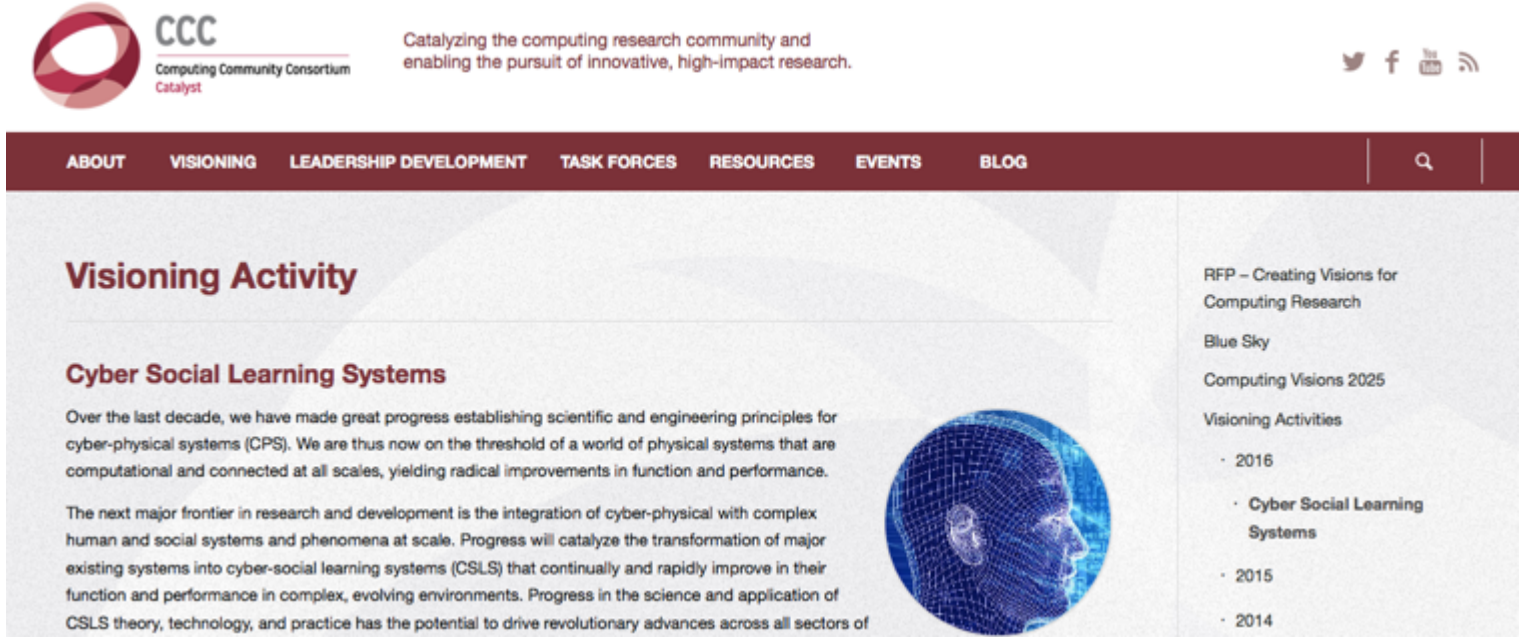


Cyber-Social-Learning-Systems

Jim Spohrer (IBM)

August 29, 2016

http://www.slideshare.net/spohrer/csls-20160821-v1

Today's Talk: Cyber-Social-Learning-Systems

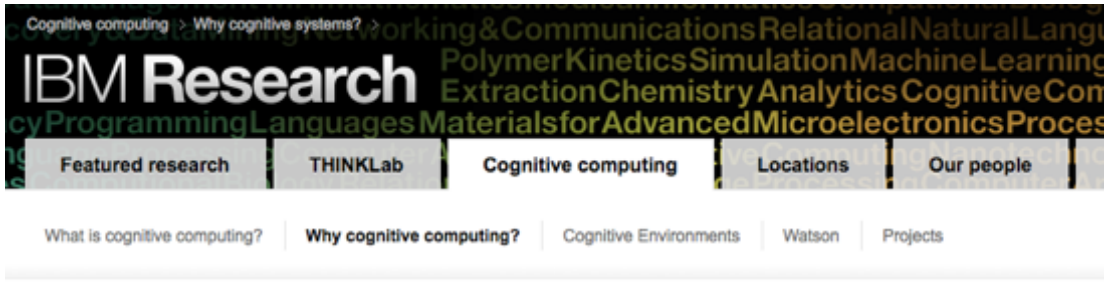
- What is the impact of Artificial Intelligence (AI) on CSLS?
  - Augmented Intelligence (IA) via digital cognitive systems
  - White House OSTP Response(s)
- Other topics to think about:
  - What are more of the implications of digital cognitive systems?
    - Tool > Assistant > Collaborator > Coach > Mediator
    - Transformation > Experience > Data > Software > Hardware
  - What does social intelligence require? Episodic Memory?
  - What is the impact of augmented reality on CSLS?
  - What are possible connections to service systems science (SSME+DAPP)?
  - What type of adaptive innovator with growth mindset needed (T-shapes)?

Augmented Intelligence

- Tool
- Assistant
- Collaborator
- Coach
- Mediator

White House OSTP Response(s)

- AI for public good
- Social & economic implications
- Education to harness AI
- Research questions and gaps
- Data sets and model sets
- Multidisciplinary research
- Role of incentives and prizes
- Safety and control protocols
- Legal and governance issues

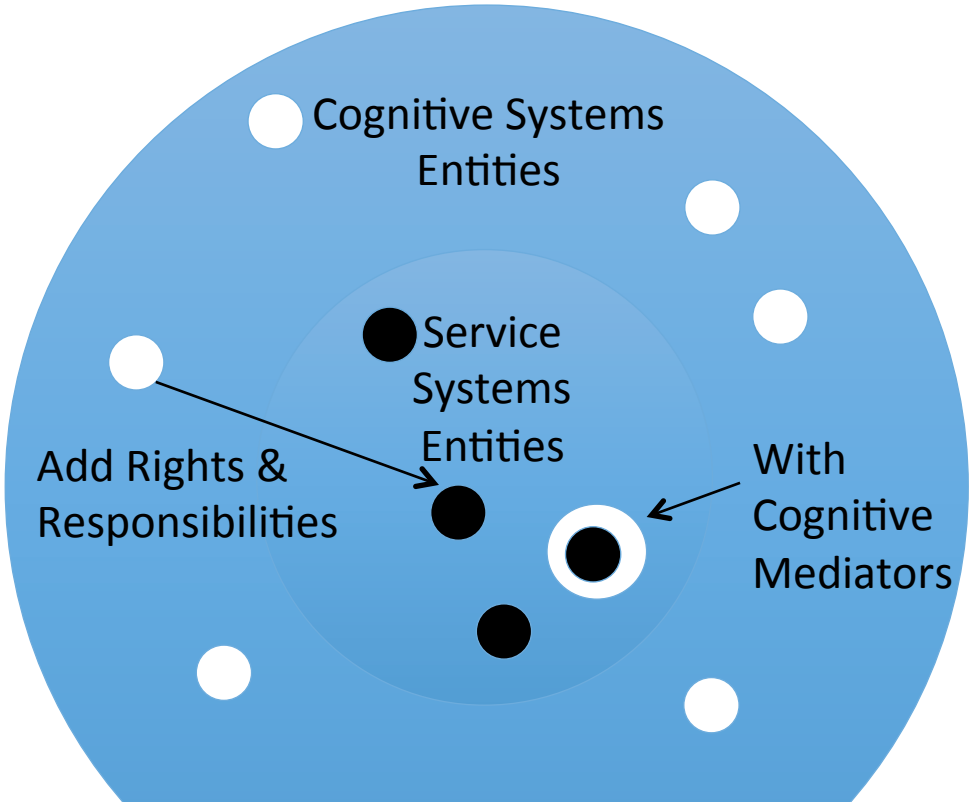


Response to - Request for Information
Preparing for the Future of Artificial Intelligence

Introduction

IBM has been researching, developing and investing in AI technology for more than 50 years. The public became aware of a major advance in 2011, when IBM Watson won the historic Jeopardy! exhibition on prime time television. Since that time, the company has advanced and scaled the Watson platform, and applied it to various industries, including healthcare, finance, commerce, education, security, and the Internet of Things. We are deeply committed to this technology, and believe strongly in its potential to benefit society, as well as transform our personal and professional lives.

In Summary



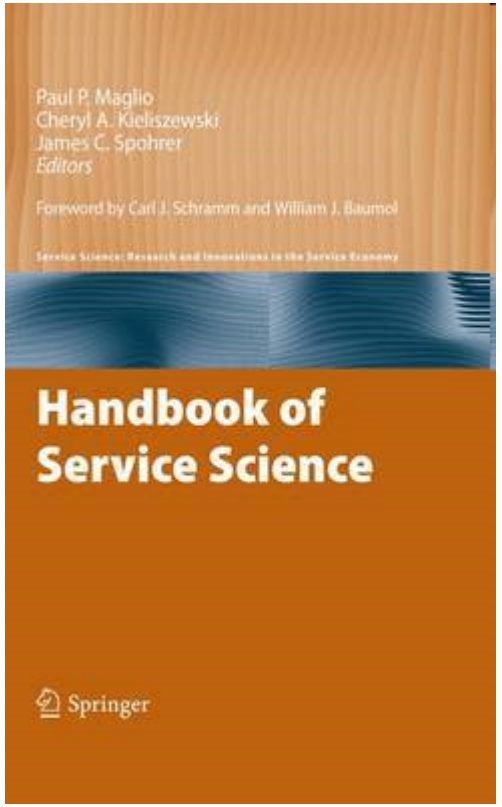

IBM Watson


Apple Siri

Microsoft Cortana

Google Now

Amazon Echo



"A service science perspective considers the evolving ecology of service system entities, their value co-creation and capability co-elevation interactions, and their capabilities, constraints, rights, and responsibilities."

