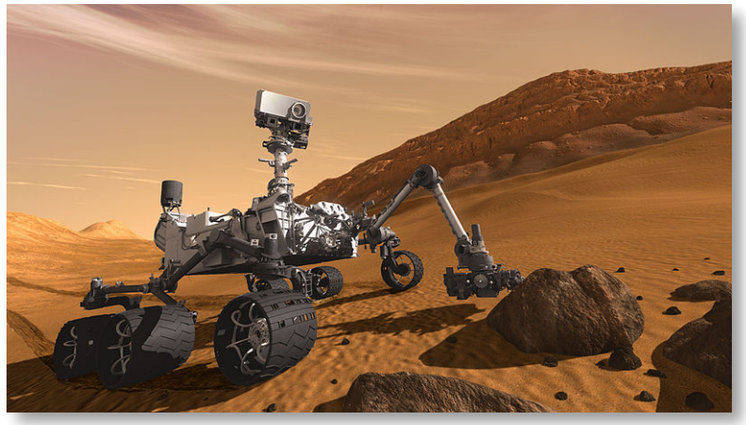
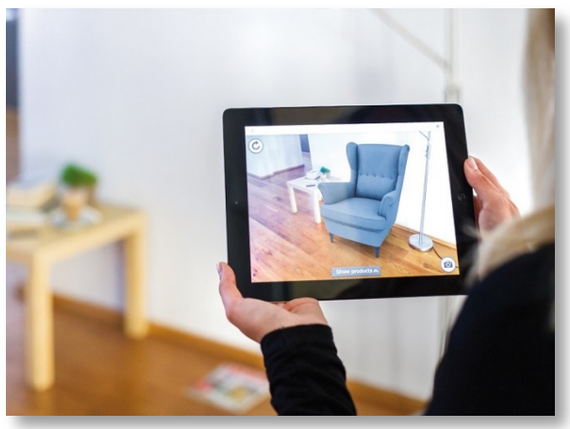
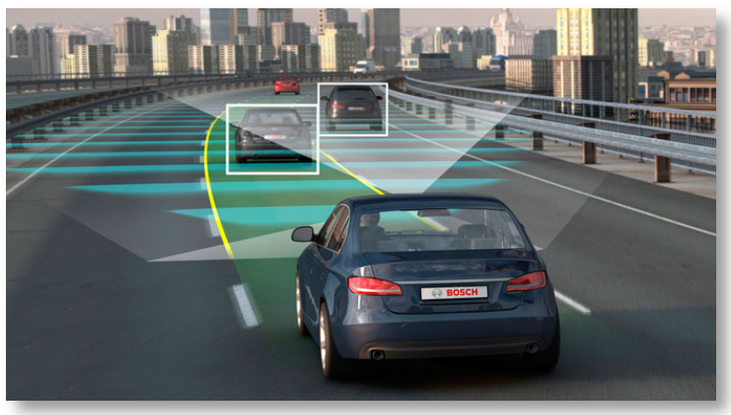
# CSCI 497P: Computer Vision








**Scott Wehrwein**

## Lecture 0: Introduction, Logistics

Zoom lectures will be recorded and posted for viewing only by members of this class. By joining the live lectures you consent to being a part of this recording. To avoid appearing in lecture recordings, you may take any of the following actions:

- Disable your video
- Mute your microphone; you may still ask questions via chat.
- Do not join the zoom calls and watch the videos asynchronously.

# About Me

# Scott Wehrwein

# My research interests

- Research interests:
  - **Computer vision** and graphics
  - Computational photography and videography
  - Photo and video enhancement
  - Visualization

# The short-term plan

**Today:**

1. What is computer vision?
2. Course logistics

**Tomorrow**:

1. Course overview: What will we cover?

2. Jumping in: images, filtering and convolution

# Questions?

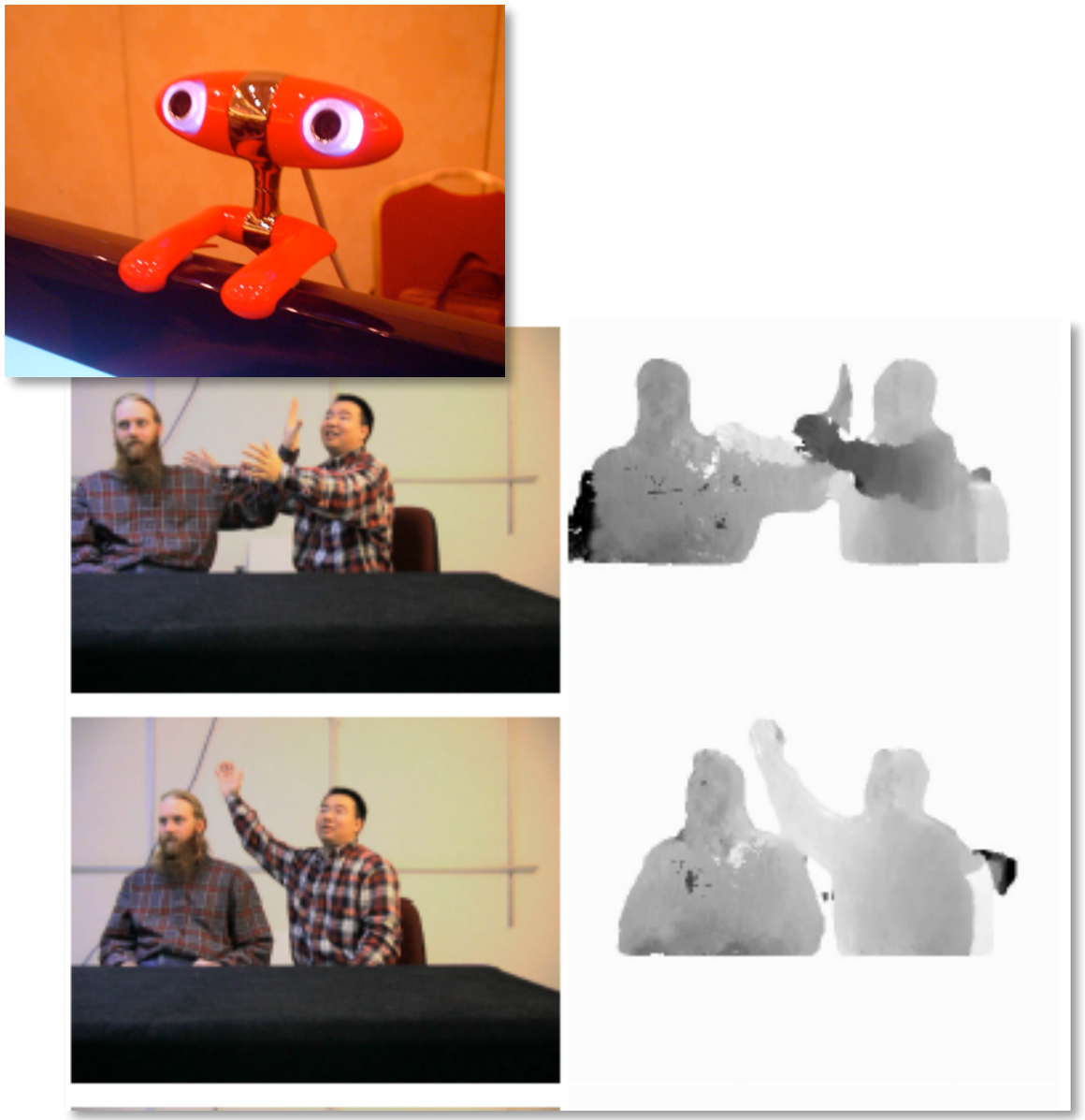
- Using the "Raise Hand" feature:
    - At the bottom of Zoom, click "Participants"
    - At the bottom of the pane on the right side, click "Raise hand"
    - Hold spacebar to temporarily unmute your mic ("push to talk")
- Using Chat:
    - At the bottom of Zoom, click "Chat" and enter your question.

