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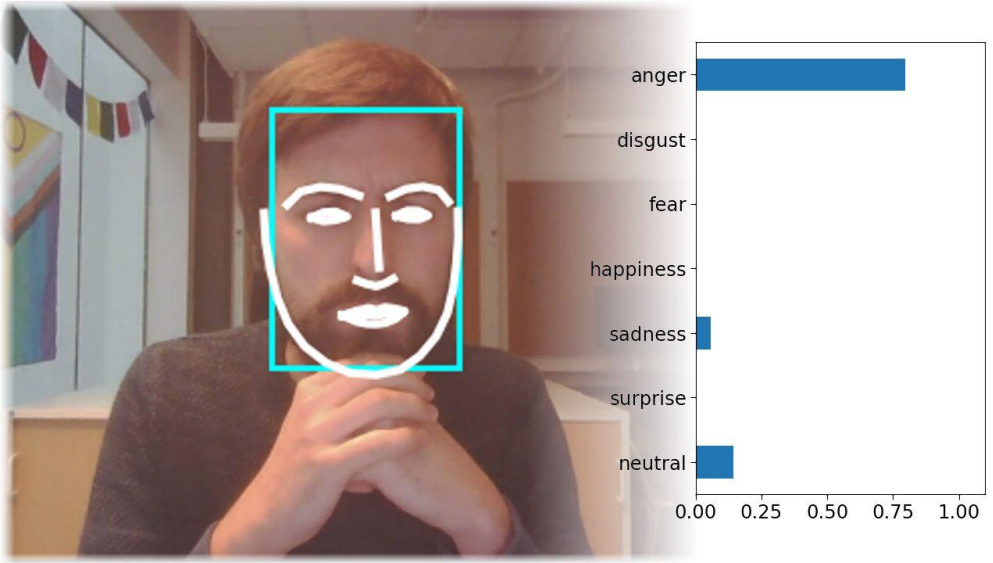
# Lab 1:
# Computer Vision

Marc Fraile

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# Digital Imaging

- Human vision
- Color is an illusion
- Faking color for monkey brains
- Raster images

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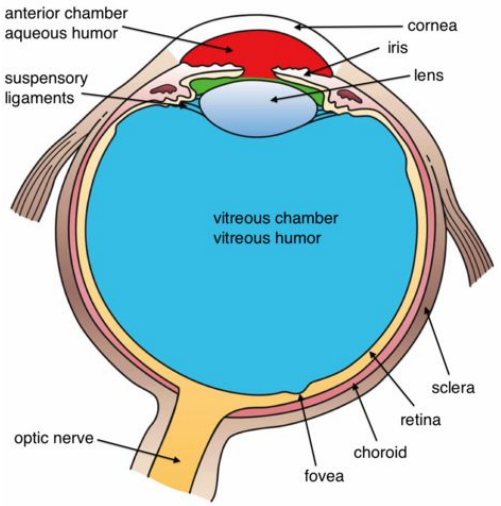
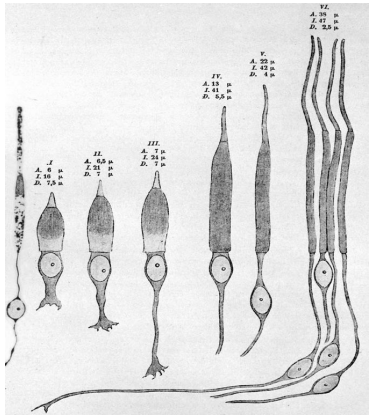
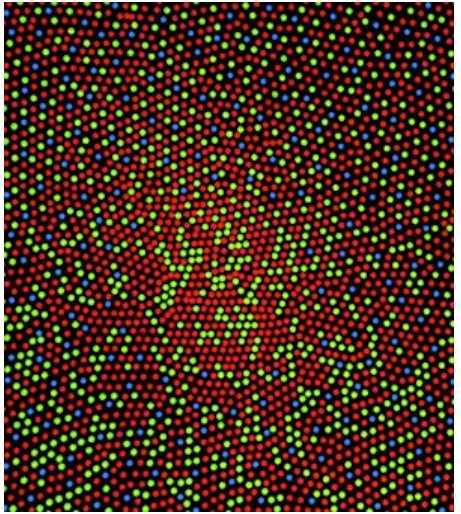
# Human vision

