
The Ancient
Secrets
Computer Vision


Chapter
One
the
Introduction


Once upon
a time...

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

PROJECT MAC

Artificial Intelligence Group — July 7, 1966
Vision Memo. No. 100.

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".

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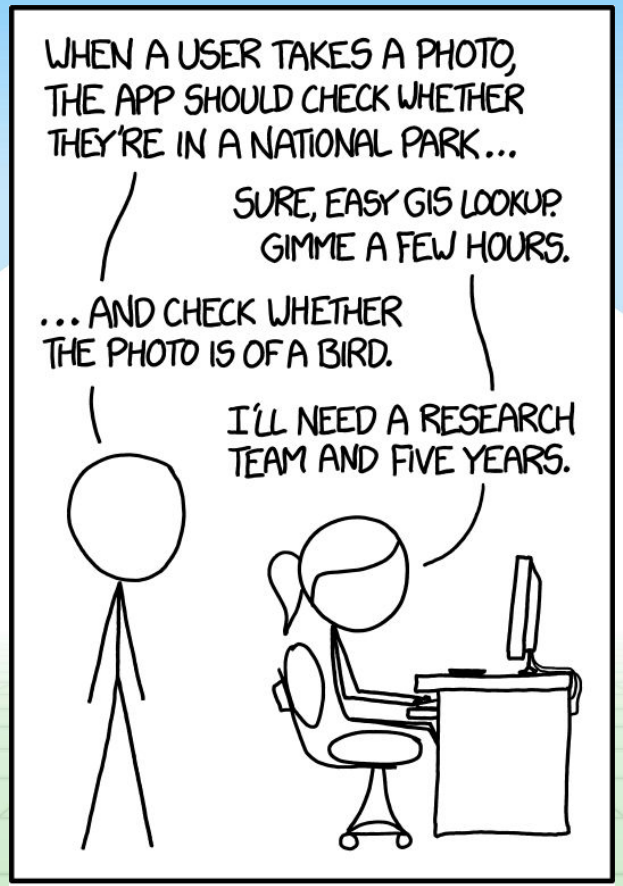


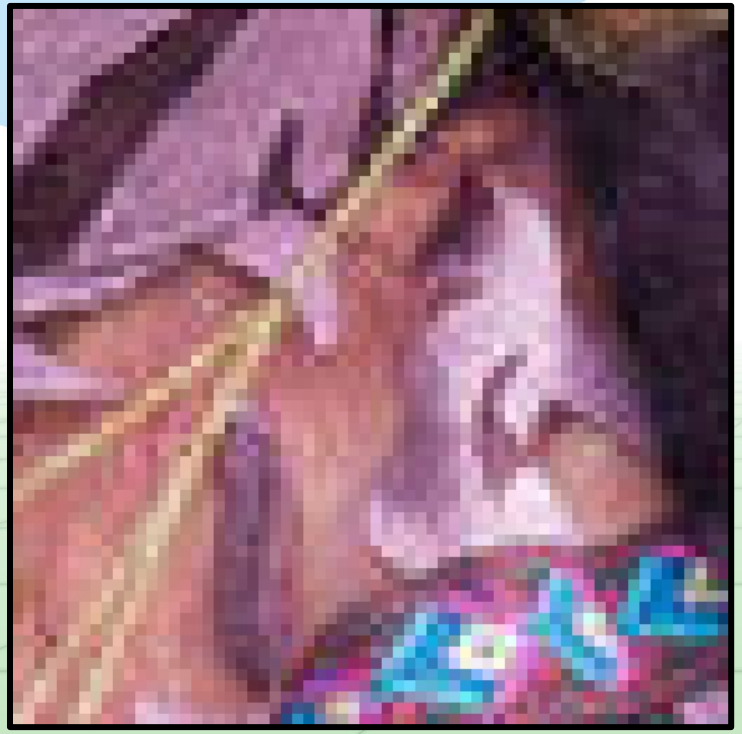
IN CS, IT CAN BE HARD TO EXPLAIN THE DIFFERENCE BETWEEN THE EASY AND THE VIRTUALLY IMPOSSIBLE.

Computer Vision

What does WALL-E see?

