Cognitive Science 102A
Distributed Cognition

Professor Edwin Hutchins

http://hci.ucsd.edu/102a
What the course is about

- The BIG question of Cognitive Science

- How shall we explain or understand processes like thinking, reasoning, speaking, decision making, planning, and so on?

- How did we get where we are?

- Where can we go from here?
What is mind?

• What is special about minds (even your cat’s mind) as opposed to inanimate objects?
• And what is special about human minds compared to other animal minds?
• Mindfulness is just matter… nicely orchestrated
Where is the mind?

- In the brain?
- In the nervous system?
- In the nervous system in the body?
- In the nervous system in the body in the physical world?
- In the nervous system in the body in a culturally organized physical world?
Legacy of the Second World War

- Cybernetics and control theory (feedback loops)
- Encryption/Decryption, mathematics, logic, formal languages, Turing Machine
- Digital computers “electronic brains”
- On/Off neurons and neural networks
- Neuropsychological syndromes, aphasia
Cognitive Science, the early years (1950s - 70s)

- What was in
  - Explicit representation, reasoning, memory, decision making, problem solving

- What was out
  - Culture, context, history, emotion
Cognitive science as a slice of scientific cake
Distributed Cognition

- Cognition emerges from the interaction of many components
- Cognitive events take place at many levels of organization
  - Brain area
  - Whole brain
  - Whole person
  - Group of persons
The attribution problem

• If mind is caused by something inside of us, what exactly is it that one must assume is IN THERE in order to account for the organized behavior one can observe?

Braitenberg’s Vehicle 2

Loves Light

Hates Light
Emergent Phenomena

- Stadium Waves
  - Structure emerges from the interactions of simple agents
- Synchronized applause
  - A propensity to coordinate with others
- Everyone say a number
  - Convergence in information cascades
Course plan

1. Overview of distributed cognition. Thinking about the science of thought.
3. An extended case study of distributed cognition.
Thinking about the science of thought.

- How science works (in general).
- The role of unexamined assumptions and presuppositions.
- What are the unexamined assumptions of cognitive science?
- How can we make them visible?
- Can we free ourselves from them?
The development of cognitive science

- Andy Clark’s combination history and critical reflection.
- Mindfulness as (some sort of) computation.
- Recent wrinkles
  - Embodiment
  - Robotics
  - Dynamics
  - Interaction with the material world
An extended case study of distributed cognition

- Ship navigation
- How institutions think
- Where is the computation?
- Embodied cognition in cultural context
- Cognitive properties of groups
- Individual and institutional learning
- The costs of ignoring culture
Instructors

- Professor Edwin Hutchins
  - ehutchins AT ucsd DOT edu
  - Th 11:00 - 11:50, CSB 175

- TAs
  - Morana Alač, malac AT cogsci DOT ucsd DOT edu
  - Allen Tran, a3tran AT weber DOT ucsd DOT edu
  - Ryan Schram, rschram AT ucsd DOT edu

- IA
  - Jen Becker, jebecker AT ucsd DOT edu
What you are expected to do

- Read and think
- Write a weekly email commentary
- Complete four written projects
- Final exam
Mindware

Andy Clark
Philosopher of Cognitive Science
Cognition in the Wild
Additional articles available on the course web site

- The Evolution of Mental Metaphors in Psychology: a 90-year retrospective. Dedre Gentner and Jonathan Grudin
- Distributed Cognition, Edwin Hutchins
- Learning about Life, Mitchell Resnick
- Unsettling the Centralized Mindset, Peter Todd
- Today the earwig tomorrow man, David Kirsh
- Adapting the environment instead of oneself, David Kirsh
- Material Anchors for conceptual blends, Edwin Hutchins
- I see what you are saying: Action as cognition in fMRI brain mapping practice, Morana Alač and Edwin Hutchins,
Email Commentaries

• Weekly email on the assigned readings.
• To be submitted by email to your discussion section (e.g., 102a-A01@hci.ucsd.edu) 24 hours before your section meets.
• Should contain a question raised by the course material, or a description of an issue raised by the course material. See course web site for more details.
4 Projects

- Distributed cognition metaphor inventory 10
- Action-oriented representation 10
- Adapting the environment 10
- Case study in distributed cognition 30

- Each project requires reading, thinking, analysis, and writing
Final Exam

• Date: Friday, March 18, 11:30am – 2:30pm.
• Place: Here
• Format: Multiple choice
• Study guides: Last year’s midterm and final exams will be available on the course web site. You may wish to consult them periodically during the quarter.
Basis of your Grade

- Weekly Commentaries 20
- Projects 60
  - Distributed cognition metaphor inventory 10
  - Action-oriented representation 10
  - Adapting the environment 10
  - Case study in distributed cognition 30
- Final Exam 20
How to Succeed in this Course
Do the Readings

- Keep up with the reading schedule
- Read carefully and critically
- Use the guidance provided on the class website
- Submit commentaries on time
- THINK ABOUT WHAT YOU ARE READING!
Get a good Dictionary and use it

- Meanings
- Word choice
- Usage conventions
- Spelling
- Language is a social tool. Knowledge is power. Workout and get strong
The American Heritage Dictionary of the English Language

fourth edition
Spend some Time on the Course

- The registrar expects 12 hours per week for a 4 unit course!
Come to Lecture Sessions

- Clean, sober, and awake
- Do NOT sleep in class
- Cell phones OFF!
- Be here. No IM or web surfing in class
- If you don’t understand something, ASK for clarification.
Go To Section

- Discuss questions
- Clarify issues
- Get ideas for and help with projects
- Prepare for the final exam
Do the Projects

- Start ahead of time
- Be sure you understand the assignment
- Make your papers easy to read and understand
- PROOFREAD! Check spelling and grammar
- Turn projects in ON TIME
Visit Office Hours

• We are here to help you
• You (or your parents) are paying for our time
• Explore ideas
• Clarify assignments
Do NOT attempt to CHEAT!

- Do your own work. You are encouraged to talk to other students about ideas, but do not “borrow” material from other students.
- Do NOT look at your neighbor’s paper during the exam.
Be Creative

• Learning can be fun.
• This course is about ideas, not the memorization of facts.
• Ideas never stand alone. They are always related to other ideas. Explore the world of ideas.
Appreciate the Challenge of Cognitive Science

• Many of the central questions are still unanswered.

• Most of them relate directly to your daily life in some way. Be alert for connections to your own experience.
For Thursday

• Buy *Mindware* (At the bookstore: $26.65 New; $20.00 Used)
• Review the material on the course web site: http://hci.ucsd.edu/102a/
• In particular, consult reading guidance for Thursday’s assignment on web site schedule page
• Read these two papers (available on the web site)
  – Gentner and Grudin, “The Evolution of Mental Metaphors in Psychology: a 90 year retrospective.”
  – Hutchins, “IESBS Distributed Cognition”
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