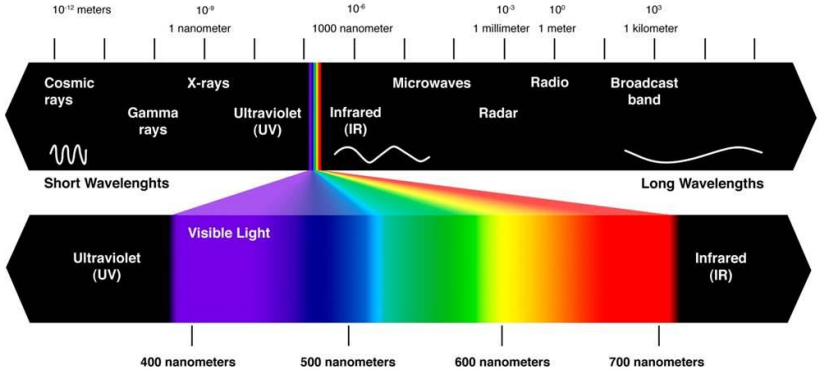



structure of the eye





distribution of cones in the retina




light spectrum

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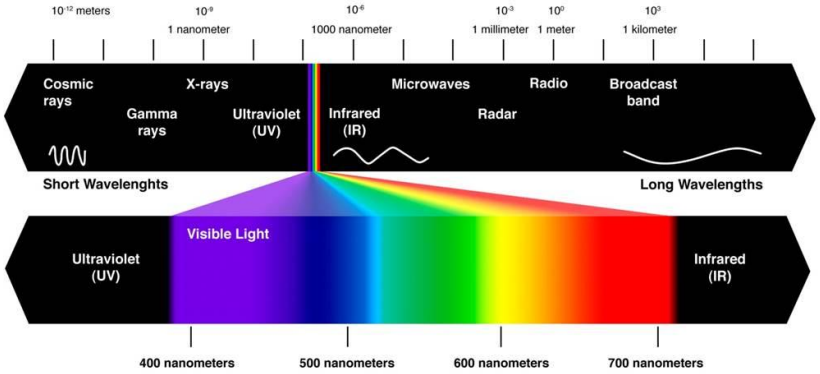
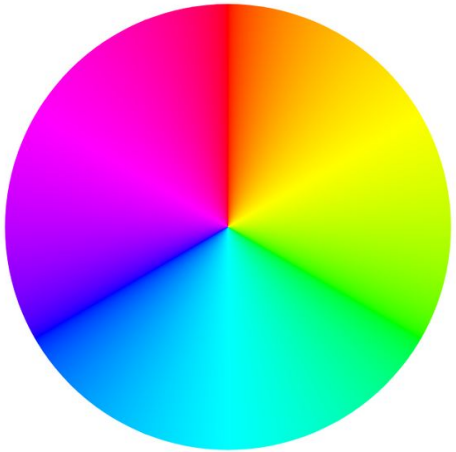
# Color is an illusion



**light spectrum: linear**

Purple and red are completely different!

**color perception: circular**

Pink closes the gap.

