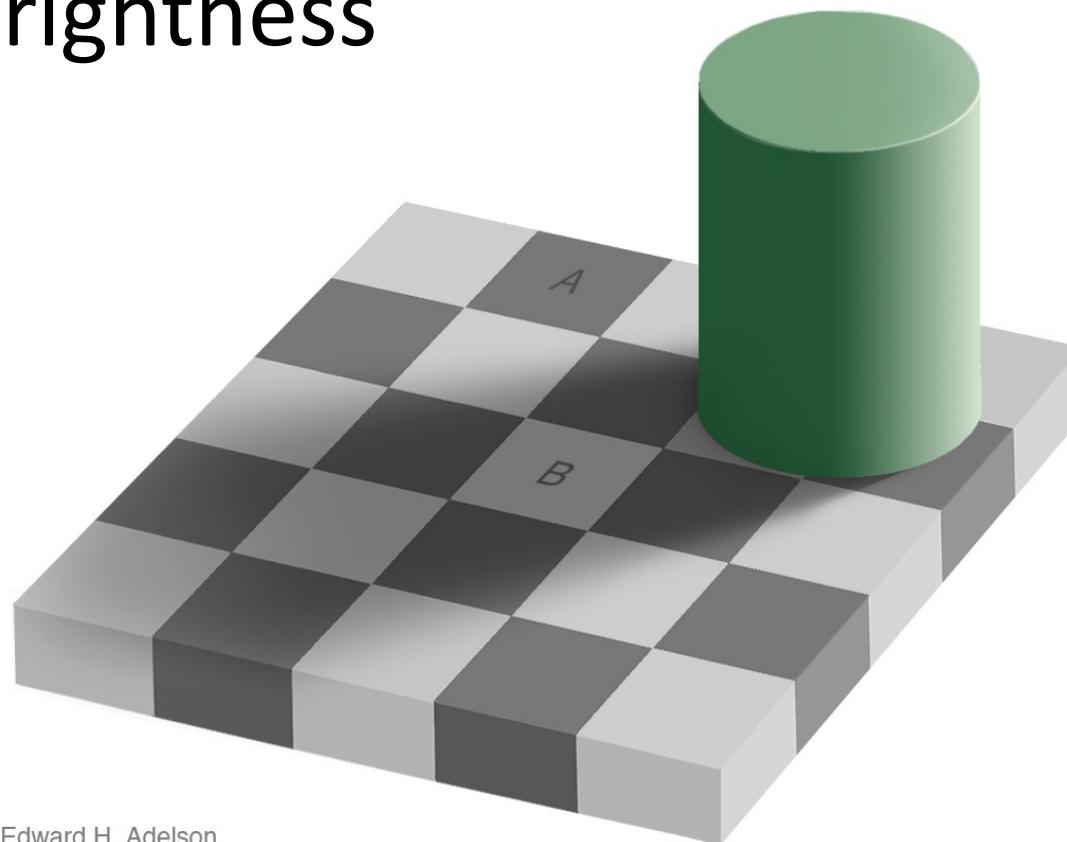


Measurement

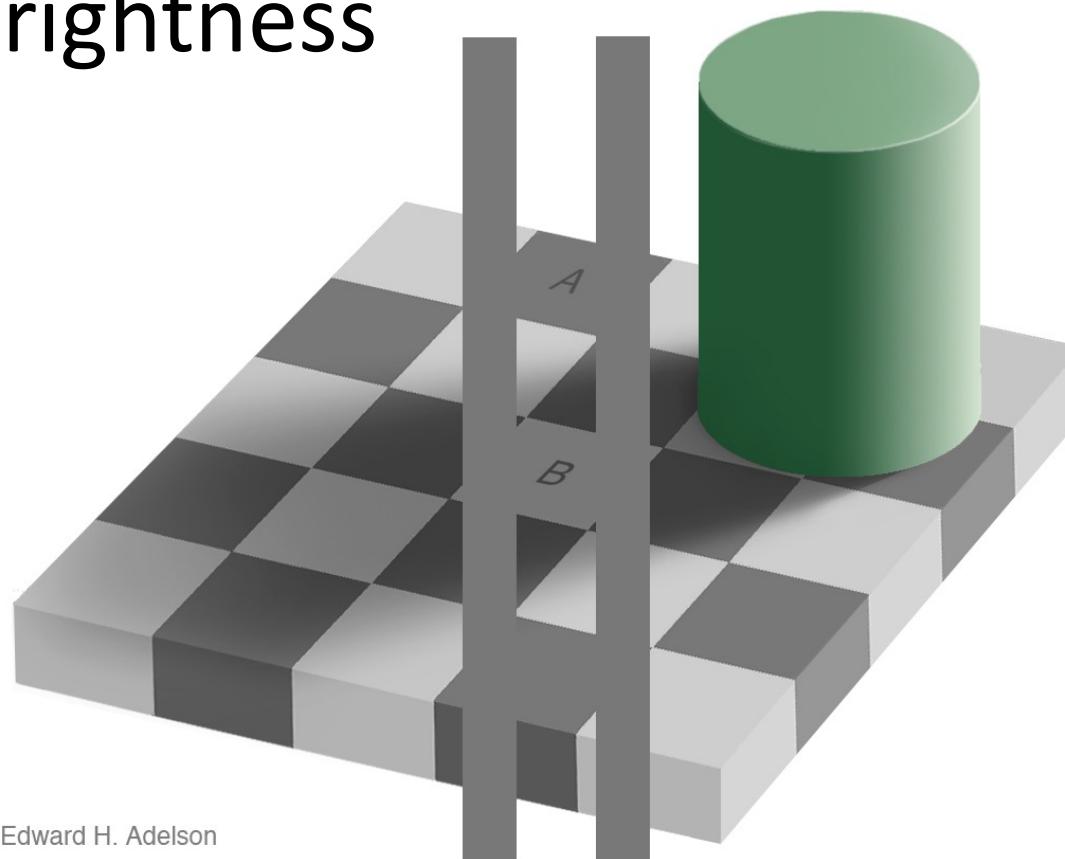
Brightness



Edward H. Adelson

Measurement

Brightness

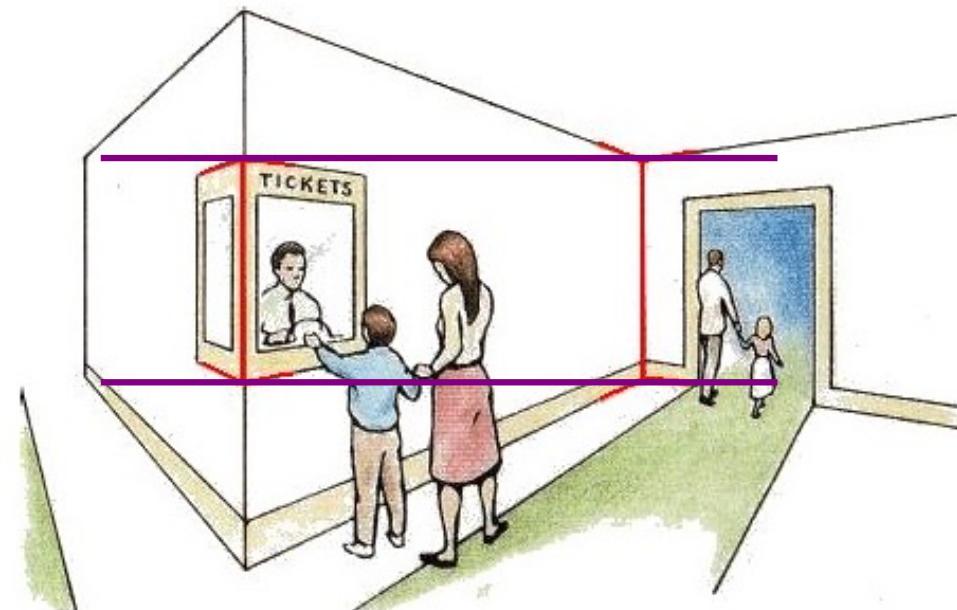


http://www.newworldencyclopedia.org/entry/Same_color_illusion