Backup Slides

- Understanding Cognitive Systems




Understanding Cognitive Systems

Jim Spohrer (IBM), August 25, 2016

CSIG (Cognitive Systems Institute Group) Speaker Series

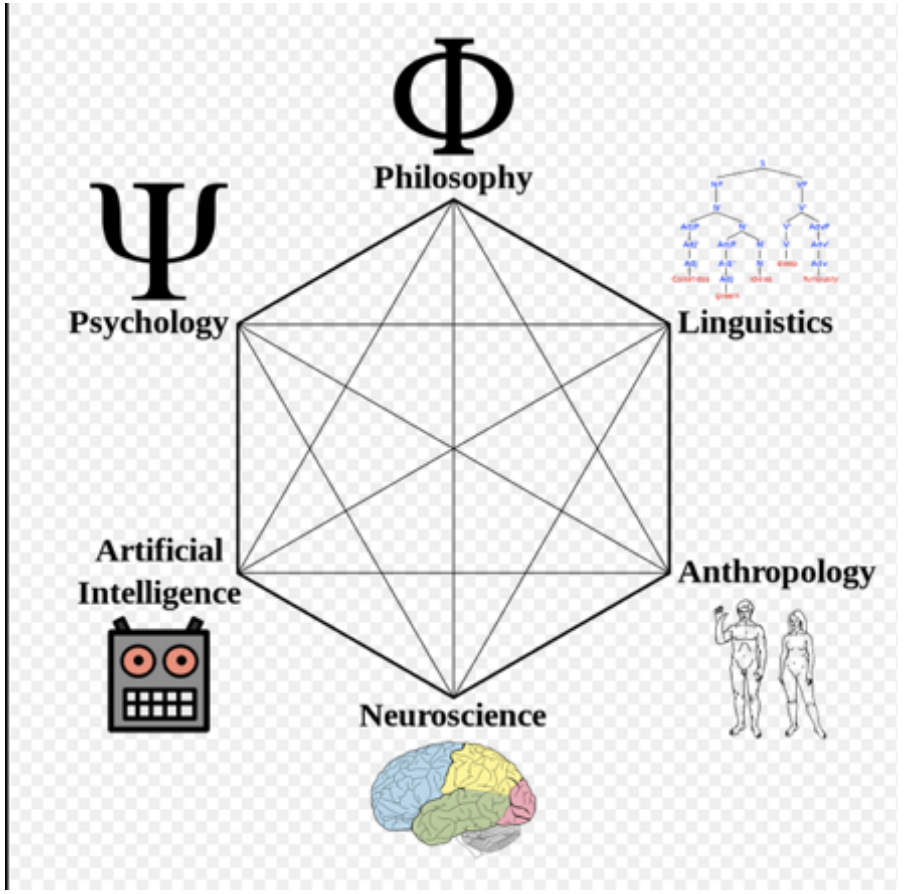
http://www.slideshare.net/spohrer/understanding_20160825_v3

Today's Talk: Understanding Cognitive Systems

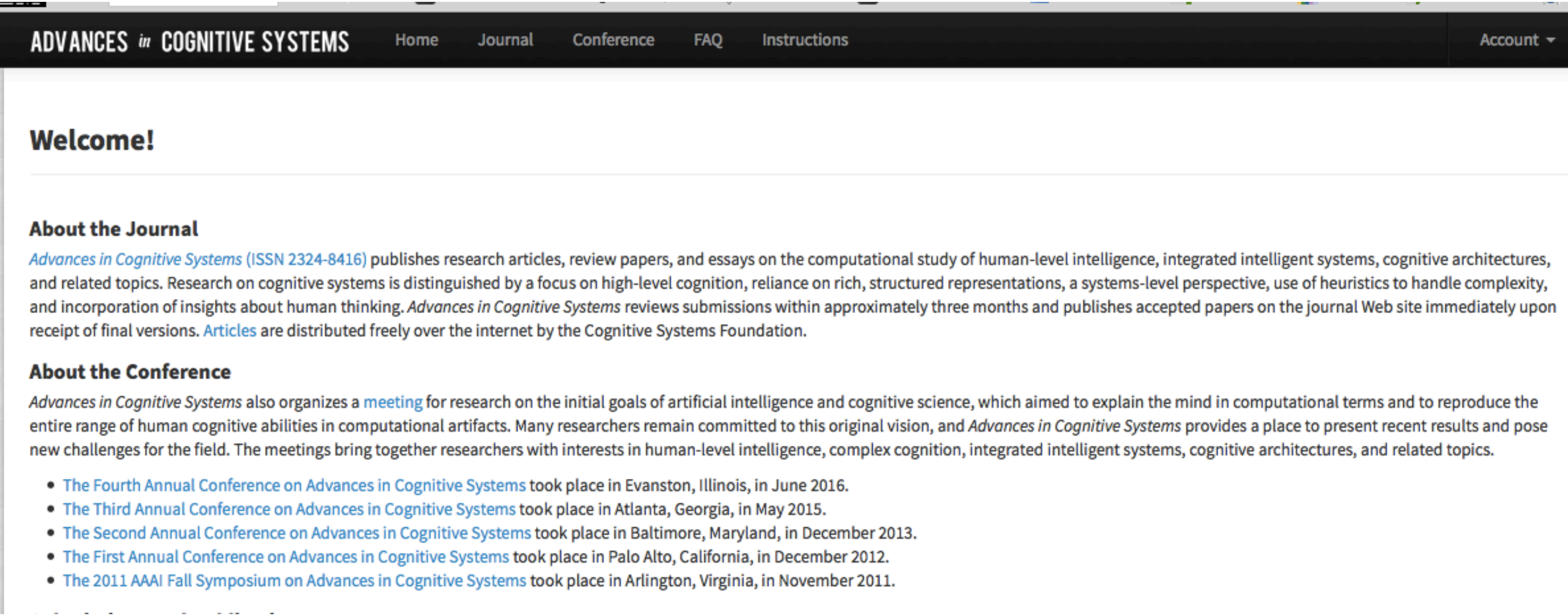
- What is a cognitive system (entity)?
  - biological
  - technological
  - types of digital cognitive systems
- How to…
  - build them?
  - understand them?
  - work with them?
- Steps toward a next generation cognitive curriculum…

But first…. Cognitive Science, a young field

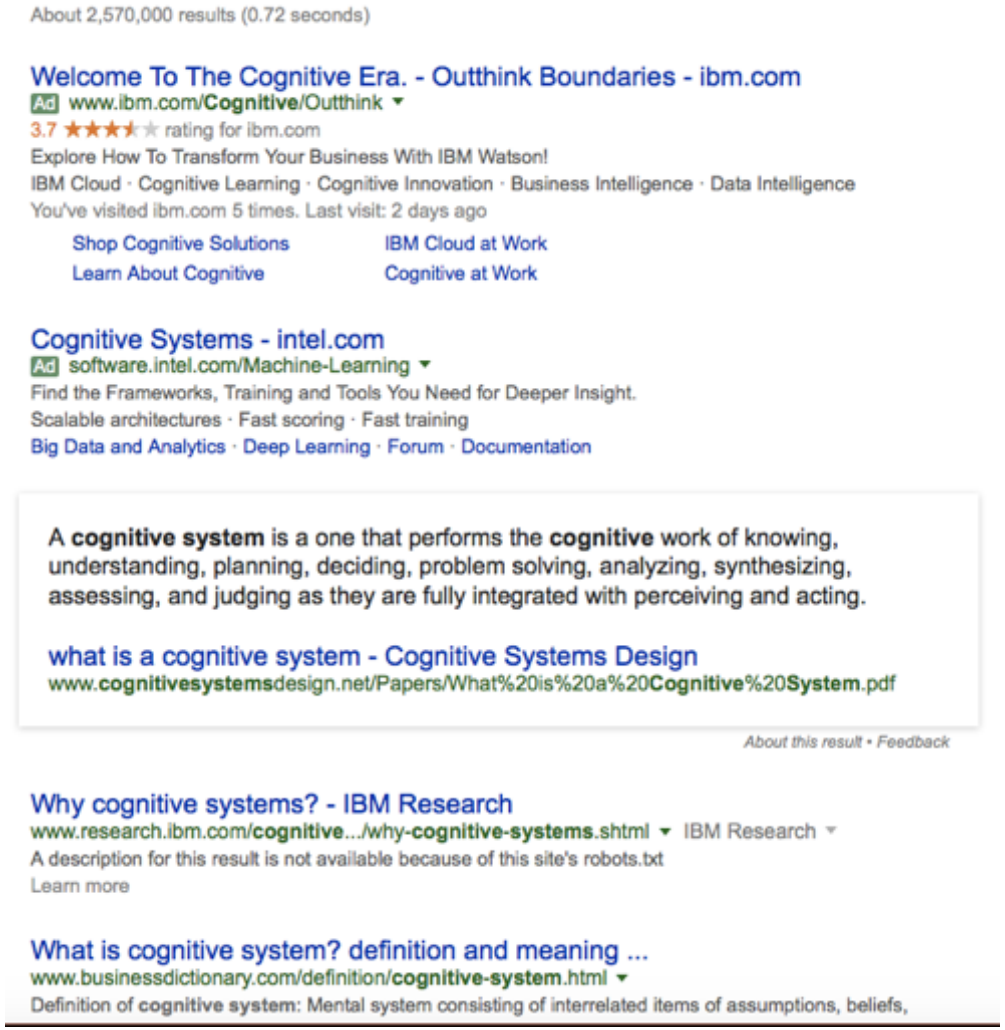
- Society
  - cognitivesciencesociety.org
- People
  - Founders: Roger Schank, Donald Norman, Allan Collins
  - Others: David Rumelhart, Herbert Simon, Allen Newell
  - Today: Patrick Langley, Wayne Gray, Kenneth Forbus, Ashok Goel, Paul Maglio, etc.
- Systems Conference
  - cogsys.org
  - (JCS wishes this was part of HICSS)



