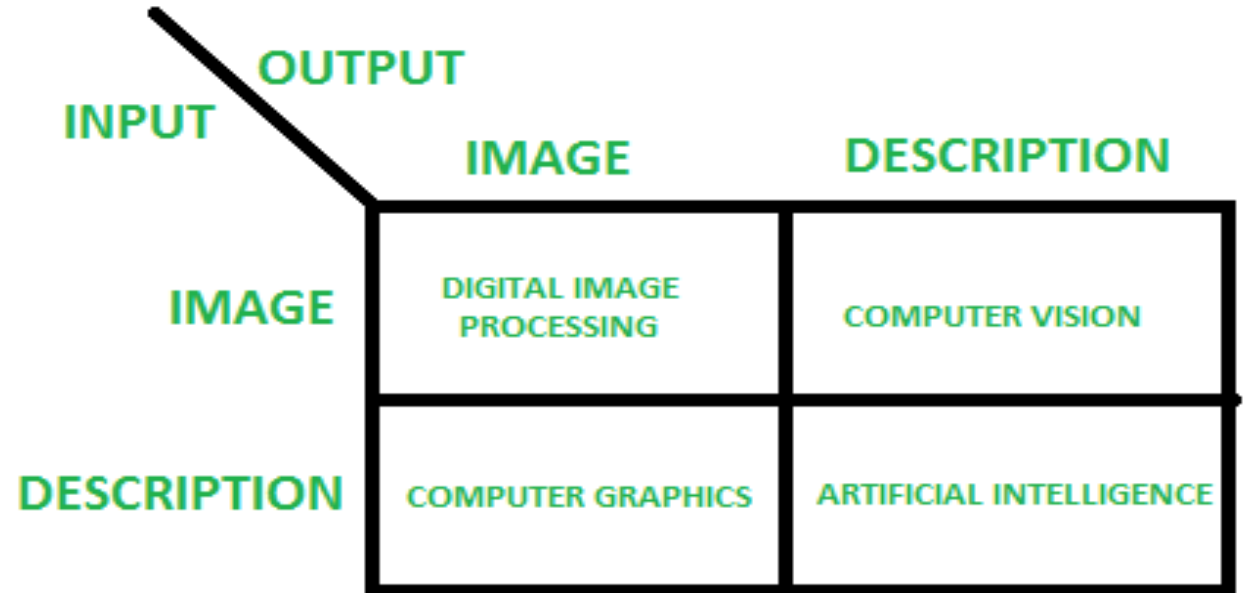
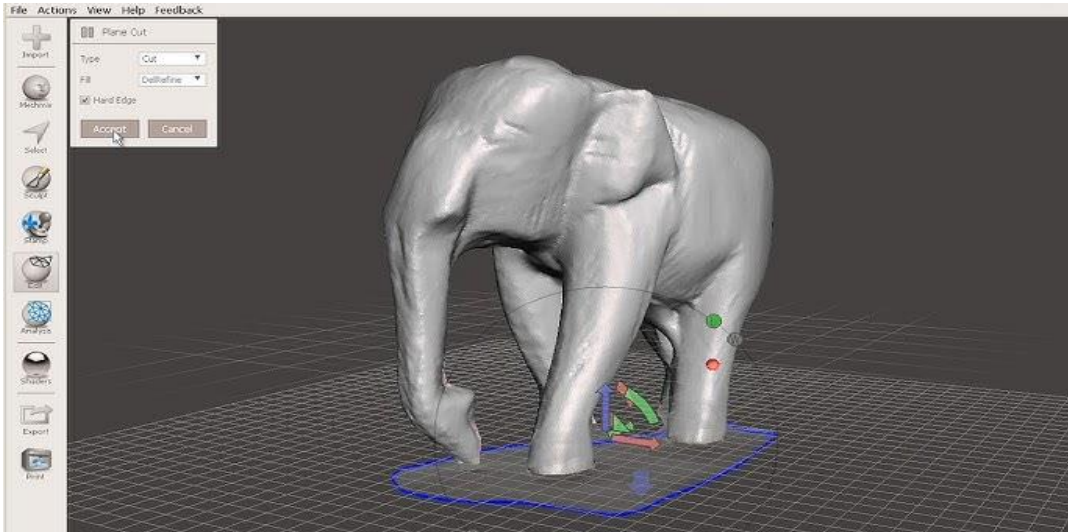