Slide Credit: Alyosha Efros²

Measurement

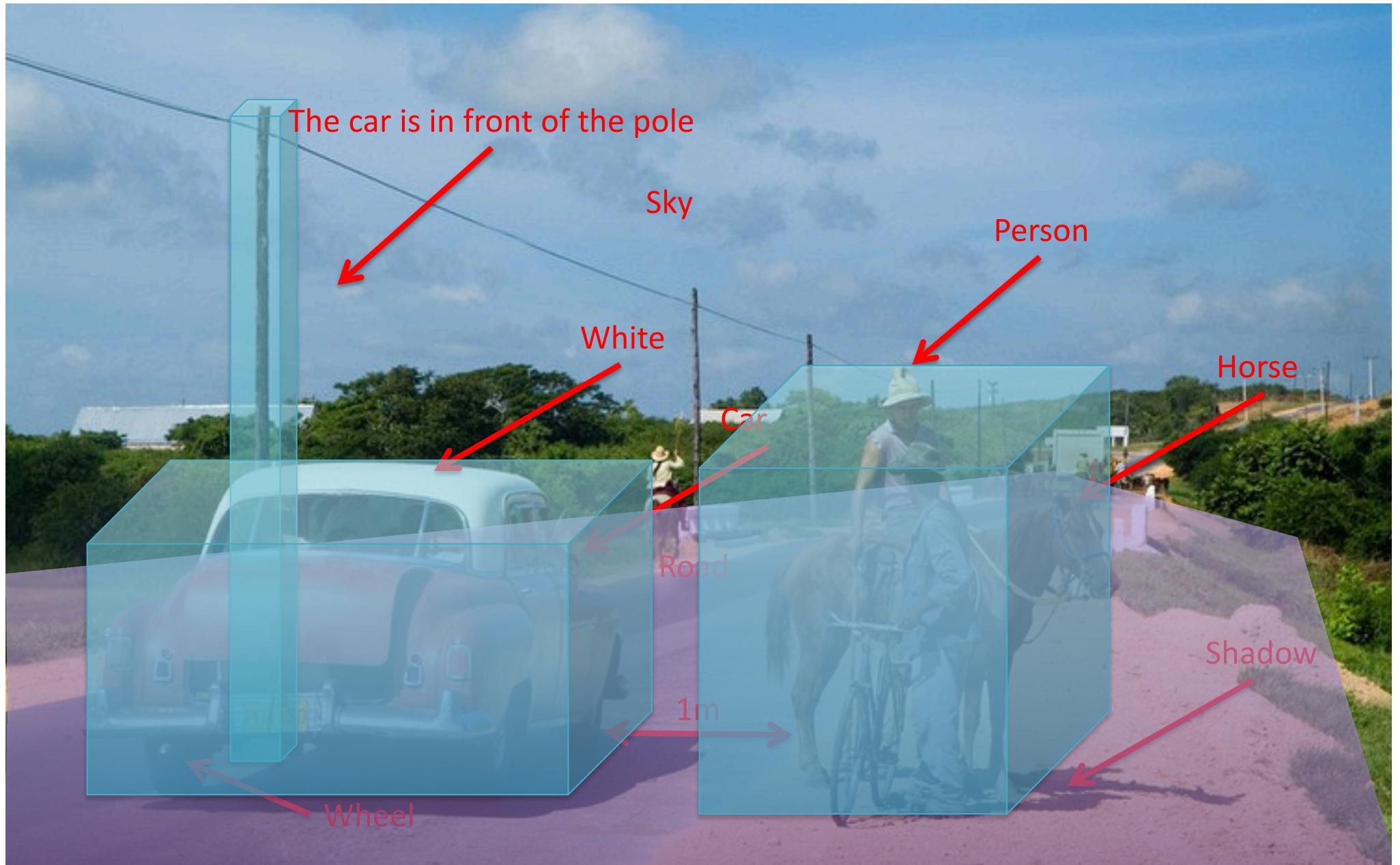
Length



Müller-Lyer Illusion

http://www.michaelbach.de/ot/sze_muelue/index.html

Slide Credit: Alyosha Efros³



Computer Vision

- **Low Level Vision**
 - Measurements
 - Enhancements
 - Region segmentation
 - Features
- **Mid Level Vision**
 - Reconstruction
 - Depth
 - Motion Estimation
- **High Level Vision**
 - Category detection
 - Activity recognition
 - Deep understandings