Low-Level: Resizing

Low-Level: Resizing



Low-Level: Image Adjustments

Low-Level: Grayscale

Low-Level: Exposure

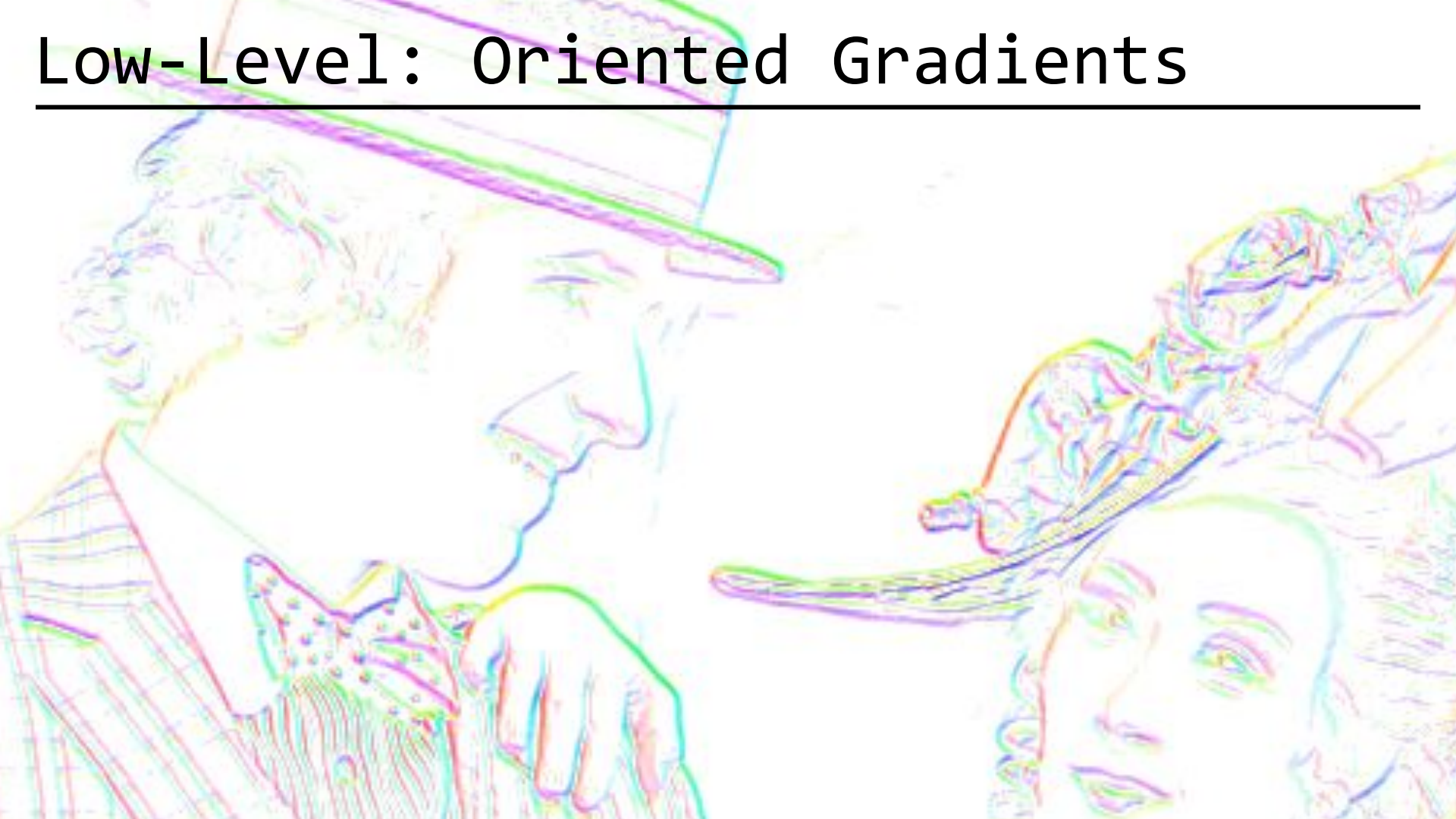
Low-Level: Saturation

Low-Level: Hue

Low-Level: Edges

Low-Level: Oriented Gradients

Low-Level: Oriented Gradients



Low-Level: Segmentation (color)

