

Review Sheet for SymbSys 100

Spring 05, Jurafsky & Richardson

Final Exam is on June 3rd, 3.30pm in 420:041

Here are the main points we'd like you to have learnt from each lecture and the associated readings.

The Turing test (3/29) and The Computational Model of the Mind 1 (3/31)

Turing's operational definition of thinking based on indistinguishability

Describe the conditions of the Turing test, and what Turing said could be claimed of something that passed the test.

The objections Turing envisioned and his responses

Modern arguments against the Turing test

Describe the targets of Searle's argument (strong AI, functionalism, Shank's scripts)

Describe the Chinese Room thought experiment

The replies to Searle's argument and his responses (systems, robot, brain simulator, combination, other minds, many mansions)

Define an algorithm

Describe a Turing machine, and what it can do

State diagrams of Turing machines

What is the halting problem?

The Computational Model of the Mind 2 (4/5)

How did behaviourism explain the mind?

How do Tolman's cognitive maps reveal a limitation to behaviourism

Characterize the symbolic account of mental representation (compositionality, systematicity, productivity)

Strengths of the symbolic approach

What is the goal of the CYC project? How does it represent knowledge?

Weaknesses of the symbolic approach

Characterize the embodied account of the mind

Give evidence for the embodied account from concept features, language processing, verb representations & social concepts,

Philosophy of Mind, John Perry (4/7)

Epiphenomenalism: There is no causal connection between qualia (conscious experience) and physical events (including neural activities).

Efficacism: Qualia carry certain functions in humans' cognitive processes; they play a causal role in cognitive activities like memory and decision-making.

Physicalism: Mental processes, including qualia, are physical and thus can interact with other physical processes such as perceptions of stimuli and bodily actions.

Dualism: Mind is not a physical process. Neo-dualism acknowledges that some mental properties can be reduced to physical processes, but maintains that qualia/intentional

properties are not physical.

Chalmers' zombie argument: A "zombie" is a creature that is physically and behaviorally identical to a human, but lacks qualia (conscious experience); an I-zombie world is a world of zombies which cannot be distinguished from the actual world on physical grounds. Chalmers argues that, since an I-zombie world, is logically possible, qualia should not be playing any causal role in human behavior.

Give the reasons to hold and the reasons to reject each of these positions (Epiphenomenalism, mental efficacy, Physicalism, Dualism)

Bridging Mind and Brain (4/12)

How can mind and brain states be logically related using: Donder's reaction time studies, brain damaged patients, brain imaging

What are the limitations and problems with linking mind and brain states (plasticity, feedback, identifying the right mental states)

Explain Marr's three levels of analysis, and why it is a useful model for explanations in cognitive science

Describe Marr's levels in regards to sound localization and coding of natural scenes

Churchland and Grush suggested there were 2 main ways to "represent" the brain:

 "Computation": relies on CS principles, problems with being serial, "top-down"

 "Signal Processing": tries to emulate neurobiological system, tries parallel processing, "bottom-up"

Historically, according to Illing, what are some of the different roles people have ascribed to the brain? (e.g., Egyptian view, brain is not important; Descartes, pineal gland is seat of the soul)

Language and Thought, Lera Boroditsky (4/14)

What is the Whorfian Hypothesis? linguistic relativism?

How do/could the following aspects of language shape thought? How have these been demonstrated?

-Orthography

-Phonology

-Lexical Items

-Grammar (gender, tense-marking, word-order)

-Metaphor

-Narrative style

-Direction words

How does knowing multiple languages influence a speaker? What will she encode?

How has verbal interference been used to study polyglots?

Perceptual Illusions (4/21)

What sort of things can illusions tell you about the perceptual system?

How do motion and colour after effects demonstrate inhibitory connections, direction and orientation selective cells, cell fatigue

Explain how receptive fields might account for the Herman grid illusion. What's the problem with this explanation?

Top-down effects on perception: how can experience or knowledge of gravity, faces,

lightness and shading, and geometry of rooms affect perception?

Ramachandran & Rogers-Ramachandran showed that we have learned to interpret shaded 2D drawing to be 3D

Give experimental evidence that what we see influences what we hear (Calvert et al)

William Newsome (4/26)

Visual Cortex is highly organized: specific columns for direction detections

Direction selectivity can be observed through RECORDING while monkey watches moving dots of varying direction and coherence

STIMULATION of direction selective cells can change monkey's response pattern

But, difficult to tell what the monkey actually feels

Nagel: If a non-human organism (i.e. a bat) has conscious experience, it is impossible for us to know what it is like to be that organism.

