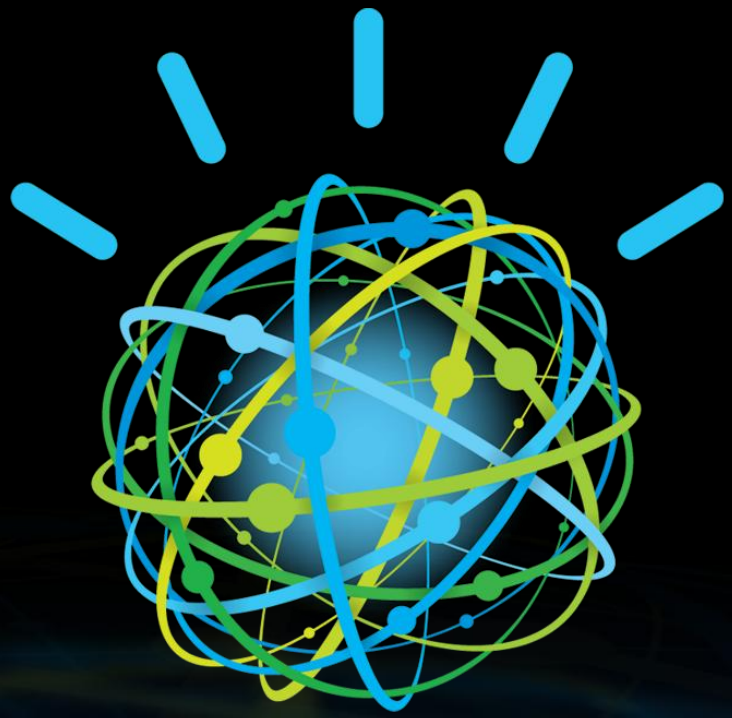
IBM

WATSON

Martin S. Kohn, MD, MS, FACEP, FACPE
Chief Medical Scientist, Care Delivery Systems
IBM Research
marty.kohn@us.ibm.com



Putting IBM Watson to Work In Healthcare

- SB 1275 Medical data in an electronic or digital format; limitations on use, storage, sharing, & processing.
  Introduced by: **Stephen H. Martin (by request)** | **all patrons** ... **notes** | **add** **to my profiles**
  SUMMARY AS INTRODUCED:
- **Medical data**. Prohibits any person that regularly stores medical data in an electronic or digital format from (i) participating in the establishment or implementation of the Nationwide Health Information Network; (ii) performing any analytic or statistical processing with regard to any medical records from multiple patients for purposes of medical diagnosis or treatment, including population health management; or (iii) processing medical data at a facility within the Commonwealth in any instance where a majority of the patients whose medical data is being processed do not reside in the Commonwealth. A database at which medical data is regularly stored in an electronic or digital format shall not store or maintain in a manner that is accessible by the operator or any other person, in an electronic or digital format, at any one time, medical data regarding more than 10,000 patients. The measure provides that any health care provider shall not be subject to any penalty, sanction, or other adverse action resulting from its failure or refusal to implement an online computerized medical record system. A patient's consent to the sharing of his health care information shall be presumed not to grant consent to the electronic or digital storing or transmission of the information to any person other than for health care coverage purposes. Finally, the measure prohibits the Commonwealth from authorizing the establishment or operation of a health information exchange

Agenda

What is IBM Watson and why is it important?

How is IBM putting Watson to work?

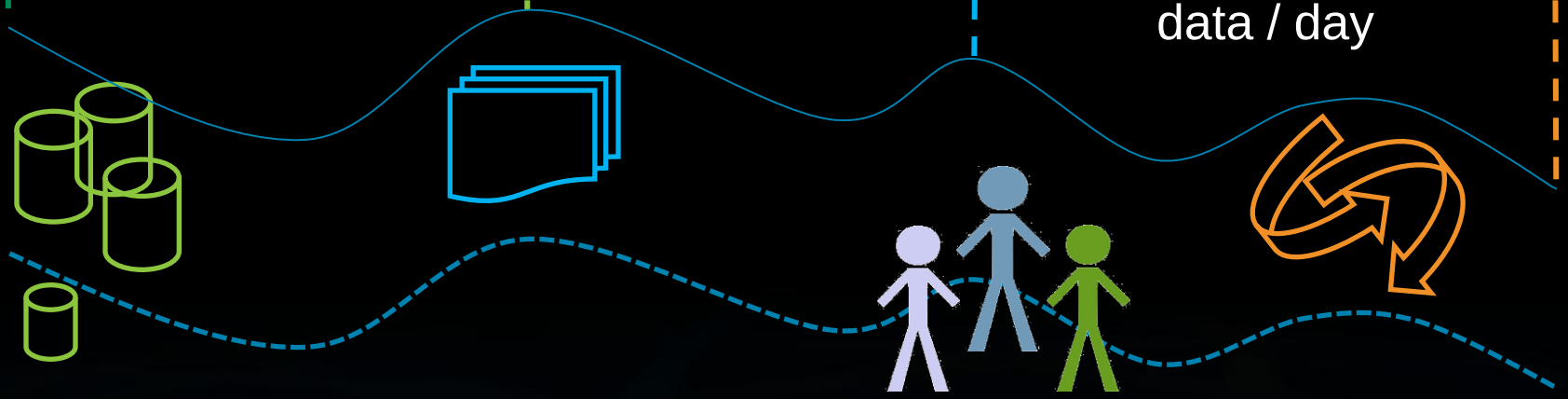
What can we expect in the future?