Low-Level Vision

Photo manipulation
- Size
- Color
- Exposure
- X-Pro II

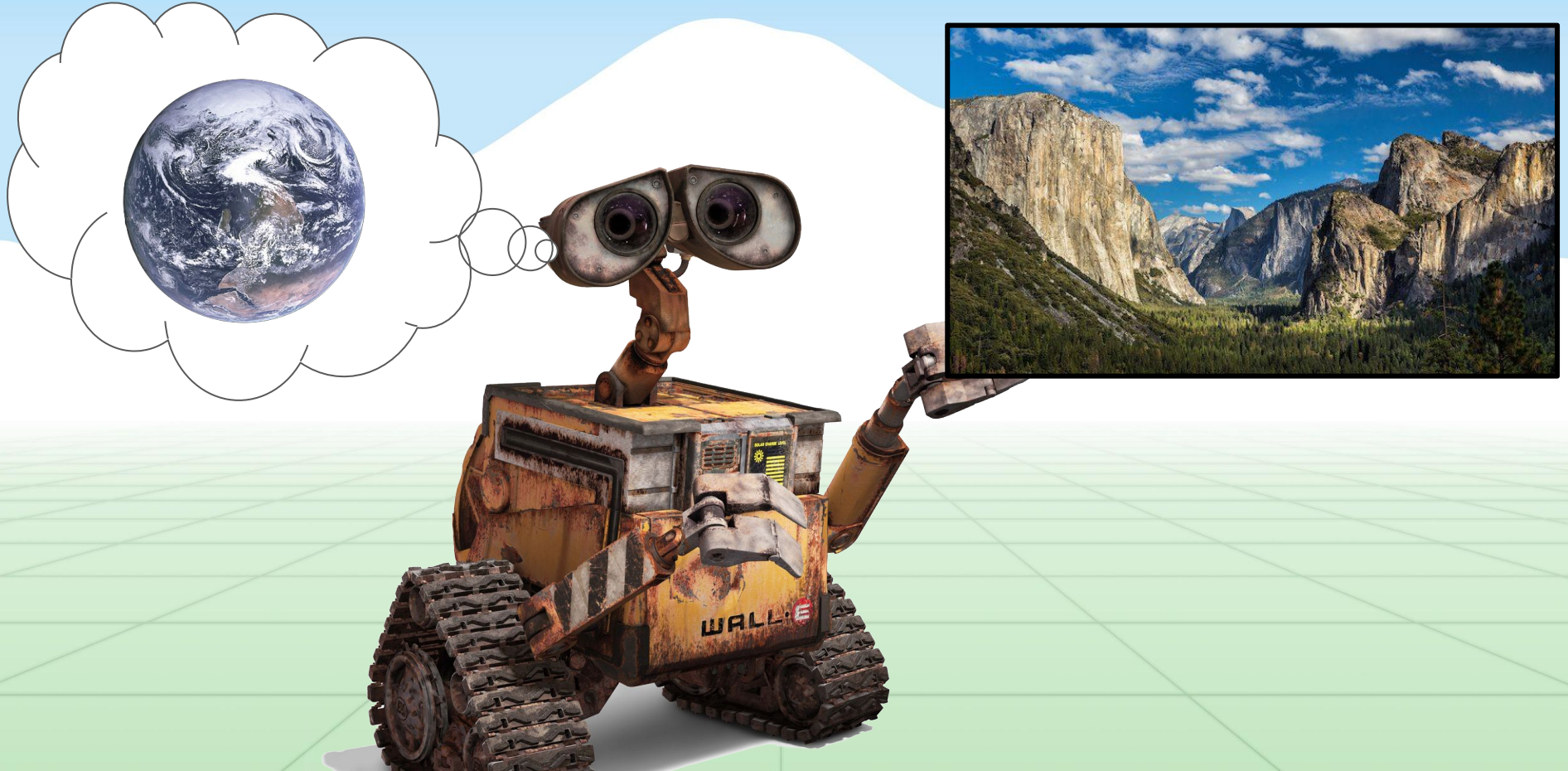
Feature extraction
- Edges
- Oriented gradients
- Segments

Low level vision is exciting!!! #latergram #nofilter

Low-Level Vision Applications?

