
Psychology 354

Midterm Review

Exam format
Exam tips
Review of course to this point

Exam Format

- 10 definitions (choose from 12)
 - 3 marks each
 - 2 marks define the term
 - 1 mark say why term is interesting
 - Don't use point form!
- 1 essay (choose from 3)
 - 35 marks
 - 3-4 pages
 - Don't use point form
- Sample exam is on the website, with Week 8 material -- but based on old text!

Exam Tips

- Time pressure – budget your time
- Don't name drop
 - Don't name a term, and assume that by naming it I will think that you know what it means
- Don't fish
 - Don't regurgitate the whole course
 - Keep your answer focused
- Try to surprise me
 - Go beyond what I've told you to get full marks on the essay

Course Review: Step 1

- Scientific psychology seems very fragmented, because there does not seem to be a unifying theme that runs through it
 - Think of commonalities between Skinner and Freud

Course Review: Step 2

- Scientific psychology seems very fragmented, because there does not seem to be a unifying theme that runs through it
 - Think of commonalities between Skinner and Freud
- Cognitive science gave the hope of being far more unified, even though it spanned disciplines
 - Think of Miller's reaction to the 1956 conference

Course Review: Step 3

- Cognitive science gave the hope of being far more unified, even though it spanned disciplines
 - Think of Miller's reaction to the 1956 conference
- Why is cognitive science unified?
 - Cognition is information processing
 - Information processing requires multiple levels of investigation
 - Multiple levels of investigation require contributions from different, communicating, disciplines

Course Review: Step 4

- Why is cognitive science unified?
 - Cognition is information processing
 - Information processing requires multiple levels of investigation
 - Multiple levels of investigation require contributions from different, communicating, disciplines
- Unity in cognitive science came from one particular view of information processing, the digital computer
 - Cognitive science began as **classical** cognitive science, no apparent alternatives

Step 5: Classical CogSci

- Classical cognitive science sees cognition as the rule-governed manipulation of symbols
- Some key ideas:
 - Structure-process distinction
 - Turing machine
 - Recursion
 - Syntax
 - Key theories in language and problem solving (Chomsky, Newell, Simon)

Classical CogSci

Classical Cognitive Science	
Core Ideas	<ul style="list-style-type: none"> • Mind as a physical symbol system • Mind as digital computer • Mind as planner • Mind as creator and manipulator of models of the world • Mind as sense-think-act processing
Preferred Formalism	Symbolic logic
Tacit Assumption	Nativism, naive realism
Type of Processing	Symbol manipulation
Prototypical Architecture	Production system (Newell, 1973)
Prototypical Domain	<ul style="list-style-type: none"> • Language • Problem solving
Philosophical Roots	<ul style="list-style-type: none"> • Hobbes • Descartes • Leibniz • Craik
Some Key Modern Theorists	<ul style="list-style-type: none"> • Chomsky • Dennett • Fodor • Pylyshyn
Some Pioneering Works	<ul style="list-style-type: none"> • <i>Plans And The Structure Of Behavior</i> (Miller, Galanter, & Pribram, 1960) • <i>Aspects Of The Theory Of Syntax</i> (Chomsky, 1965) • <i>Human Problem Solving</i> (Newell & Simon, 1972)

Step 6: Classical Problems

- Between the 1950s and the 1980s, some researchers were frustrated with the slow pace of classical success
- It was argued that the digital computer metaphor was the fatal flaw
- Researchers argued that alternative views of information processing, views that moved away from symbol manipulation, were required

Step 7: Connectionist CogSci

- Connectionist cognitive science sees cognition as the messy pattern classification activities of brain-like networks
- Some key ideas:
 - Parallel distributed processing
 - Neuronal inspiration
 - Different kinds of networks (hidden units or not)
 - Learning as connection weight changes