**Color perception is not physical reality**

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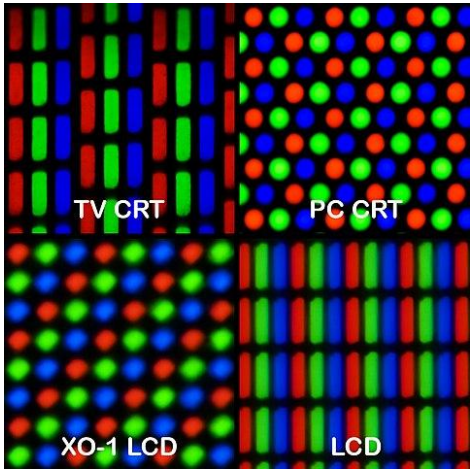
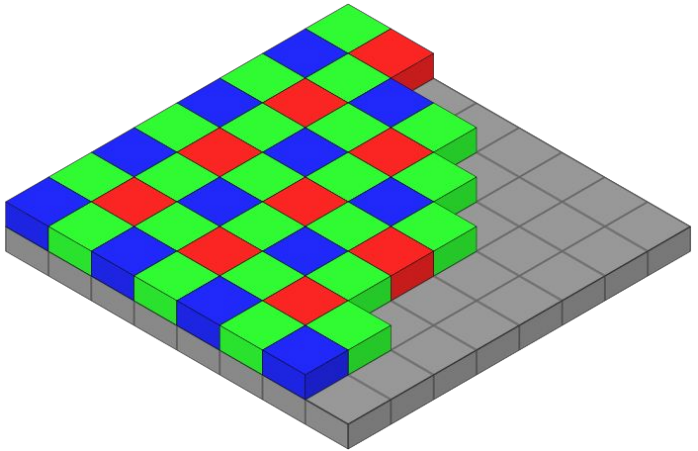
# Faking color for monkey brains




**Screens use RGB**

From far away, colored light mixes.



**Cameras use RGB**

Always need more precision on **Green**.

**Great! We can fake it!**

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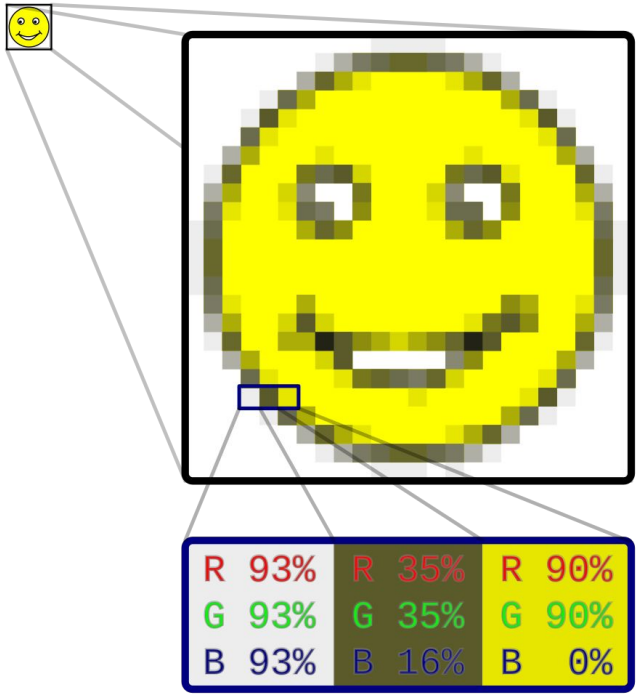
# Raster images




3D arrays: (height, width, channels)

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# Computer Vision

- What is computer vision?
- Feature extraction
- End-to-End
- Which approach is best?