Anyone?

Mid-Level Vision



Mid-Level: Panorama Stitching

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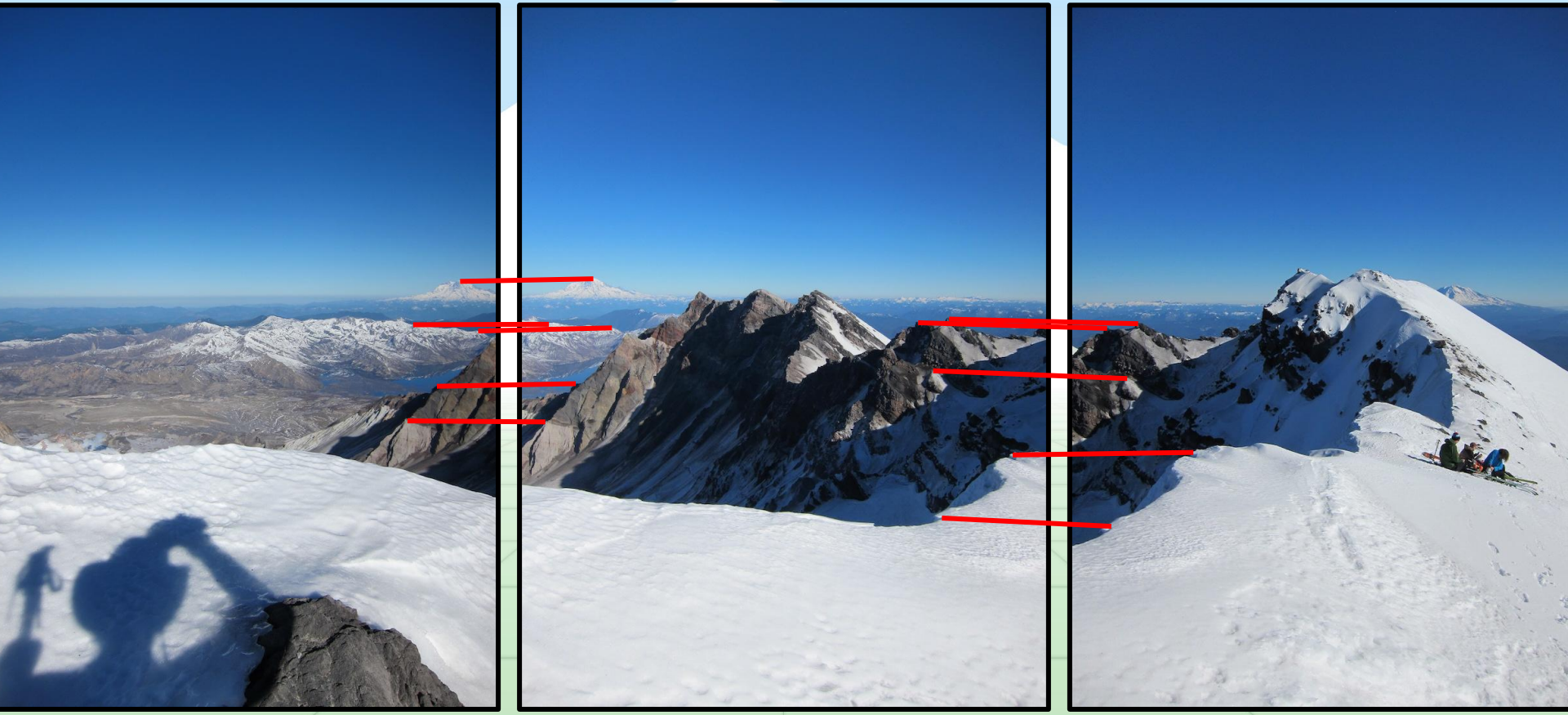

