BusinessConnect
A New Era of Smart
June 12, 2014

From Analytics to Cognitive Systems - a New Era of Computing

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Director of IBM Research – Haifa

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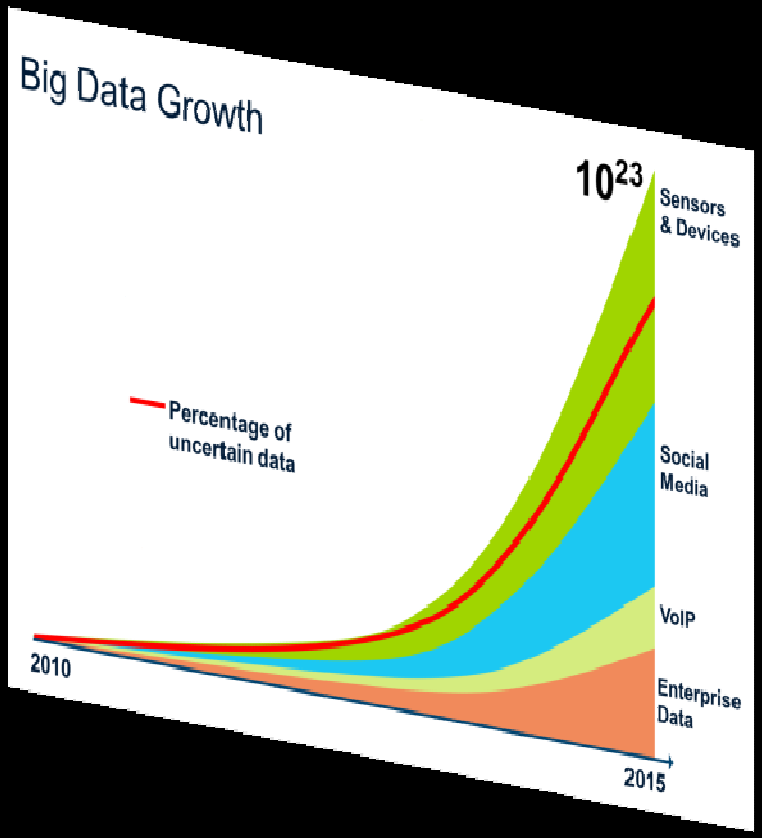
The Next 'Natural' Resource



- 4-V's: Volume, Velocity, Variety, Veracity
- Data/Information Overload

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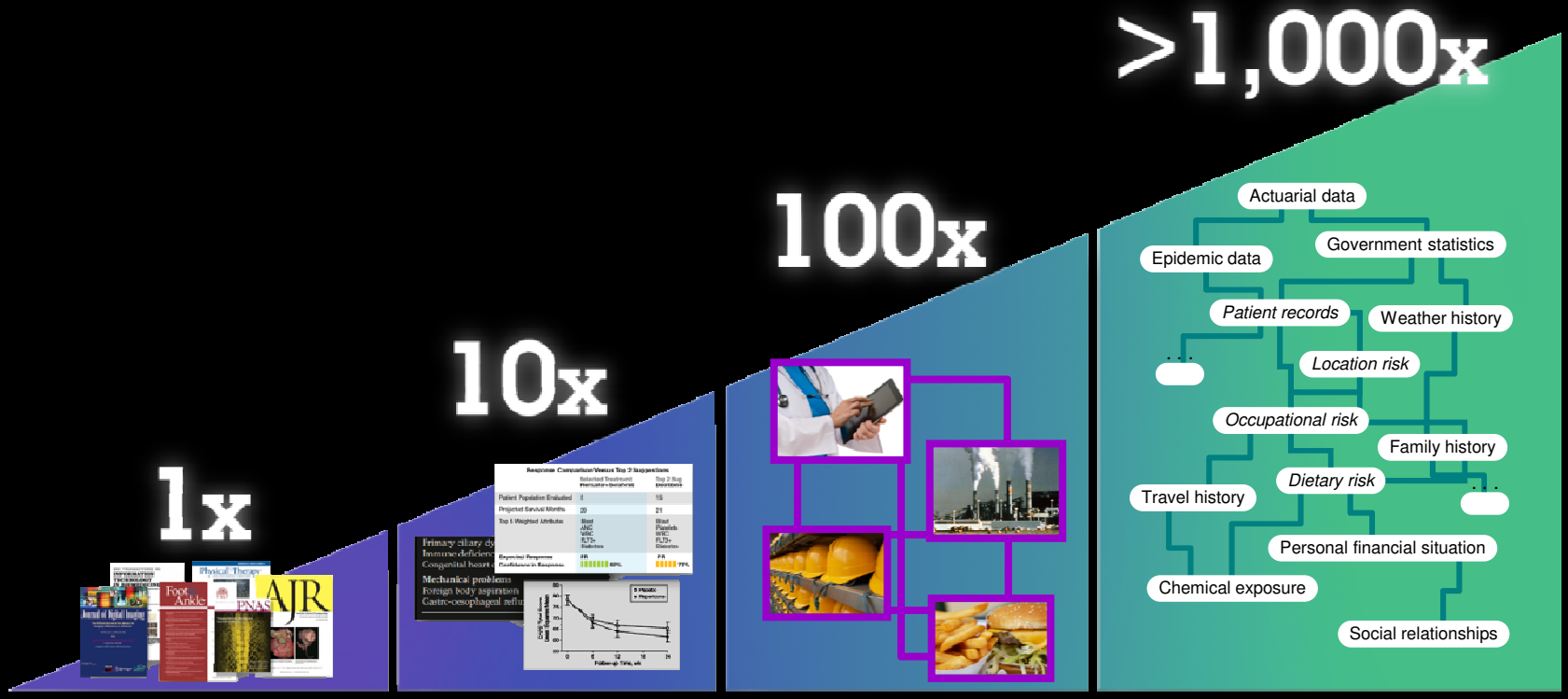
Context Multiplier Effect