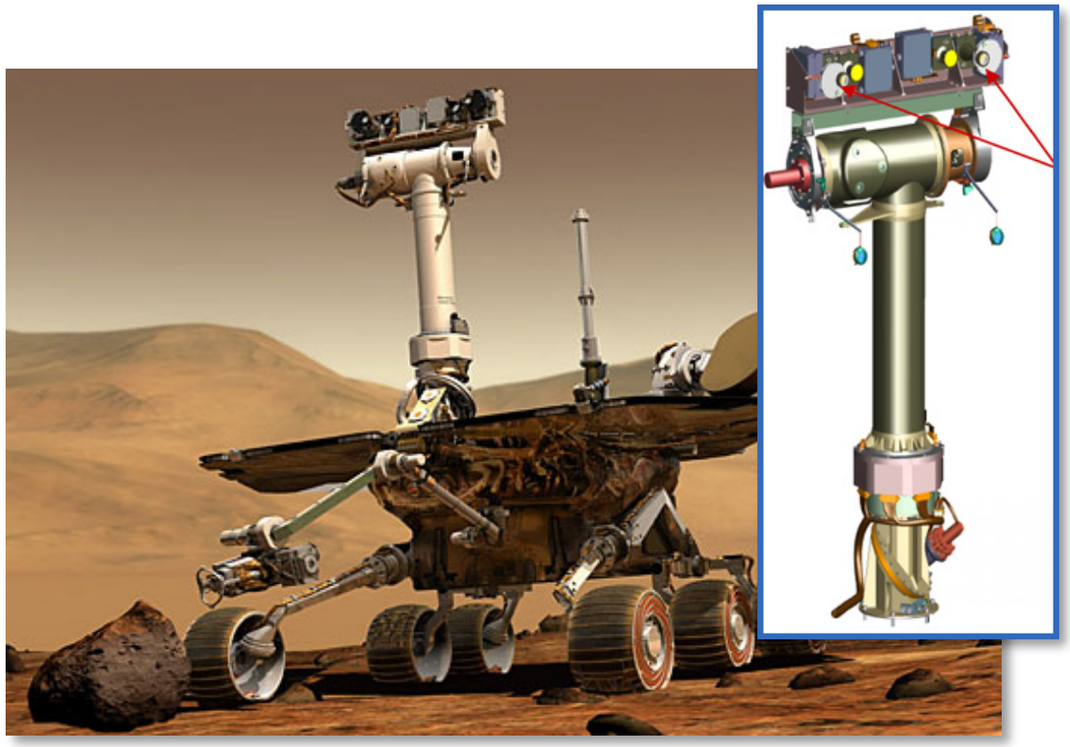
# What is computer vision?

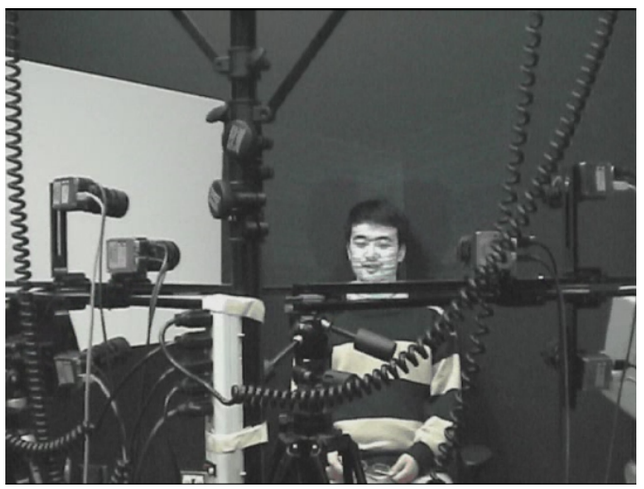
- A goal-oriented field.