Advances in Cognitive Systems - cogsys.org



Google Search: August 26, 2016



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Welcome To The Cognitive Era. - Outthink Boundaries - ibm.com
Ad www.ibm.com/**Cognitive**/Outthink
3.7 ★★★½☆ rating for ibm.com
Explore How To Transform Your Business With IBM Watson!
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Scalable architectures · Fast scoring · Fast training
Big Data and Analytics · Deep Learning · Forum · Documentation

A **cognitive system** is a one that performs the **cognitive** work of knowing, understanding, planning, deciding, problem solving, analyzing, synthesizing, assessing, and judging as they are fully integrated with perceiving and acting.

what is a cognitive system - Cognitive Systems Design
www.**cognitivesystems**design.net/Papers/What%20is%20a%20**Cognitive**%20**System**.pdf

About this result • Feedback

Why cognitive systems? - IBM Research
www.research.ibm.com/**cognitive**.../why-**cognitive-systems**.shtml ▾ IBM Research ▾
A description for this result is not available because of this site's robots.txt
Learn more

What is cognitive system? definition and meaning ...
www.businessdictionary.com/definition/**cognitive-system**.html ▾
Definition of **cognitive system**: Mental system consisting of interrelated items of assumptions, beliefs,

Enterprise cognitive system - Wikipedia, the free encyclopedia
https://en.wikipedia.org/wiki/Enterprise_**cognitive_system** ▾ Wikipedia ▾
Enterprise **Cognitive Systems** (ECS) are part of a broader shift in computing, from a programmatic to a probabilistic approach, called **Cognitive** computing.

Cognitive architecture - Wikipedia, the free encyclopedia
https://en.wikipedia.org/wiki/**Cognitive**_architecture ▾ Wikipedia ▾
A cognitive architecture can refer to a theory about the structure of the human mind. One of the ... It proposes (artificial) computational processes that act like certain **cognitive systems**, most often, like a person, or acts intelligent under some ...

What is cognitive computing? - Definition from WhatIs.com
whatis.techtarget.com › ... › Business intelligence - business analytics ▾
Cognitive computing is the simulation of human thought processes in a computerized model. **Cognitive** computing involves self-learning **systems** that use data mining, pattern recognition and natural language processing to mimic the way the human brain works.

[PDF] **what is a cognitive system - Cognitive Systems Design**
www.**cognitivesystems**design.net/.../What%20is%20a%20**Cognitive**%20**System**.pdf ▾
is a **Cognitive System** and in what sense can we characterize the airspace as a cognitive ... cognition and joint **cognitive systems** offer considerable leverage for ...

Cognitive Systems Institute Group – to augment and scale human ...
cognitive-science.info/ ▾
The **Cognitive Systems** Institute, a new set of IBM university programs launched in conjunction with IBM Research and the Watson Business Unit, focuses faculty ...
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Advances in Cognitive Systems
www.cogsys.org/ ▾
Advances in **Cognitive Systems** (ISSN 2324-8416) publishes research articles, review papers, and essays on the computational study of human-level ...
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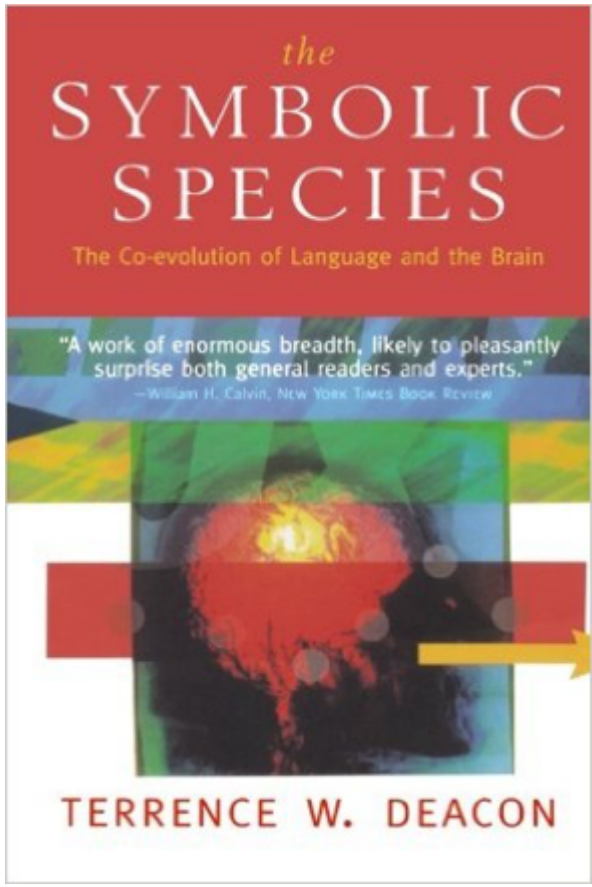
Welcome to the Era of Cognitive Systems « A Smarter Planet Blog

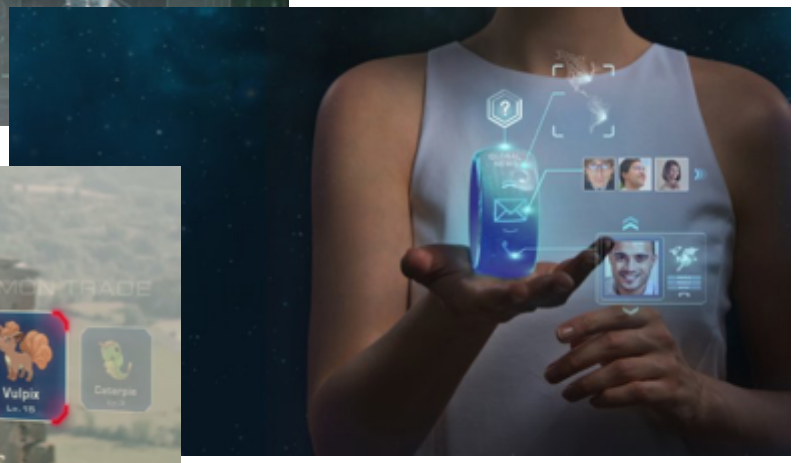
Today's Talk: Understanding Cognitive Systems

- What is a cognitive system (entity)?
  - biological
  - technological
  - types of digital cognitive systems
- How to…
  - build them?
  - understand them?
  - work with them?
- Steps toward a next generation cognitive curriculum…

What is a cognitive system (entity)?



What is a digital cognitive system (entity)?



What types of digital cognitive systems?

- Cognitive Build: Outthink Challenge (250K people)
  - Imagine a digital cognitive system to help you do something important in your personal or professional lives
  - Team to design it and advocate for it, and then everyone votes
  - Winners: reduce waste and human suffering, screen for health issues and safety threats, learn life skills and make better choices, find what you are looking for, move around more effectively, provide emotional support, provide IT support, learn about important public policy goals and make better choices
- Types: Tool, Assistant, Collaborator, Coach, Mediator