Mid-Level: Panorama Stitching

Mid-Level: Multi-View Stereo

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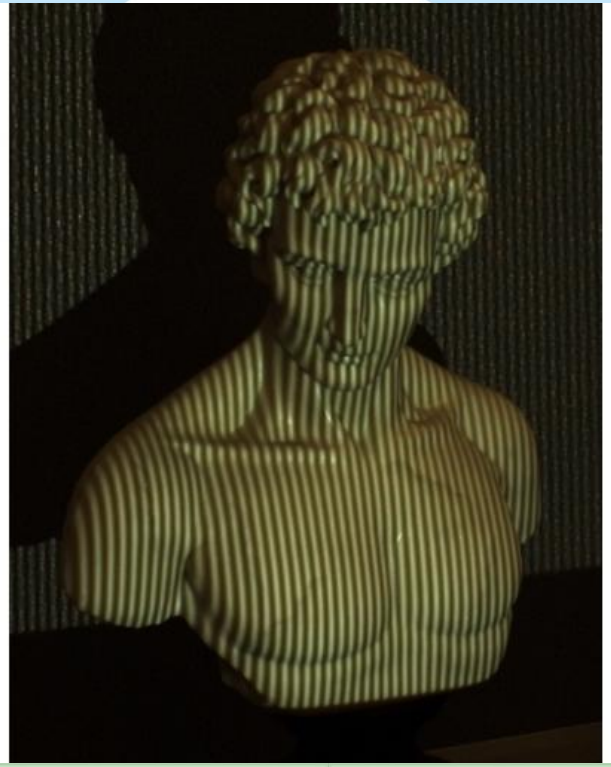
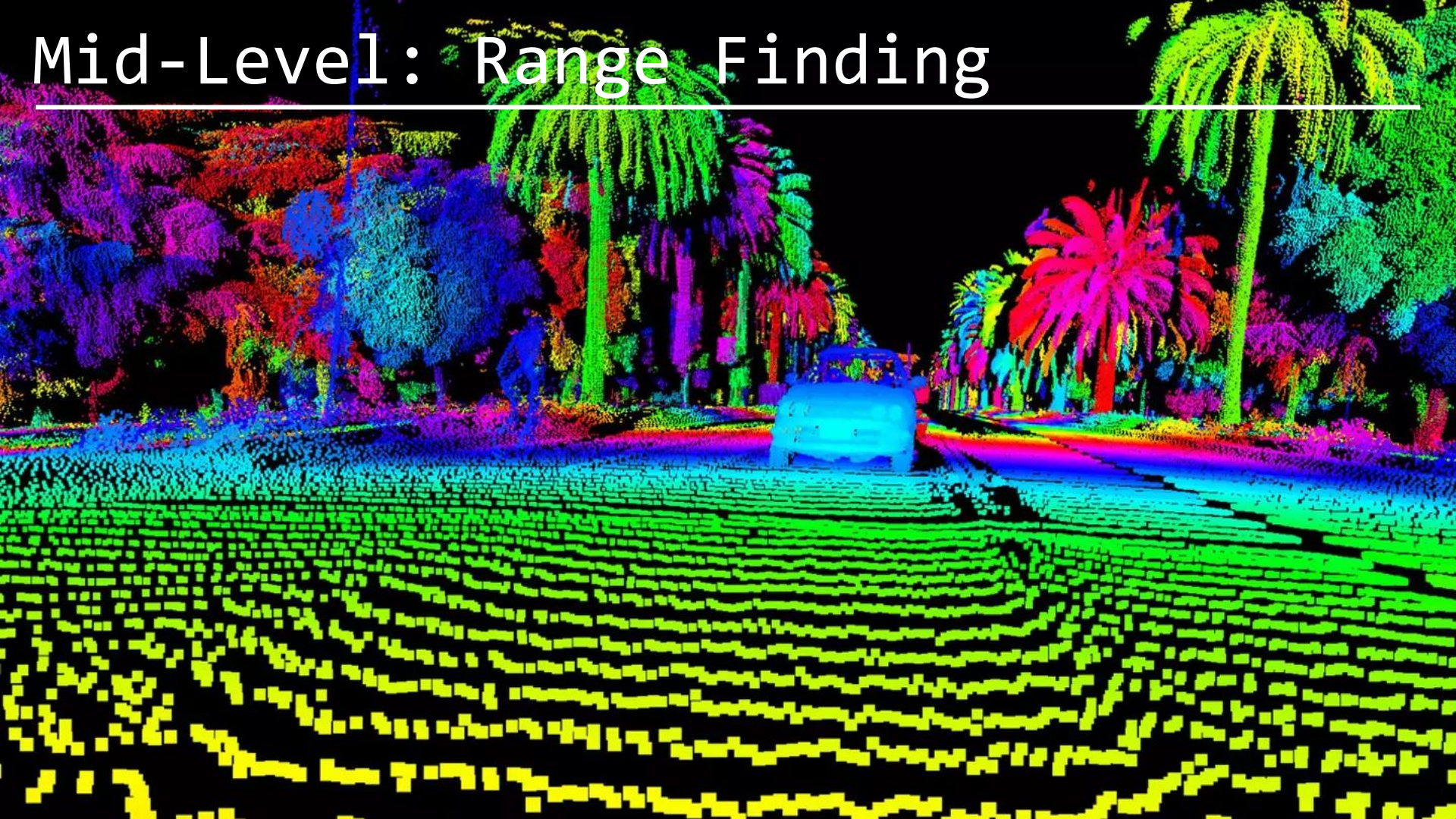
Mid-Level: Structured Light Scan