https://www.youtube.com/watch?v=9MeaaCwBW28

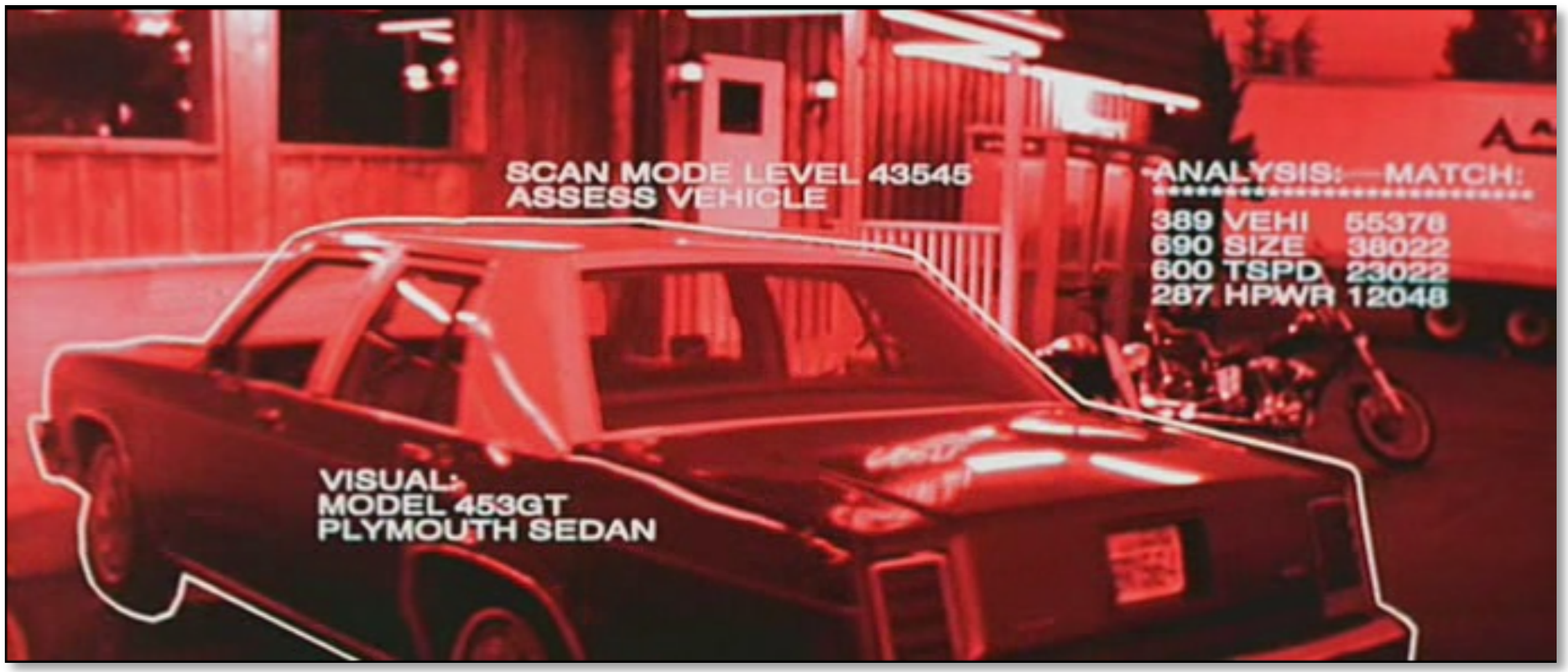
# 3D Shape Understanding







# Object and Person Recognition

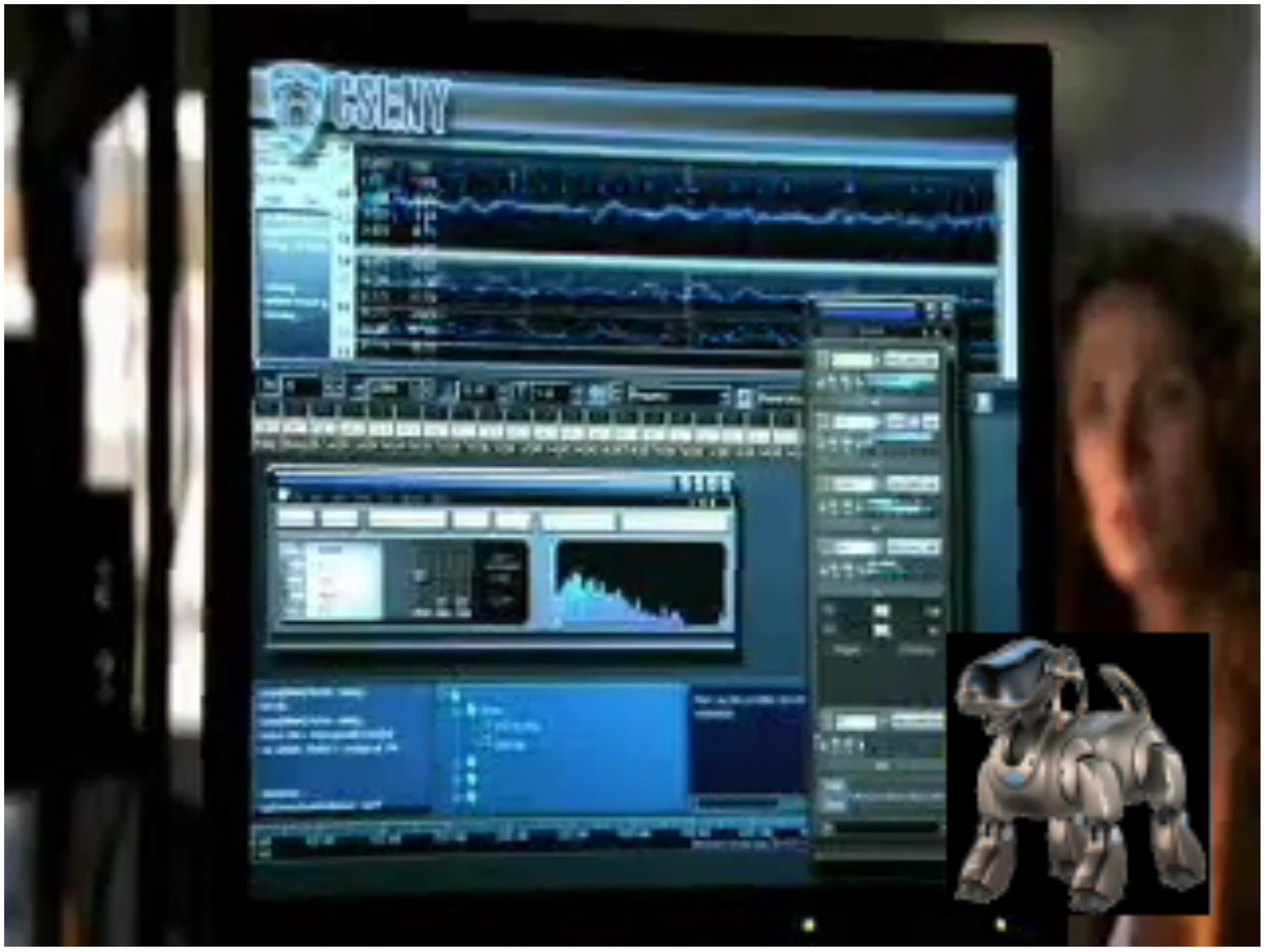



*Terminator 2, 1991*

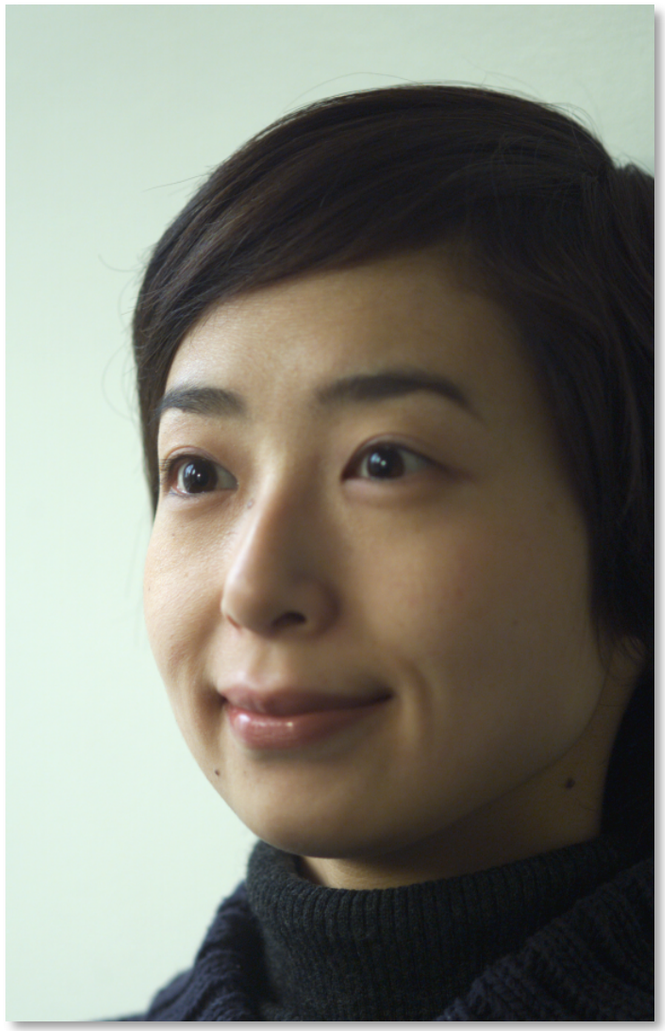
中华人民
和国万岁
世界
民大团结万岁

sky
building
flag
face
banner
wall
street lamp
bus
bus
cars
slide credit: Fei-Fei, Fergus & Torralba

