; or
- Suppurative (pus forming) complications, including but are not limited to:
  a. Subperiosteal abscess; or
  b. Brain abscess;
  or
- Chronic polyposis with symptoms unresponsive to medical therapy; or
- Allergic fungal sinusitis as indicated by **all** of the following:
  a. Nasal polyposis; and
  b. Positive CT findings; and
  c. Eosinophilic mucus;
  or
- Mucocele causing chronic sinusitis; or
- Recurrent sinusitis that triggers or aggravates pulmonary disease, such as asthma or cystic fibrosis; or
- Uncomplicated sinusitis (i.e., sinusitis confined to the paranasal sinuses without adjacent involvement of neurologic, soft tissue, or bony structures **and all** (a, b, and c) of the following:
  a. Either of the following:
    - four or more documented episodes of acute rhinosinusitis (i.e., less than 4 weeks duration) in one year, or
    - chronic sinusitis (i.e., greater than 12 weeks duration) that interferes with lifestyle;
    AND
  b. Maximal medical therapy has been attempted, as indicated by **all** of the following:
    - Antibiotic therapy for at least 4 weeks; and

Watson Engagement Advisor

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- **Watson as virtual agent (Customer service/advice, sales, support…)**
  - Insurance
  - Telecommunications
  - Banking sector

- **Generic mass market offering**
  - Take company data e.g. product manuals, help notes, research docs…etc
  - Answer questions over this content
  - Direct conversation with company's clients
    - or as a 3rd party to conversation between human agent
  - Improves client experience and satisfaction
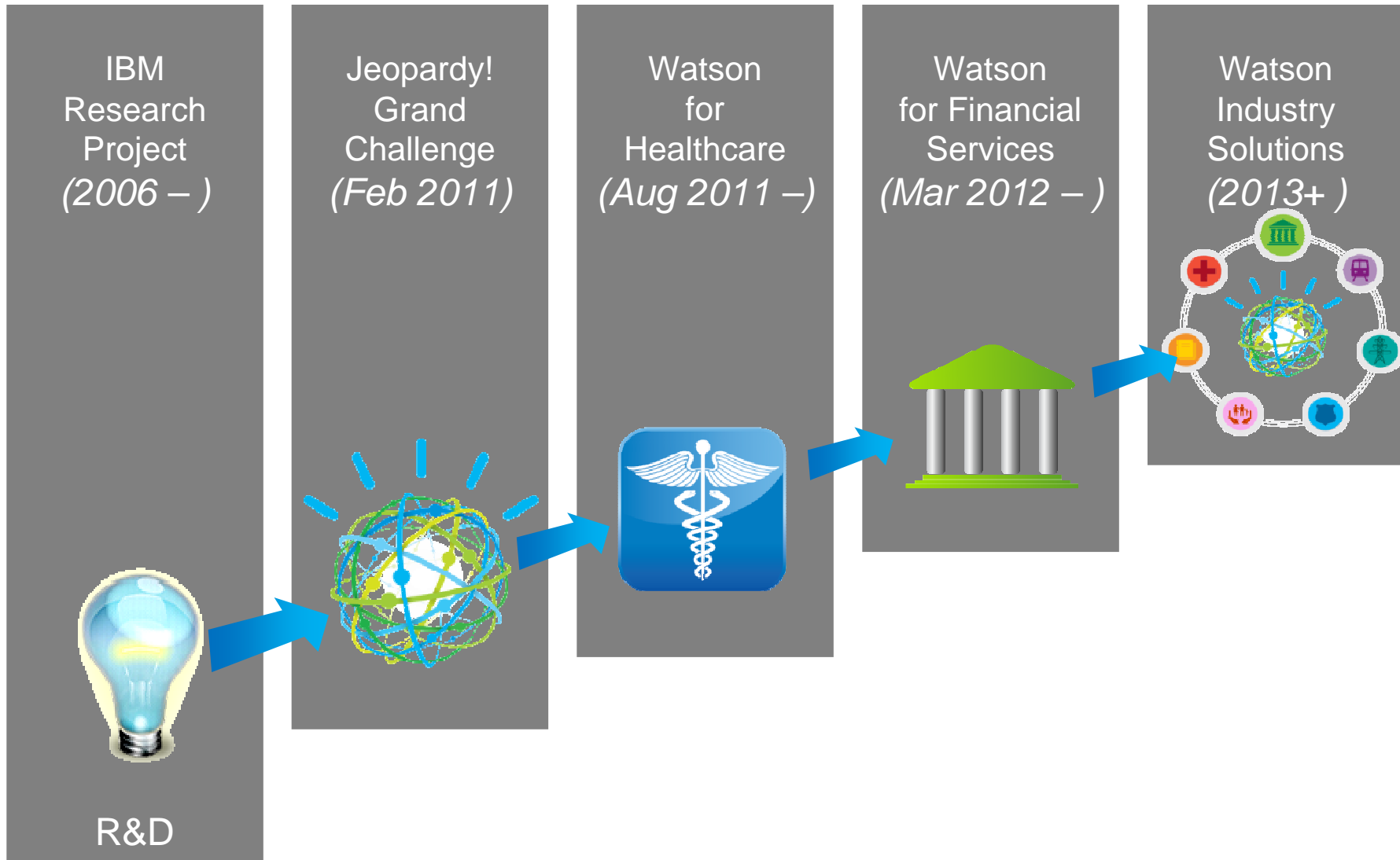
- **Questions…?**
  - *"How much* **stuff** *is in a* **typical dorm room**?"
  - *"When will* **I** *be able to* **retire***?"*
  - *"Which* **bank account/ data plan** *should* **I** *use?"*
  - *"How much will it cost to send* **my daughter** *to* **school***?"*

