CMPE 489 Special Topics: Cognitive Science SYLLABUS

Course Description:

CMPE 489  Special Topics: Cognitive Science (Bilişsel Bilim) (3+0+0) 3 AKTS 6
Introduction of basic concepts, approaches and issues in the field of cognitive science to increase the awareness of the students to the questions raised in the disciplines of computer science, linguistics, philosophy and psychology; focus on the interaction of these disciplines in approaching the study of the mind; specialization on topics central to cognitive science such as the nature of mental representation, reasoning, perception, language use, learning as well as other cognitive processes of humans and other intelligent systems.

Syllabus:
The course will have no main textbook, but roughly the following topics and readings week by week:

Week 1: Introduction to Cognitive Science
Introduction to the study of cognitive sciences. A brief history of cognitive science. Methodological concerns in philosophy, artificial intelligence and psychology.

- One Hundred Year Study on Artificial Intelligence (AI100), Stanford University, accessed August 1, 2016
- “ARTIFICIAL INTELLIGENCE AND LIFE IN 2030" [https://ai100.stanford.edu/2016-report](https://ai100.stanford.edu/2016-report)
- Nilsson, The Quest for Artificial Intelligence. (optional)

Week 2: Psychology, Nervous system and brain
Structure and constituents of the brain; Brief history of neuroscience; Mathematical models; Looking at brain signals

- Atkinson et al., Intro. To Psychology, chap 2 (optional)
- O’Shea, The Brain: A very short introduction, chap 2,3 (optional)
- Sajda, Neural Networks (optional)
**Week 3: Brain and sensorymotor information:**

Processing of sensory information in the brain;

- Lecture notes for McCullogh-Pitts and Rosenblatt Neural Networks:
  http://ecee.colorado.edu/~ecn4831/lectures/NNet2.html
- "Neural Networks" chapter of "Encyclopedia of the Human Brain" by Paul Sajda (optional)
- "Neuroimaging" chapter of "Encyclopedia of the Human Brain" by Ganis and Kosslyn (optional)
- O’Shea, The Brain: A very short introduction, chap 5 (optional)
- Stein et al., Multisensory integration (optional)

**Week 4: Representation of sensory information:**

Neural Network Models; Processing of sensory information in the brain; motor and sensory areas; Brain Imaging, fMRI, MEG, PET, EEG,

- Imaging: Brain Mapping Methods, JOHN C. MAZZIOTTA, RICHARD S. J. FRACKOWIAK
- Representation of sensory information: Neural Network Models; Processing of sensory information in the brain; motor and sensory areas;

**Week 5: From Sensation to Cognition; Roots of Cognitive Science:**

Multisensory integration in cortex; information fusion; from sensation to cognition, cybernetics; From physics to meaning; Analog vs. Digital: Code duality

- Dupuy, On the origins of cognitive science, chapters 1,2

**Week 6: Language**

What is language?; Linguistic knowledge: Syntax, semantics, (and pragmatics); Generative linguistics; Brain and language; Language disorders; Lateralization; The great past tense debate

- Introduction to Psychology, Chapter 2, Asymmetries in the brain
- Caplan, Neural Basis of Language (optional)
Week 7: Embodiment
Cognitivist and emergent standpoints; A robotic perspective
• Ziemke, What’s that Thing Called Embodiment? 2003
• Calvo & Gomila, “Handbook of cognitive science”, 2008

Week 8: Affordances in biological and artificial systems
Affordances, direct perception, Ecological Psychology, affordance learning in robotics

Week 9: Cognitive Development
Development, child and robotic development
• Introduction to Psychology, Chapter 3, pg. 68-86.

Week 10: Attention
Attention and related concepts; Human visual attention; Computational models of attention; Applications of computational models of attentional
• Vecera & Luck, Attention, Encyclopedia of the Human Brain, Pages 269-284,
• Knudsen, Fundamental concepts of attention, Annual Review of Neuroscience, 2007. 30:57–78

Week 9: Learning
Categories and concepts; Concept learning; Logic; Machine learning
• E. Alpaydın, Intro. to Machine Learning, Chapter 1&2

Week 10: Memory
Constructing memories; Explicit vs. implicit memory; Information processing (three-boxes) model of memory; Sensory memory; Short term memory; Long term memory
• Atkinson&Hilgard's Introduction to Psychology, Chapter 8, Memory
• Miller, George A. "The magical number seven, plus or minus two: some limits on our capacity for processing information." Psychological review 63.2 (1956): 81.

**Week 11: Reasoning**
Rationality; Bounded rationality; Prospect theory; Heuristics and biases; Reasoning in computers

• Atkinson et al., Intro. To Psychology, chapter 9
• Hertwig & Todd, Heuristics (optional)
• Simon, Bounded Rationality in Social Science: Today and Tomorrow, Mind & Society, 1, 2000, 25-39. (optional)

**Week 12: Social Cognition**
Key points in social cognition; Context and social judgment; Schemas; Social signals

• Kasslin, chap 11: Social and Cultural Influences
• Week 13 & 14: Project presentations