Raw data

Feature extraction metadata

Domain linkages

Full contextual analytics

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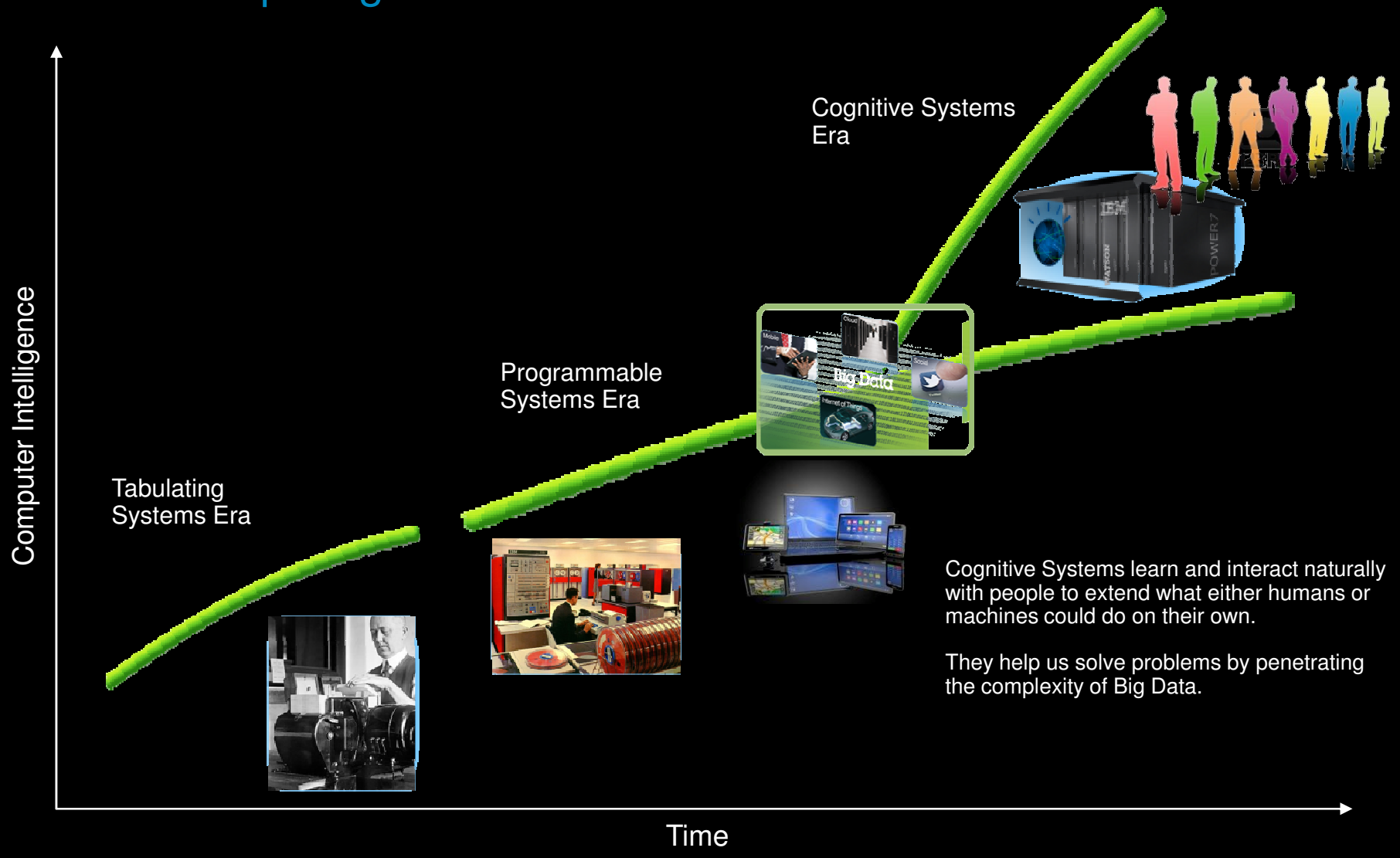
Eras of Computing



Cognitive Systems learn and interact naturally with people to extend what either humans or machines could do on their own.

They help us solve problems by penetrating the complexity of Big Data.

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Eras of Computing

- Tabulating Systems Era
  - Automation of tasks
  - Productivity and shift from menial work

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Eras of Computing

Programmable Systems Era
- Automation of processes and transactions
- Enable global enterprise and empower the individual

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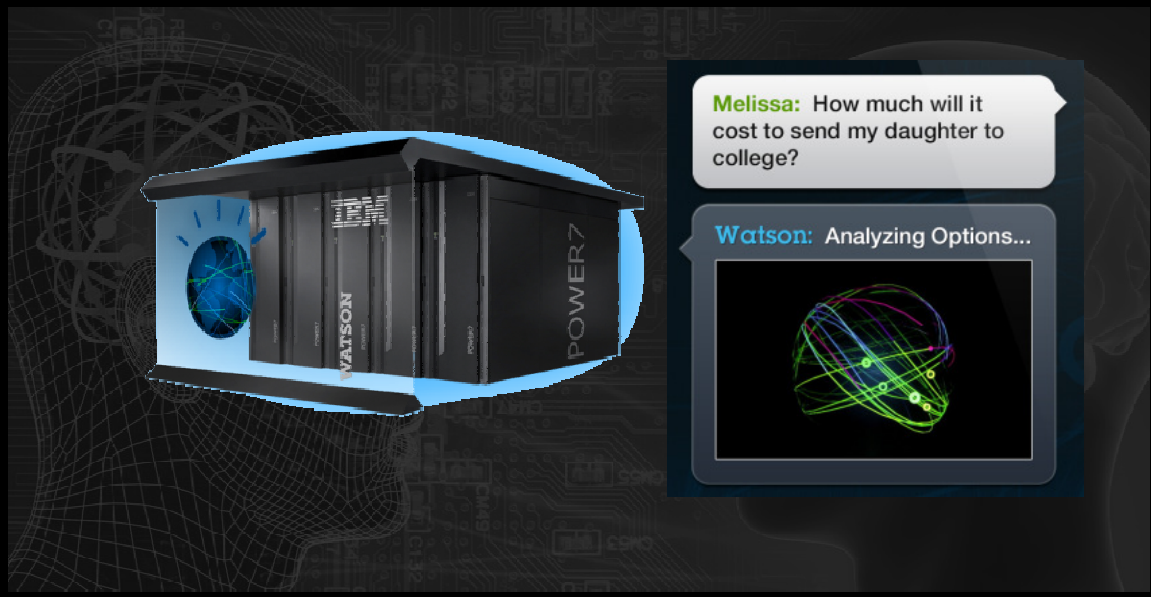
Eras of Computing