- **Interactive Q&A with Watson**
  - Responds with weighted confidence
  - Full data transparency
  - Active dialog in natural language
  - Leverages multiple data sources
  - Systematically learns from user responses, new data, and outcomes

A Brief History of Watson

IBM Research Project (2006 –)

R&D

Jeopardy! Grand Challenge (Feb 2011)

Watson for Healthcare (Aug 2011 –)

Watson for Financial Services (Mar 2012 –)

Watson Industry Solutions (2013+)

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IBM Watson brings together transformational technologies

2 Generates and evaluates evidence-based hypothesis

1 Understands natural language and human communication
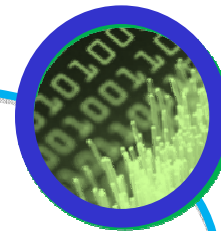
3 Adapts and learns from user selections and responses
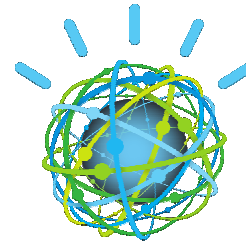
…built on a massively parallel architecture optimized for IBM POWER7

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Thank You

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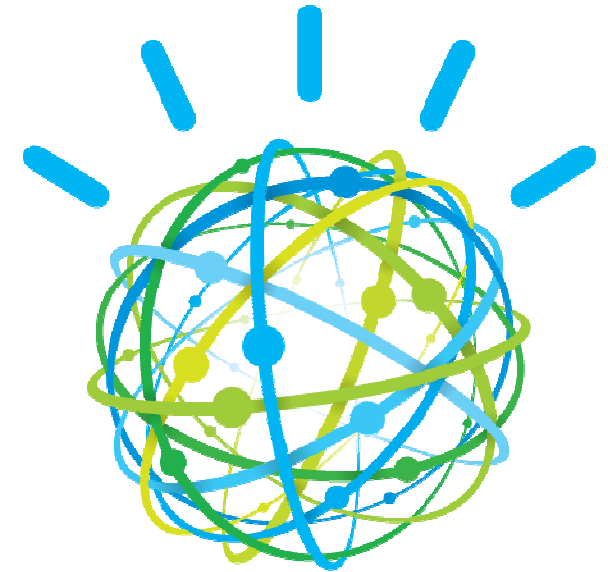
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