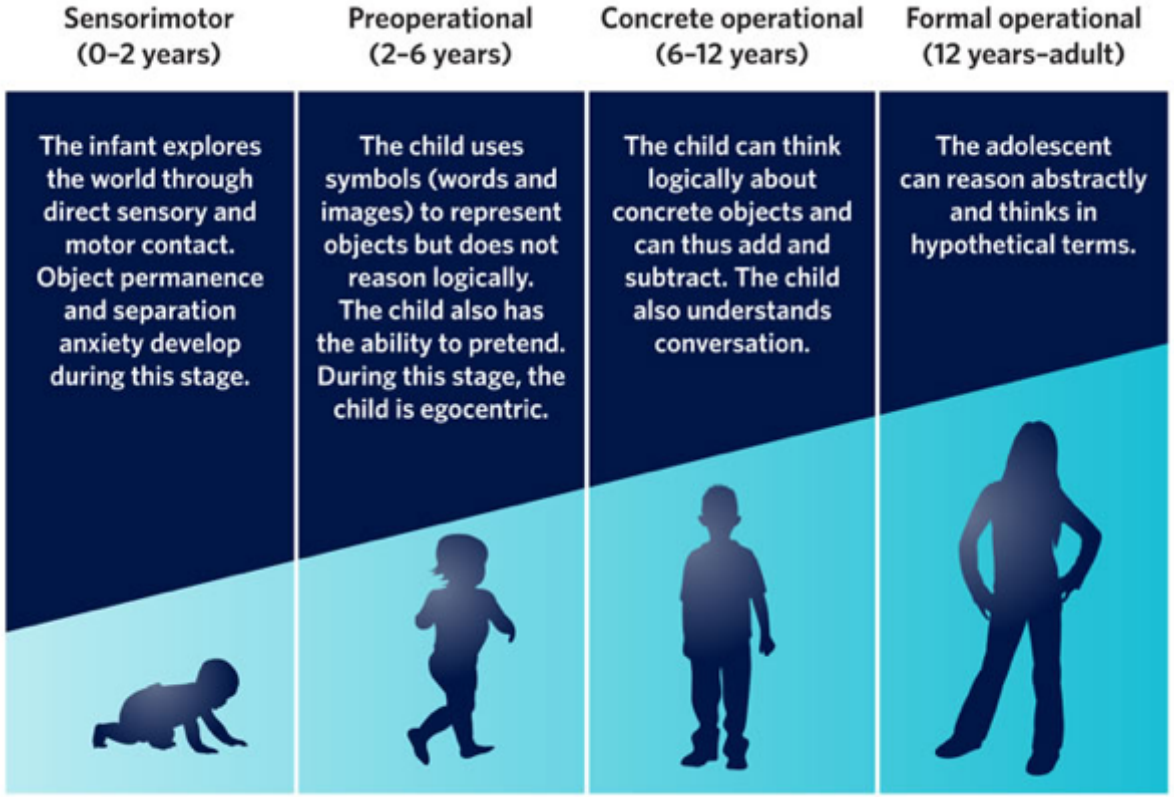
Types

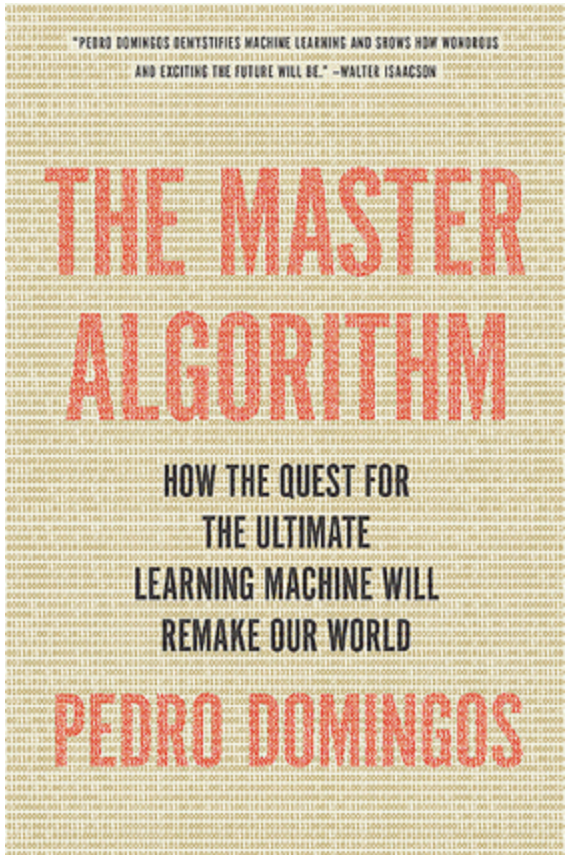
- Tool
- Assistant
- Collaborator
- Coach
- Mediator

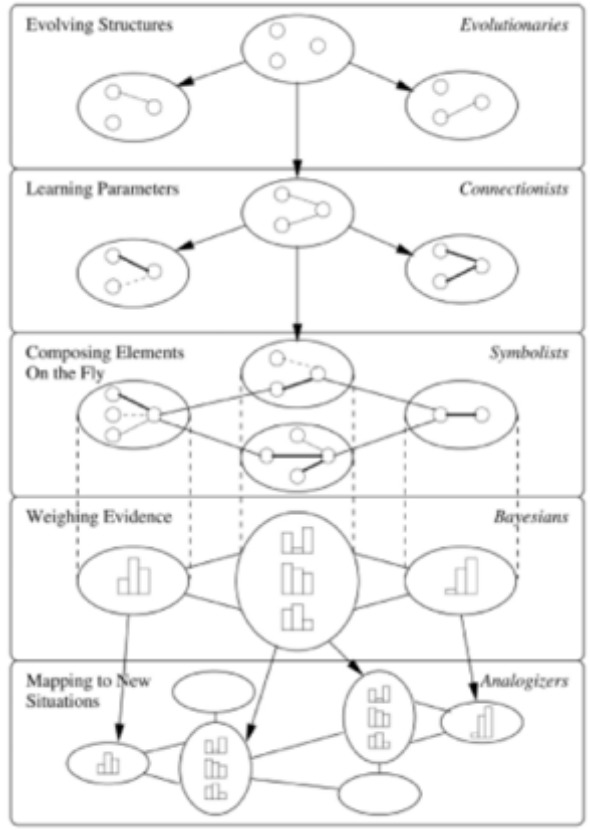
Types: Progression of models and capabilities

	Task & World Model/ Planning & Decisions	Self Model/ Capacity & Limits	User Model/ Episodic Memory	Institutions Model/ Trust & Social Acts
Tool	+	-	-	-
Assistant	++	+	-	-
Collaborator	+++	++	+	-
Coach	++++	+++	++	+
Mediator	+++++	++++	+++	++

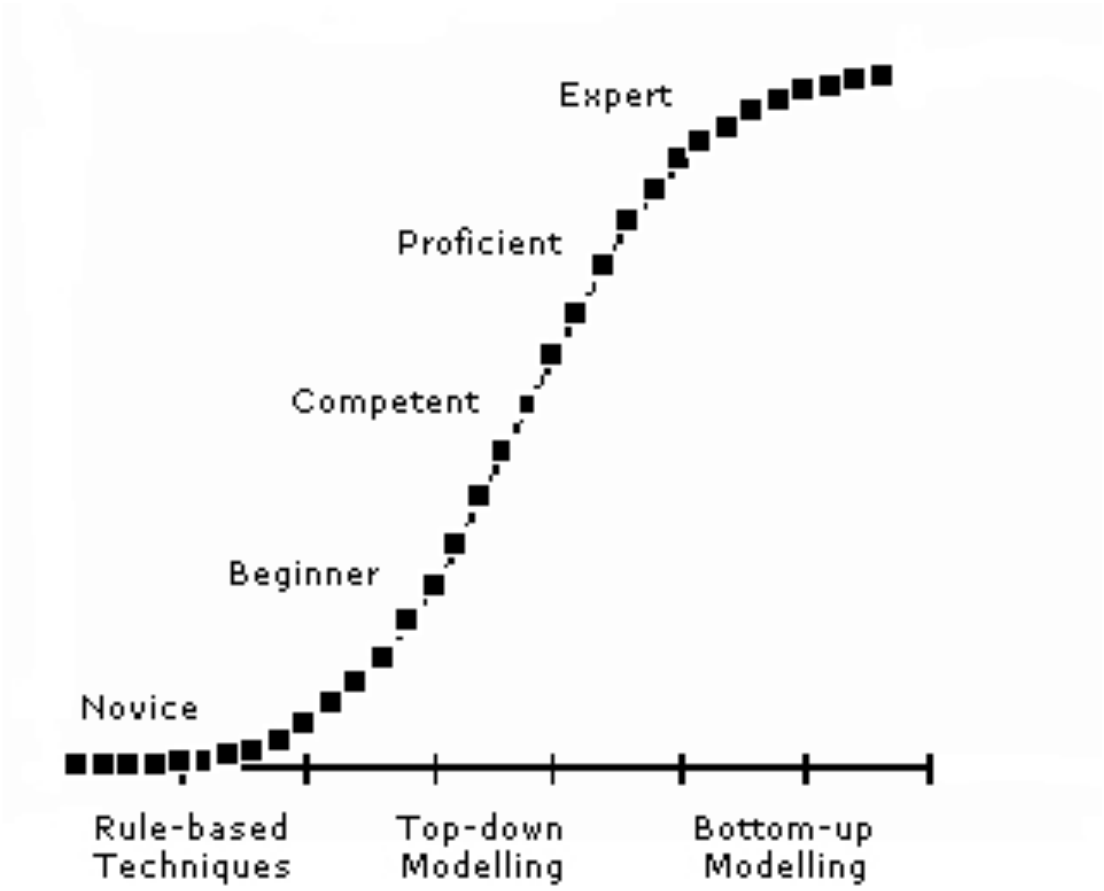
Build: 10 million minutes of experience

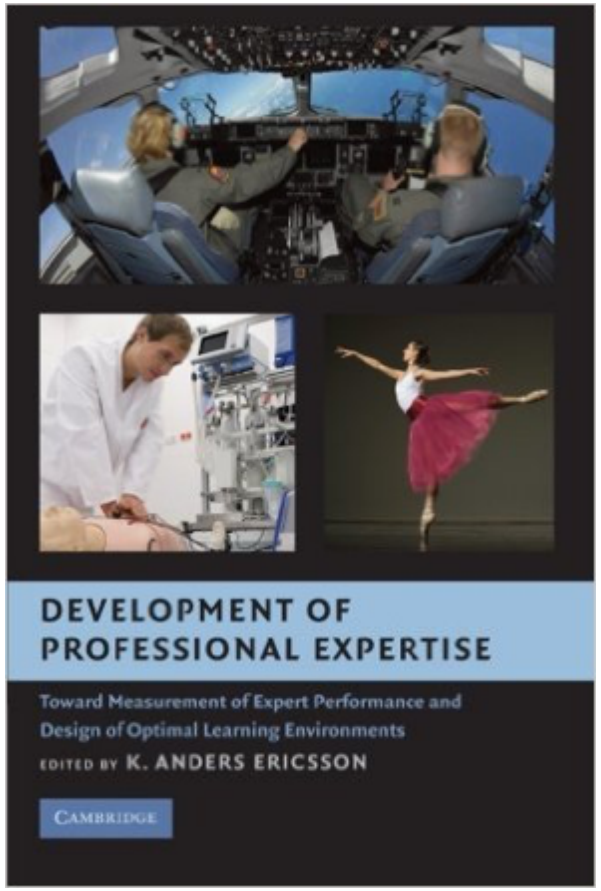






Build: 2 million minutes of experience





Build: Hardware < Software < Data < Experience

The Human Speechome Project

Deb Roy, Rupal Patel*, Philip DeCamp, Rony Kubat, Michael Fleischman, Brandon Roy, Nikolaos Mavridis, Stefanie Tellex, Alexia Salata, Jethran Guinness, Michael Levit, Peter Gorniak
Cognitive Machines Group, MIT Media Laboratory
*Communication Analysis and Design Laboratory, Northeastern University