# Zoom and Enhance



# Zoom and Enhance

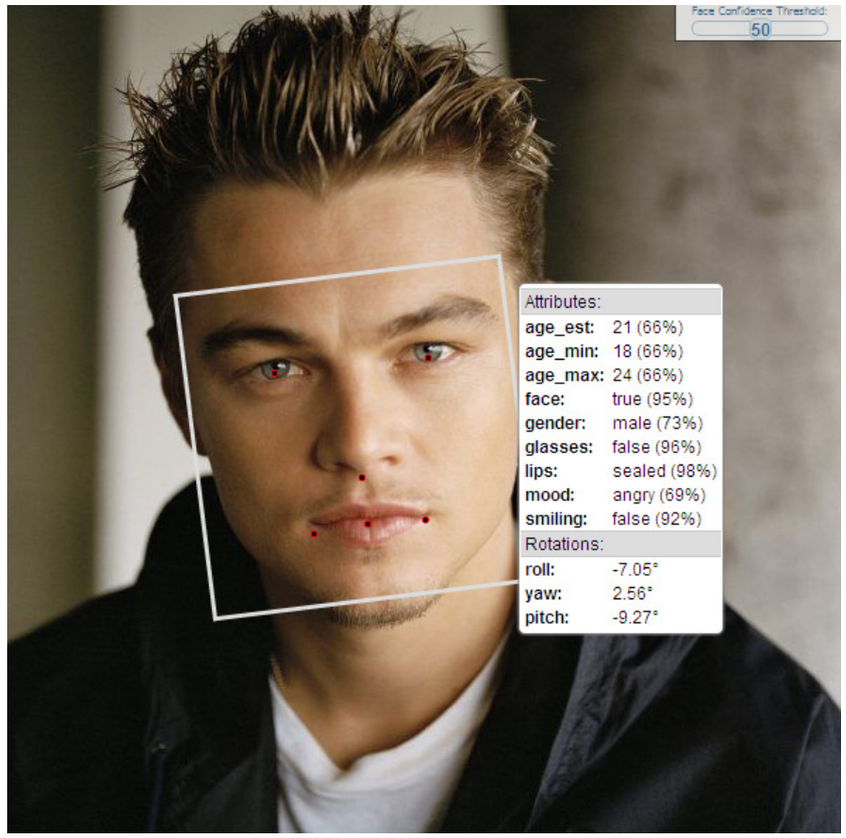


**Source:**
**Nayar and Nishino, “Eyes for Relighting”**

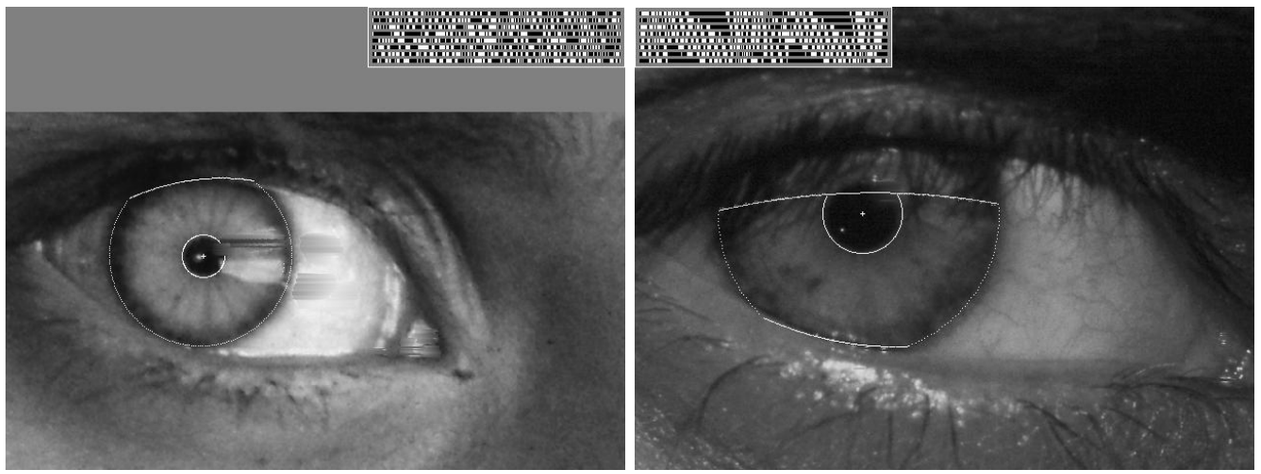
# Face Detection

# Face Recognition, Biometrics

**Source: S. Seitz**




FACE++



*“How the Afghan Girl was Identified by Her Iris Patterns”*

# Graphics, Movies, Games

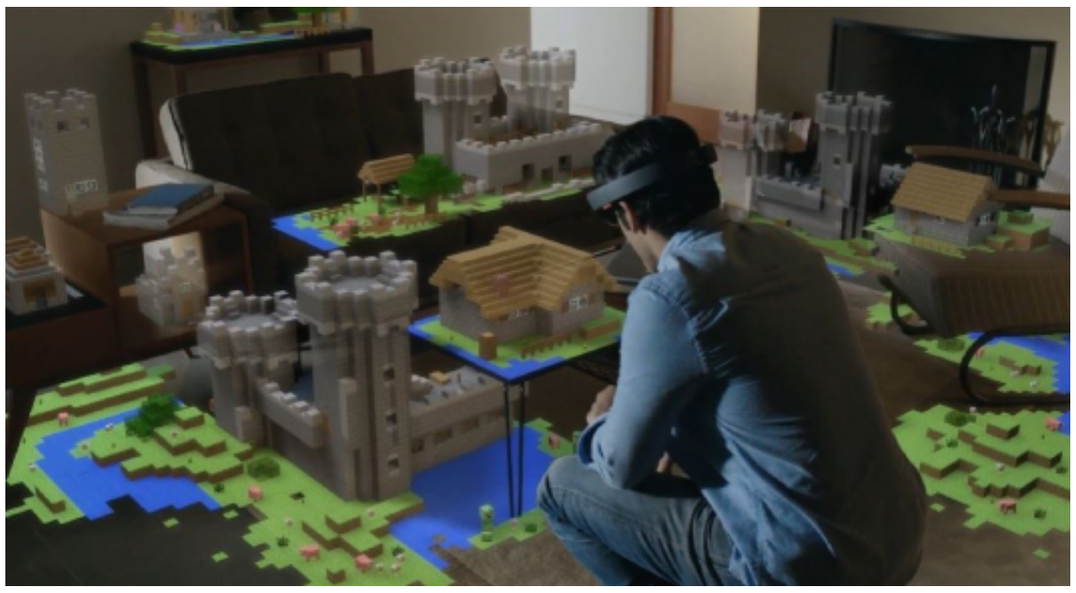
# Sports; Augmented Reality

*Sportvision* first down line

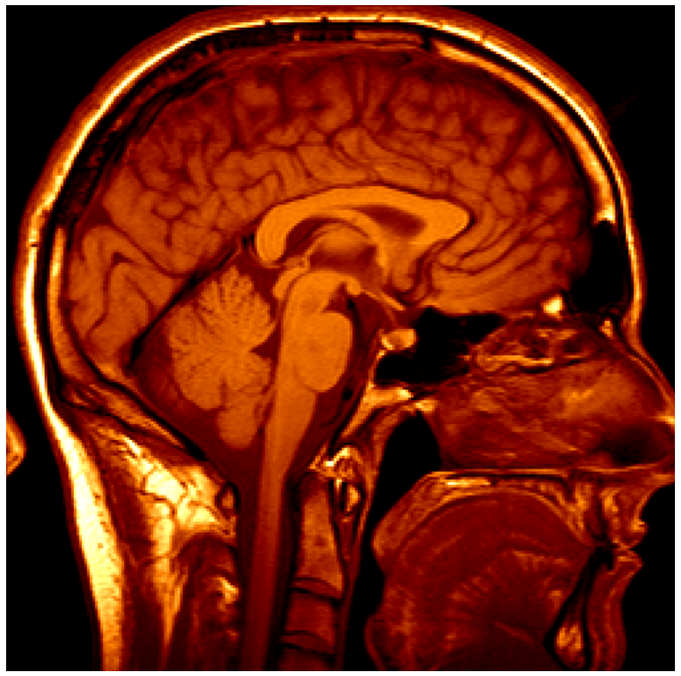
Nice [explanation](#) on www.howstuffworks.com

Tracking

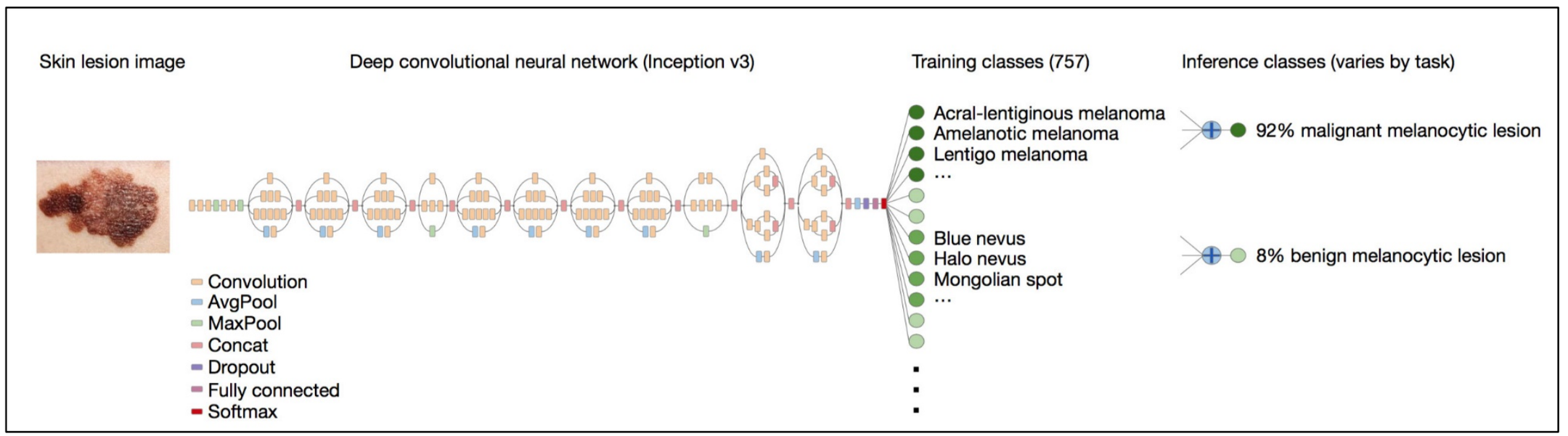
Scene understanding



# Medical imaging



MRI, CT Reconstruction




Skin cancer classification with deep learning: https://cs.stanford.edu/people/esteva/nature

# Robotics

Mars Curiosity Rover

Amazon Picking Challenge
http://www.robocup2016.org/en/events/amazon-picking-challenge/

# Smart and Self-Driving Cars

Mobileye
Tesla Autopilot
Safety features in many newer cars

Waymo
Uber
...