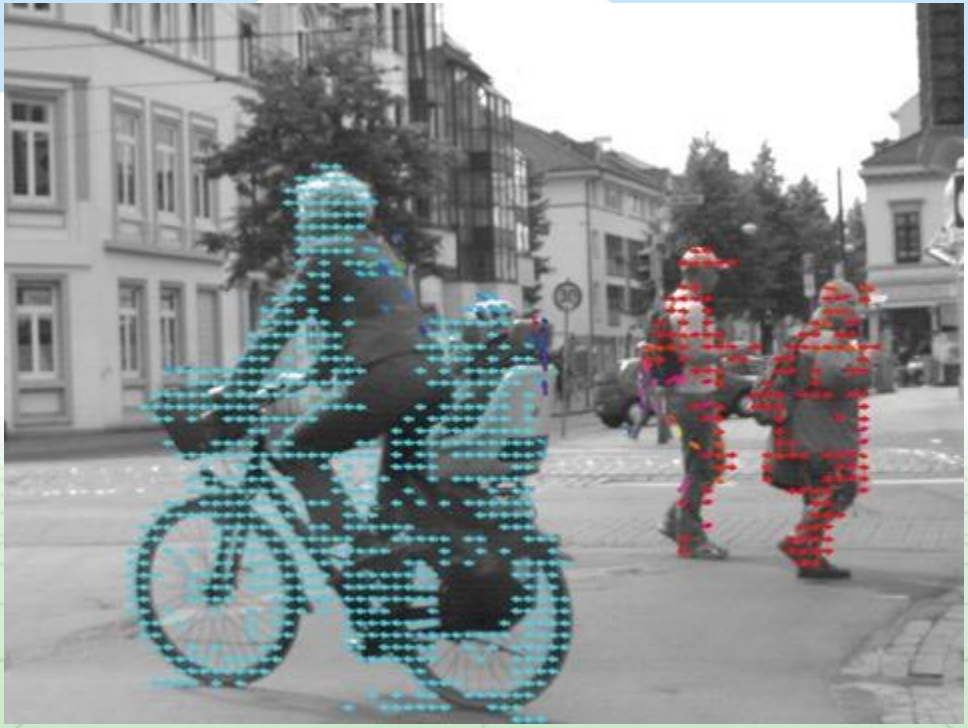
Mid-Level: Structured Light Scan



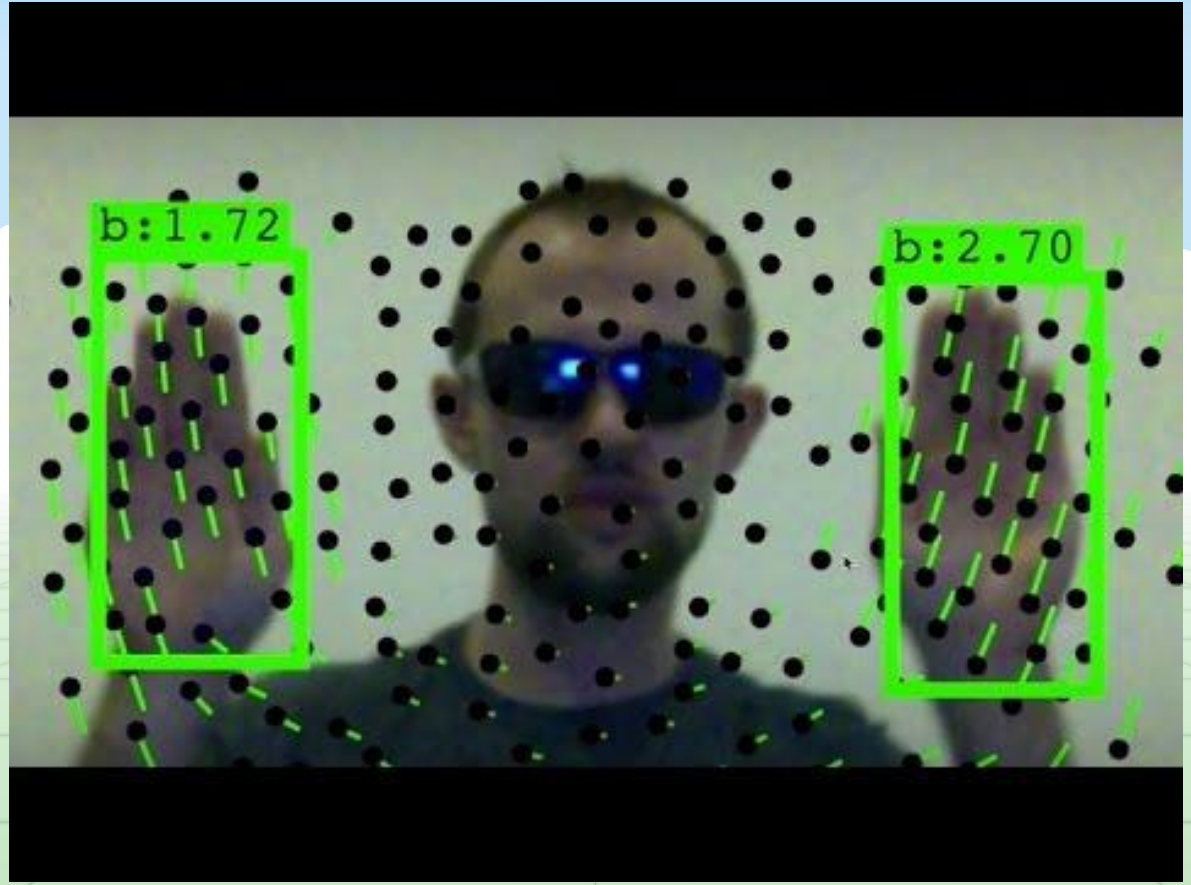
Mid-Level: Range Finding



Mid-Level: Optical Flow



Mid-Level: Optical Flow



Mid-Level: Time Lapse

Mid-Level Vision

Image <-> Image