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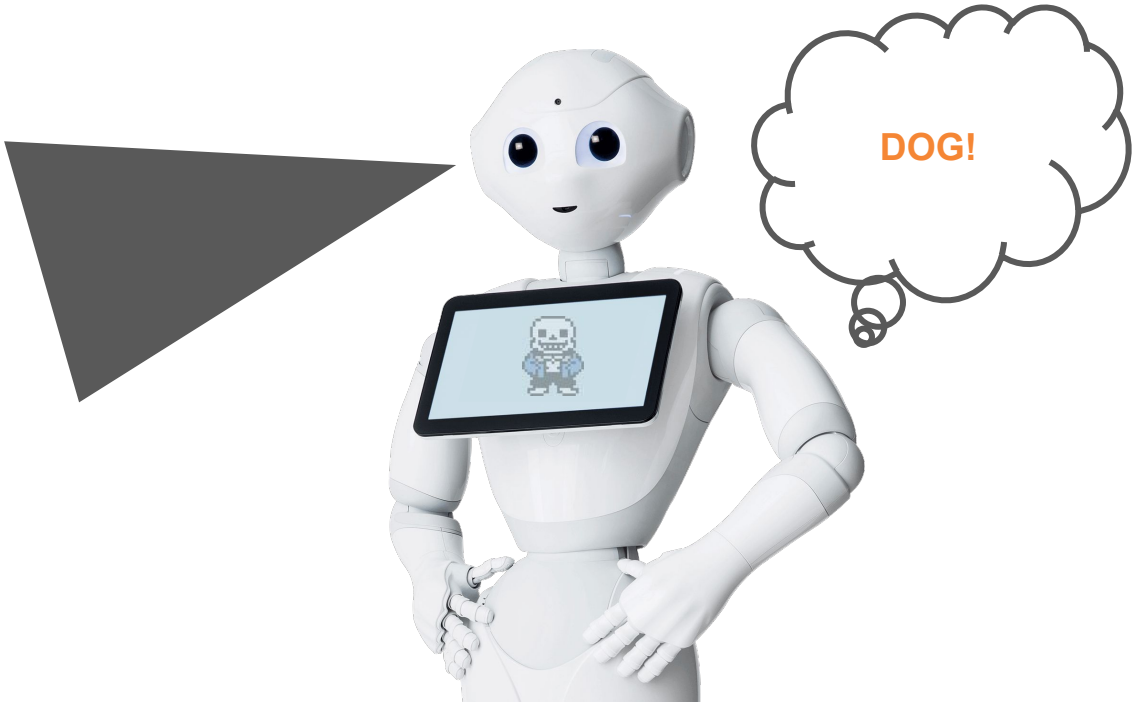
# What is computer vision?