Abstract

The Human Speechome Project is an effort to observe and computationally model the longitudinal course of language development for a single child at an unprecedented scale. The idea is this: Instrument a child's home so that nearly everything the child hears and sees from birth to three is recorded. Develop a computational model of language learning that takes the child's audio-visual experiential record as input. Evaluate the model's performance in matching the child's linguistic abilities as a means of assessing possible learning strategies used by children in natural contexts. First steps of a pilot effort along these lines are described including issues of privacy management and methods for overcoming limitations of fully-automated machine perception.

Stepping into the Shoes of Children

To date, the primary means of studying language acquisition has been through observational recordings made in laboratory settings or made at periodic intervals in children's homes. While laboratory studies provide many useful insights, it has often been argued that the ideal way to observe early child development is in the home

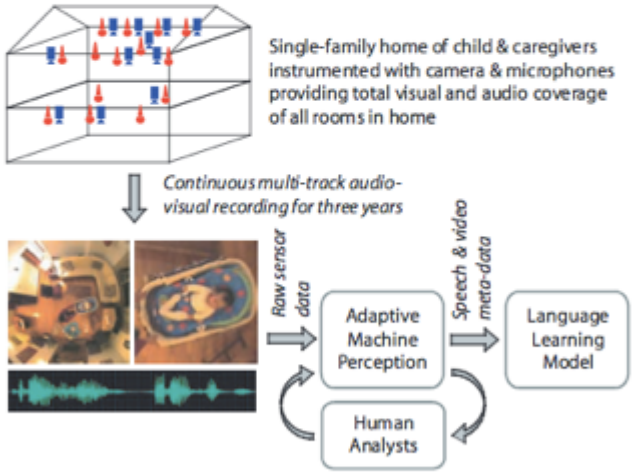
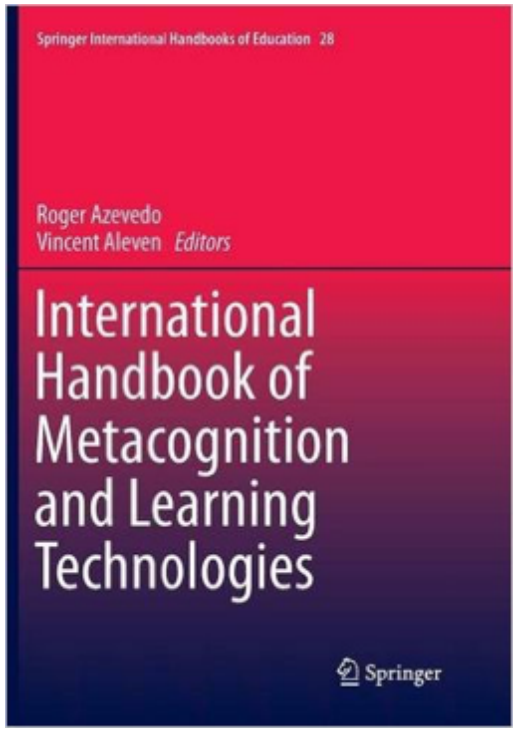
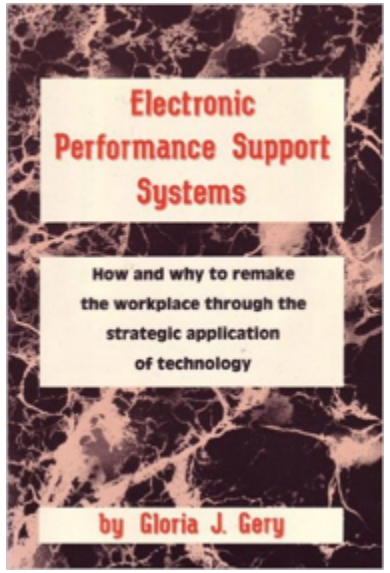


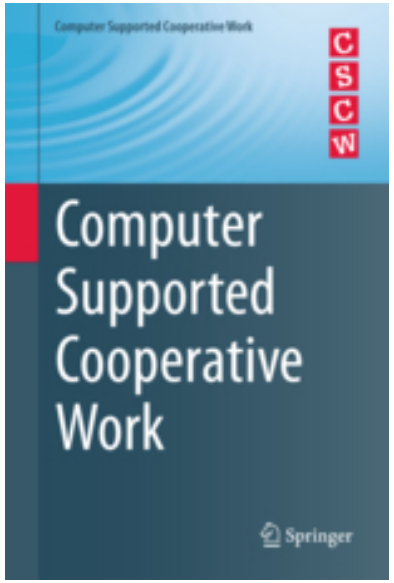
Figure 1: The goal of HSP is to create computational models of word learning evaluated on longitudinal *in vivo* audio-visual recordings.

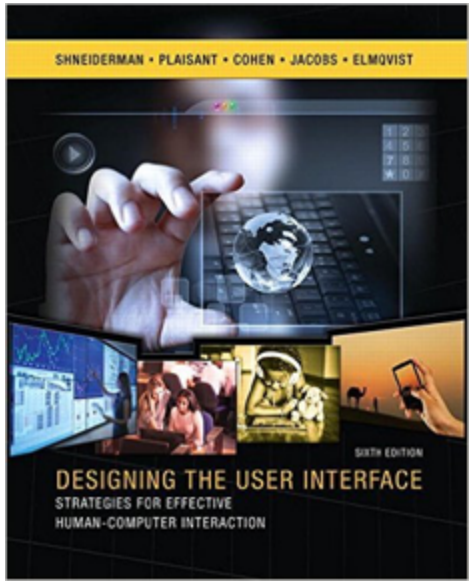
Understand them…



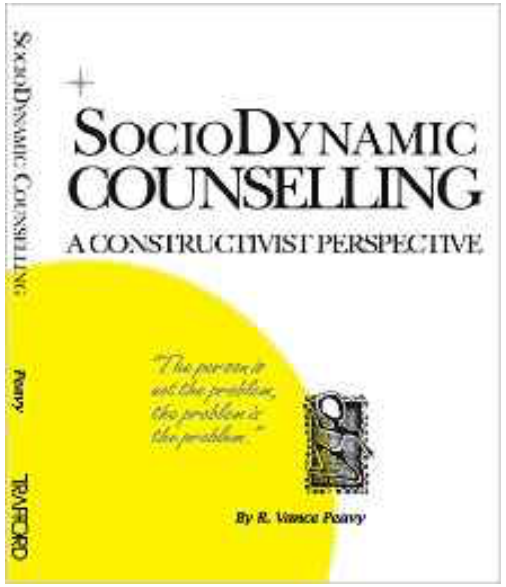
Work with…


Electronic
Performance Support
Systems
How and why to remake
the workplace through the
strategic application
of technology
by Gloria J. Gery


Computer Supported Cooperative Work
CSCW
Computer
Supported
Cooperative
Work
Springer


SHNEIDERMAN • PLAISANT • COHEN • JACOBS • ELMQVIST
SIXTH EDITION
DESIGNING THE USER INTERFACE
STRATEGIES FOR EFFECTIVE
HUMAN-COMPUTER INTERACTION


COLLABORATIVE
INTELLIGENCE
Thinking with People
Who Think Differently
Dawna
Markova,
Ph.D.
Angie
McArthur


SocioDynamic
COUNSELLING
A CONSTRUCTIVIST PERSPECTIVE
By R. Vance Peavy
TRAFFORD

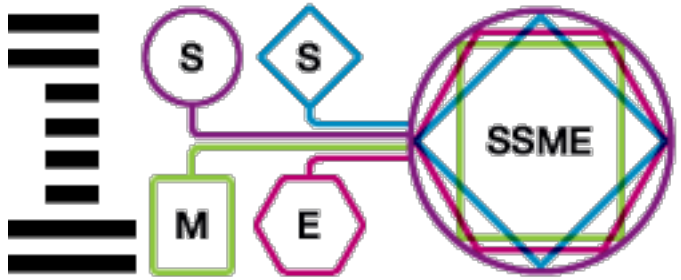
Next generation cognitive curriculum

Name	Type	Comments
Dan Klein, Pieter Abbeel	MOOC – Berkeley EdX	Intro AI (for Game Worlds)
Peter Norvig, Sebastian Thrun	MOOC – Stanford Udacity	Intro AI (Search with Applications)
Katie Malone, Sebastian Thrun	MOOC – Stanford Udacity	Machine Learning
Ashok_Goel, David_Joyner	MOOC – GaTech Udacity	Knowledge-Based AI
Dave Hortz, Cheng-Han Lee	MOOC – Google Udacity	Intro Data Science

Backup slides

- Service systems - http://service-science.info/archives/3368

What is service science?