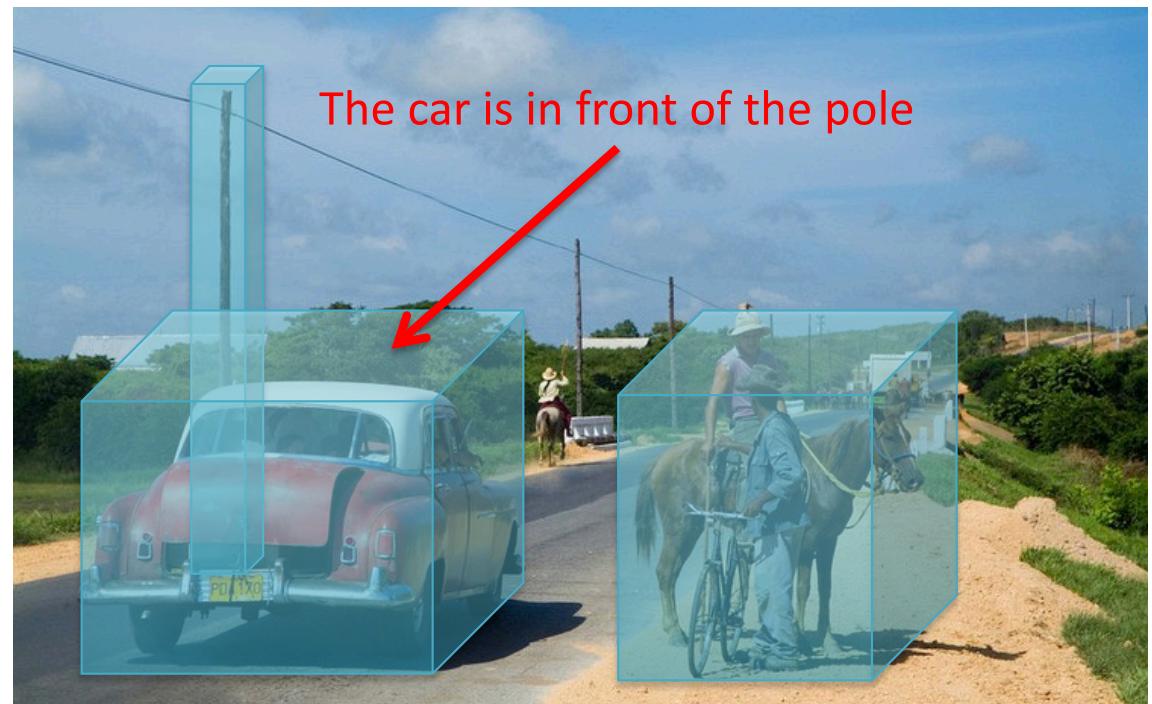
Computer Vision

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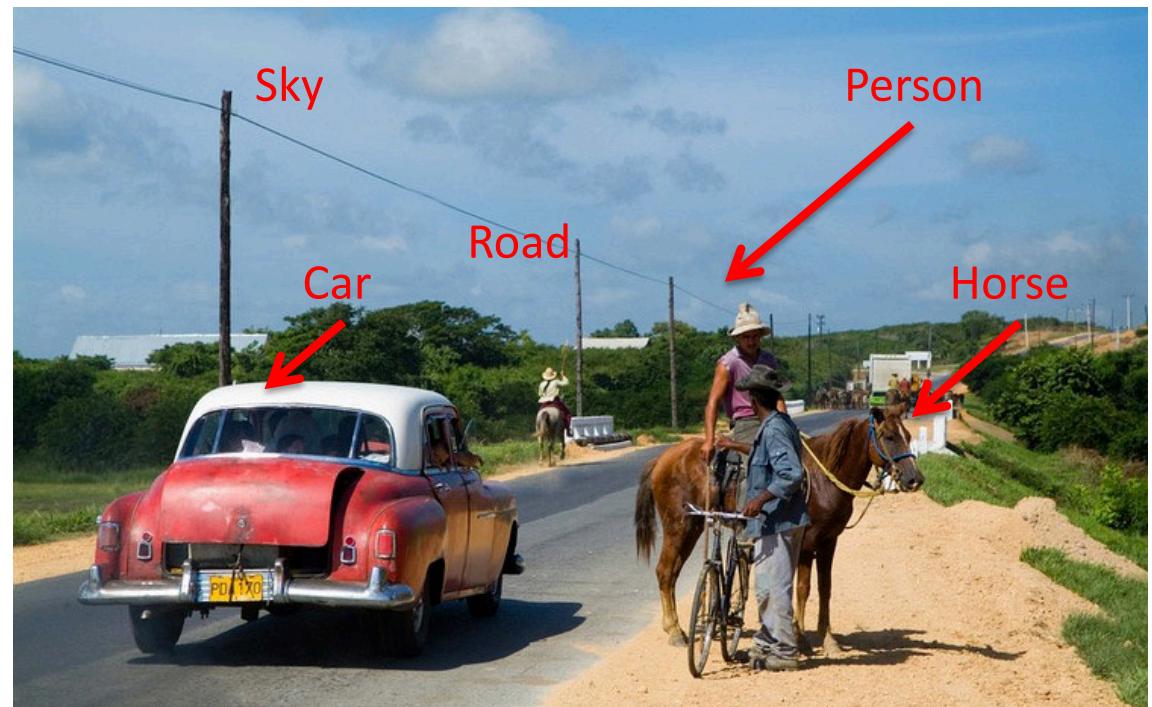
Computer Vision

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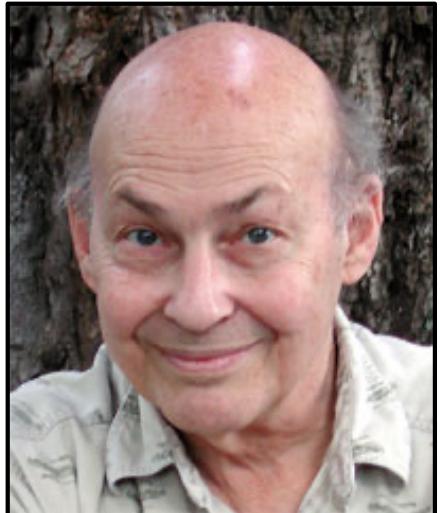


Computer Vision

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 - Deep understandings
 - Pose estimation



How hard is computer vision?