- Panoramas

Image <-> World
- Multi-view stereo
- Structure from motion
- Structured light
- LIDAR

Image <-> Time
- Optical flow
- Time lapse

High-Level Vision

High-Level: Classification

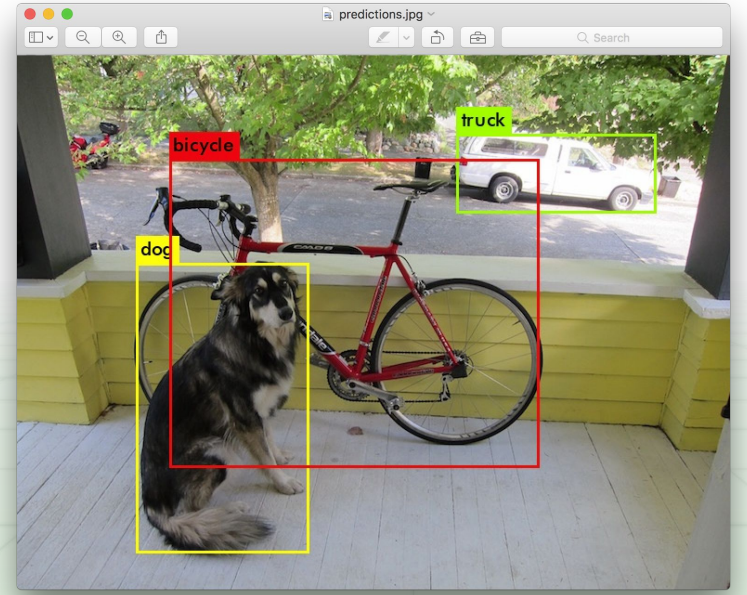
- What is in the image?