- Cognitive Systems Era
  - Penetrate complexity
  - Scale and magnify human capability
  - Unlock time value of insight



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Winning the Jeopardy! Challenge - a Milestone in Computing History

Question Answering

1. Broad/open domain
2. Complex language
3. High precision
4. Accurate confidence
5. High speed

Paganini “24 capricci” set the standard for etudes for this instrument

If leadership is an art then surely he has proven himself as a master painter at GE

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The New IBM Watson Group

TECH | 1/08/2014 @ 11:16PM | 10,623 views

IBM Announces $1B Watson Group, Moves Jeopardy Ace Computer To NYC

+ Comment Now + Follow Comments

Three years after its splash appearance on Jeopardy, IBM is turning to the Watson computer system for inspiration again–this time as the centerpiece of a major new business unit in the Big Apple. The company will announce a major new business unit, at an event Thursday that it's created the IBM Watson Group to build out an ecosystem around Watson–and hopefully start making big-picture money off it–out of a major new office in New York City's East Village.

The new IBM Watson at work. (Credit: IBM)

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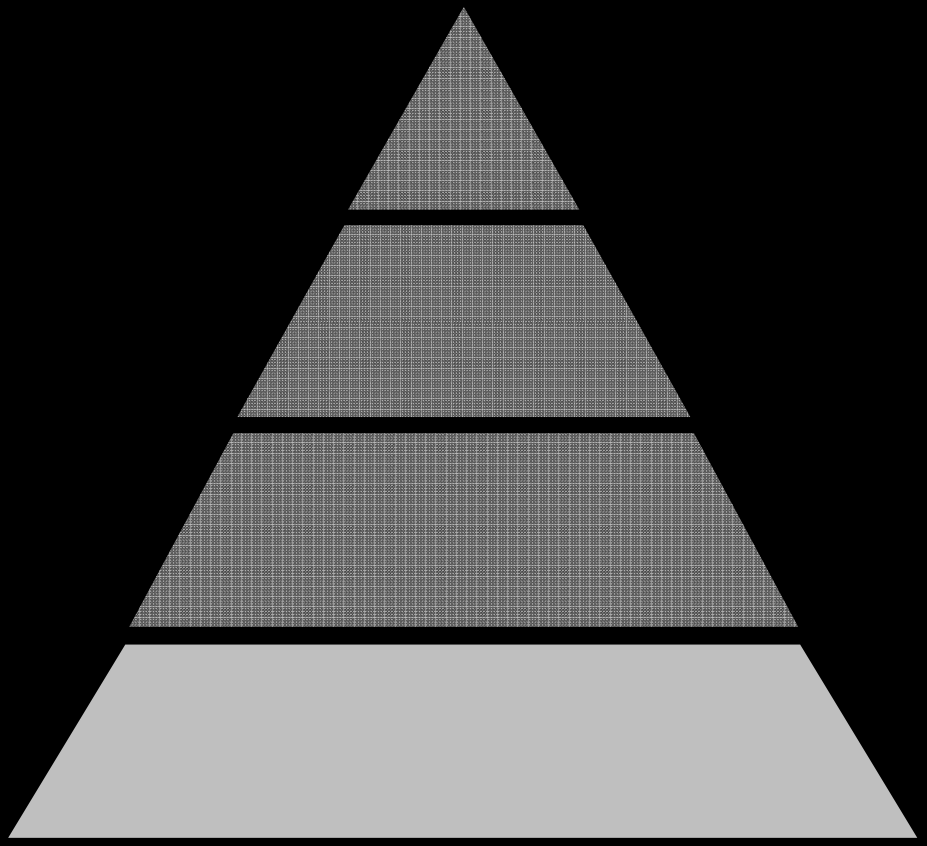
Cognitive Computing –
Four broad capabilities



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Cognitive Computing – Assistance
Leverage encyclopedic domain knowledge

e.g. Watson Advisor

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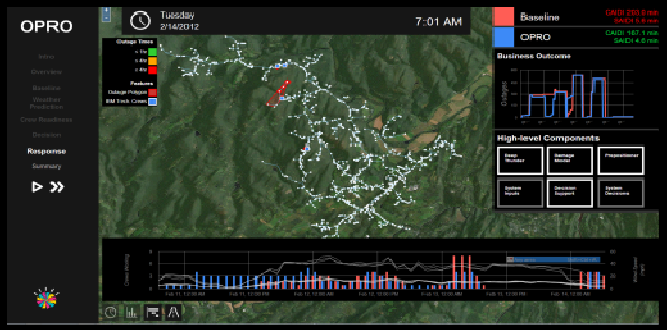
Cognitive Computing – Understanding
Map emergent patterns and connections



e.g., Using a weather forecast to understand the impact on infrastructure

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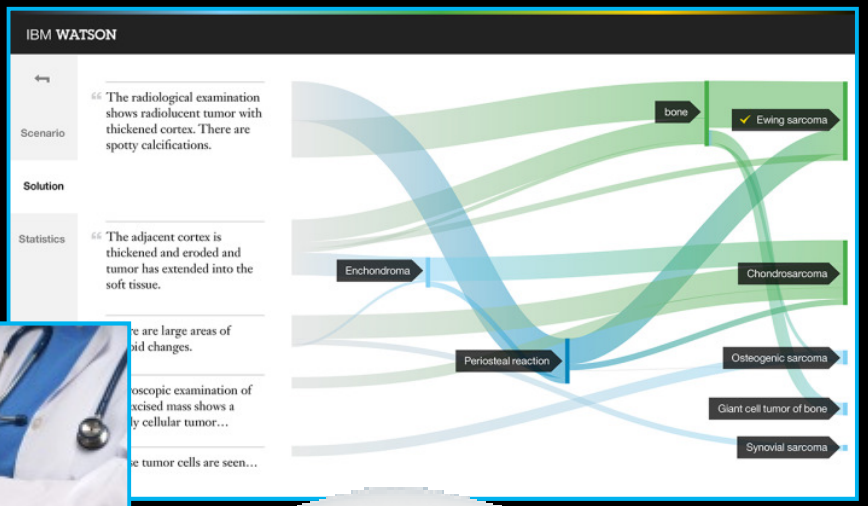
Cognitive Computing – Decisions
Analyzing conflicting points of view