Marvin Minsky, MIT
Turing award, 1969

“In 1966, Minsky hired a first-year undergraduate student and assigned him a problem to solve over the summer: connect a television camera to a computer and get the machine to describe what it sees.”

Crevier 1993, pg. 88

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
PROJECT MAC

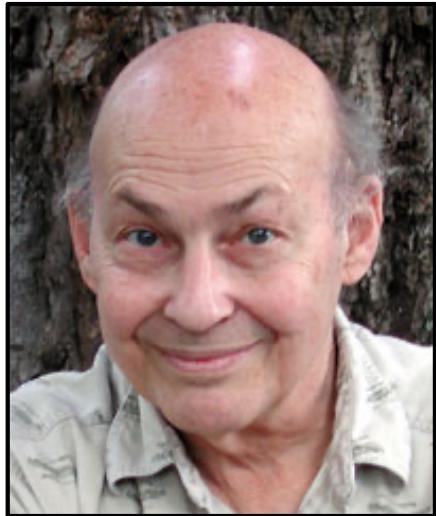
Artificial Intelligence Group
Vision Memo. No. 100.

July 7, 1966

THE SUMMER VISION PROJECT

Seymour Papert

The summer vision project is an attempt to use our summer workers effectively in the construction of a significant part of a visual system. The particular task was chosen partly because it can be segmented into sub-problems which will allow individuals to work independently and yet participate in the construction of a system complex enough to be a real landmark in the development of "pattern recognition".



Marvin Minsky, MIT
Turing award, 1969



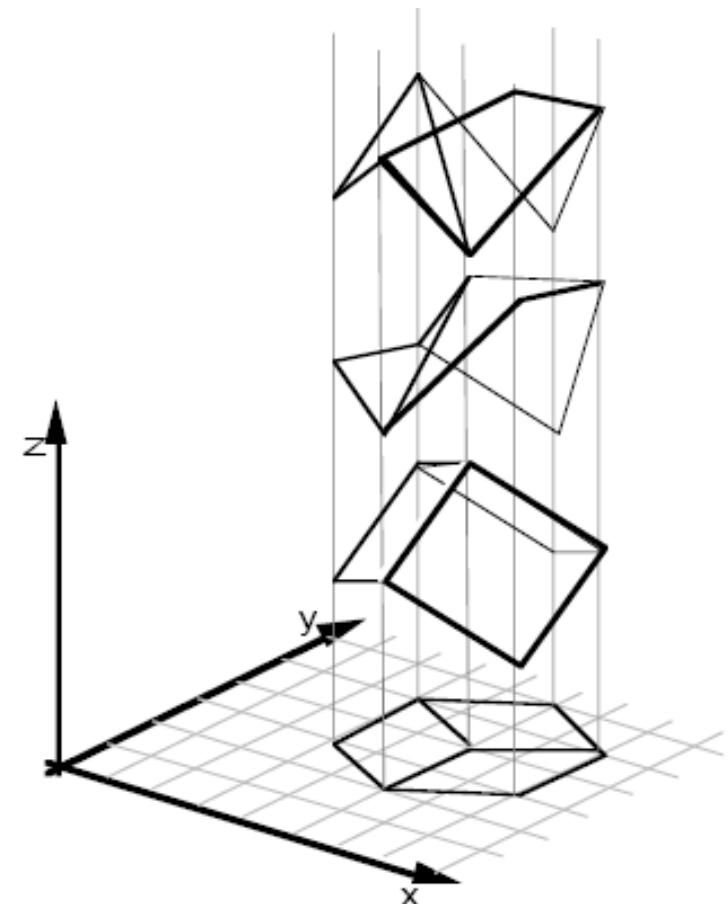
Gerald Sussman, MIT
(the undergraduate)

“You’ll notice that Sussman never worked
in vision again!” – Berthold Horn

Why vision is so hard?