**Any approach that lets a computer interpret images and video!**

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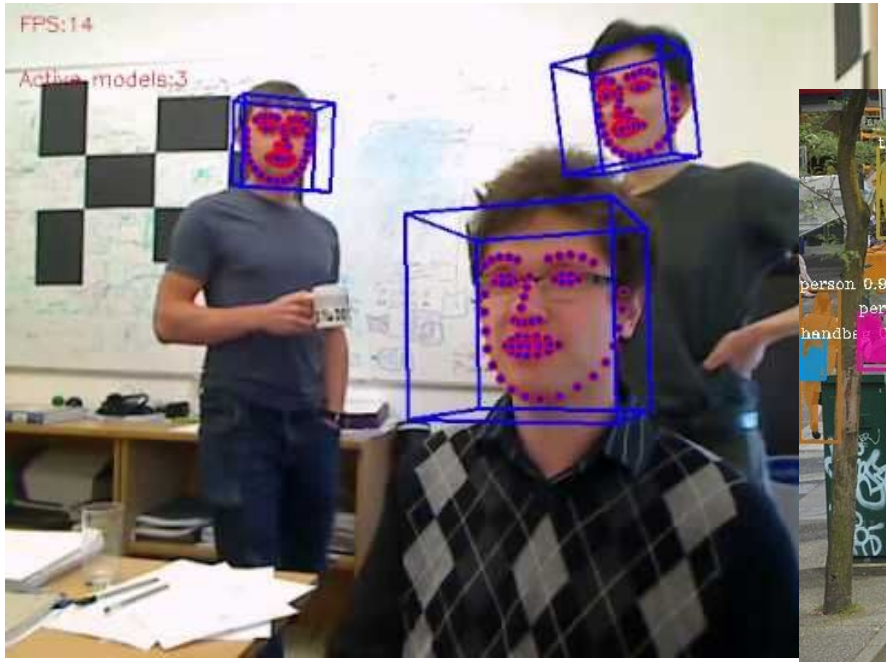
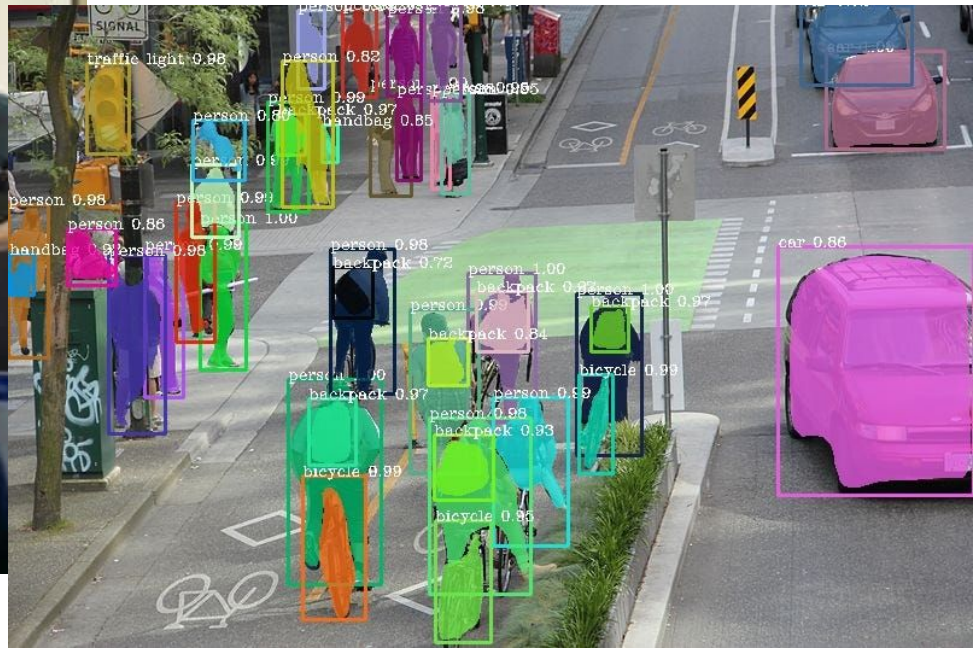
# What is computer vision?



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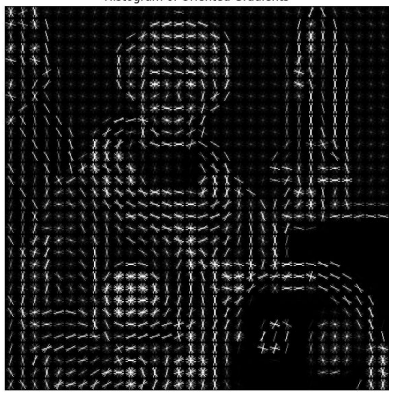
# Feature extraction

