

## February 6

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

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## 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

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## 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?

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## February 8 (contd.)

- Pattern recognition by invertebrates

How do octopii recognize shapes?

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## 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?

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## February 13

- Pattern recognition by birds

1. Can birds recognize and categorize complex shapes/scenes?
2. What recognition strategies do birds use?

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## 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

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## February 15

- Object recognition by humans (psychophysics)

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

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## February 15 (contd.)

- Object recognition by humans (psychophysics)

**Student presentation:**

Can human observers recognize highly impoverished motion sequences?

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## February 20

- No Class.

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## 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?

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## February 22 (contd.)

- Object recognition by primates (physiology)

**Student presentation:**

What have functional imaging studies told us about brain Mechanisms of recognition?

**2:00 pm:**

DiCarlo talk in E25-401

*Brain mechanisms of recognition*

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## 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?

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## 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’)

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## 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?

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## March 1 (contd.)

- Beyond individual object recognition

**Student presentation:**

How are scenes encoded in memory? – studies using the  
‘change-blindness’ paradigm.

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## 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?

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## March 6 (contd.)

- Development of object perception

**Student presentation:**

Case study of sight recovery in adulthood  
(‘To see and not see’, Oliver Sacks)

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## March 8

- Classical pattern classification theory

1. Bayes decision theory
2. Supervised and unsupervised learning

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## 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

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## 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)

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## 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.

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## March 15

- Computational theories of object recognition

*Sinha in Arlington, VA*

**Student presentation:**

Using linear object models for recognition

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## 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?

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## March 20 (contd.)

- Image and model correspondence

**Student presentation:**  
Segmentation via saliency computations

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## March 22

- Network models of object recognition

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

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## March 22 (contd)

- Network models of object recognition

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

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## March 27

- Spring Break

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## March 29

- Spring Break

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## April 3

- Notable case studies of artificial recognition schemes

1. The first artificial recognition system (Roberts)
2. Histogram based recognition (Swain and Ballard)

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## April 3 (contd.)

- Notable case studies of artificial recognition schemes

**Student presentation:**

PCA based recognition (Shree Nayar)

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## April 3 (contd.)

- Notable case studies of artificial recognition schemes

**Guest presentation:**

Recognition schemes used in the industrial vision systems  
(Cognex Corp.)

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## April 5

- Midterm exam

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## April 10

- Face recognition vs. general object recognition

Are faces special? (Evidence from physiology, neuropsychology,  
Psychophysics, imaging and developmental studies)

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## April 10 (contd.)

- Face recognition vs. general object recognition

**Student presentation:**

Are faces special? Psychophysics and imaging with dog experts

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## 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?

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## April 12 (contd.)

- Face recognition studies

**Student presentation:**

What can facial caricatures tell us about face recognition processes?

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## April 17

- Patriot's Day (no class)

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## April 19

- Social aspects of face recognition

*Sinha in Research Directors' Conference?*

How do we perceive facial affect, gaze direction, and aesthetics?

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## April 19 (contd.)

- Social aspects of face recognition

*Sinha in Research Directors' Conference?*

**Student presentation:**

Do babies prefer attractive faces?

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## 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?

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## 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?

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## April 24 (contd.)

- Psycho-forensic aspects of face recognition

**Guest presentation:**

A demonstration of the IdentiKit system by a local police artist

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## 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

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## April 26 (contd.)

- Implemented systems for face recognition

**Student presentation:**

Other biometric systems:

Iris recognition

Retina recognition

Face recognition in IR

Ear recognition

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## 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?

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## May 1 (contd.)

- Closing the loop between recognition and perception

**Student presentation:**

A model for incorporating recognition based influences in early perception.

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## 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?

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**May 8**

- Vision Sciences Meeting, Sarasota  
No class

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**May 10**

- Object recognition research at MIT

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

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**May 10 (contd.)**

- Object recognition research at MIT

**Student presentation:**  
Object recognition research at other universities

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**May 15**

- Project presentations

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**May 17**

- Project presentations



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