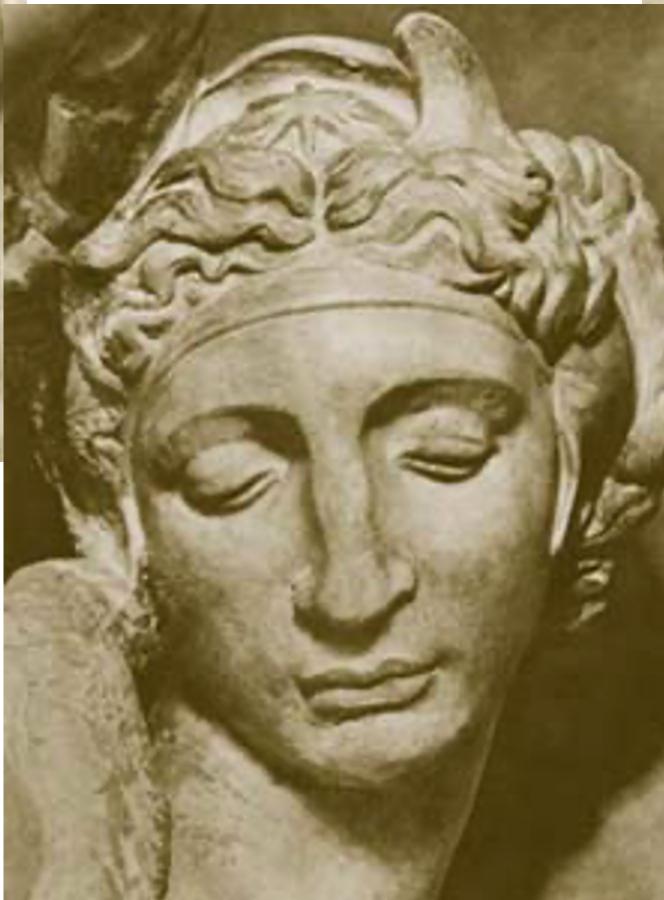
Why is vision so hard?

- Ill-posed problem



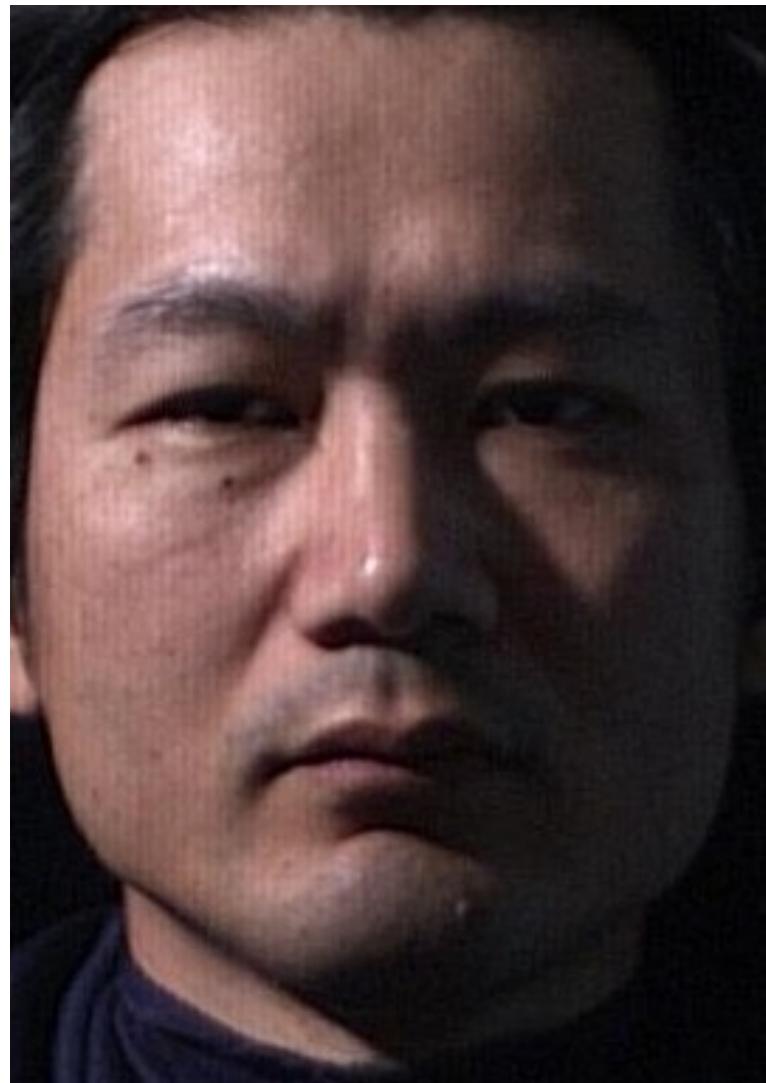
[Sinha and Adelson 1993]