# And so on...

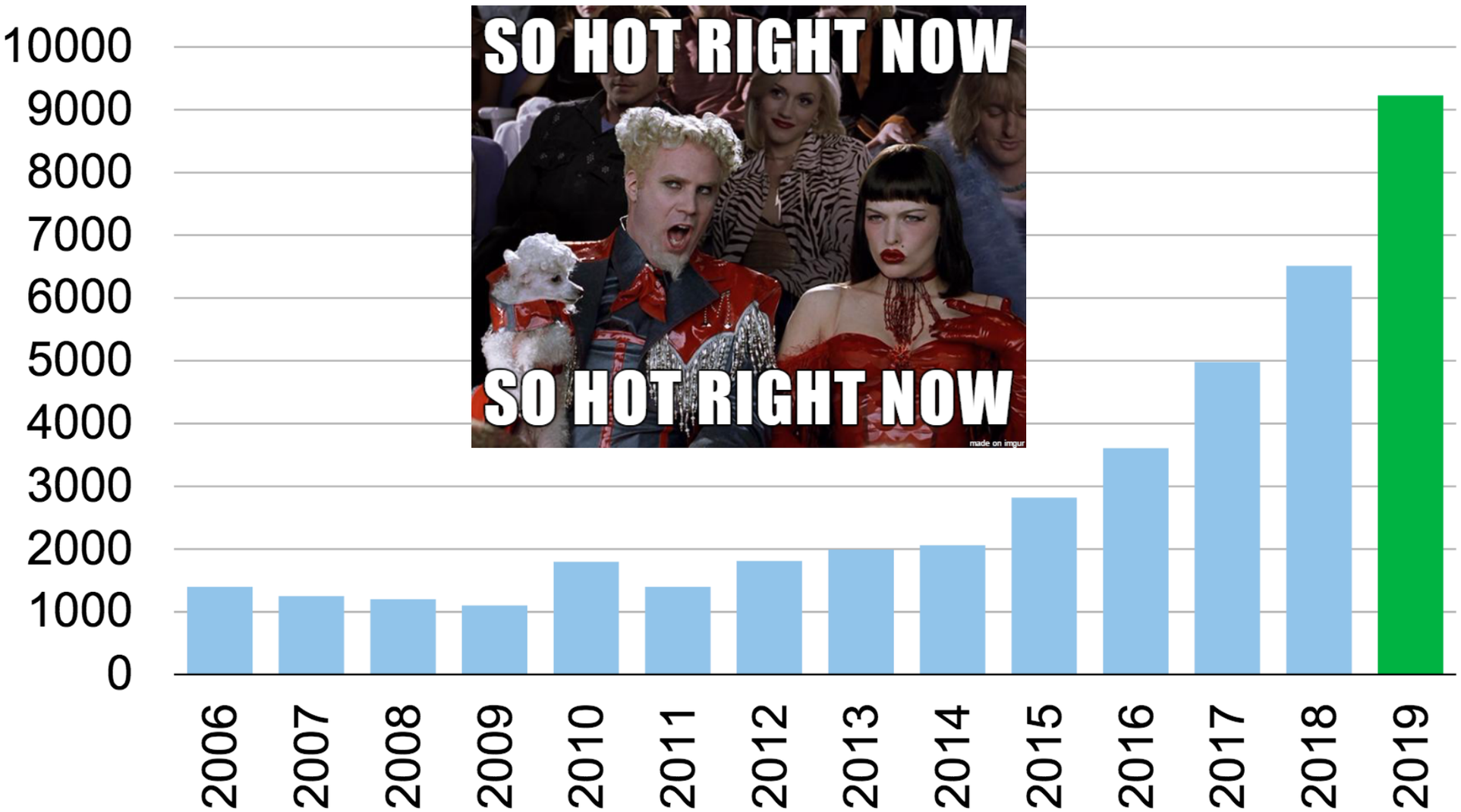
- You just saw some examples of recent systems, many new in the past few years.

- Computer vision is a highly active research area
    - Deep learning has revolutionized the field in the past decade

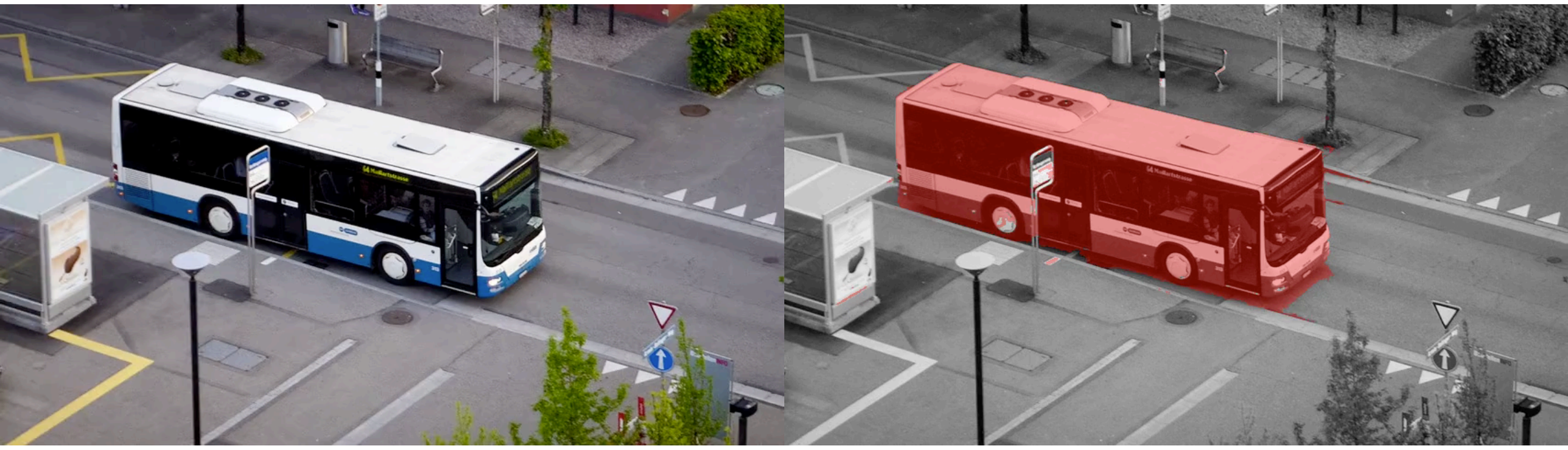
- Lots of work going on in industry, both at Big Tech and startups.

# Computer Vision

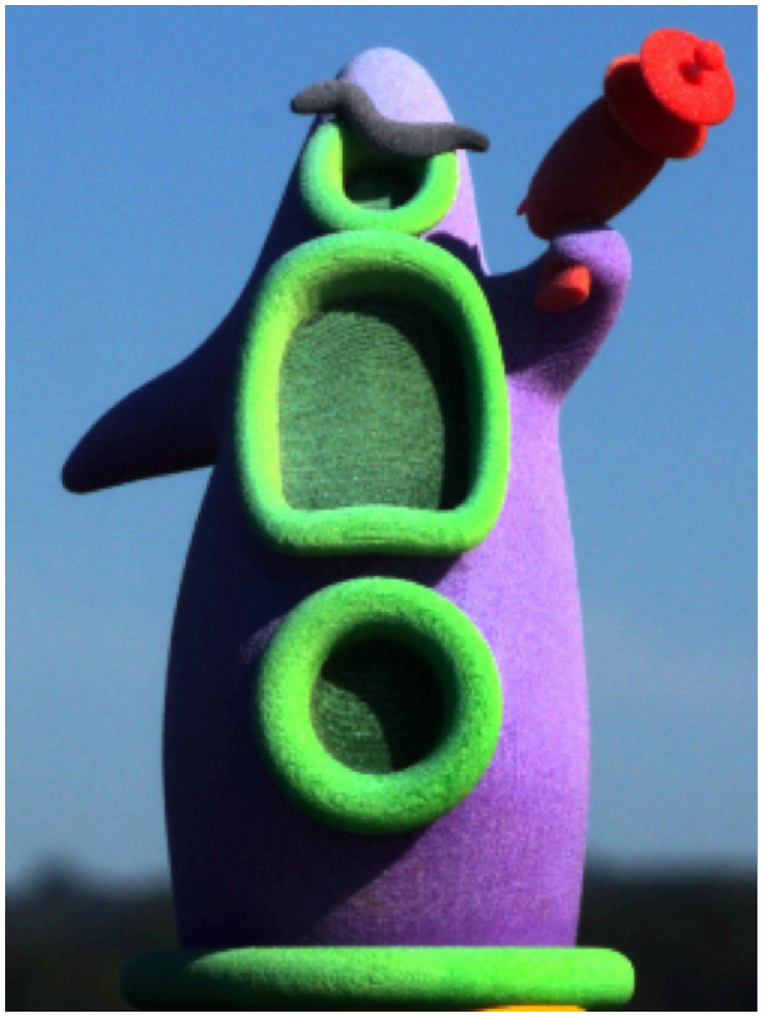
Attendees at CVPR, the flagship computer vision research conference:

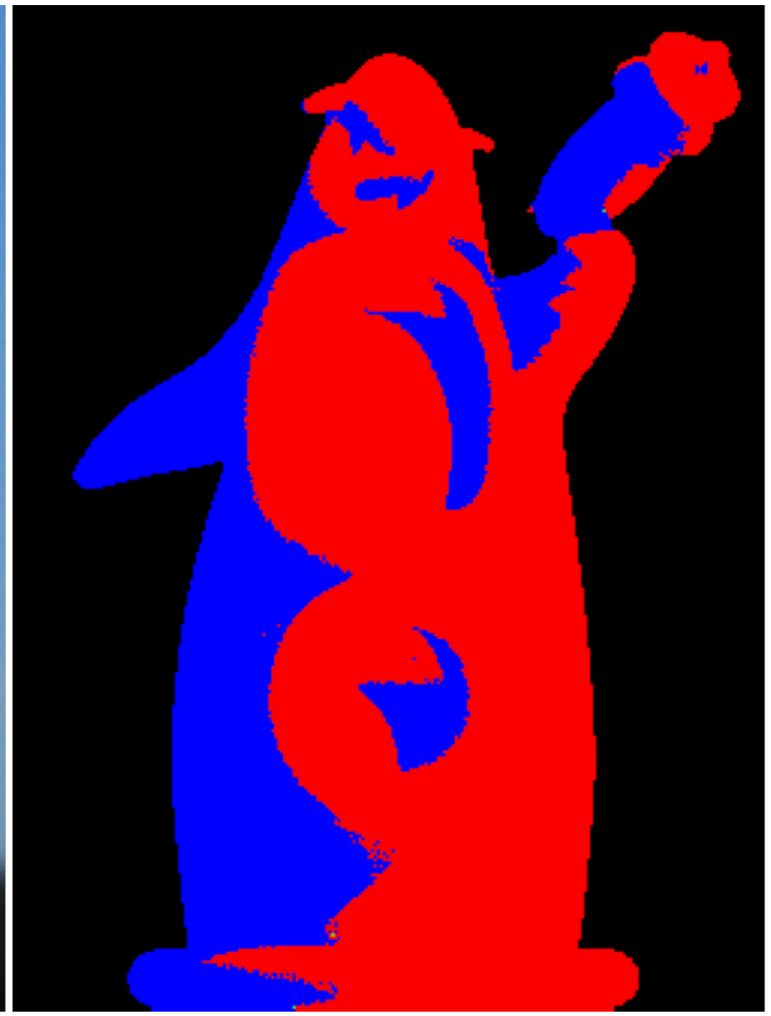


# My work: Video Segmentation



# My work: Illumination Estimation

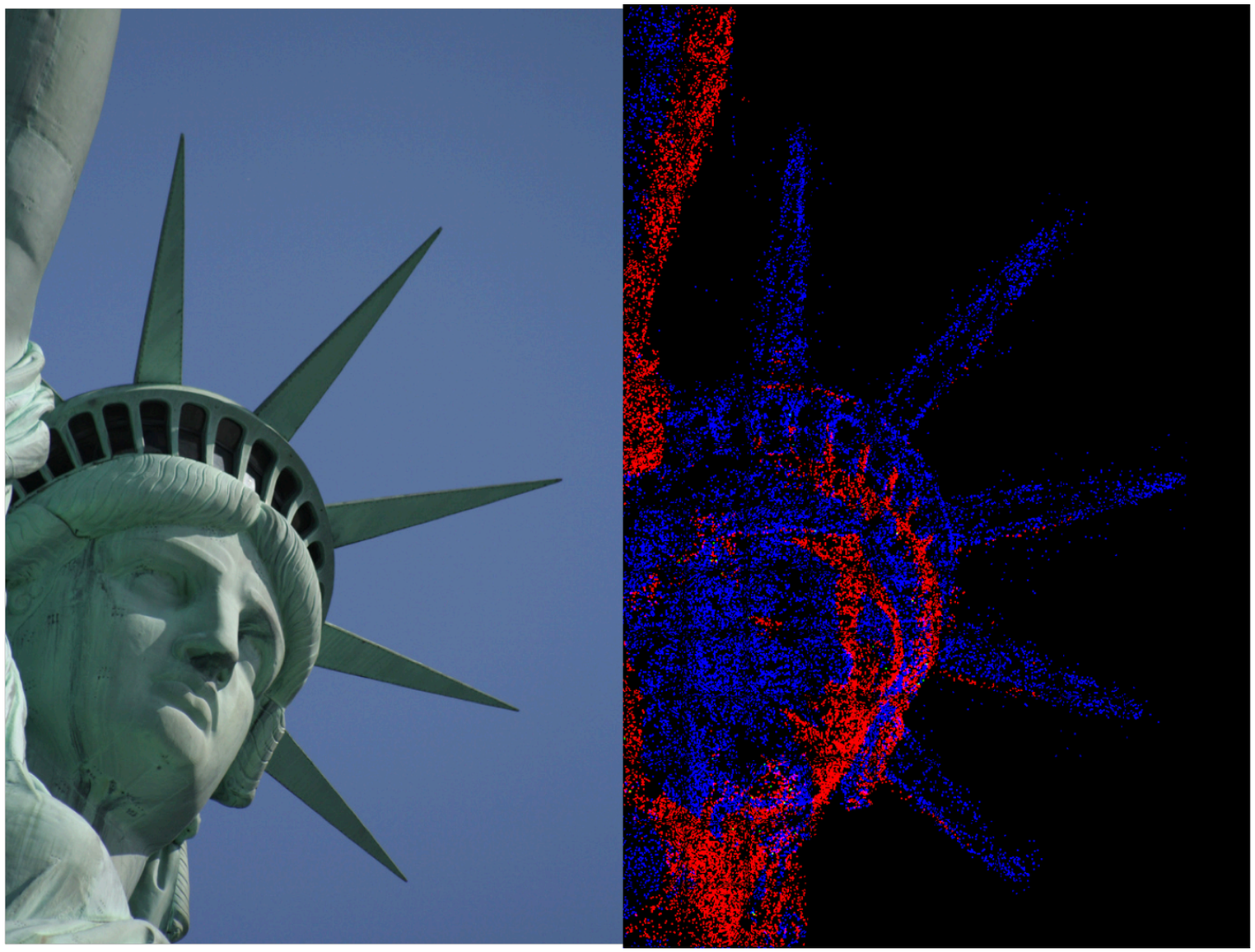




Sunlit

Shadowed

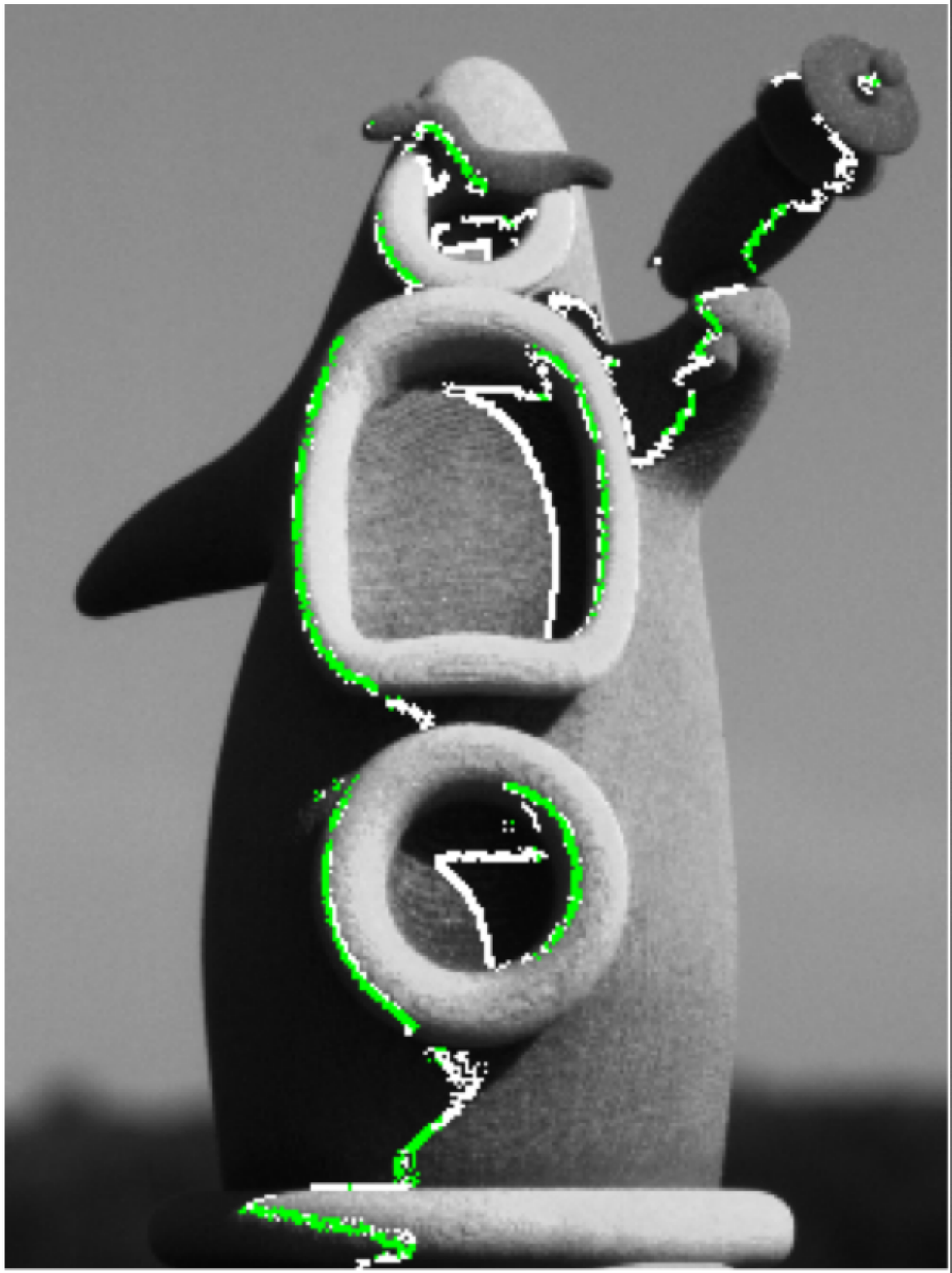
# My work: Illumination Estimation

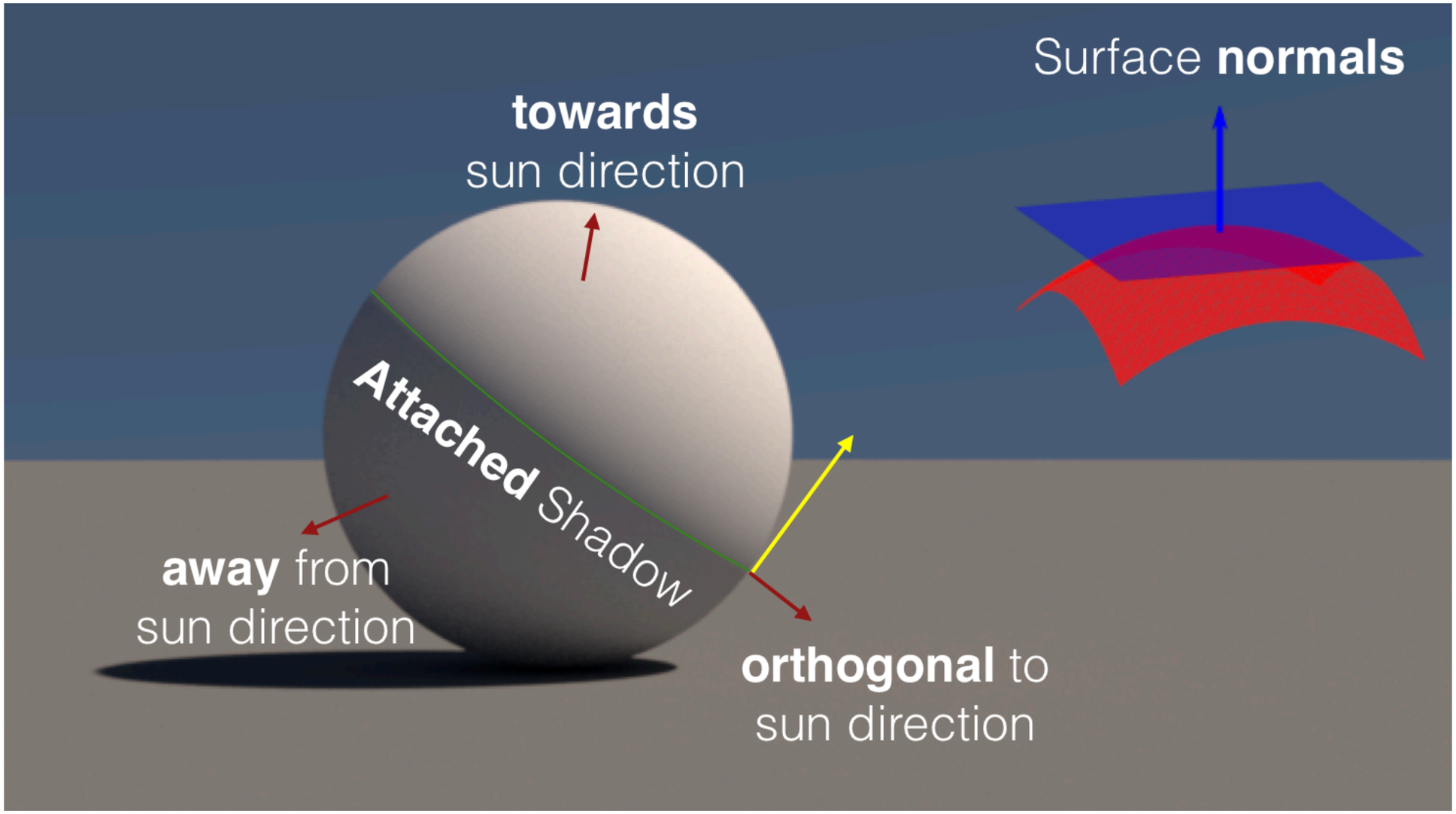


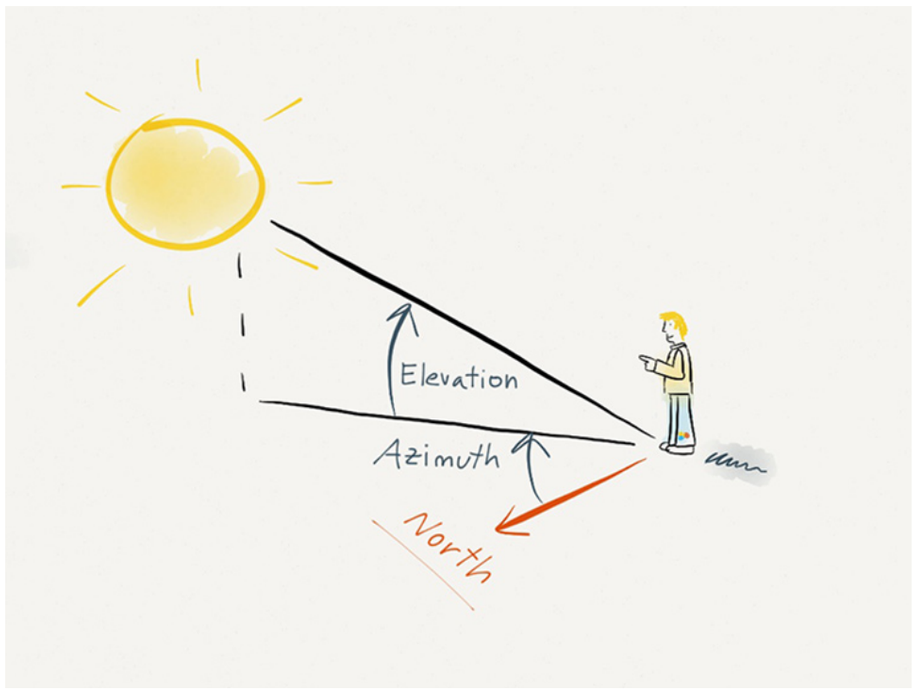


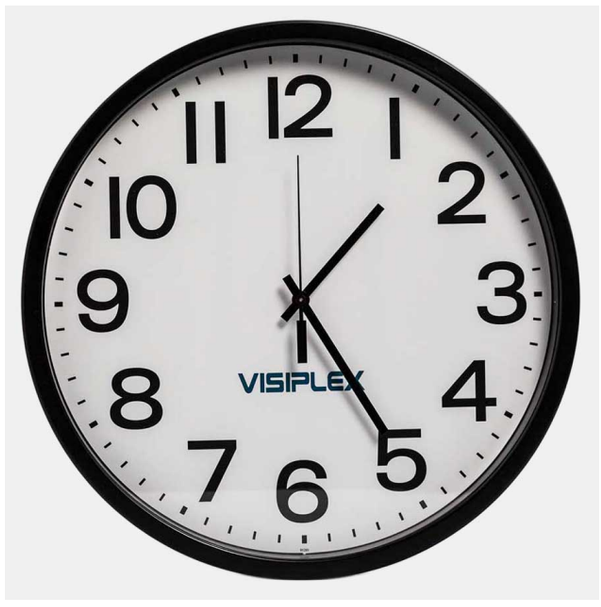
Sunlit

Shadowed

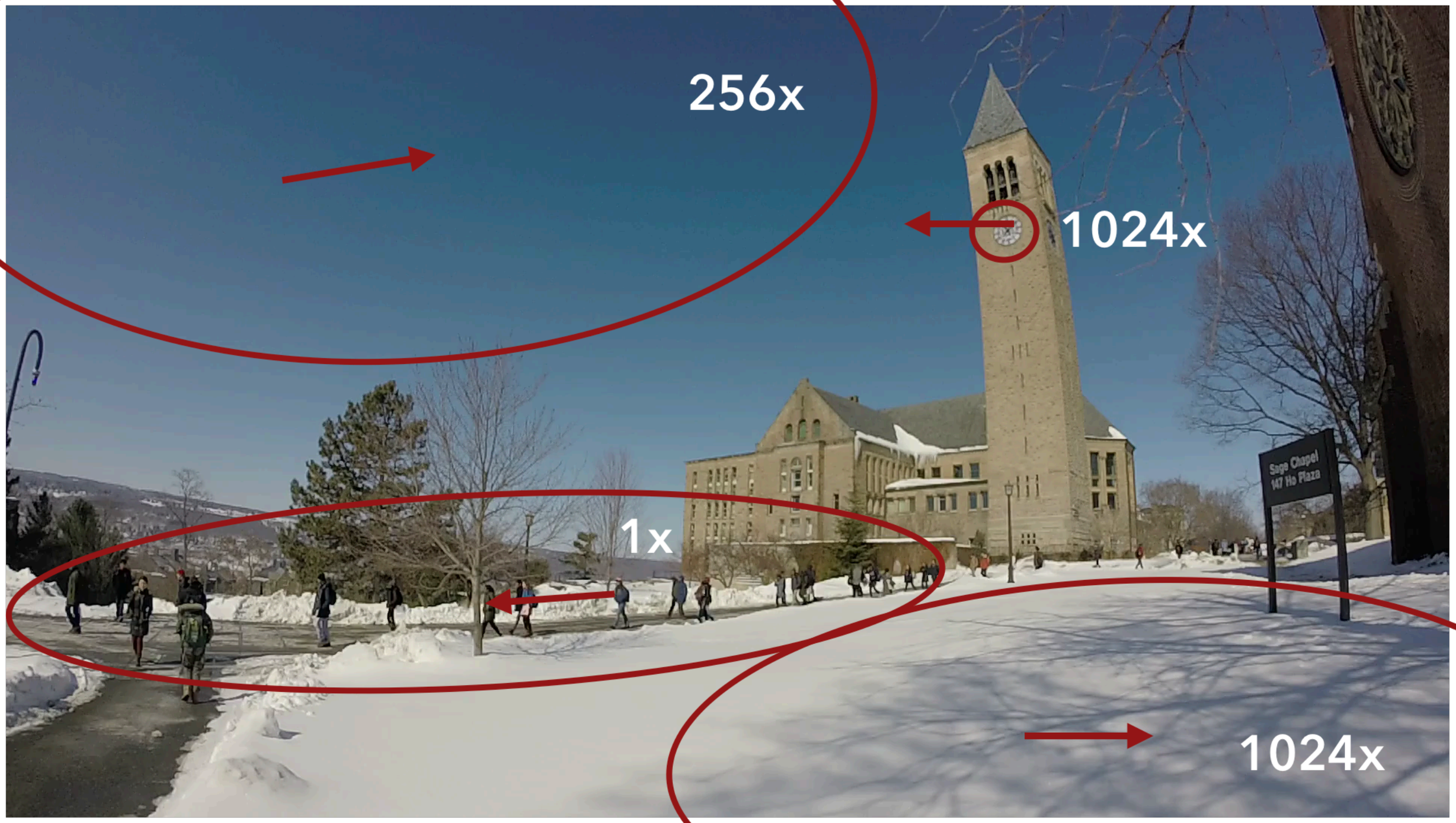



towards
sun direction
Surface **normals**
**Attached** Shadow
**away** from
sun direction
**orthogonal** to
sun direction


Elevation
Azimuth
North


VISIPLEX

# My work: Timelapse Visualization


256x
1024x
1x
1024x
Sage Chapel
147 Ho Plaza

