Introduction

Computer Vision (CSCI 4220U)

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http://vclab.science.ontariotechu.ca

A bit about me

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Important questions

- Will I get an A+ in this course?
- What is computer vision anyways?

Acknowledgments

These slides draw upon other computer vision courses. I would in particular like to thank S. Seitz, D. Forsyth, K. Derpanis, J. Hoiem, A. Efros, Criminisi and many others for making their material available for teaching and learning purposes.

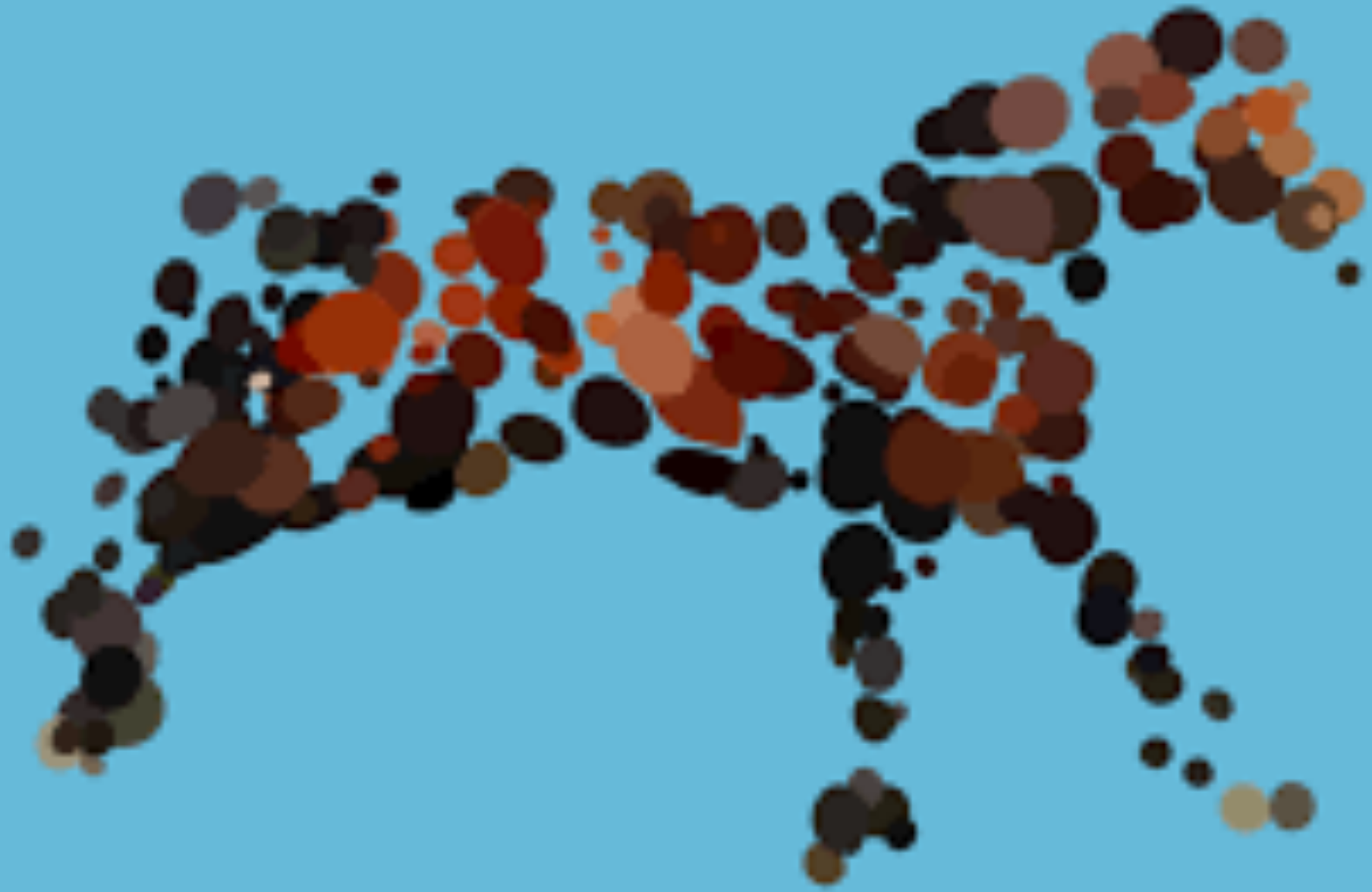
Understand images and videos


Recover useful properties about the world from images and videos

Computer vision is hard

- Visual cortex occupies nearly 50% of Macaque brain
- Greater fraction of human brain is devoted to vision (processing) than anything else