Businesses are "dying of thirst in an ocean of data"

90%
of the world's data was created in the last two years

80%
of the world's data today is unstructured

1 Trillion
connected devices generate 2.5 quintillion bytes data / day



1 in 2
business leaders don't have access to data they need

83%
of CIOs cited BI and analytics as part of their visionary plan

2.2X
more likely that top performers use business analytics

Why Watson for healthcare?

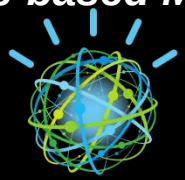
Complexity

- Diagnosis and treatment errors
- Shortage of MDs
- Demand for remote medicine

Policy Changes

- Shift from Fee-for-Service to ACOs
- Focus on Wellness and Prevention
- Universal coverage

Evidence-based Medicine



Personalized Medicine

Costs

- Costs are 18% of US GDP
- 34% of $2.3T US spend is waste
- Costs can vary up to 10x

Info Overload

- Medical data doubles every 5 years
- Detailed patient biomedical markers
- Targeted therapies

Why is it so hard for computers to understand us?

Welch ran this?

Person	Organization
L. Gerstner	IBM
J. Welch	GE
W. Gates	Microsoft

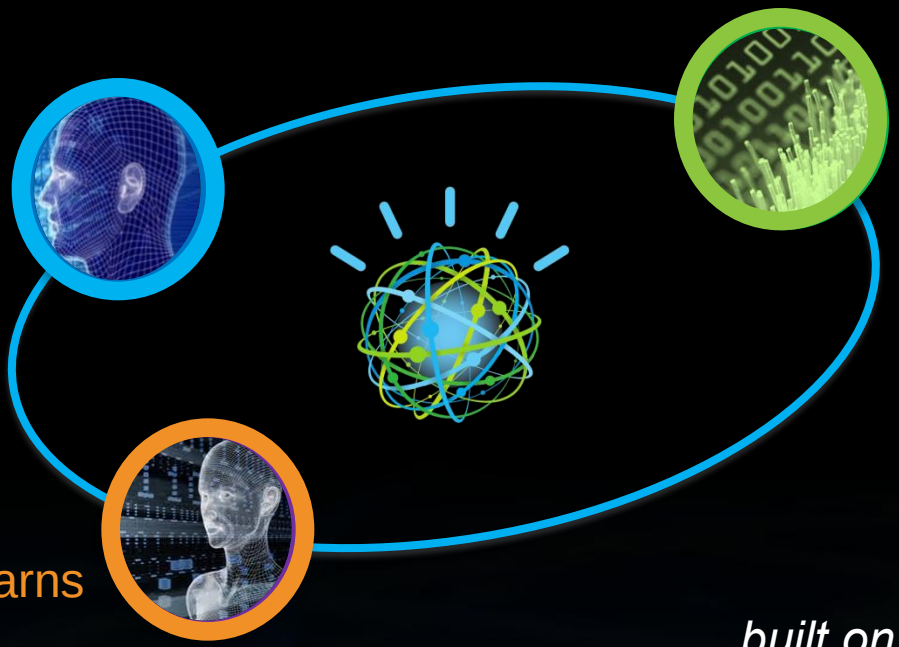
"If leadership is an art then surely Jack Welch has proved himself a master painter during his tenure at GE."

- Noses that run and feet that smell?
- How can a house burn up as it burns down?
- Does CPD represent a complex comorbidity of lung cancer?
- What mix of zero-coupon, non-callable, A+ munis fit my risk tolerance?