Sage Chapel
Mc Ho Plaza

Sage Chapel
147 Ho Plaza

# Some current work...

# Questions?

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# What to expect from this course

- We will not (cannot) cover everything you just saw.
- There will be more **math** than the shiny pictures let on. We will use lots of Linear algebra and some calculus.
    - I'll try to give reminders/primers as we go.
    - I don't always know what you don't know - please **tell me** if I'm using stuff you haven't seen.
- Whiteboard-style presentation coming soon - my new iPad arrives later this week.

# Course Logistics

- Course website is the syllabus:

  https://facultyweb.cs.wwu.edu/~wehrwes/courses/csci497p_20s/

- Remote logistics:

  - Lecture: Synchronous Zoom lectures plus recordings.

  - In-class exercises: break-out groups and Socrative polls

  - Office hours: Zoom meeting with waiting room

# Course Logistics

- Course website is the syllabus:

  https://facultyweb.cs.wwu.edu/~wehrwes/courses/csci497p_20s/

- Assessment:
  - Programming projects (50%)
  - Written homeworks (15%)
  - Take-home midterm (15%)
  - Take-home final (20%)

# Policies

- Late work: 3 free slip days; after that, get in touch ahead of time and I'm often flexible.

- I want your feedback - email, office hours, or via anonymous Google Form linked from the syllabus.

- Inclusive classroom