e.g., Watson PATHS

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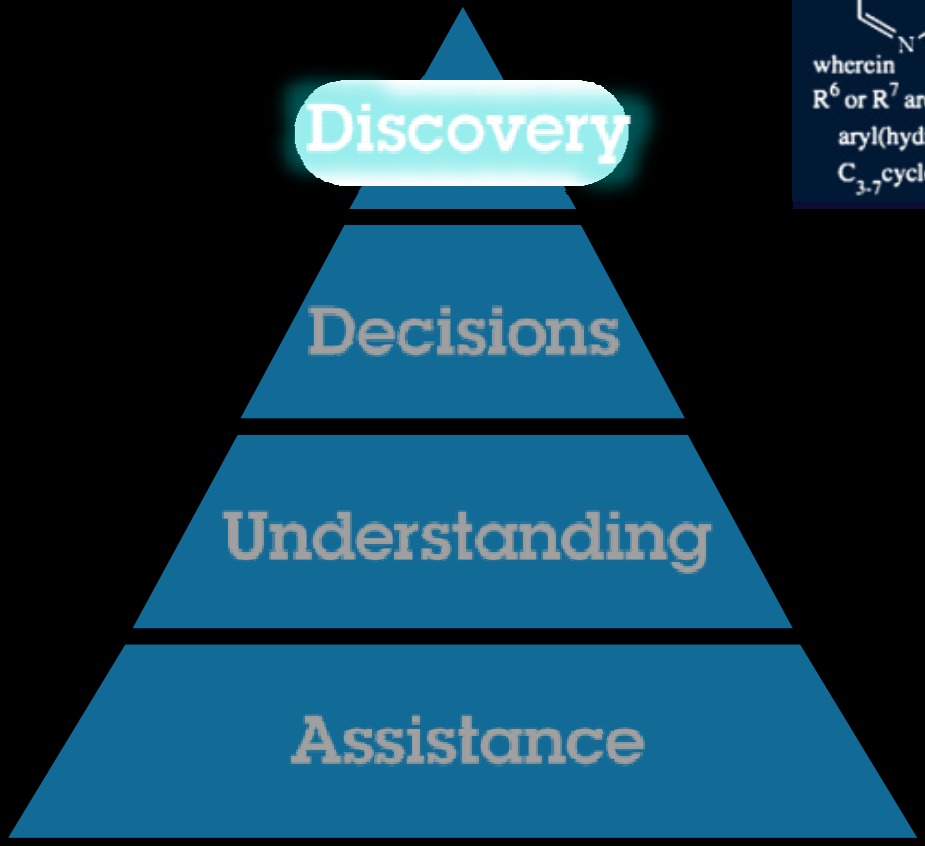
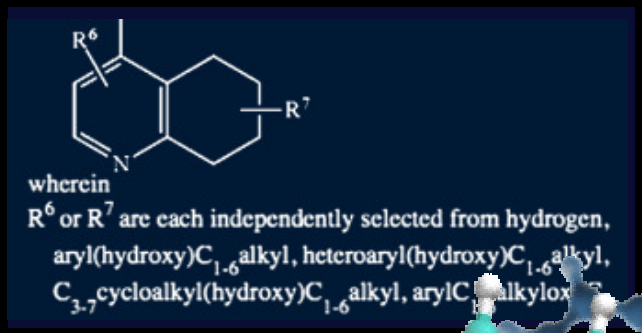
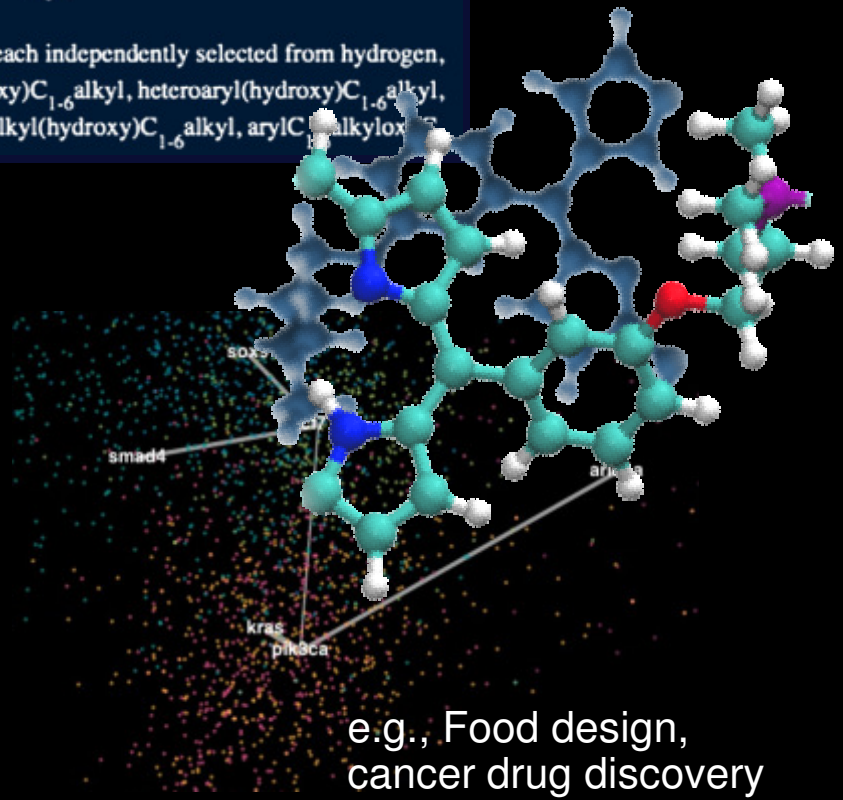
Cognitive Computing – Discovery
Create new insights and find new value







e.g., Food design,
cancer drug discovery

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The Human/Computer Partnership

People and computers collaborating
with the goal of scaling and magnifying human cognition

Learning & reasoning systems

People

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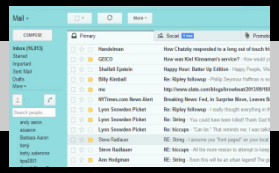
Enhancing Human Capability

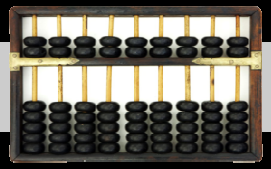
Physical limitations



Connectivity limitations


Productivity limitations



Complexity limitations

We need enhanced cognition.