IBM Watson combines transformational technologies

1 Understands natural language and human communication

2 Generates and evaluates evidence-based hypothesis



3 Adapts and learns from user selections and responses

…built on a massively parallel architecture optimized for IBM POWER7

Watson enables three classes of cognitive services

Ask

- Leverage vast amounts of data
- Ask questions for greater insights
- Natural language inquiries
- e.g. - Next generation Chat

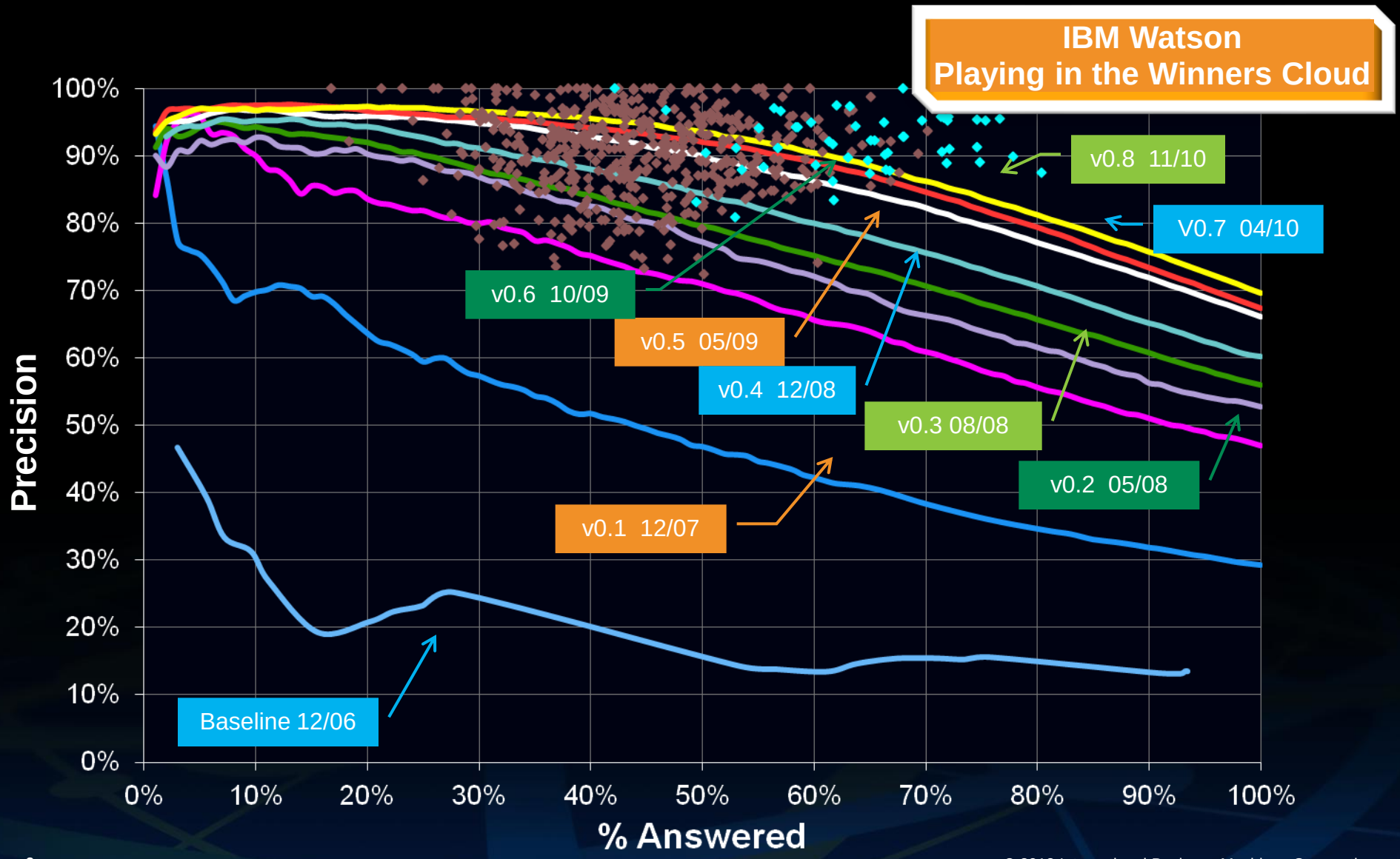
Discover

- Find the rationale for given answers
- Prompt for inputs to yield improved responses
- Inspire considerations of new ideas
- e.g. - Next generation Search → Discovery