- IBM initiated effort to establish a multidisciplinary field to study *service systems* … with a focus on people-centered, IT-enabled service innovations for business and society
  - based on service-dominant logic
  - service = value co-creation
  - IT-enabled service architectures
  - service systems (socio-technical systems for win-win value co-creation)
- IBM helped establish
  - computer science (1945-present)
  - service science (2005-present)

Service systems are dynamic configurations of resources (people, technology, organizations, and information) interconnected by value propositions, internally and externally.

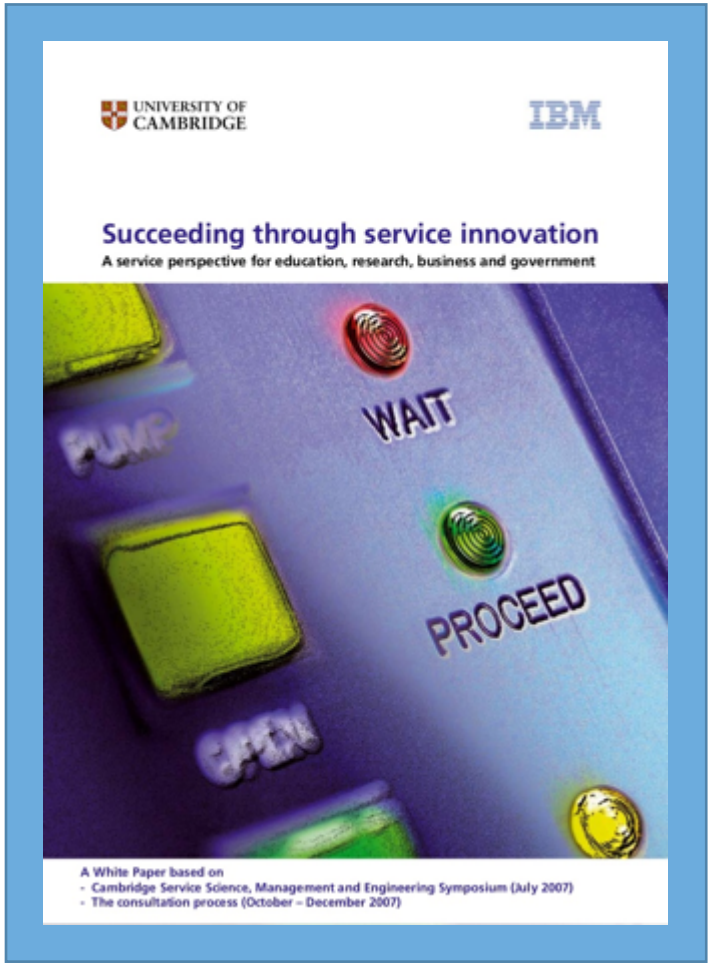
Examples:
- macro: cities, states, nations
- meso: hospitals, universities, businesses
- micro: households, families, individuals

Reference:
Spohrer J, Maglio P, Bailey J, Gruhl D (2007) Steps toward a science of service systems. IEEE Computer Society. 40(3):71-77(January).

What is service science?

- Now over 500 universities globally teach a more multidisciplinary approach to service innovation, including:
  - Service management and marketing
  - Service engineering and operations
  - Service design and arts
  - Service public policy and economics
  - Service computing and informatics

- SSME + DAPP =
  Service Science Management Engineering + Design Arts Public Policy
  - People, technology, organizations, information interconnected by value propositions.

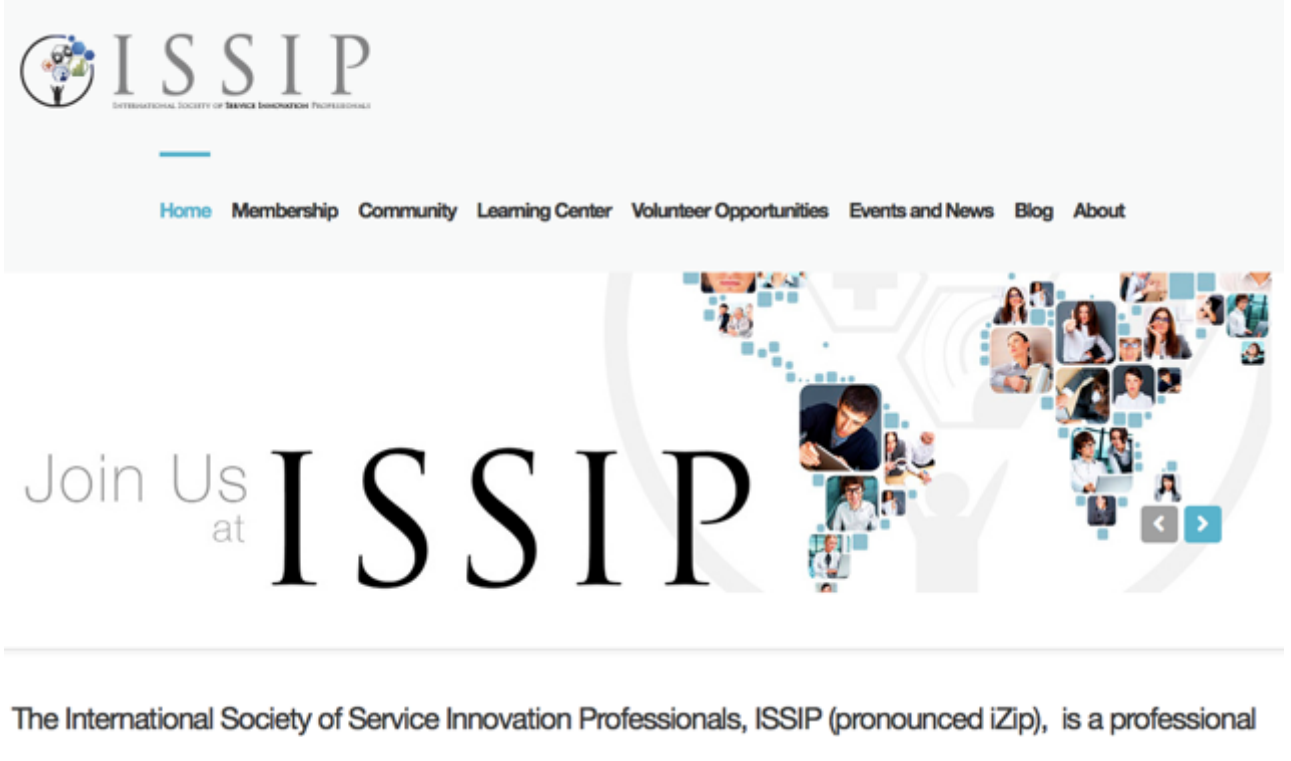


Reference:

IfM & IBM (2008). Succeeding through service innovation: A service perspective for education, research, business and government. University of Cambridge Institute for Manufacturing, Cambridge, UK. 2008.

How to get involved?

- Weekly speaker series
  - Service innovation
  - Service education & research
  - Smart service/cognitive systems
- Discovery summits & book series
- Opportunities
  - Institutional memberships
  - Leadership & ambassadors
  - Volunteer opportunities
  - Awards & sponsored conferences



ISSIP.org is a non-profit society
International Society of Service Innovation Professionals

Membership:
Over 1000 professionals and students from 40+ countries, 50+ companies and 50+ universities.

How to get involved?

- Journals (INFORMS, etc.)
- Conferences (HICSS, etc.)
- Courses (MIT, etc.)
- Funding (NSF, etc.)
- Society (ISSIP, etc.)

MIT-NSF Workshop: Smarter Service Systems through Innovation Partnerships and Transdisciplinary Research

November 20-21, 2014 | Le Méridien Cambridge-MIT

MIT SOCIOTECHNICAL SYSTEMS RESEARCH CENTER

National Science Foundation WHERE DISCOVERIES BEGIN

Press Release 15-106

NSF invests $10 million in smart, human-centered service systems

Awards to spur innovation for smart health, manufacturing and infrastructure

Robots can learn to help both nurses and patients. Credit and Larger Version

What are the hot topics?