# What is Computer Vision?

Chiranjit Pal, USAR

# Computer Vision and Nearby Fields

- Computer Graphics: Models to Images
- Comp. Photography: Images to Images
- Computer Vision: Images to Models



# Computer Vision

Make computers understand images and video.



What kind of scene?

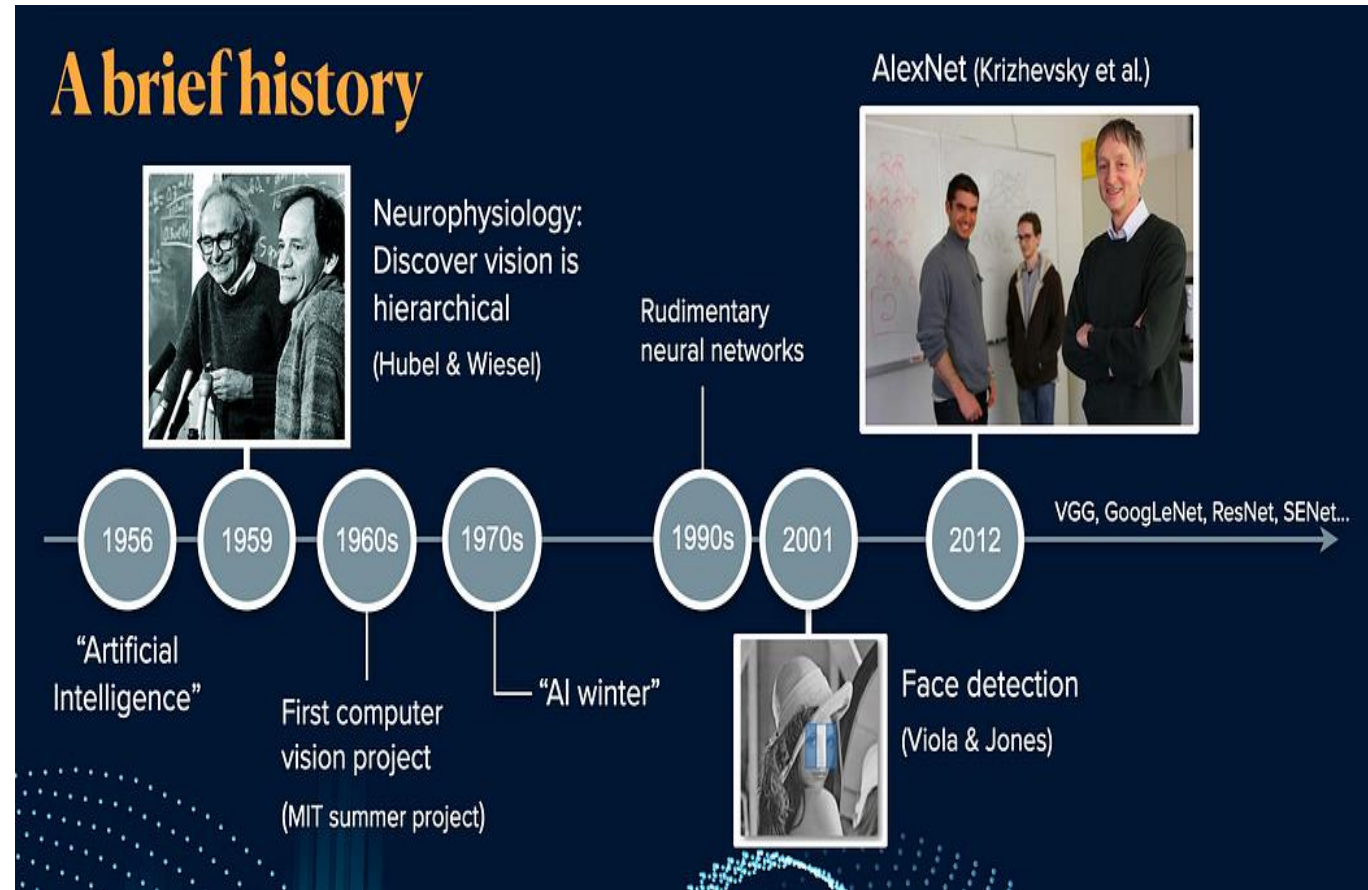
Where are the cars?