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Enhancing Human Capability

For the Enterprise…

Finance	Operations	Marketing & Sales	R&D and Design
Mergers, Acquisitions & Divestitures	Crisis and Emergency Management	Product Pricing & Launch	Brainstorming & Discovery
Investment Decisions	Project Planning	Selection of Markets & Geos	Innovation Portfolio Planning
Strategic Planning & Scenario Analysis	Discovery & Diagnosis	Competitive Analysis	Product Design

For the Individual…

Education	Large Purchases	Financial Investments	Medical
Selecting a college	Purchasing a home	Retirement investment decisions	Selecting medical plans
Financing education	Purchasing a car	Stock market investments	Deciding on treatment options

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Cognitive Environments

An infrastructure inhabited by a society of cogs, humans and devices that enables them to behave as one shared integrated resource, enabling human-computer collaboration at the speed of thought

The Cognitive Experience Lab @ T.J.Watson Research Center

A cognitive room is just one possible instantiation of a customized cognitive environment.

We envision people will create a huge variety of customized cognitive environments (offices, homes, cars, etc)

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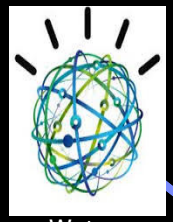
The Society of Cogs

Cognitive agents that collectively learn and leverage sophisticated models of humans, engaging with them via adaptive multi-modal interfaces

We want to cooperate with universities on COGs.


Sequential Markov Decision Process


Watson

Human to Human



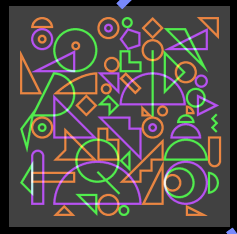
Fact Checker


Sensitivity Analysis


Sentiment Analysis

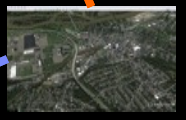
Cog to Human


Rule Elicitation


Influence Diagram Constructor


Objective Identification


Lighting


Critical Sites


Consequence Table

Cog to Cog


Smart Swaps


Personal Avatar

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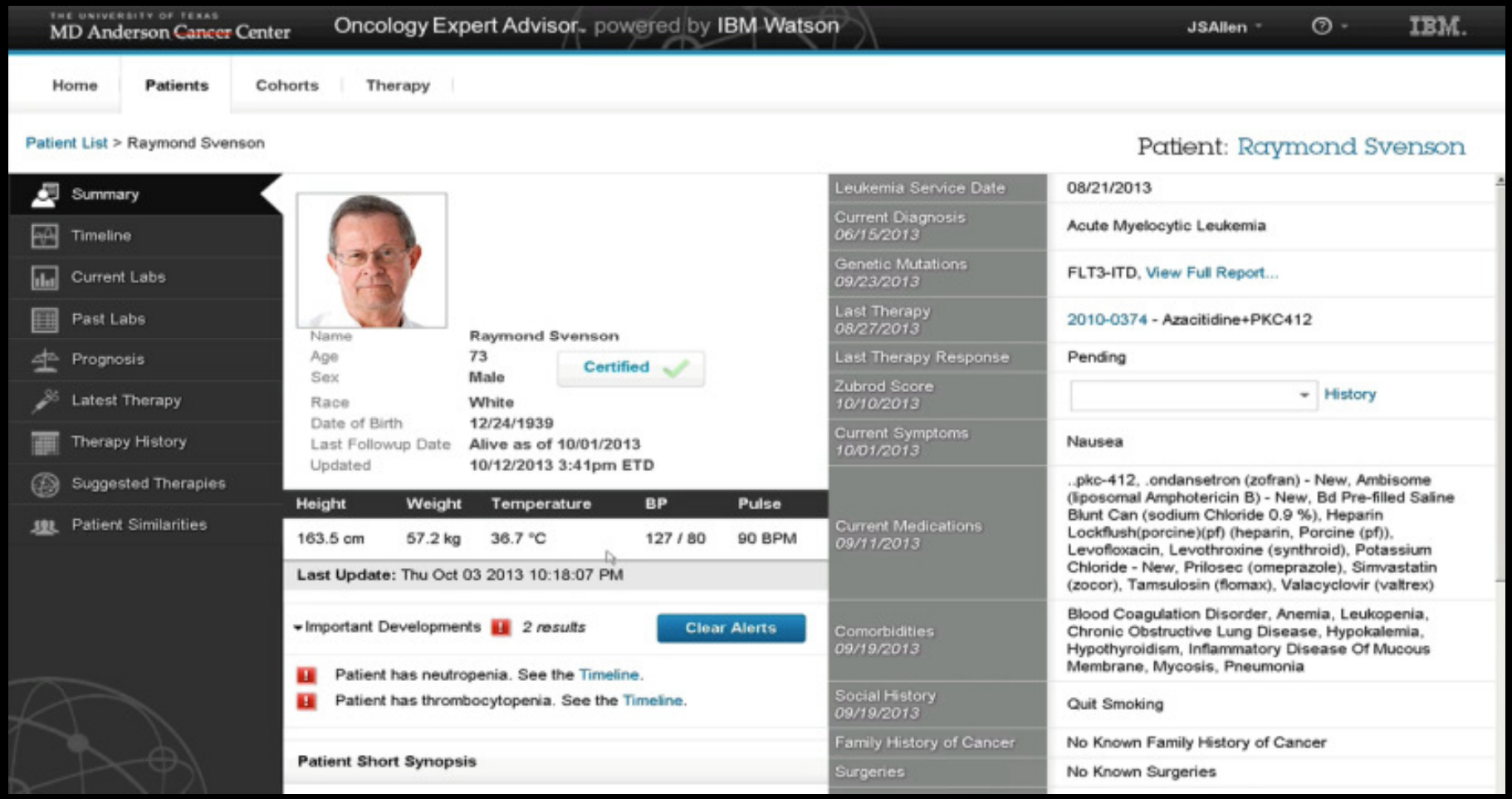
MD Anderson Cancer Center - Oncology Expert Advisor