- Smart Service Systems: Intelligence Augmentation
  - AI + AR UX (Artificial Intelligence + Augmented Reality User Experience)
  - Smartphones (mobile, social, secure, etc.)
- Collaborative Economy: Servitization
  - From assets to co-creation (e.g., Uber, AirBnB, etc.)
  - From product to capability/outcome-as-a-service
  - Manufacturing as a local recycling service
- Digital Transformation: Trust and Identity
  - Blockchain: Don Tapscott's TED Talk & book
  - Big Data: Service Analytics & HAT (Hub of All Things)

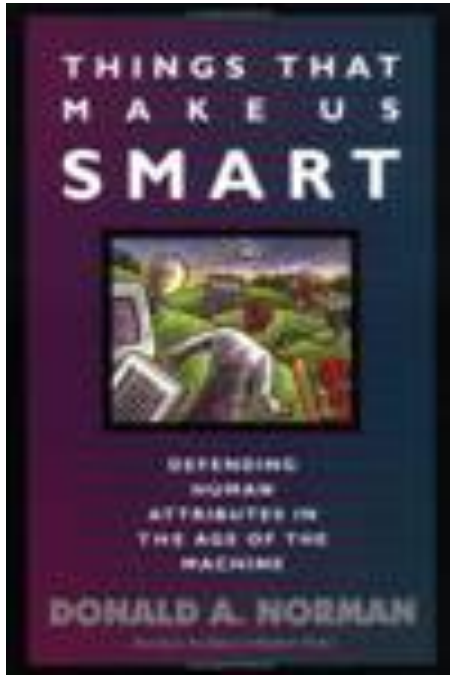
Backups

- T-shaped people

Some paths to becoming 64x smarter:

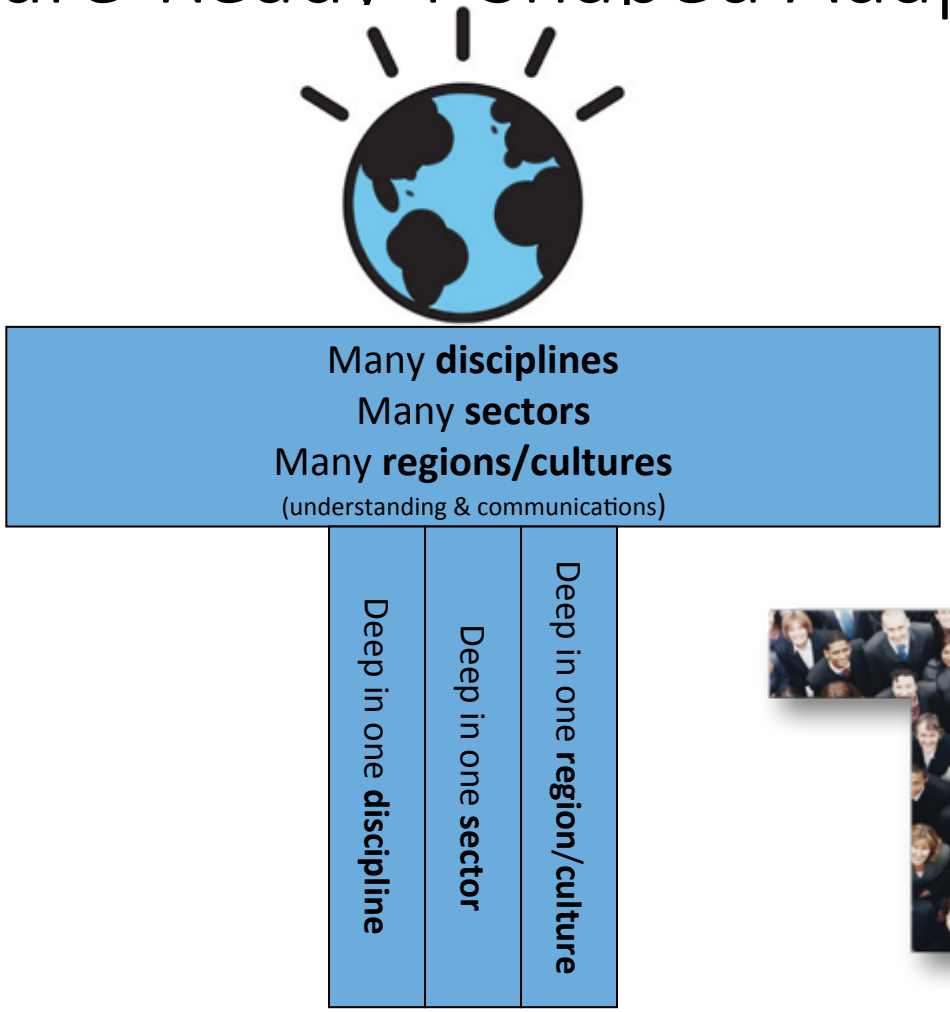
Improving learning and performance

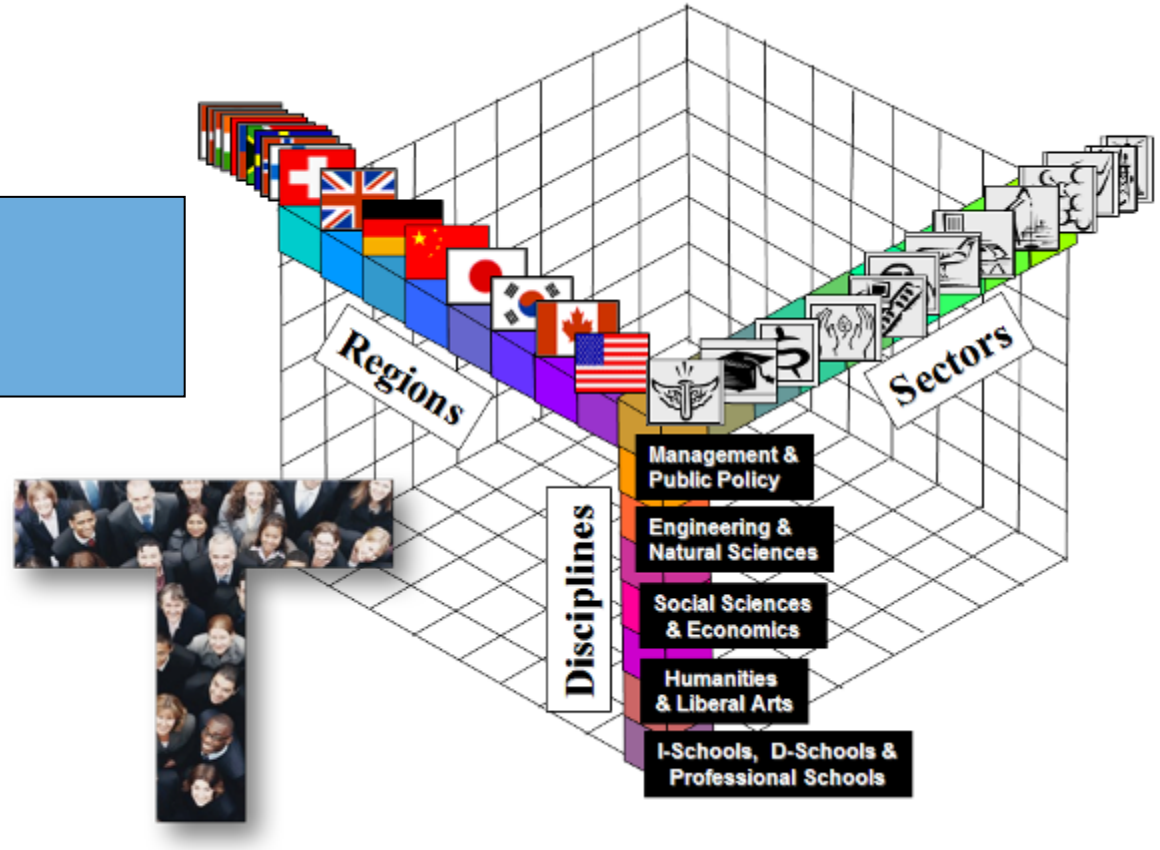
- 2x from Learning sciences (methods)
  - Better models of concepts
  - Better models of learners
- 2x from Learning technology (tools)
  - Guided learning paths
  - Elimination of “thrashing”
- 2x from Quantity effect (overlaps)
  - More you know, faster you go
  - Advanced organizers
- 2x from Lifelong learning (time)
  - Longer lives and longer careers
  - Keeps “learning-mode” activated
- 2x from Early learning (time)
  - Start earlier: Challenged-based approach
  - STEM-2D in K-12 (SSME+DAPP Design of Smart Service Systems)
- 2x from Cognitive systems (performance support)
  - Technology & Infrastructure Interactions
  - Organizations & Others Interactions



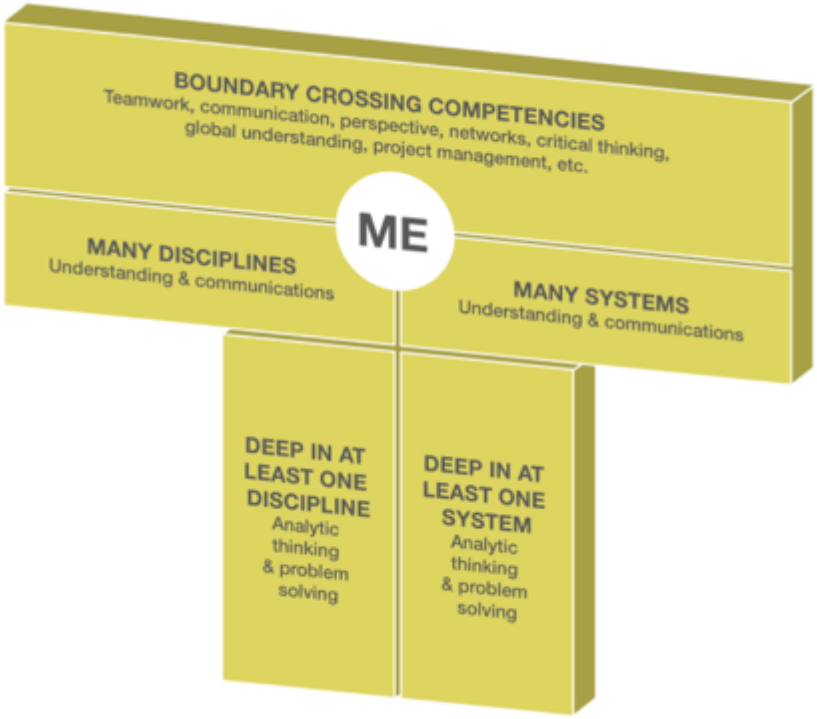
Next Generation:

Future-Ready T-Shaped Adaptive Innovators





Future-Ready T-Shapes



The ME in the T: Can-Do Attitude

Summary of Dweck's *Mindset*

Fixed vs Growth

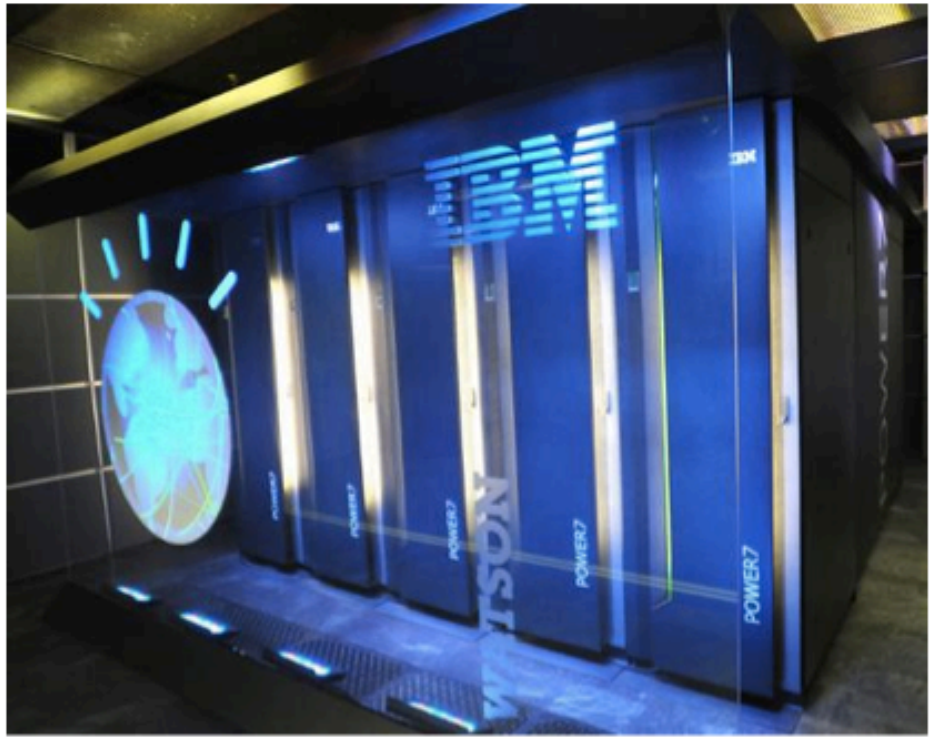
ability is static		ability is developed
avoids challenges		embraces challenges
gives up easily		persists in obstacles
sees effort as fruitless		sees effort as necessary
ignores useful criticism		learns from criticism
threatened by others		inspired by others' success

Brief History of AI

- 1956 – Dartmouth Conference
- 1956 – 1981 Micro-Worlds
- 1981 – Japanese 5th Generation
- 1988 – Expert Systems Peak
- 1990 – AI Winter
- 1997 – Deep Blue
- 1997 – 2011 Real-World
- 2011 – Jeopardy! & SIRI
- 2013 – Cognitive Systems Institute
- 2014 – Watson Business Unit &
- True North Brain Chip
- 2015 – "Cognition as a Service" on IBM Blu

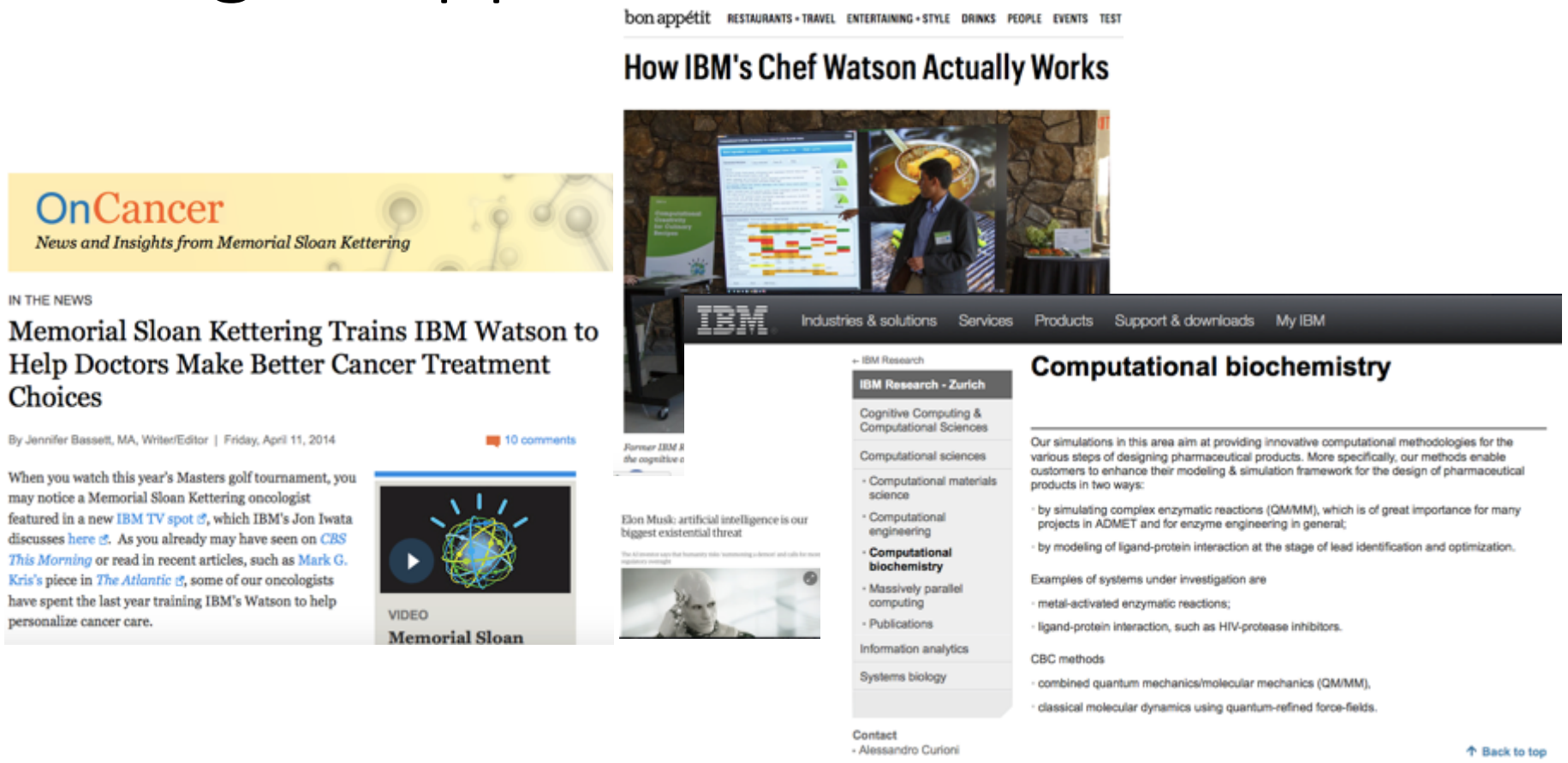
Spohrer said:

> *Our view is that these new cognitive systems will accelerate progress immensely. Up until now we have been using cognitive shovels, but these new tools will be like cognitive bulldozers, enabling us to do a lot more in terms of decision support systems that augment human performance. And from the global university perspective they will also have profound implications regarding the ways we teach. Just as the calculator changed how students did math problems, cognitive computers will transform higher education.*



IBM's Watson cluster supercomputer beat the human champions on the television quiz show Jeopardy.

Cognitive Assistants for all occupations are beginning to appear



OnCancer

News and Insights from Memorial Sloan Kettering

IN THE NEWS

Memorial Sloan Kettering Trains IBM Watson to Help Doctors Make Better Cancer Treatment Choices

By Jennifer Bassett, MA, Writer/Editor | Friday, April 11, 2014 10 comments

When you watch this year's Masters golf tournament, you may notice a Memorial Sloan Kettering oncologist featured in a new IBM TV spot, which IBM's Jon Iwata discusses here. As you already may have seen on *CBS This Morning* or read in recent articles, such as Mark G. Kris's piece in *The Atlantic*, some of our oncologists have spent the last year training IBM's Watson to help personalize cancer care.

VIDEO

Memorial Sloan

bon appétit RESTAURANTS + TRAVEL ENTERTAINING + STYLE DRINKS PEOPLE EVENTS TEST

How IBM's Chef Watson Actually Works

Elon Musk: artificial intelligence is our biggest existential threat

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Computational biochemistry

Our simulations in this area aim at providing innovative computational methodologies for the various steps of designing pharmaceutical products. More specifically, our methods enable customers to enhance their modeling & simulation framework for the design of pharmaceutical products in two ways:

- by simulating complex enzymatic reactions (QM/MM), which is of great importance for many projects in ADMET and for enzyme engineering in general;
- by modeling of ligand-protein interaction at the stage of lead identification and optimization.

Examples of systems under investigation are

- metal-activated enzymatic reactions;
- ligand-protein interaction, such as HIV-protease inhibitors.

CBC methods

- combined quantum mechanics/molecular mechanics (QM/MM),
- classical molecular dynamics using quantum-refined force-fields.

Contact

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