High-Level: Tagging

- What are ALL the things in the image?

High-Level: Detection

- What are ALL the things in the image?
- Where are the?



High-Level: Semantic Segmentation

High-Level: Instance Segmentation

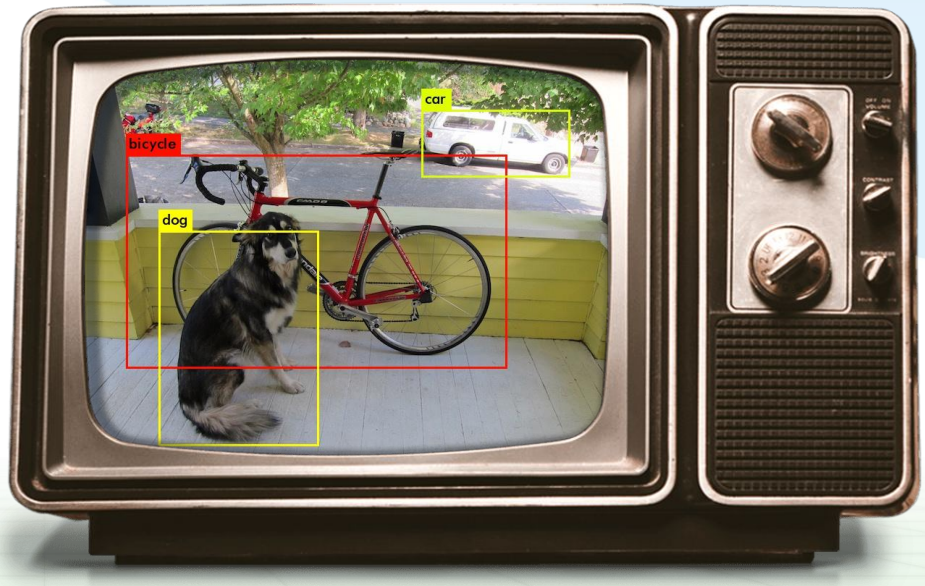
High-Level: So many other things

- Single image 3D
- Game playing
- Super-resolution
- Retrieval
- Other cool things, yay!

High-Level Vision

Semantics!
- Image classification
- Object detection
- Segmentation

Applications
- Retrieval
- Robots?
- and…????



Assignments

Build a vision library from the ground up
Mostly in C
Play with advanced tools, neural networks

Beginning: lots of skeleton code, explanations
End: less guidance, more experimentation

Tentatively 8 assignments (this may get cut down)

Due Thursdays at Midnight (by popular demand)

Final Project

Use your library or any modern vision tools or frameworks to do something cool!

We'll provide default project ideas but it is very open ended. If you are interested in something specific this is your chance to explore!

Teams are encouraged

Grading

8 assignments - 80%
Final project - 20%

4 late days to use when you want
Up to 10% penalty per day after.

Collaboration

Do: talk to each other, ask for help, give help, explain concepts, talk about examples, google terms or concepts, lots of wikipedia!

Don’t: read other peoples code, copy code, search for code, etc.

Use any resource that helps you understand the material and concepts, don’t go looking for shortcuts around understanding just to finish an assignment. Submit all your own work.

Office hours: TBD

We have some awesome TAs, all are graduate students in computer vision. We will get you through this class, don’t worry!

Questions??

Mattermost!

Sign up with GitLab, link is on website

Also, email or anonymous feedback, see website for details.