

Cognitive Computing 2007

A Multi-disciplinary Synthesis of Neuroscience, Computer Science,
Mathematics, Cognitive Neuroscience, and Information Theory

May 2-3, 2007, UC Berkeley

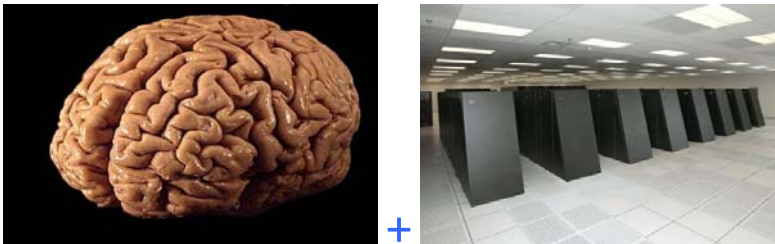
[The Auditorium of the Berkeley Art Museum](#)

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<http://www-bisc.eecs.berkeley.edu/CognitiveComputing07/>

<http://www.citris-uc.org/CognitiveComputing07>

What is Cognitive Computing?



Cognitive Computing is a study of top-down, global, unifying theories that explain observed cognitive phenomena (“mind”), that are consistent with known bottom-up neurobiological facts (the “brain”), that are computationally feasible (for example, implement-able on a BlueGene), and that are mathematically principled. Cognitive Computing is a search for computer science-type software/hardware elements that are consistent with known neurobiological facts about the brain and give rise to observed mental processes of perception, memory, language, intelligence, and, eventually, consciousness. Very simply speaking, **Cognitive Computing is when computer science meets neuroscience to explain and implement psychology.** We have, in the brain and nervous system, an information processing system unrivalled by artificial means. While it trails machines in accuracy and mathematical computation, it wins on adaptability, flexibility, functionality, and parallelism. The ultimate goal is to reverse engineer enough of this system so that the design principles can be applied to building robust and adaptable computer systems.

Cognitive Computing is different from Artificial Intelligence (AI) and Neural Networks (NN). From the outset, AI ignored neurobiology. While neural networks started from biological motivation, they too quickly discarded biological plausibility. In both cases, the approach has been to focus on a suitable problem, and to offer a “symbolic” or “neural network” solution to it. The brain, however, works in exactly the opposite fashion, it has evolved a solution that allows it to deal with problems as they arise. AI and NN technologies take one or more cognitive phenomena exhibited by the brain as a starting point and then try to replicate that capability by inventing algorithms/learning rules. In contrast, CC is about learning how the brain operates, about algorithms, about diligent reverse engineering and testing plausible models. **Cognitive Computing is about engineering the mind by reverse engineering the brain.**

Purpose of Cognitive Computing 2007

Inspired by the success of the 2006 Cognitive Computing event organized by IBM Almaden Research Center (see below), and motivated by tremendous interest in the field, in 2007, we are organizing an event "Cognitive Computing" at University of California, Berkeley, on May 2-3, 2007.

The meeting will examine approaches to understanding cognition that unify neurological, biological, psychological, mathematical, computational, and information-theoretic insights. The meeting will focus on the search for global, top-down theories of cognition that are consistent with known bottom-up, neurobiological facts and serve to explain a broad range of observed cognitive phenomena. The ultimate goal is to understand how and when can cognition be mechanized. The meeting will endeavor to construct a bird's eye view of the state-of-the-art via a number of invited talks and panel discussions. The meeting will help elucidate and formulate the main open questions in this grand quest, will help frame competing paradigms, and will help highlight promising directions. The goal is to ask tough questions, to raise important discussions, and to prompt significant constructive action around a contemporary scientific and technological theme.

We are also inviting other world-renowned scientists in computational neuroscience, neuro-imaging, vision, cognitive psychology, theoretical computer science, and information theory to speak at the event. We will invite prominent and influential attendees from selected universities, media agencies, government and funding agencies, venture capital firms, industrial and government research labs, industry, and think tanks. We

believe that this meeting will be a historic event with lasting impact on the field and on society.

Event Co-chairs

Dr. Dharmendra S. Modha of IBM Almaden Research Center who manages the Cognitive Computing Group and who organized the 2006 Almaden Institute on Cognitive Computing.

