Introduction to Visual Recognition

➡️ General visual recognition
        importance for intelligence? challenges?

Face recognition
        importance for intelligence? challenges?

Rapid object categorization

How good are we at recognizing faces?
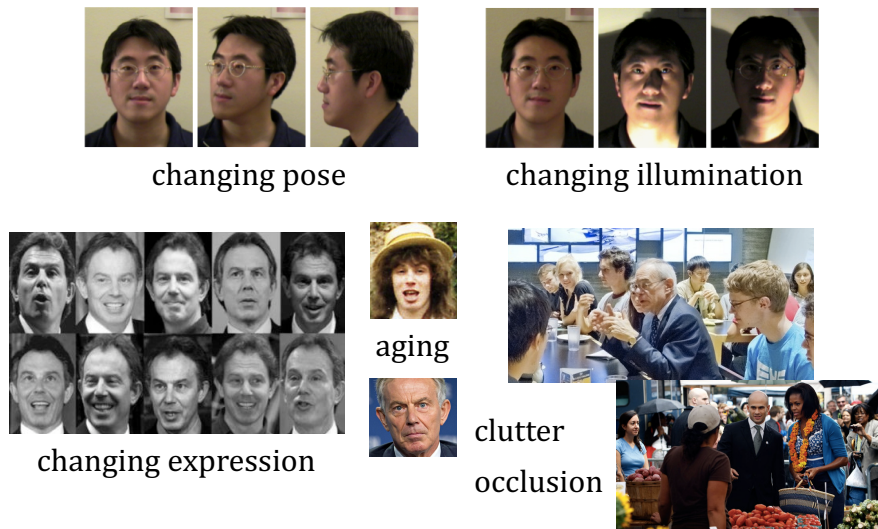
How good are the best machines?
        taste of machine learning
        applications of face recognition

What can we recognize from vision?

Slide by Fei-Fei, Fergus, Torralba

"Understanding vision and building visual systems is really understanding intelligence"
        – Fei-Fei Li

Why is visual recognition difficult?

Fei-Fei Li

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→ Face recognition
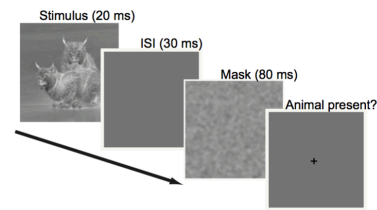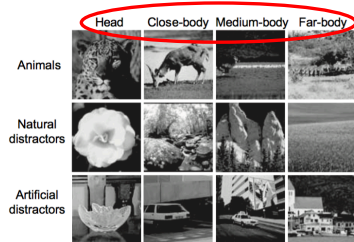importance for intelligence? challenges?

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Why are faces important for intelligence?
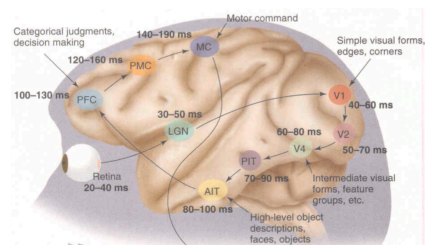

Why is face recognition hard?

changing pose

changing illumination

changing expression

aging

clutter
occlusion

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Rapid object categorization

Serre et al. (2007)

- 1,200 images, half contain animals and half are "distractors"
- respond as quickly as possible: does the image contain an animal or not?
- human subjects were ~80% correct

It takes about 100 ms for visual signals
from the eye to reach the first cortical
areas engaged in object/face recognition

Thorpe & Fabre-Thorpe (2001)

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➡ How good are we at recognizing faces?

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How good are we at face recognition?

Jenkins, White, Van Montfort & Burton, *Cognition*, 2011

Cambridge face memory test

~ 20 minutes

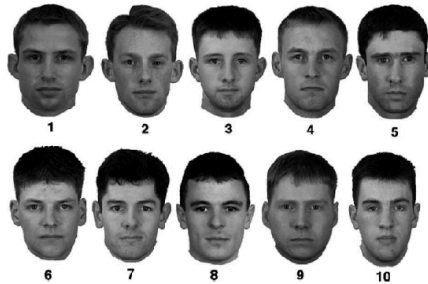# Famous faces memory test
testmybrain.org

Face recognition performance in humans

Which of the 10 photos on the bottom depicts the target face?

Viewers are ~ 70% correct

Performance degrades with changes in pose & expression

Importance of familiar vs. unfamiliar face recognition!

Bruce et al., 1999

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How good are the best machines?

Public databases of face images to test performance:

Labeled Faces in the Wild (LFW)
> 13,000 celebrity images, 5,749 identities

YouTube Faces Database (YTF)
3,425 videos, 1,595 identities

same person?

Private face image datasets used to "train" face recognition systems:

(Facebook) Social Face Classification dataset
4.4 million face photos, 4,030 identities
(Google) 100-200 million face images, ~ 8 million identities

	LFW	YTF
Facebook DeepFace	97.4%	91.4%
Google FaceNet	99.6%	95.1%
Human performance	97.5%	89.7%

False accept   False reject

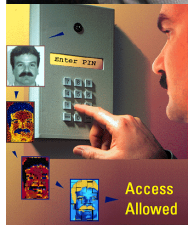# Machine vision applications of face recognition

security, forensics

access control

surveillance

More applications of face recognition
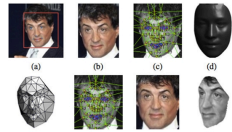
content-based image retrieval

social media

graphics, HCI
humanoid robots

Faces are everywhere...