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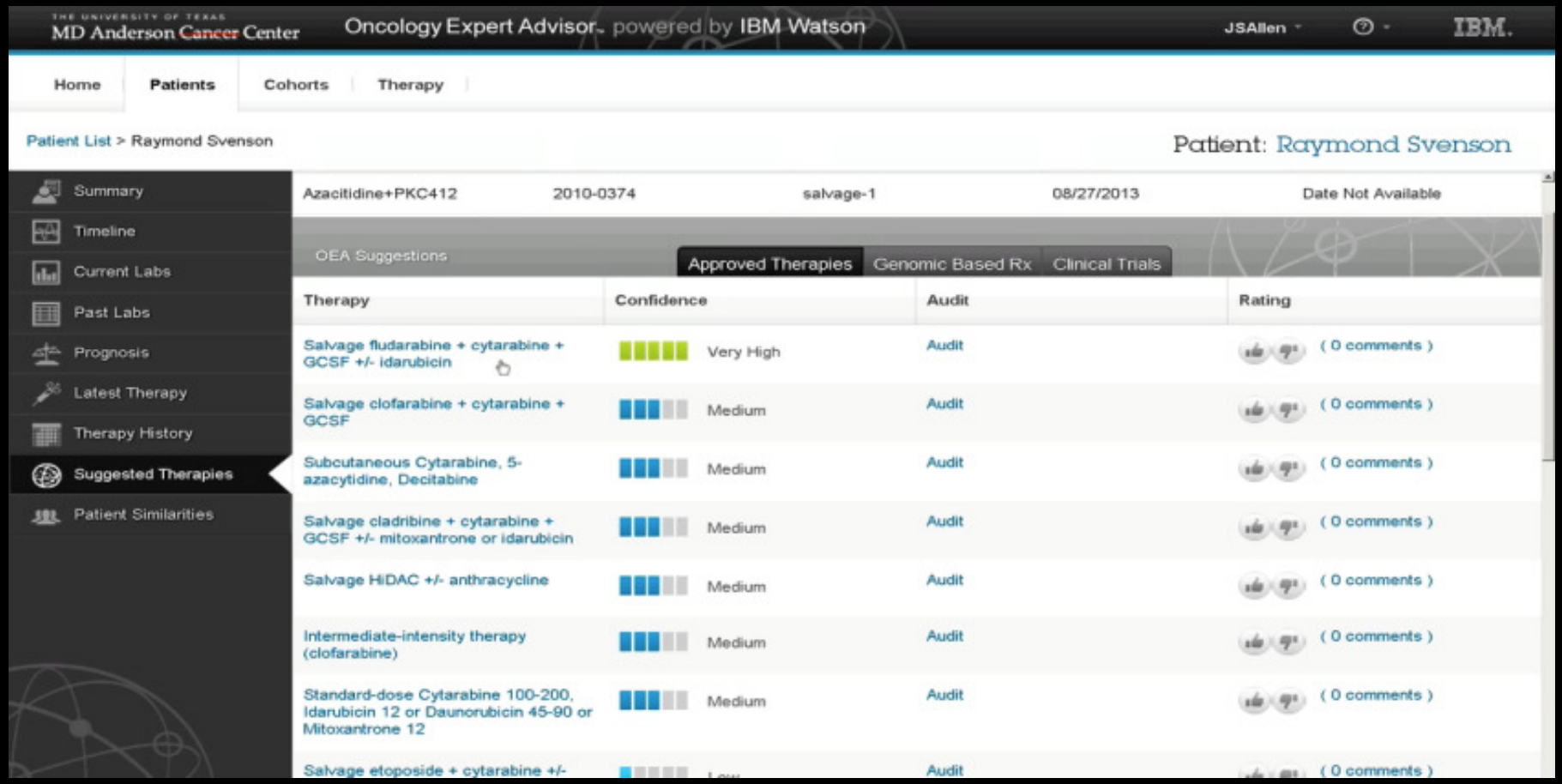
MDACC Oncology Expert Advisor



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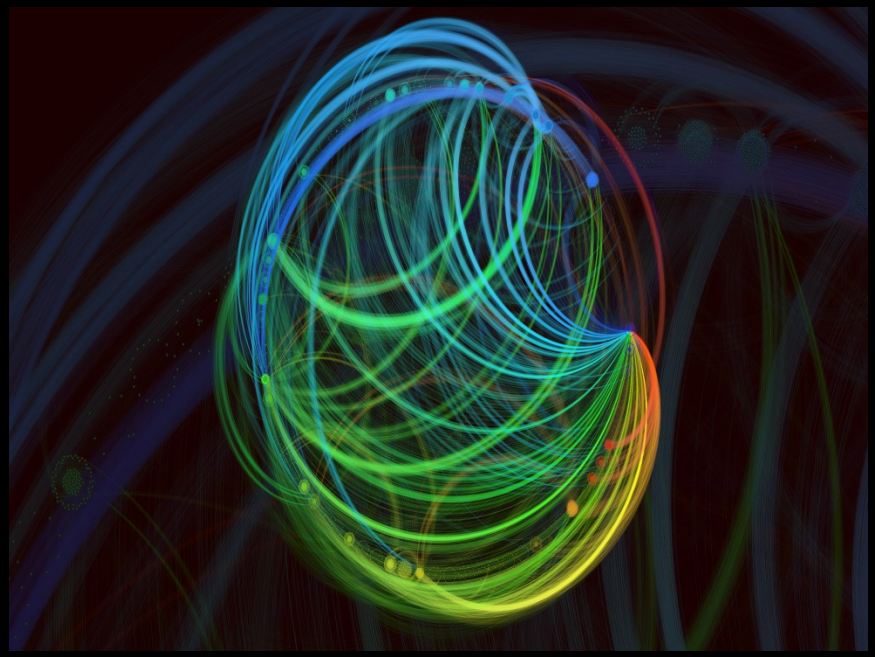
How do we Take Inspiration from the Brain?

