February 6

- What is recognition and why is it hard?
- Class overview
- Class requirements

Bird’s eye-view of 9.67

Feb. 8 – Mar. 6: Experimental studies of recognition
Mar. 8 – Apr. 3: Computational studies of recognition
Apr. 5 – Apr. 26: Face recognition
May 1 – May 10: Synthesis and open issues
May 15 – May 17: Project presentations

February 8

- Pattern recognition by invertebrates
  1. How do honey bees recognize shapes?
  2. How do bees and ants use their recognition abilities to navigate?

February 8 (contd.)

- Pattern recognition by invertebrates
  How do octopii recognize shapes?

February 8 (contd.)

- Pattern recognition by robots modeled on invertebrates

Student presentation:
How can we enable a robot to navigate based on insect recognition strategies?

February 13

- Pattern recognition by birds
  1. Can birds recognize and categorize complex shapes/scenes?
  2. What recognition strategies do birds use?
February 13 (contd.)
- Pattern recognition by birds

Student presentation:
1. Recognition of individuals in a gull colony
2. Recognition by chicks of mother’s beak via key-signs
3. Pigeons’ recognition of Monet and Picasso paintings

February 15
- Object recognition by humans (psychophysics)

1. What are the key characteristics of human recognition performance (speed, viewpoint/orientation dependency, reliance on prototypes…)?

Student presentation:
Can human observers recognize highly impoverished motion sequences?

February 15 (contd.)
- Object recognition by humans (psychophysics)

February 20
- No Class.

February 22
- Object recognition by primates (physiology)

1. Does the brain have areas specialized for recognition?
2. Are there different functional streams in the brain for recognition and spatial analysis?

Student presentation:
What have functional imaging studies told us about brain mechanisms of recognition?

February 22 (contd.)
- Object recognition by primates (physiology)

2:00 pm:
DiCarlo talk in E25–40
Brain mechanisms of recognition
February 27
- Object recognition deficits following brain damage in primates
  1. What have lesion studies in monkeys told us about brain mechanisms of recognition?
  2. What are the basic characteristics of visual agnosias and how are they correlated with the nature of damage?

February 27 (contd.)
- Object recognition deficits following brain damage in primates
  Student presentation:
  A case study of visual agnosia
  ('The man who mistook his wife for a hat')

March 1
- Beyond individual object recognition
  1. How do humans recognize large scenes?
  2. Does scene-context influence individual object recognition? Can we formalize a model of contextual influences?
  3. What is the role of eye-movements in scene perception?

March 1 (contd.)
- Beyond individual object recognition
  Student presentation:
  How are scenes encoded in memory? – studies using the 'change-blindness' paradigm.

March 6
- Development of object perception
  1. Can babies parse the visual world into objects?
  2. How and when do babies acquire knowledge of object properties?

March 6 (contd.)
- Development of object perception
  Student presentation:
  Case study of sight recovery in adulthood
  (“To see and not see”, Oliver Sacks)
March 8
- Classical pattern classification theory
  1. Bayes decision theory
  2. Supervised and unsupervised learning

March 8 (contd.)
- Classical pattern classification theory
  Student presentation:
  Case study of statistical pattern classification:
  A trainable tool for finding small volcanoes in SAR Imagery of Venus

March 13
- Computational theories of object recognition
  1. Theories based on 3D object models
  2. Theories based on 2D image models
     (alignment approach; linear combination of views)

March 13 (contd.)
- Computational theories of object recognition
  Student presentation:
  Case study – Brook’s ACRONYM system of recognition based on 3D models and symbolic reasoning.

March 15
- Computational theories of object recognition
  Sinha in Arlington, VA
  Student presentation:
  Using linear object models for recognition

March 20
- Image and model correspondence
  1. How can we determine the matching features in images and models?
  2. How can we segment images into objects and objects into parts?
March 20 (contd.)
- Image and model correspondence

Student presentation:
Segmentation via saliency computations

March 22
- Network models of object recognition

1. Feedforward models of recognition (Fukushima, RBFs)
2. Feedback models of recognition (Ullman)

March 22 (contd)
- Network models of object recognition

Student presentation:
A particular network model of recognition – Mumford’s scheme.

March 27
- Spring Break

March 29
- Spring Break

April 3
- Notable case studies of artificial recognition schemes

1. The first artificial recognition system (Roberts)
2. Histogram based recognition (Swain and Ballard)
April 3 (contd.)
- Notable case studies of artificial recognition schemes
  
  **Student presentation:**
  PCA based recognition (Shree Nayar)

April 3 (contd.)
- Notable case studies of artificial recognition schemes
  
  **Guest presentation:**
  Recognition schemes used in the industrial vision systems (Cognex Corp.)

April 5
- Midterm exam

April 10
- Face recognition vs. general object recognition
  
  Are faces special? (Evidence from physiology, neuropsychology, Psychophysics, imaging and developmental studies)

April 10 (contd.)
- Face recognition vs. general object recognition
  
  **Student presentation:**
  Are faces special? Psychophysics and imaging with dog experts

April 12
- Face recognition studies
  
  1. Is face recognition feature-based or holistic?
  2. What are the salient shape and surface cues in a face?
April 12 (contd.)
- Face recognition studies

**Student presentation:**
What can facial caricatures tell us about face recognition processes?

April 17
- Patriot’s Day (no class)

April 19
- Social aspects of face recognition

*Sinha in Research Directors’ Conference?*
How do we perceive facial affect, gaze direction, and aesthetics?

April 19 (contd.)
- Social aspects of face recognition

*Sinha in Research Directors’ Conference?*

**Student presentation:**
Do babies prefer attractive faces?

April 24
- Psycho-forensic aspects of face recognition

1. What are the forensic applications of facial recognition research?
2. Can people be trained to be better encoders of faces?

April 24 (contd.)
- Psycho-forensic aspects of face recognition

**Student presentation:**
- What are the current facial composite creation systems?
- Can they be improved based on research results?
April 24 (contd.)
- Psycho-forensic aspects of face recognition

**Guest presentation:**
A demonstration of the IdentiKit system by a local police artist

April 26 (contd.)
- Implemented systems for face recognition

**Student presentation:**
Other biometric systems:
Iris recognition
Retina recognition
Face recognition in IR
Ear recognition

April 26
- Implemented systems for face recognition
An examination of a few notable systems:
Turk’s Eigenface based system
Von der Marlsburg’s graph based system
Beymer’s template based system

May 1
- Closing the loop between recognition and perception

1. Can recognition influence early perception? – historical ideas
2. Is there any experimental evidence to support this idea?

May 1 (contd.)
- Closing the loop between recognition and perception

**Student presentation:**
A model for incorporating recognition based influences in early perception.

May 3
- Grand synthesis

1. Might different sensory modalities share similar recognition strategies?
2. What are the key open questions in the area of recognition?
May 8
- Vision Sciences Meeting, Sarasota
  No class

May 10
- Object recognition research at MIT

What are the opportunities for research in high-level vision
In BCS and the AI lab?

May 10 (contd.)
- Object recognition research at MIT

Student presentation:
Object recognition research at other universities

May 15
- Project presentations

May 17
- Project presentations

Last day
Of class