Connectionist CogSci

Connectionist Cognitive Science	
Core Ideas	<ul style="list-style-type: none"> • Mind as information processor, but not as a digital computer • Mind as a parallel computer • Mind as pattern recognizer • Mind as a statistical engine • Mind as biologically plausible mechanism
Preferred Formalism	Nonlinear optimization
Tacit Assumption	Empiricism
Type of Processing	Pattern recognition
Prototypical Architecture	Multi-layer perceptron (Rumelhart, Hinton, & Williams, 1986)
Prototypical Domain	<ul style="list-style-type: none"> • Discrimination learning • Perceptual categorization
Philosophical Roots	<ul style="list-style-type: none"> • Aristotle • Locke • Hume • James
Some Key Modern Theorists	<ul style="list-style-type: none"> • J.A. Anderson • Hinton • Kohonen • McClelland
Some Pioneering Works	<ul style="list-style-type: none"> • <i>Principles Of Neurodynamics</i> (Rosenblatt, 1962) • <i>Parallel Models Of Associative Memory</i> (Hinton & Anderson, 1981) • <i>Parallel Distributed Processing</i> (McClelland & Rumelhart, 1986; Rumelhart & McClelland, 1986b)

Step 8: Embodied CogSci

- Embodied cognitive science sees cognition as controlling action on the world, not as planning
- Some key ideas:
 - Sense-act cycle
 - Embodiment
 - Situation
 - Extended mind
 - Abandoning central control and central representation

Embodied CogSci

Embodied Cognitive Science	
Core Ideas	<ul style="list-style-type: none"> Mind as controller of action Mind emerging from situation and embodiment, or being-in-the-world Mind as extending beyond skull into world Mind as sense-act processing
Preferred Formalism	Dynamical systems theory
Tacit Assumption	Embodied interaction
Type of Processing	Acting on the world
Prototypical Architecture	Behavior-based robot (Brooks, 1989)
Prototypical Domain	<ul style="list-style-type: none"> Locomotion Social interaction
Philosophical Roots	<ul style="list-style-type: none"> Vico Dewey Heidegger Merleau-Ponty
Some Key Modern Theorists	<ul style="list-style-type: none"> Brooks Clark Noë Wilson
Some Pioneering Works	<ul style="list-style-type: none"> <i>Cognition And Reality</i> (Neisser, 1976) <i>The Ecological Approach To Visual Perception</i> (Gibson, 1977) <i>Understanding Computers And Cognition</i> (Winston & Flores, 1987)

The Cognitive Sciences: Step 9

- When cognitive science arose, it was unified because it emerged from a single view of information processing
- Now it seems less unified
- There are three different views of cognition, resulting in three flavors of cognitive science
- What is the relation amongst them?
- Are there many cognitive sciences, or only one?
- The first half of the course has motivated these questions!

The Cognitive Sciences

Core Ideas	Classical Cognitive Science	Connectionist Cognitive Science	Embodied Cognitive Science
	<ul style="list-style-type: none"> Symbolic processing Mind as a program Mind as a computer Mind as a system Mind as a network Mind as a process Mind as a state Mind as a structure Mind as a function Mind as a mechanism Mind as a system Mind as a process Mind as a state Mind as a structure Mind as a function Mind as a mechanism 	<ul style="list-style-type: none"> Information processing Mind as a network Mind as a system Mind as a computer Mind as a network Mind as a process Mind as a state Mind as a structure Mind as a function Mind as a mechanism Mind as a system Mind as a process Mind as a state Mind as a structure Mind as a function Mind as a mechanism 	<ul style="list-style-type: none"> Mind as a network Mind as a system Mind as a computer Mind as a network Mind as a process Mind as a state Mind as a structure Mind as a function Mind as a mechanism Mind as a system Mind as a process Mind as a state Mind as a structure Mind as a function Mind as a mechanism
Preferred Formalism	Symbolic processing	Information processing	Embodied interaction
Tacit Assumption	Symbolic processing	Information processing	Embodied interaction
Type of Processing	Symbolic processing	Information processing	Embodied interaction
Prototypical Architecture	Symbolic processing	Information processing	Embodied interaction
Prototypical Domain	Symbolic processing	Information processing	Embodied interaction
Philosophical Roots	Symbolic processing	Information processing	Embodied interaction
Some Key Modern Theorists	Symbolic processing	Information processing	Embodied interaction
Some Pioneering Works	Symbolic processing	Information processing	Embodied interaction

Course Review: Other Steps?

- The summary just provided tells the story of the course from one perspective
- Other perspectives are possible – make up your own as you think about relationships between course topics
- Be prepared to tell a “big picture” story, and to defend that story with pertinent examples