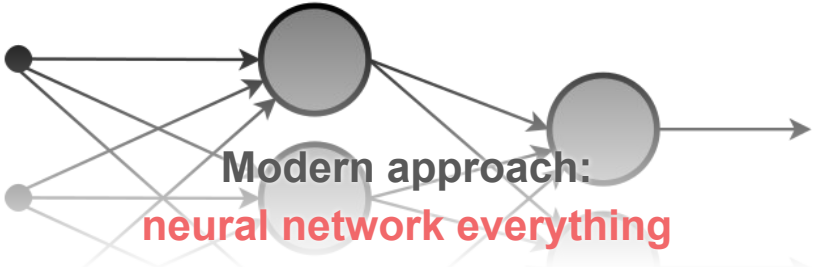
**Classic approach:**

**use math to capture texture**

Input image

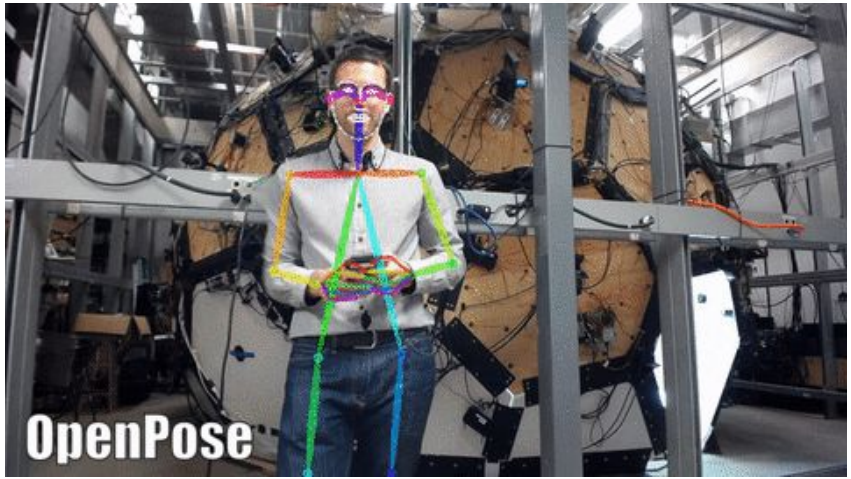
Histogram of Oriented Gradients





**Modern approach:**

**neural network everything**

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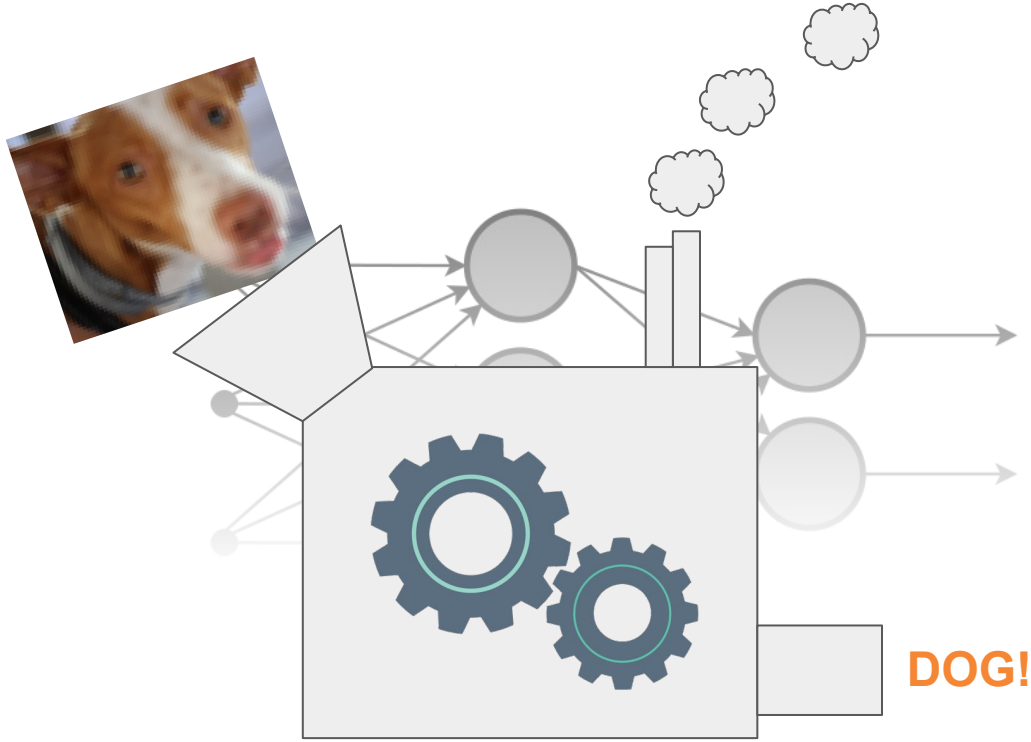
# End-to-End

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# Which approach is best?

## Feature Extraction

- Needs reasonable amounts of data.
- Classic methods tend to run fast in the CPU.
- Easy to anonymize samples.

## End-to-End

- Needs LOTS of data.
- Neural networks need GPU acceleration to run, and are resource-intensive.
- Usually contain identifying data.

**Context is king!**