Challenges 1: view point variation



Michelangelo 1475-1564

Challenges 2: illumination



Challenges 3: occlusion



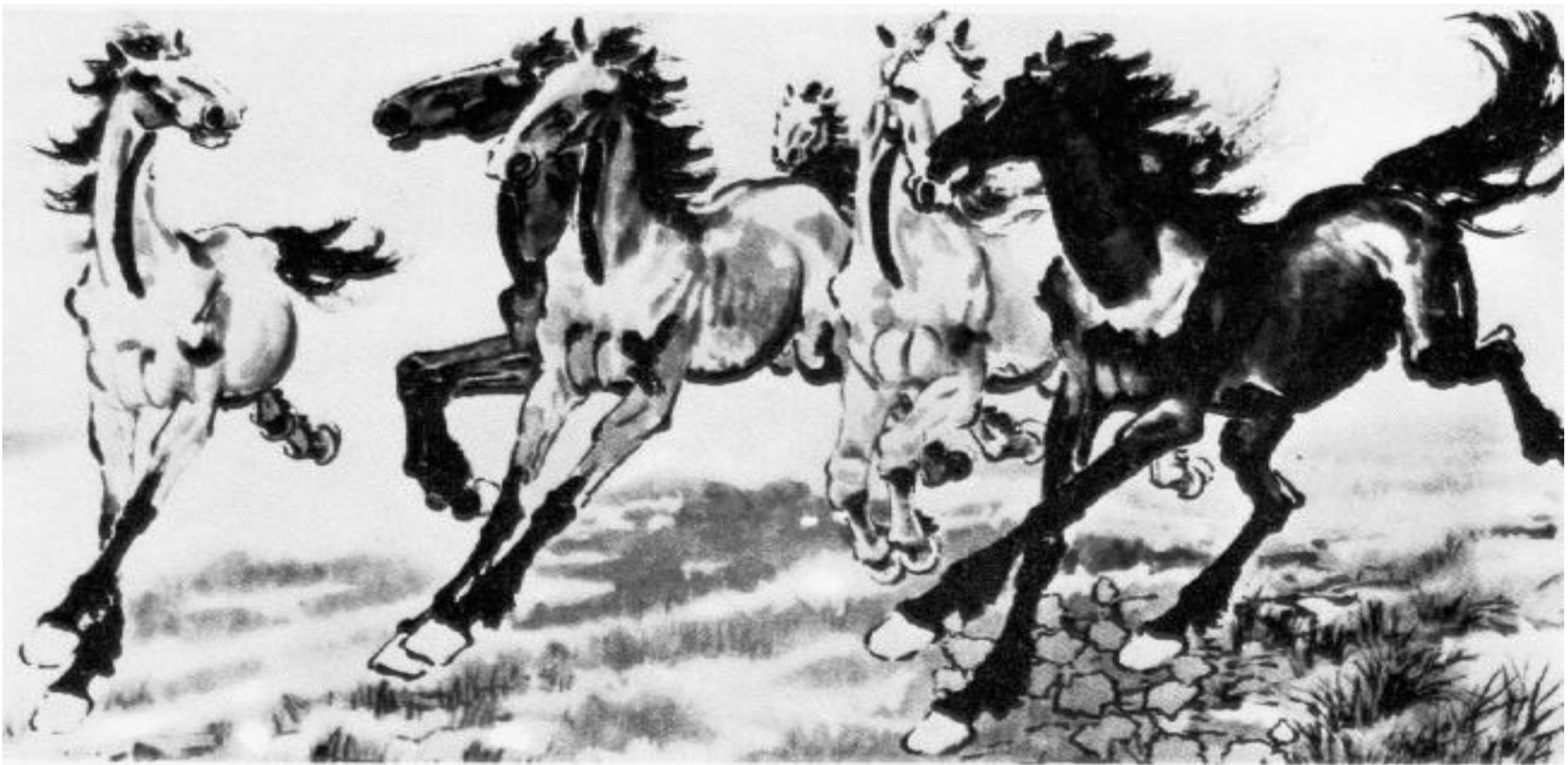
Magritte, 1957

19
slide by Fei Fei, Fergus & Torralba

Challenges 4: scale



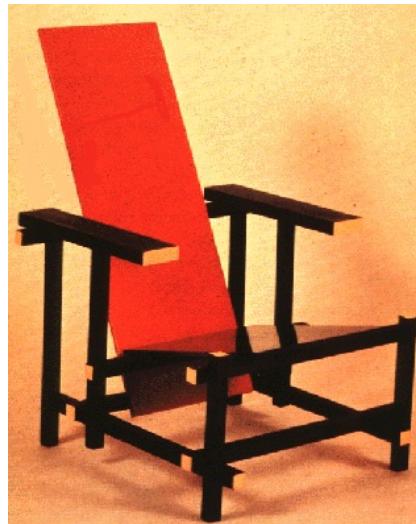
Challenges 5: deformation



Challenges 6: background clutter