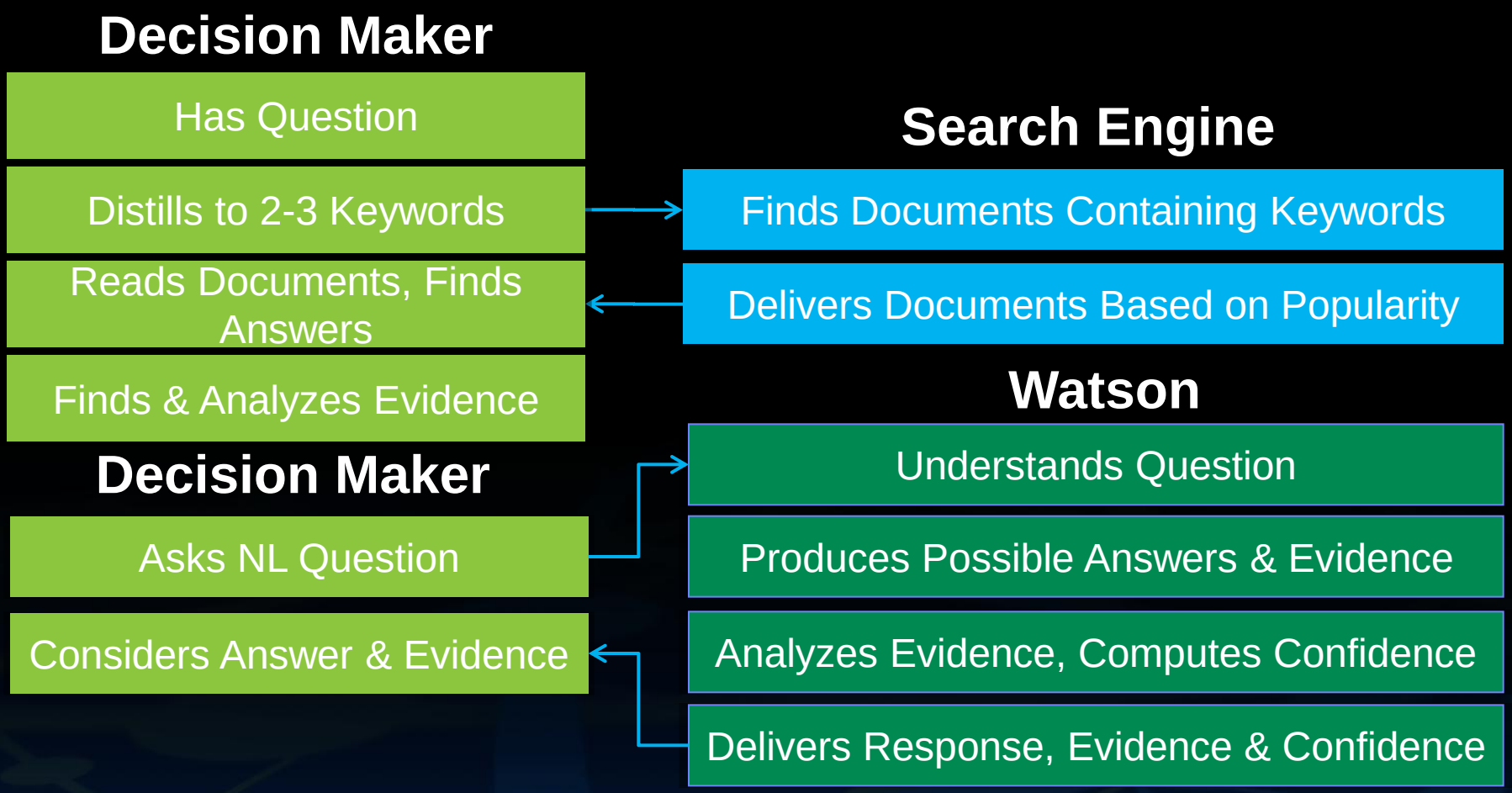
Decide

- Ingest and analyze domain sources, info models
- Generate evidence based decisions with confidence
- Learn with new outcomes and actions
- e.g. - Next generation Apps → Probabilistic Apps