- Post silicon technology – e.g., organic superconductors
  - Our understanding of these mechanisms is still extremely limited
    Architecture - Non-Von Neuman programming models
  - SyNAPSE



Monkey Brain wiring diagram

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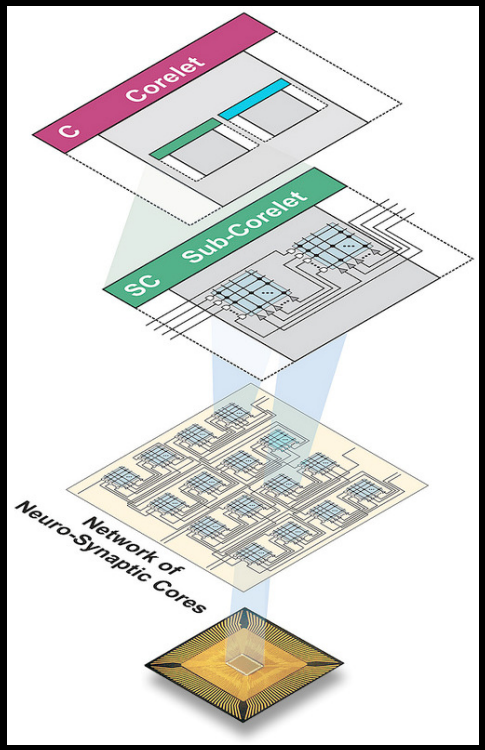
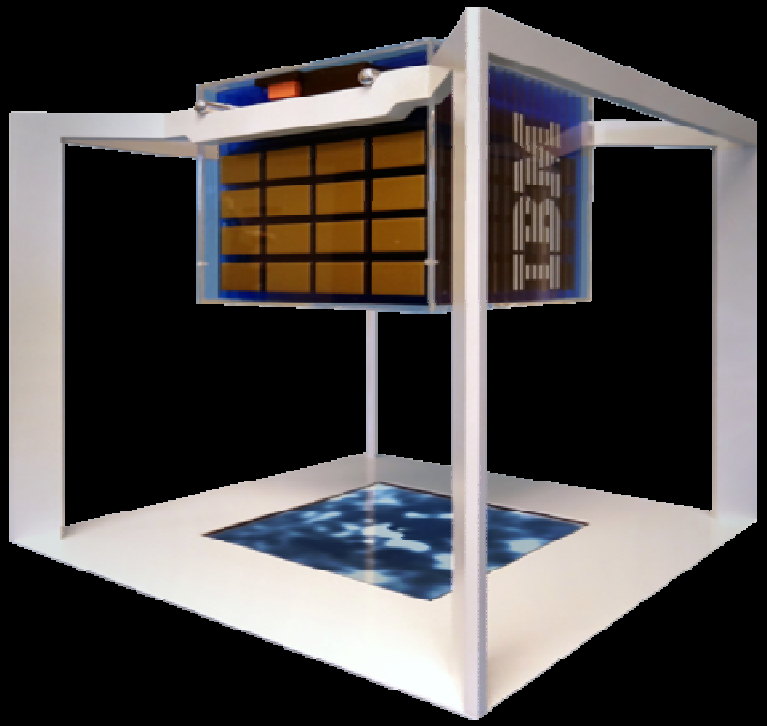
Cognitive Computing – SyNAPSE

Ultra-low power neurosynaptic supercomputer





2013 Milestones

- Non-Von Neuman "Corelet" programming model (August)
- First Silicon (September)

2014:

- enable developers to create and test uses for SyNAPSE

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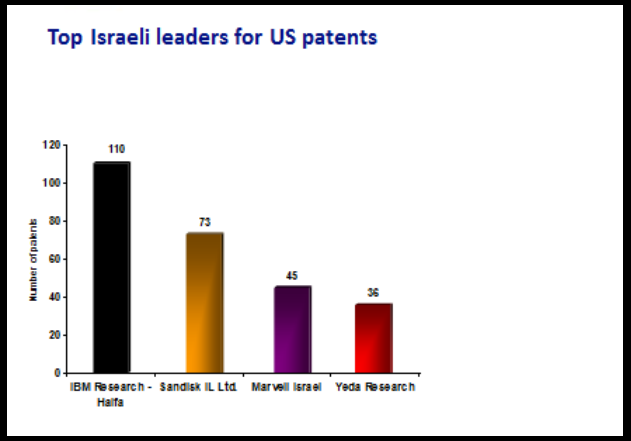
IBM Research – Haifa

- Established in 1972
- Largest IBM Research facility outside the US
- Spanning all IBM Research strategy areas
- Working with IBM business units and IBM clients worldwide
- Collaborating with academia and industry
- About 100 patents / year



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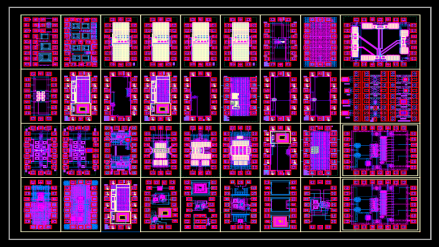
Innovation from IBM Research – Haifa

