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

8/30/16
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
"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)
Welcome!

About the Journal

*Advances in Cognitive Systems* (ISSN 2324-6418) publishes research articles, review papers, and essays on the computational study of human-level intelligence, integrated intelligent systems, cognitive architectures, and related topics. Research on cognitive systems is distinguished by a focus on high-level cognition, reliance on rich, structured representations, a systems-level perspective, use of heuristics to handle complexity, and incorporation of insights about human thinking. *Advances in Cognitive Systems* reviews submissions within approximately three months and publishes accepted papers on the journal Web site immediately upon receipt of final versions. Articles are distributed freely over the Internet by the Cognitive Systems Foundation.

About the Conference

*Advances in Cognitive Systems* also organizes a meeting for research on the initial goals of artificial intelligence and cognitive science, which aimed to explain the mind in computational terms and to reproduce the entire range of human cognitive abilities in computational artifacts. Many researchers remain committed to this original vision, and *Advances in Cognitive Systems* provides a place to present recent results and pose new challenges for the field. The meetings bring together researchers with interests in human-level intelligence, complex cognition, integrated intelligent systems, cognitive architectures, and related topics.

- The Third Annual Conference on Advances in Cognitive Systems took place in Atlanta, Georgia, in May 2015.
- The Second Annual Conference on Advances in Cognitive Systems took place in Baltimore, Maryland, in December 2013.
- The First Annual Conference on Advances in Cognitive Systems took place in Palo Alto, California, in December 2012.
Google Search: August 26, 2016

Welcome To The Cognitive Era. - Outthink Boundaries - ibm.com
www.ibm.com/Cognitive/Outthink
Explore How To Transform Your Business With IBM Watson!
IBM Cloud - Cognitive Learning - Cognitive Innovation - Business Intelligence - Data Intelligence
You've visited ibm.com 5 times. Last visit: 2 days ago
Shop Cognitive Solutions IBM Cloud at Work
Learn About Cognitive Cognitive at Work

Cognitive Systems - intel.com
software.intel.com/MachineLearning
Find the Frameworks, Training and Tools You Need for Deeper Insight.
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.cognitivesystemdesign.net/Papers/What%20is%20a%20Cognitive%20System.pdf

Why cognitive systems? - 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,
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

<table>
<thead>
<tr>
<th>Type</th>
<th>Task &amp; World Model/ Planning &amp; Decisions</th>
<th>Self Model/ Capacity &amp; Limits</th>
<th>User Model/ Episodic Memory</th>
<th>Institutions Model/ Trust &amp; Social Acts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tool</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Assistant</td>
<td>++</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Collaborator</td>
<td>+++</td>
<td>++</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Coach</td>
<td>+++++</td>
<td>+++</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Mediator</td>
<td>+++++++</td>
<td>+++</td>
<td>+++</td>
<td>++</td>
</tr>
</tbody>
</table>
Build: 10 million minutes of experience
Build: 2 million minutes of 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 that: 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 experience 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...
Next generation cognitive curriculum

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dan Klein, Pieter Abbeel</td>
<td>MOOC – Berkeley EdX</td>
<td>Intro AI (for Game Worlds)</td>
</tr>
<tr>
<td>Peter Norvig, Sebastian Thrun</td>
<td>MOOC – Stanford Udacity</td>
<td>Intro AI (Search with Applications)</td>
</tr>
<tr>
<td>Katie Malone, Sebastian Thrun</td>
<td>MOOC – Stanford Udacity</td>
<td>Machine Learning</td>
</tr>
<tr>
<td>Ashok_Goel, David_Joyner</td>
<td>MOOC – GaTech Udacity</td>
<td>Knowledge-Based AI</td>
</tr>
<tr>
<td>Dave Hertz, Cheng-Han Lee</td>
<td>MOOC – Google Udacity</td>
<td>Intro Data Science</td>
</tr>
</tbody>
</table>
Backup slides

• Service systems - http://service-science.info/archives/3368
What is service science?

- IBM initiated effort to establish a multidisciplinary field to study \textit{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)

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

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

\textbf{Reference:}
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:
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.)
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

Many disciplines
Many sectors
Many regions/cultures
(understanding & communications)

Deep in one discipline
Deep in one sector
Deep in one region/culture
Future-Ready T-Shapes

The ME in the T: Can-Do Attitude

Summary of Dweck’s *Mindset*

Fixed vs Growth

- ability is static
  - avoids challenges
  - gives up easily
  - sees effort as fruitless
  - ignores useful criticism
  - threatened by others

- ability is developed
  - embraces challenges
  - persists in obstacles
  - sees effort as necessary
  - learns from criticism
  - inspired by others’ success
Brief History of AI

- 1956 – Dartmouth Conference
- 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
Cognitive Assistants for all occupations are beginning to appear