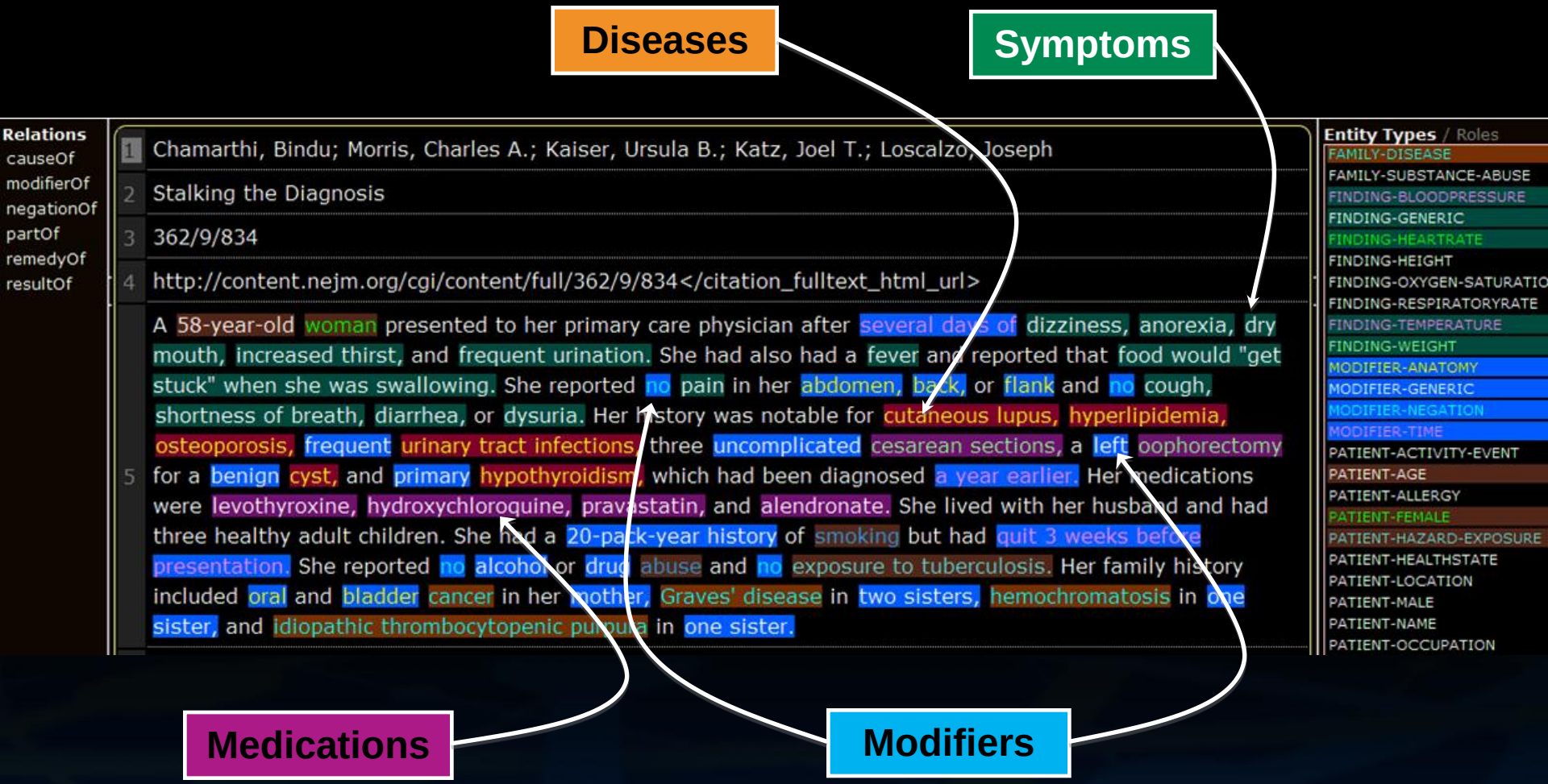
Watson made incremental progress in precision and confidence