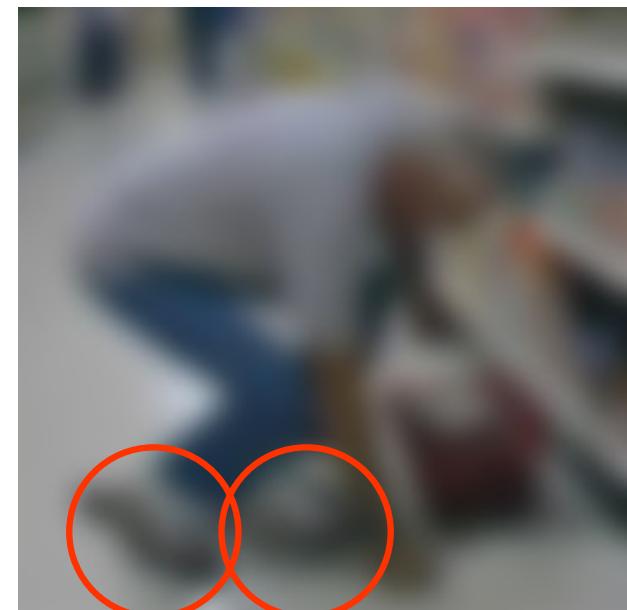
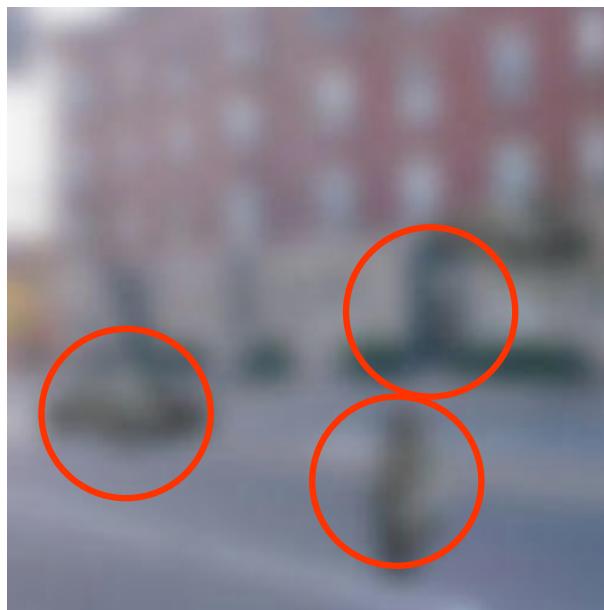
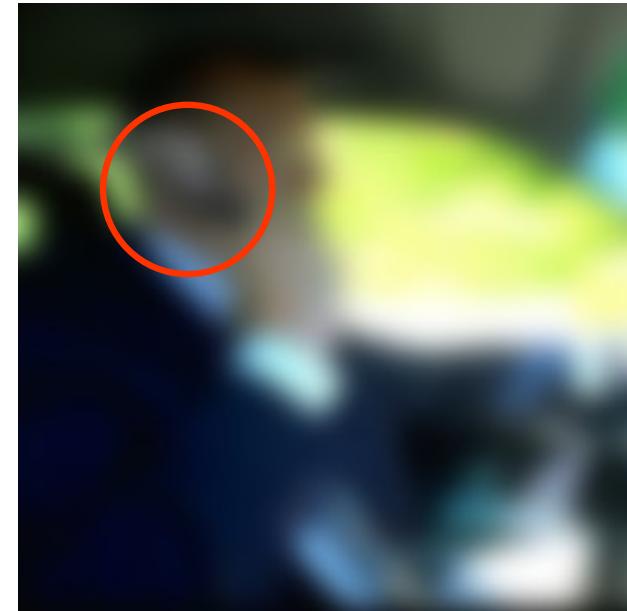
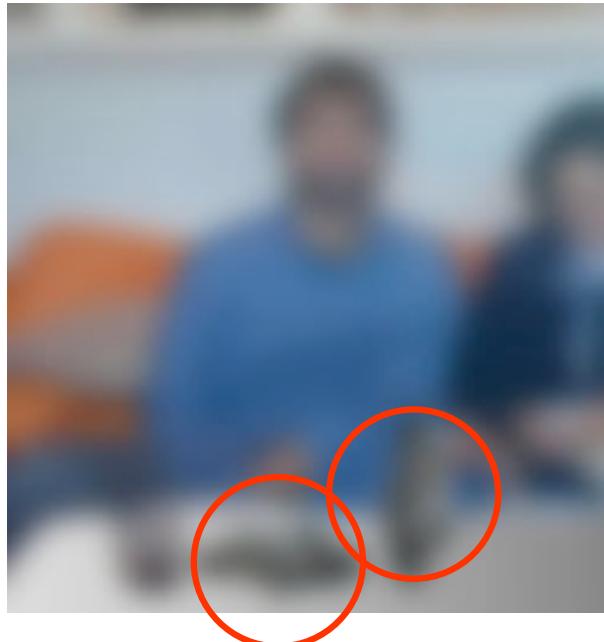


Challenges 7: object intra-class variation



slide by Fei-Fei, Fergus & Torralba ²³

Challenges 8: local ambiguity



Challenges 9: the world behind the image