Prof. Robert Hecht-Nielsen of UCSD who is a pioneer in Neural Networks, a noted entrepreneur, and has recently developed his Confabulation Theory.

Dr. Masoud Nikravesh of UC Berkeley who is BISC Executive Director and is organizing Berkeley's expected upcoming Cognitive Computing initiative.

Venue



The Auditorium of the beautiful Berkeley Art Museum.

Confirmed Speakers



Nobelist Donald Glaser, UC Berkeley



Prof. James Anderson, Brown University



Prof. Michael Arbib, USC



Prof. Edward Callaway, Salk Institute



Prof. Robert Hecht-Nielsen, UCSD



Dr. Edgar Koerner, President, Honda Research Institute Europe



Dr. Dharmendra Modha, IBM



Prof. Almut Schüz, Max-Planck Institute for Biological Cybernetics



Prof. Roger Shepard, Emeritus, Stanford University



Prof. Brian A. Wandell, Stanford University



Dr. Masoud Nikravesh, UCB

Confirmed Panelists for “The Future of Cognitive Computing”



Dr. Jerome Swartz, The Swartz Foundation (Panel Moderator)



Dr. Tony Bell, Redwood Center for Theoretical Neuroscience, UCB



Prof. Jose M. Carmena, EECS and Cognitive Sciences, UCB



Dileep George, Numenta



Steve Jurvetson, Pre-eminent VC, Draper Fisher Jurvetson

Dr. Paul Rhodes, Stanford & President, Evolved Machines, Inc.



Dr. Lloyd Watts, Audience, Inc.

Opening & Closing Remarks



Opening Remarks on Day 1: **Prof. Shankar Sastry**, UCB (who will welcome participants and is expected to briefly announce Berkeley's new initiatives)



Opening remarks on Day 2: **Dr. Horst Simon**, NERSC Director (who will welcome participants and who is expected to briefly announce LBNL's new initiatives)

Event Sponsorship

Chief Sponsors:



CITRIS Program - UCB



NERSC-LBNL

Co-Sponsors:



ONR



The University of California Discovery Grant



Finnish Funding Agency for Technology and Innovation



IEEE-Computational Intelligence Society



BISC program of EECS



IBM Almaden Research Center



UCSD



UCB



LBL

Meeting Format

Two days of 10 invited talks, one concluding panel to reflect on the future of Cognitive Computing, and ample time for debate, discussion, and networking.

Expected Impact

1. 200 leaders from Industry and Academia are expected to attend.
2. Cognitive Computing will become a yearly event.

3. Emergence of a brand new timely research field that attempts to synthesize neuroscience, computer science, electrical engineering, mathematics, and psychology to understand how the brain works and how we can mechanize it.
4. Birth of new entrepreneurial activity in the Silicon Valley area and elsewhere.
5. Development of new academic curricula.
6. Anecdotally, Honorable Dan Goldin (former NASA Administrator and now head of Intellisys Corporation - which is building products based upon Cognitive Computing research; but who is not yet ready to make any disclosures at Cognitive Computing 2007) has agreed to speak at, and to personally serve on the organizing committee for, Cognitive Computing 2008!

Retrospective: 2006 IBM Almaden Institute on Cognitive Computing

The 2006 Almaden Institute on Cognitive Computing was held on May 10-11 at IBM's Almaden Research Center. The event focused on scientific and technological issues around the quest to truly understand the workings of the human brain and to mechanize cognition. The event was wildly successful with over extremely distinguished speakers and over 165 attendees from over 60 organizations.

The video presentations from the event were downloaded over 60,000 times! The IBM website counter reached roughly 100,000 hits last Fall before being accidentally deactivated.

For details of this event, please see:

<http://www.almaden.ibm.com/institute/2006/agenda.shtml>

2006 SPEAKERS AND PANELISTS:

Nobelist Gerald Edelman, The Neurosciences Institute, **Henry Markram**, EPFL/BlueBrain, **Robert Hecht-Nielsen**, UCSD, **Jeff Hawkins**, Palm/Numenta, **James Albus**, NIST, **Theodore Berger**, USC, **Kwabena Boahen**, Stanford, **Ralph Linsker**, IBM, **Jerry Swartz**, The Swartz Foundation, **V. S. Ramachandran**, UCSD, **John Searle**, UC Berkeley, **Joaquin Fuster**, UCLA, **Leslie Valiant**, Harvard University, **Toby Berger**, University of Virginia, and **Christof Koch**, Caltech.