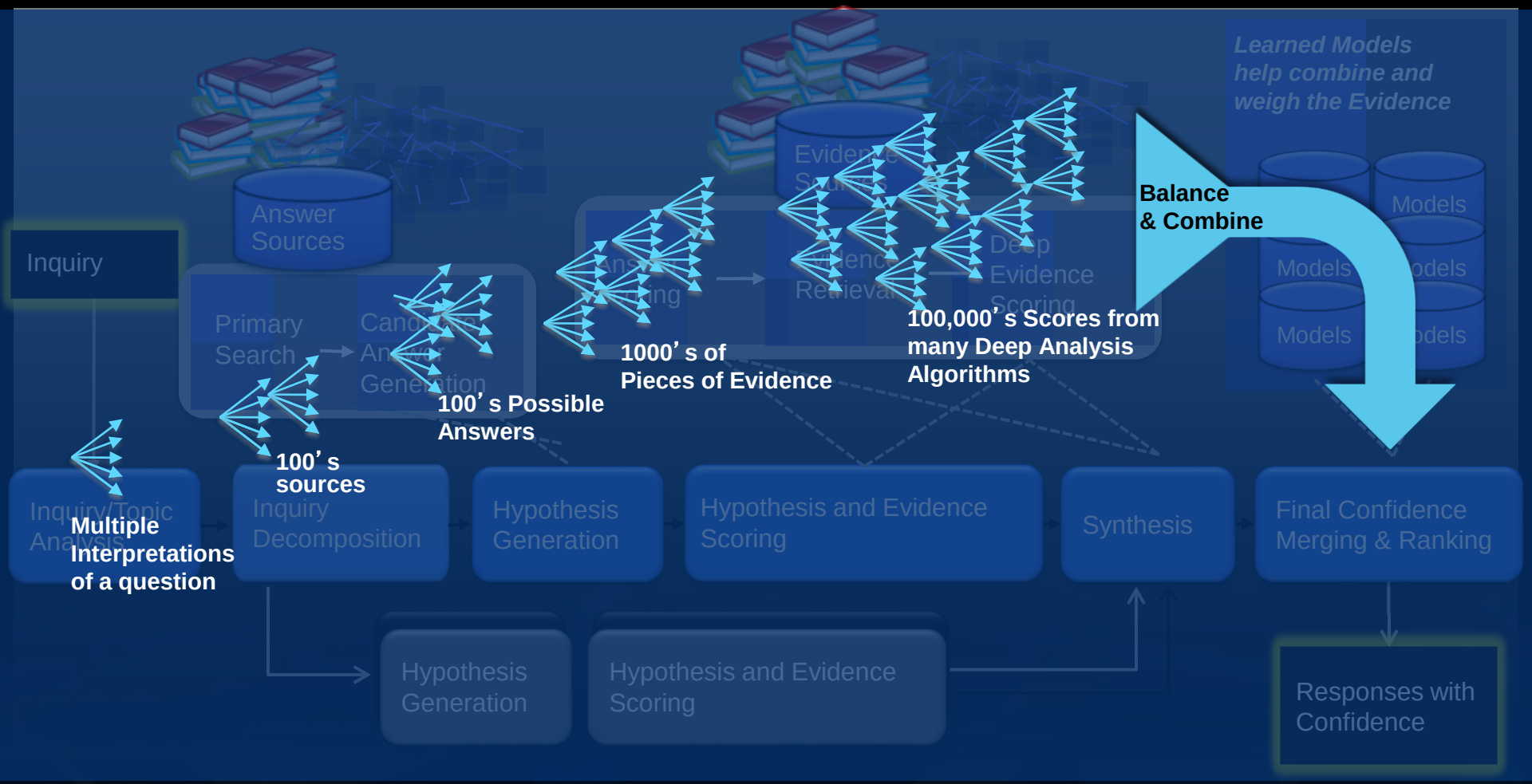
Informed decision making: search vs. Watson