Cloud Computing

Storage



Quality

Big Data Analytics

Cognitive Computing

Social Analytics

Mobile

Healthcare

Retail

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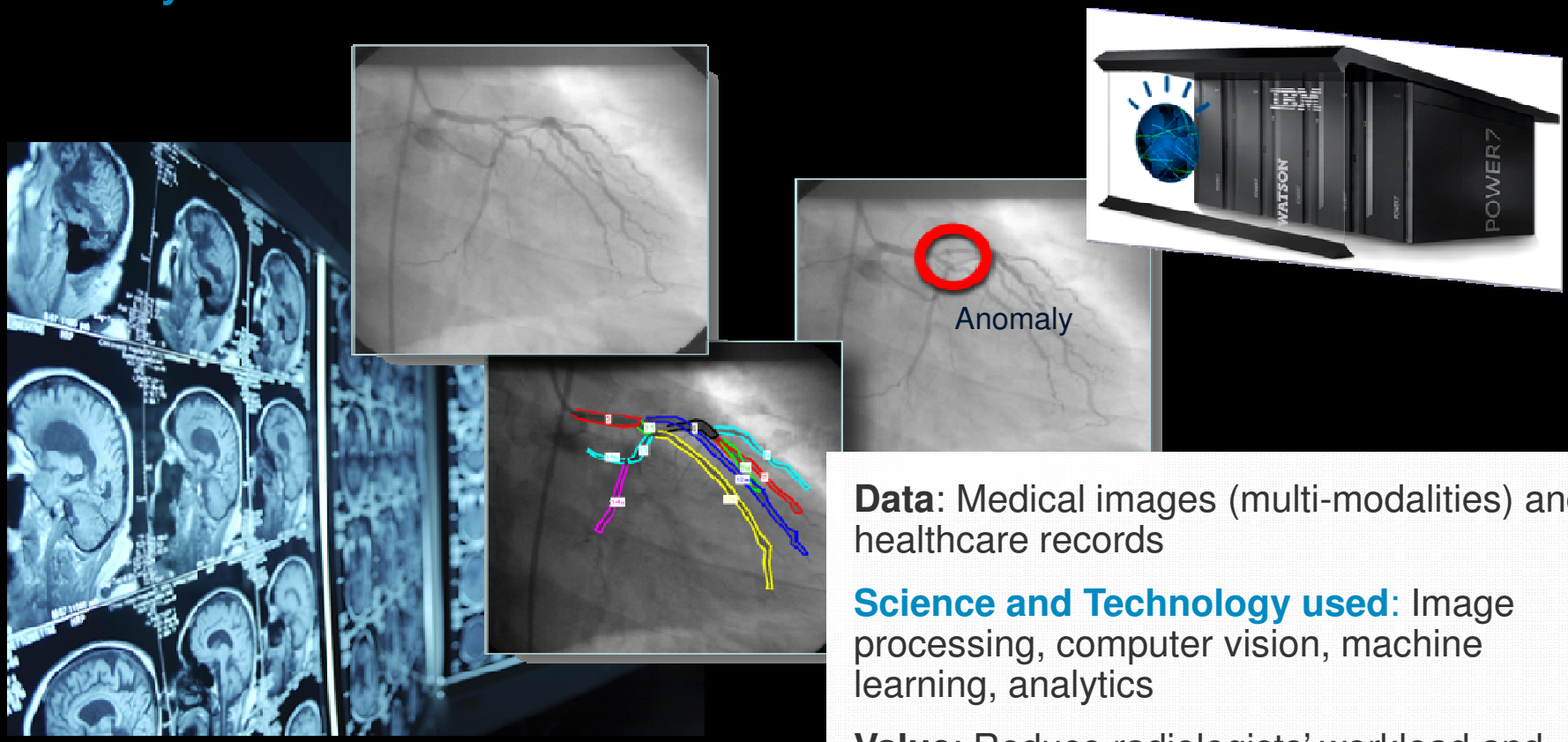
Medical Sieve - Cognitive radiology assistant for the 21st century



Data: Medical images (multi-modalities) and healthcare records

Science and Technology used: Image processing, computer vision, machine learning, analytics

Value: Reduce radiologists' workload and improve diagnostic quality

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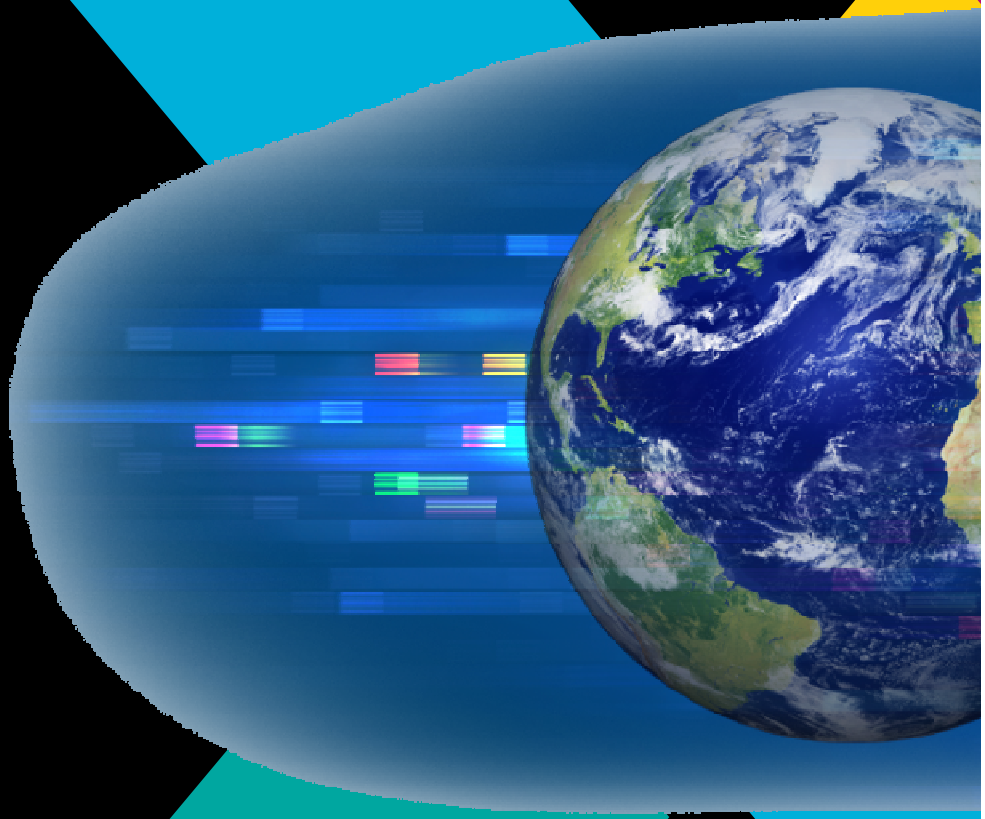

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