2006 ATTENDEES:

UNIVERSITIES: Brandeis, CalTech, EPFL, George Mason, Harvard, SFSU, Stanford, Rockefeller, UC Davis, UC Berkeley, UC Los Angeles, UC Merced, UC San Diego, UC San Francisco, University of Massachusetts, University of Nevada, USC, University of Virginia, The Neurosciences Institute

GOVERNMENT: Air Force, CIA, DARPA, NIST, NIH, ONR

INDUSTRY & GOV LABS: Allen Institute of Brain Science, Honda, Hitachi, House Ear Institute, Intel, JPL, LBNL, MSRI, Mitsubishi, PARC, Samsung, Santa Fe, SRI, Yahoo!

START-UPS/VENTURE CAPITALISTS: Draper Fisher Jurvetson, KPMG, Numenta, Posit Science, Security First Corp., Symbol Technologies, Sutter Hill Ventures, Technology Partners, The Intellis Corporation

MEDIA: CNET, New York Times, Red Herring, San Francisco Chronicle, Scientific American, The Register, Wired

PHILANTHROPIC FOUNDATIONS: Kavli, Swartz

Cognitive Computing 2007

May 2-3, 2007

The Auditorium of the Berkeley Art Museum
University of California, Berkeley

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Agenda: Cognitive Computing 2007

Wednesday, May 2, 2007 Cognitive Computing

8.15	9:00	Registration and Continental Breakfast
9:00	9:30	Shankar Sastry , CITRIS Director: <i>Opening Remarks</i>
9.30	10.30	Dharmendra S. Modha , IBM Almadan Research Center: <i>Towards Engineering the Mind by Reverse Engineering the Brain</i>
10.30	11:00	Conversation with Refreshments
11:00	12:00	Ed Callaway , Salk Institute: <i>Towards an Understanding of Cortical Function: Problems and Solutions</i>
12:00	1:30	Lunch
1:30	2:30	Michael Arbib , USC: <i>From Cognitive Neuroscience to Computing Architectures</i>
2:30	3:30	SPECIAL LECTURE: Nobelist Donald Glaser , UC Berkeley: <i>The Brain might Optimize Visual Acuity using Cortical Noise via Stochastic Resonance/Sampling</i>
3:30	4.00	Conversation with Refreshments
4:00	5:00	Almut Schüz , Max-Planck-Institute for Biological Cybernetics: <i>Bridging the Gap between Cortical Structure and Cortical Function</i>
5:00	6:00	James Anderson , Brown University: <i>The Ersatz Brain Project</i>
6:00	7:30	Reception

Thursday, May 3, 2007 Cognitive Computing

8.15 -	9.00	Continental Breakfast
9:00	9:30	Horst Simon , NERSC Director: <i>Opening Remarks</i>
9.30	10.30	Robert Hecht-Nielsen , UC San Diego: <i>Understanding Speech</i>
10.30	11.00	Conversation with Refreshments
11.00	12.00	Edgar Koerner , President, Honda Research Institute Europe GmbH: <i>Intelligence for the Humanoid Robot ASIMO: A Synthetic Approach to Understanding Principles of Processing in the Brain</i>
12:00	1:30	Lunch
1:30	2:30	Brian A. Wandell , Stanford: <i>The Human Visual Pathways: Maps, Plasticity, and Reading</i>
2:30	3:30	Roger Shepard , Professor Emeritus, Stanford: <i>Principles of Cognition as Adaptations to the World</i>
3:30	3:45	Conversation with Refreshments
3:45	6:00	Panel: VC's, Entrepreneurs, and Innovators: <i>The Future of Cognitive Computing</i> Moderator: Jerome Swartz , The Swartz Foundation for Computational Neuroscience Tony Bell Redwood Center for Theoretical Neuroscience, UC Berkeley Jose M. Carmena , EECS and Cognitive Sciences, UC Berkeley Dileep George , Numenta Steve Jurvetson , Managing Director of Draper Fisher Jurvetson Paul Rhodes , Stanford & Evolved Machines, Inc. Lloyd Watts , Audience, Inc.
6.00 -	6.15	<i>Closing Remarks</i>