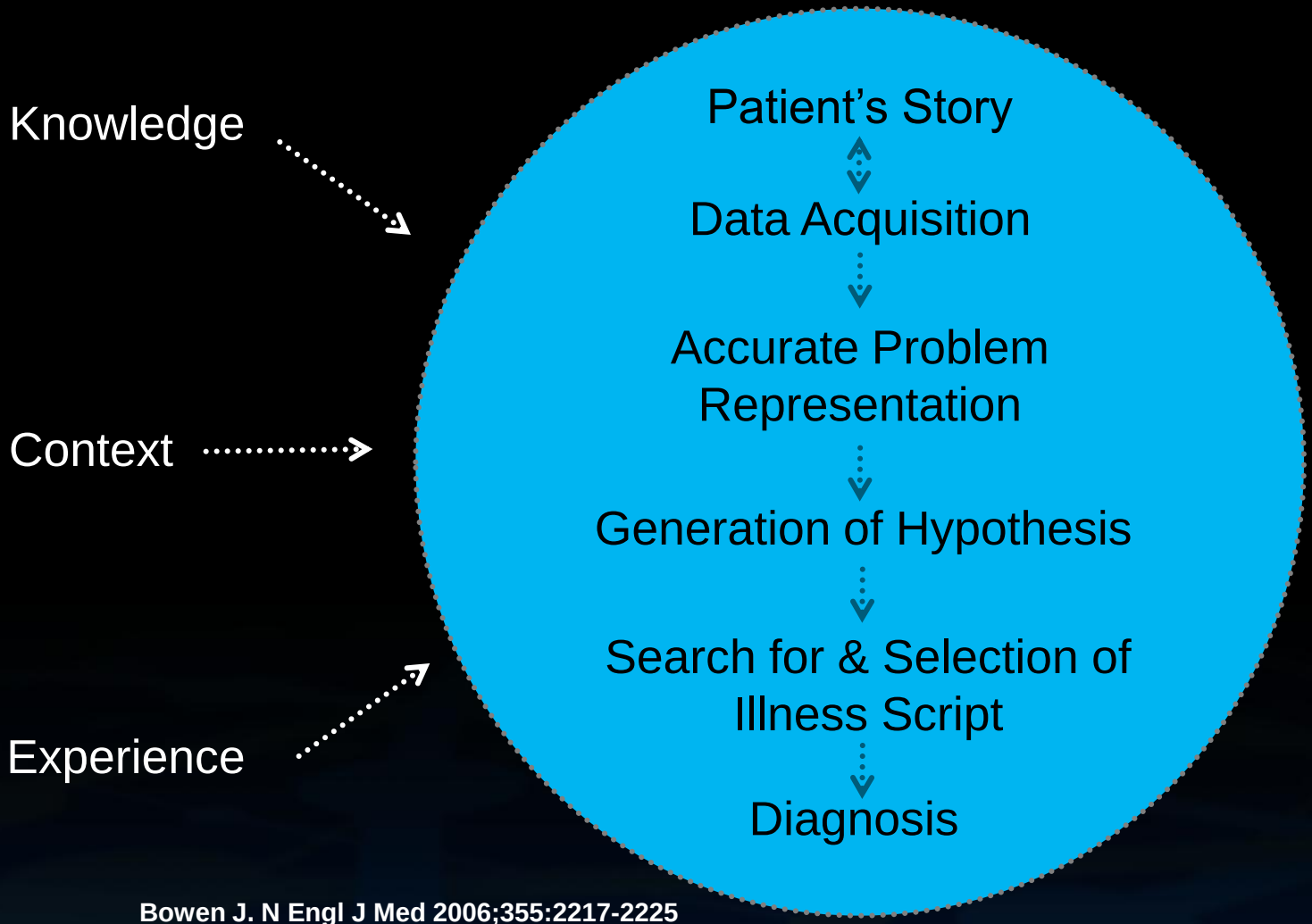
Medical journal concept annotations



How Watson works: DeepQA Architecture



Key Elements of the Clinical Diagnostic Reasoning Process



Bowen J. N Engl J Med 2006;355:2217-2225

The NEW ENGLAND JOURNAL of MEDICINE

Watson's Reasoning

- "Shallower" reasoning over large volumes of data
- Delivers weighted responses to clinicians to assist in making a informed evidence based decison
  - Considers large amounts of data (e.g. EMR, Literature)
  - Unbiased
  - Learns
- Hits sweet spot of human judgment (e.g. problems with bias, Big Data)
- Identifies missing information
- Watson's interactive process helps clinician vector in on the appropriate decisions
- Not limited by database structure

Where to put Watson to work

Watson Capabilities

- Natural language understanding
- Broad domain of unstructured data
- Hypothesis generation and confidence scoring
- Iterative Question/Answering
- Machine learning

Best Fit for Watson

- Problems that require the analysis of unstructured data
- Critical questions that require decision support with prioritized recommendations and evidence
- High value in decision support
- Leverage scale to maximize machine learning and improve outcomes over time

Imagine if…

… call center agents could find better answers to customer questions 50% faster.

That's exactly what a major provider of financial management software did.

"Contact centers of the future will improve precision and personalization, transforming centers from a cost orientation to a strategic assets."
- Leading Telco Supplier

271B calls come in to call centers annually costing $600B

50% of all incoming calls require escalation or go unresolved

61% of all unresolved calls could have been resolved with better access to information