How far is the building?

...

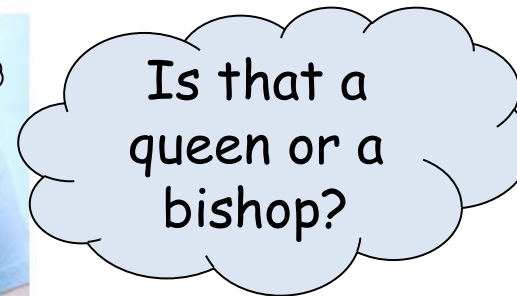
# Brief history of computer vision

- 1960: Minsky assigns computer vision as an undergrad summer project
- 1960's: interpretation of synthetic worlds
- 1970's: some progress on interpreting selected images
- 1990's: ANNs come and go; shift toward geometry and increased mathematical rigor
- 1990's: face recognition; statistical analysis in vogue
- 2000's: broader recognition; large annotated datasets available; video processing starts



# Vision is really hard

- Vision is an amazing feat of natural intelligence
  - Visual cortex occupies about 50% of Macaque brain
  - More human brain devoted to vision than anything else

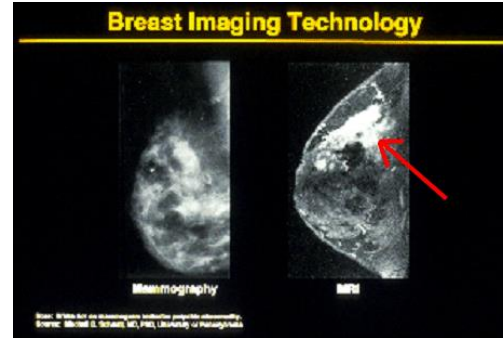




# Why computer vision matters



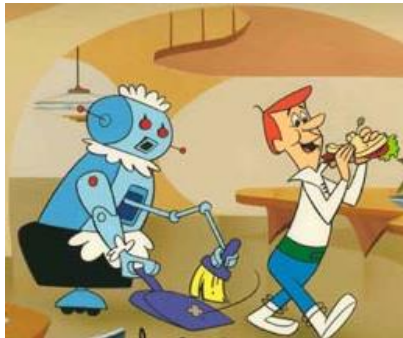
Safety



Health



Security



Comfort



Fun

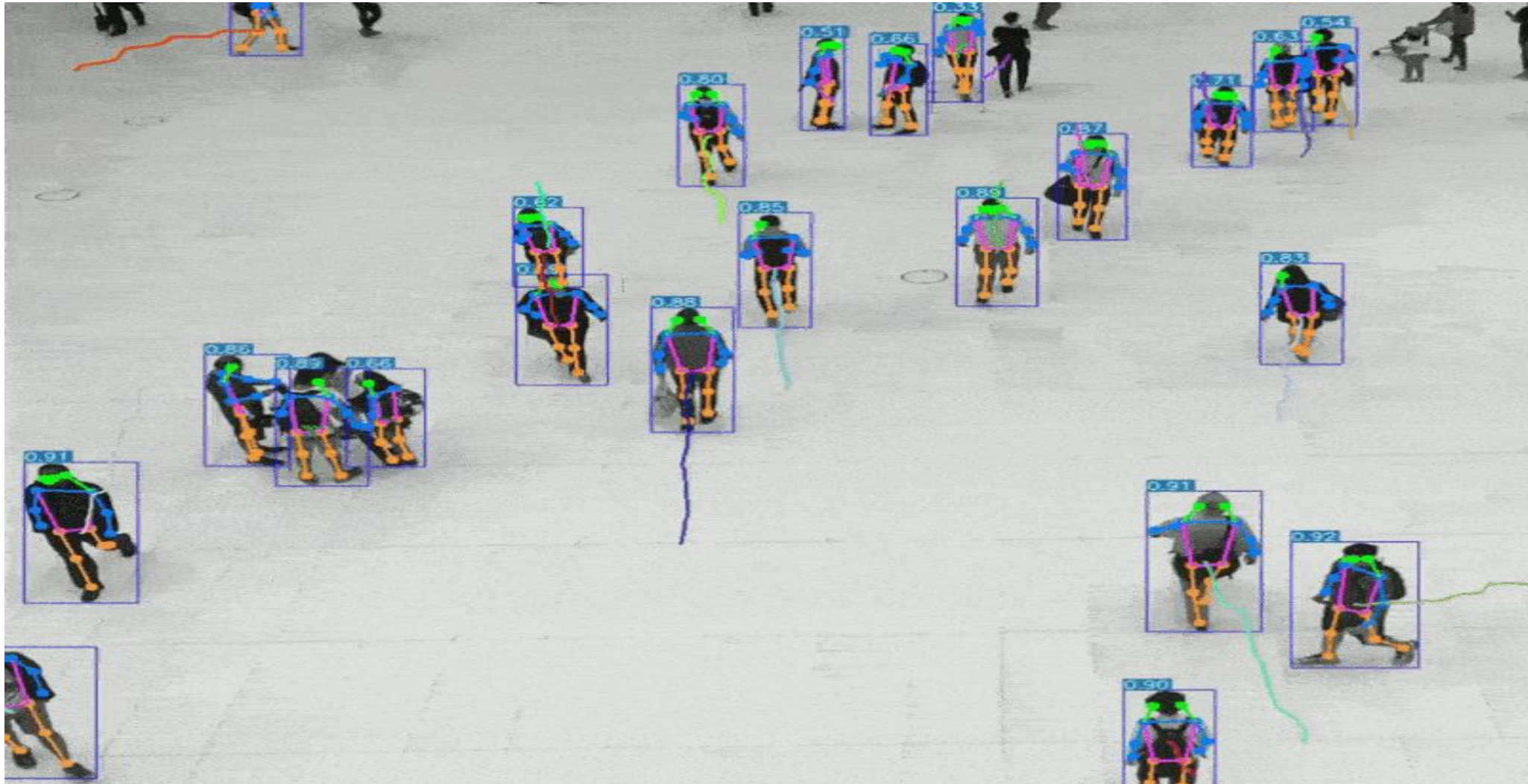


Access

# How vision is used now

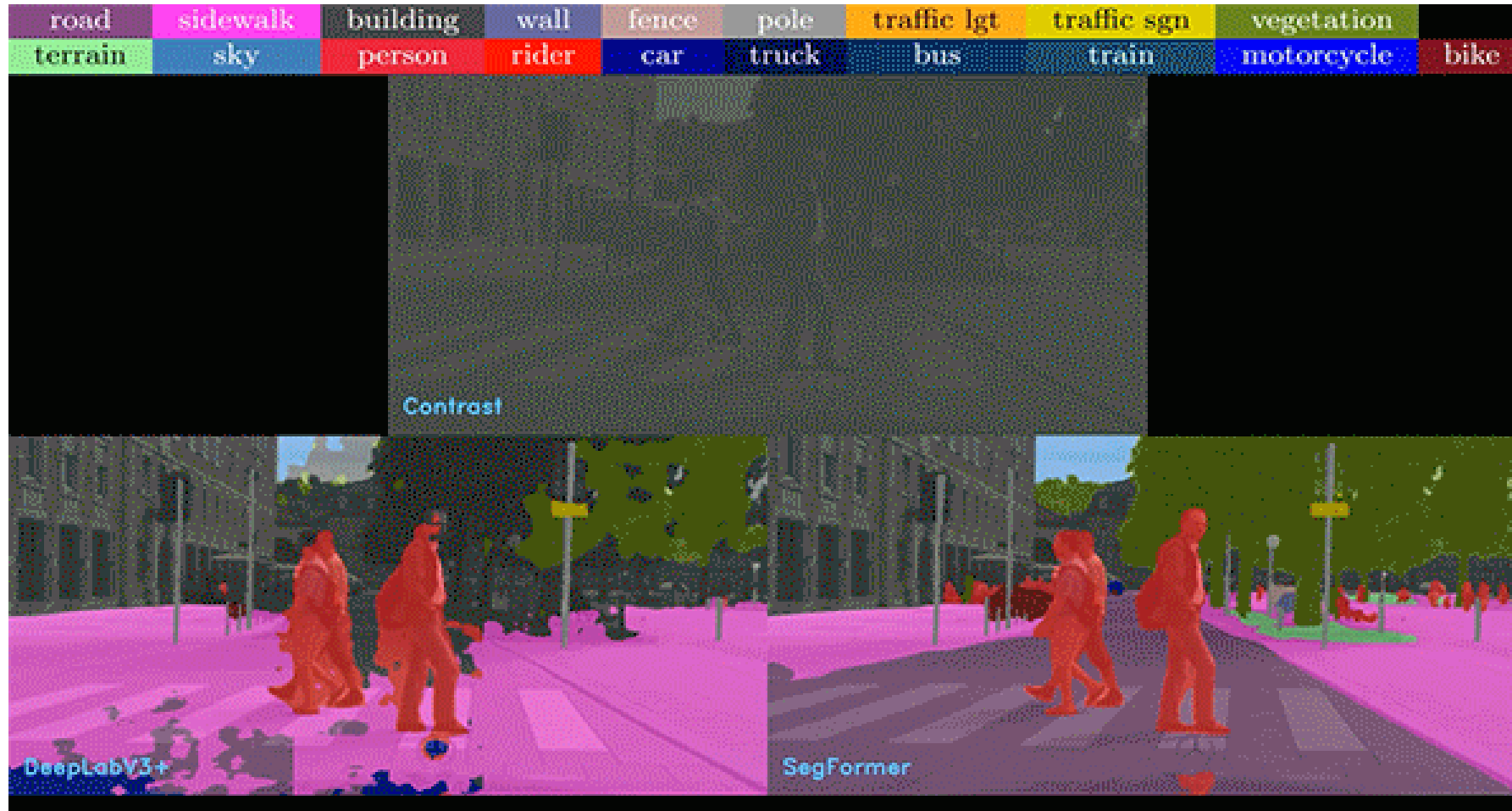