The Goal of Perception (4/28)

What is the 'picture in the head' view of vision

How is does the anatomy and behaviour of the of the eye make it different from a digital camera (fovea, blindspot, poor periphery, frequent movement)

"Though the eye may not be optimal for such a task, the goal of perception is to form an accurate internal representation of the external world" – how is this challenged by the gorilla experiment, the door study and the flickering pictures?

What are the possible explanations for change blindness? Why might airline pilots be more likely than novices at noticing changes in a flight simulator

Churchland et al: Interactive Vision can give a better account than Pure Vision for visual perception and visual learning, and is supported through evidence in neuroanatomy and neurophysiology

Active Vision and Artificial Life (5/3)

Contrast the 'picture in the head' or 'pure vision' view with the 'active vision' view
Explain experimental demonstrations of 'offloading' computations onto the external world (Block moving task, Hollywood squares, Tetris)

Give examples of behaviour being guided by sensorimotor contingencies or patterns of change (Alien hands, tactile visual stimulation, Kohler's prisms)

Contrast the (a) goals (b) methods of classical artificial intelligence with Brooks' 'artificial life'

Language Processing (5/5)

Give examples of semantic, syntactic & phonetic ambiguities

What does shadowing show?

Why is phone perception difficult?

Restoration effect - phoneme perception in context

What is the McGurk effect?

What did Shillock show with a cross-modal priming / lexical decision task?

Explain what the candy/candle experiment showed

What can we conclude from Swinney's experiments on lexical ambiguity

Give examples of different speech acts

Metaphor (5/10)

What is metaphor?

What is metonymy?

What are the "target" and "source" of a metaphor?

Describe the conduit metaphor and give some examples

What is the folk theory of anger that Lakoff refers to, and what are some example data that argues for this theory?

What are some different metaphors for time and how are these metaphors similar and different?

Conversation (5/12)

What is a Gricean Maxim?

What is the Maxim of Relevance? What is an example of it in use?

What is the Maxim of Manner? What is an example of it in use?

What is the Maxim of Quantity? What is an example of it in use?

What is the Maxim of Quality? What is an example of it in use?

What is a presequence?

What is a turn?

How do conversations tend to open ?

How do conversations tend to close ?

What are "uh" and "um" used for in English and what is the difference between them?

What is a 'continuer'?

What is 'collaborative completion'

Reasoning and Decision Making (5/17)

What is the difference between the bounded rationality approach and unbounded rationality approach?

What is a Bayesian model?

Contrast Aristotle and Mill's view of human decision making with Bernoulli and Kahneman & Tversky

Explain the recognition heuristic and its ecological rationality

Give an example of the conjunction fallacy, explaining why it is irrational and why it is nonetheless made

Give an example of base rate neglect

Show how framing differences demonstrate that people do not make judgements based on utility alone

What does the s-curve of value predict about human decision making?

What is the evolutionary psychology explanation of biases in human decision making?

What advantages might 'fast and frugal' heuristics have?

Cognitive Development – Natasha Kirkham (5/19)

Why should we study infants?

How can we test infants?

What is habituation? dishabituation? What does it show?

What is "violation of expectation"?

Understand nativist and constructivist positions and problems

What is 'object permanence'? What are the different ways it can be tested?
How does the 'rod and box' experiment demonstrate infants' understanding of occlusion?
What does the A-not-B experiment demonstrate?
What is inhibition?
What does the card sort experiment show about children's ability to follow rules?

Machine Learning and Neural Networks (5/24)

What is a McCulloch Pitts neuron?
What is a feedforward network?
What is linear separability?
What is the XOR problem and why couldn't single-layer perceptrons solve it?
What is supervised learning?
What is unsupervised learning?
What is reinforcement learning?
What is a training set and how is it different than a test set?
What is a decision tree? give an example of a decision tree for some problem

Nativism vs Empiricism and Language Learning (5/26)

Rationalism and Empiricism
What is Plato's problem?
How does LSA learn word meanings?
Understand and be able to give examples of the vector model of meaning
How does LSA compute the meaning of a passage from the meaning of the individual words
Describe the experiment that displays LSA's model of word similarity via having LSA take the TOEFL test
How does LSA grade essays?
What are some problems with LSA?

Evolution of Mind (5/31)

What is the Wason card problem, and how might it reflect evolved cognitive faculties?
Give some examples of evolutionary explanations for aspects of human behaviour
What are some of the challenges to evolutionary psychology?
What is the Great Leap Forward?