ASK

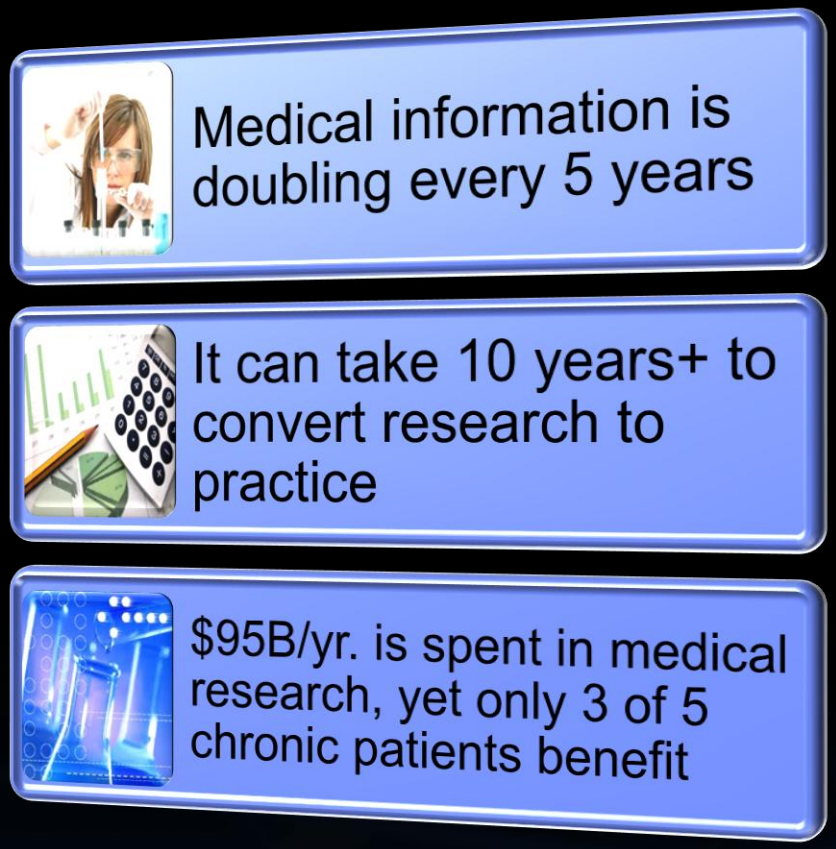
Imagine if…

. . . new insights from medical research find their way to patient treatment programs in months instead of years?

That's exactly what a global leader in cancer care is doing today.

"Watson will be an invaluable resource for our physicians and will dramatically enhance the quality and effectiveness of medical care."

-Dr Sam Nussbaum,
Chief Medical Officer, WellPoint



DISCOVER

Imagine if…

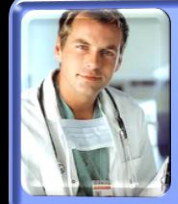
. . . the 1.5M people diagnosed with cancer in the US last year had a better prognosis?

That's exactly what a major health plan provider is working to accomplish.

"Watson can aggregate information and give probabilities that will enable (experts) to zero in on the most likely diagnosis."

-Dr. Steven Nissen,
Cleveland Clinic

$263.8B was the overall cost of treating cancer in the US in 2010



3X is the rate cancer costs climb vs. std. health costs, or 15-18% / yr

20-44% of cancer cases receive the wrong diagnosis initially

DECIDE

Watson for Healthcare solutions are build on repeatable assets

Solutions

Watson for Healthcare

TEACH
Enable new methods for teaching & medical training
Ex. Watson Oncology Research Advisor

PRACTICE
Enable research and delivery of evidence based medicine
Ex. Watson Oncology Diagnosis and Treatment Advisor

PAY
Enable the rapid evaluation and pre-auth. of medical treatment
Ex. Watson Utilization Management Advisor

ASK Services | **DISCOVER Services** | **DECISION Services**

Capabilities

NLP & Machine Learning
- Medical annotation
- Clinical feedback
- Medical based insights

Data
- Medical Journals / Articles / Text Books
- Research
- Clinical Trials
- Govt. / Industry guidelines

Analytics
- Data mining
- Optimized Algorithms
- Business Intelligence
- Text analytics

Cloud
- Public Cloud
- Private Cloud
- Hybrid Cloud
- Scalable
- Secure (e.g. HIPAA)

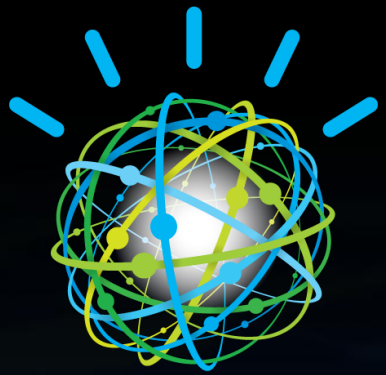
Mobile
- Healthcare Applet
- Smartphone/ Tablet based UI for clinicians

Workload Optimized Systems
- Massive parallel processing
- Tuned to unique Healthcare requirements

Platform

Content | Tooling | Methods | Algorithms | APIs

We have only just begun to build a new era of computing powered by cognitive systems



- Transforming how organizations think, act, and operate
- Learning through interactions
- Delivering evidence based responses driving better outcomes