- Examples of state-of-the-art

# Pedestrian Detection

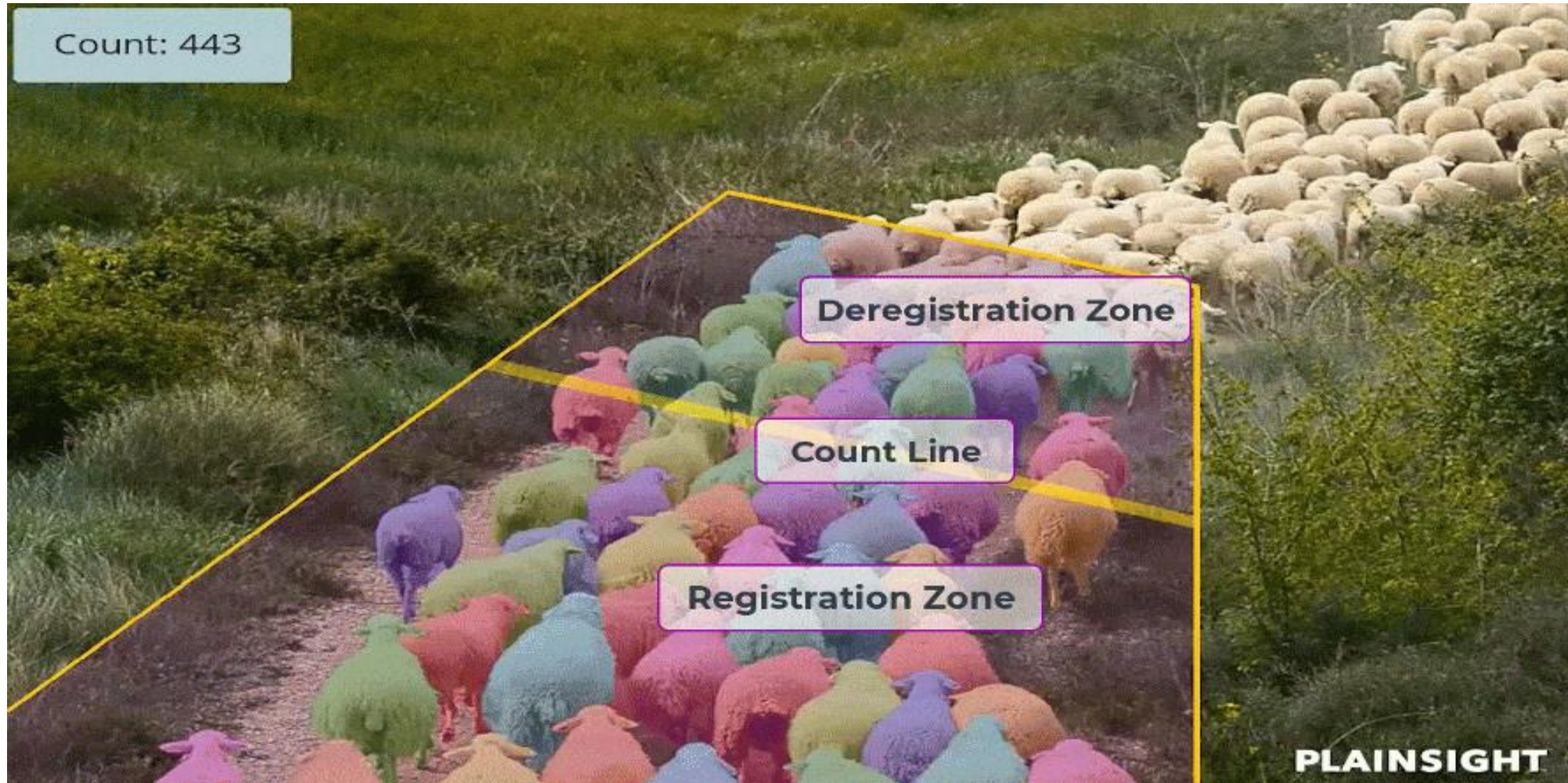




# Object Segmentation

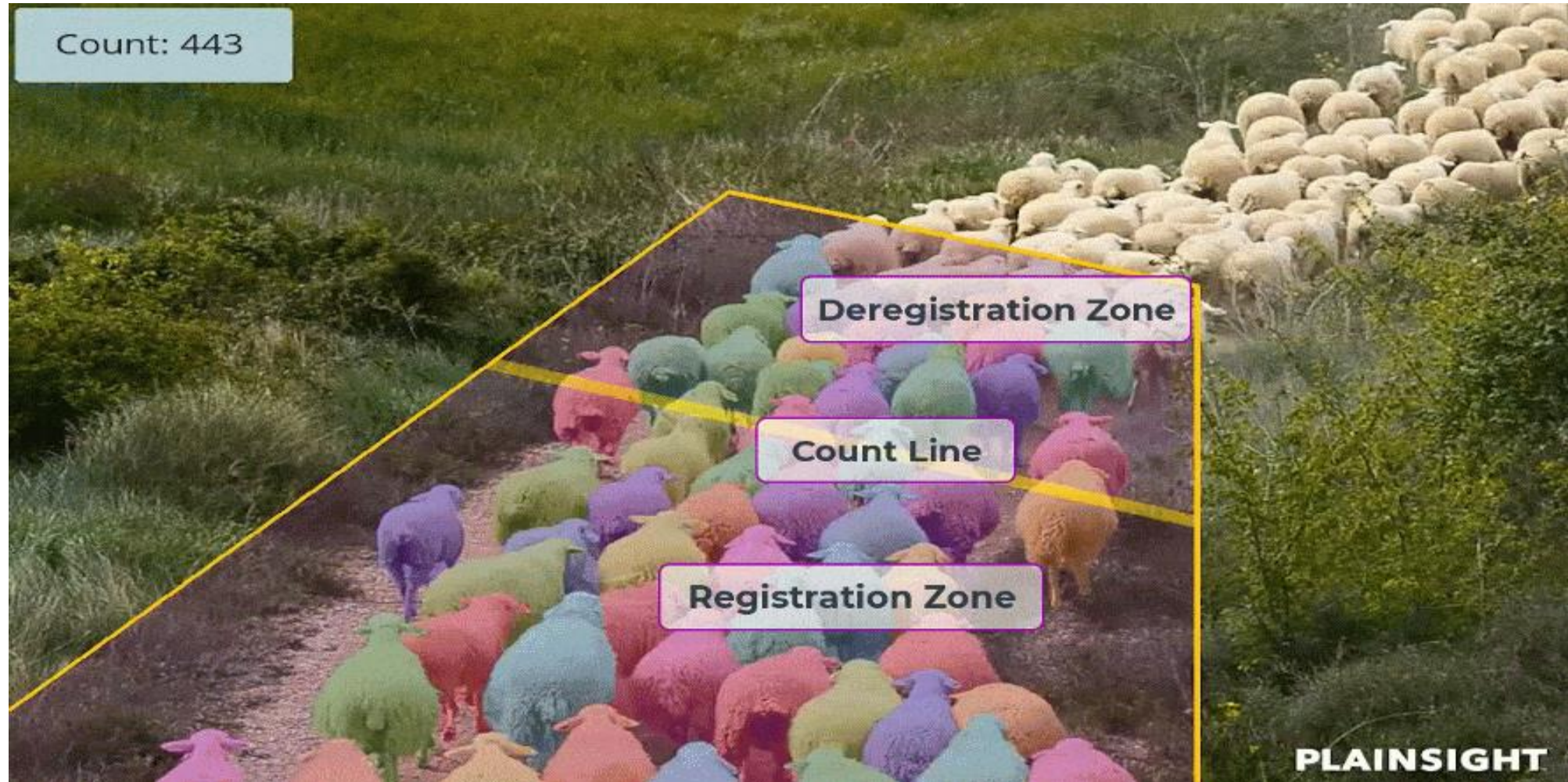


# Object Counts





# Object Counts



# Image Generation



**Object Transformation**

Input Image



Ground Truth



Predicted Image



**Object Colorization**

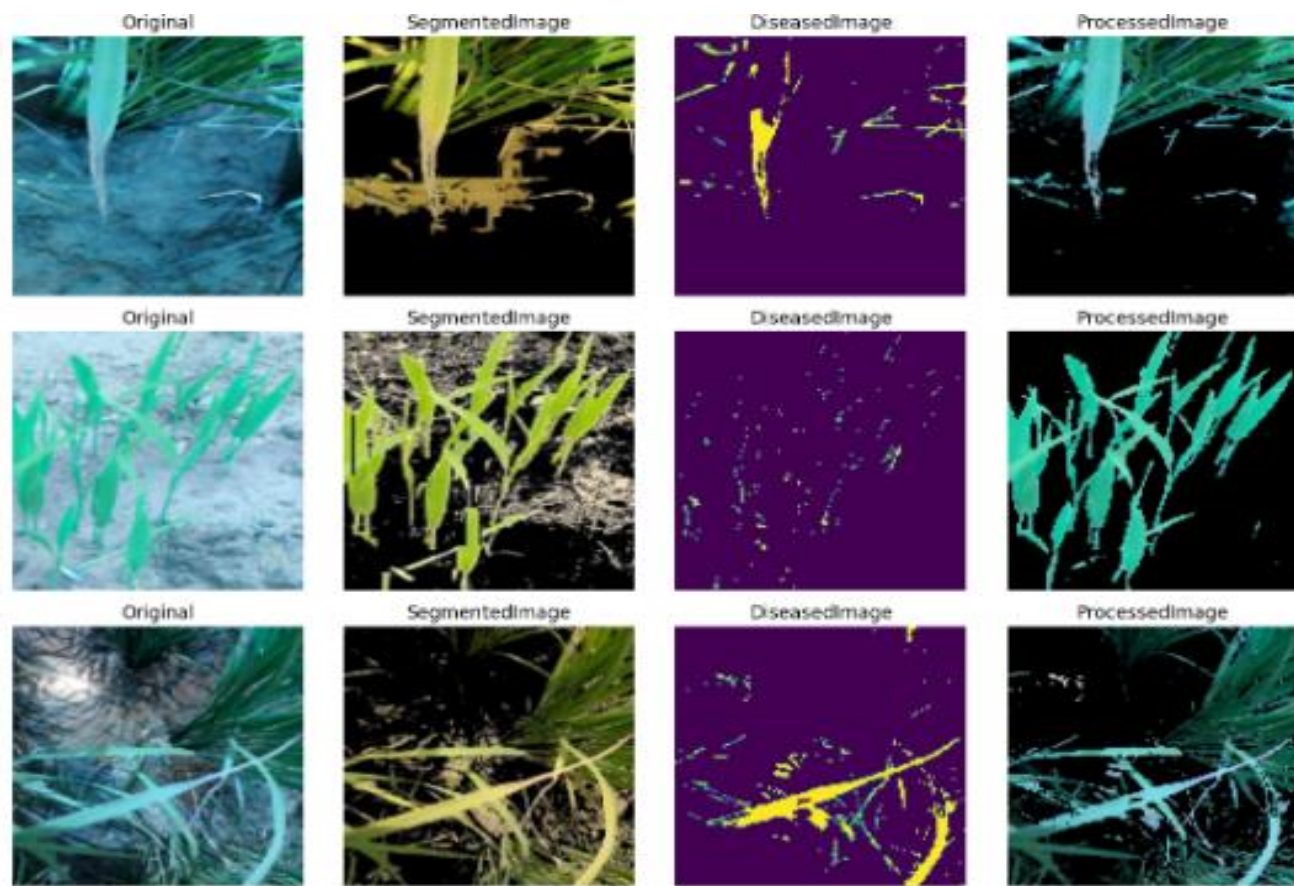


# Challenges: background clutter



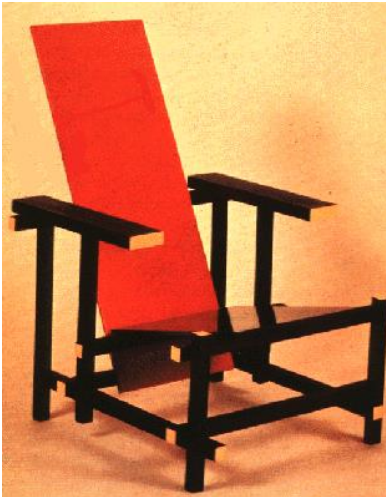
Emperor shrimp and commensal crab on a sea cucumber in Fiji  
Photograph by Tim Laman





**Fig. 4:** 1st column displays the original images; Next column displays the segmented image; 3rd column displays the diseased pixels to isolate from soil pixel; Last column displays the soil removed output.

# Challenges: object intra-class variation



slide credited: Fei-Fei, Fergus & Torralba



# Challenges or opportunities?

- Images are confusing, but they also reveal the structure of the world through numerous cues
- Our job is to interpret the cues!