By Rameessos - Own work, Public Domain, https://commons.wikimedia.org/w/index.php?curid=5569986



MASSACHUSETTS INSTITUTE OF TECHNOLOGY

PROJECT MAC

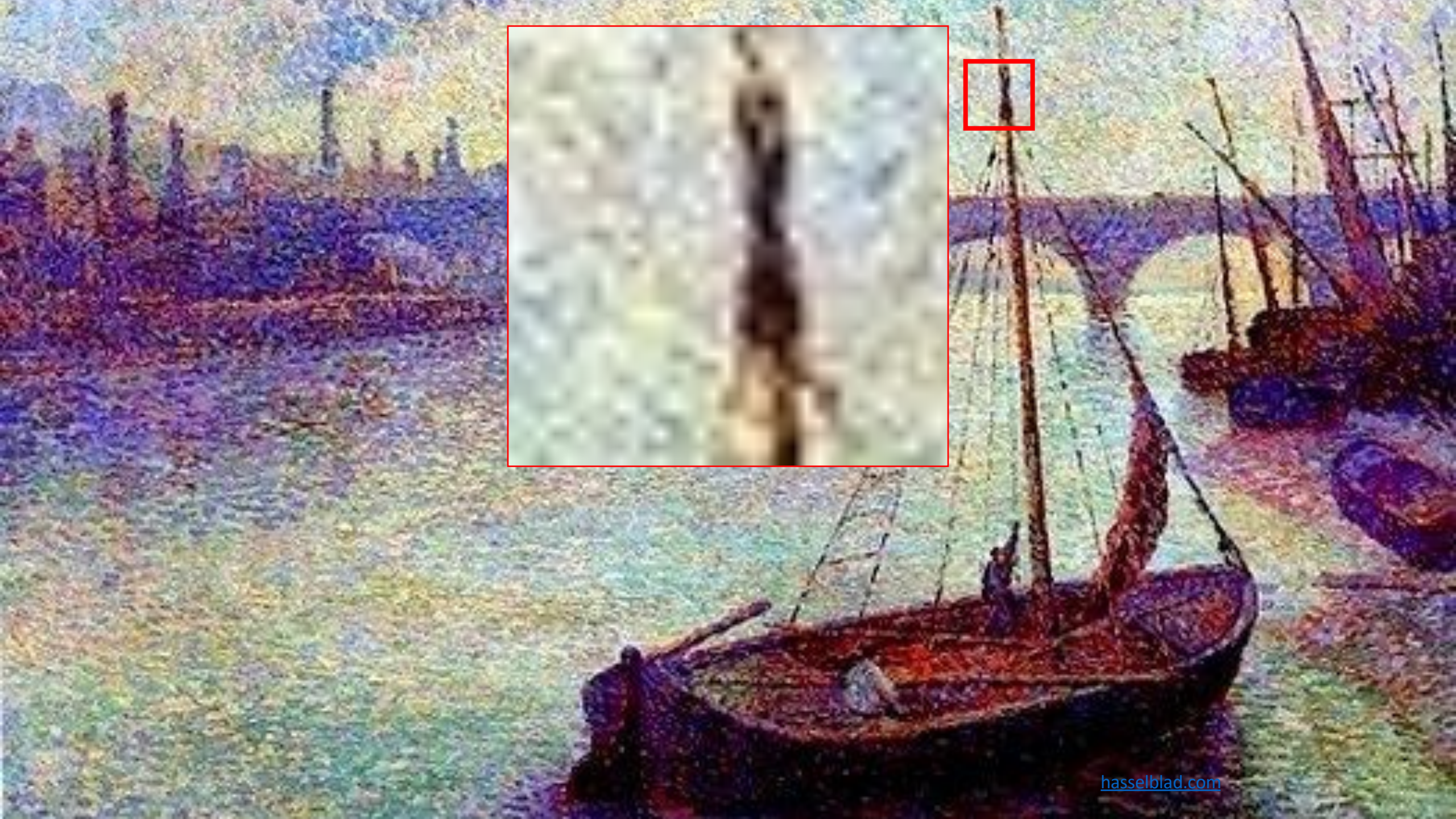
Artificial Intelligence Group July 7, 1966
Vision Memo. No. 100.

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".


hasselblad.com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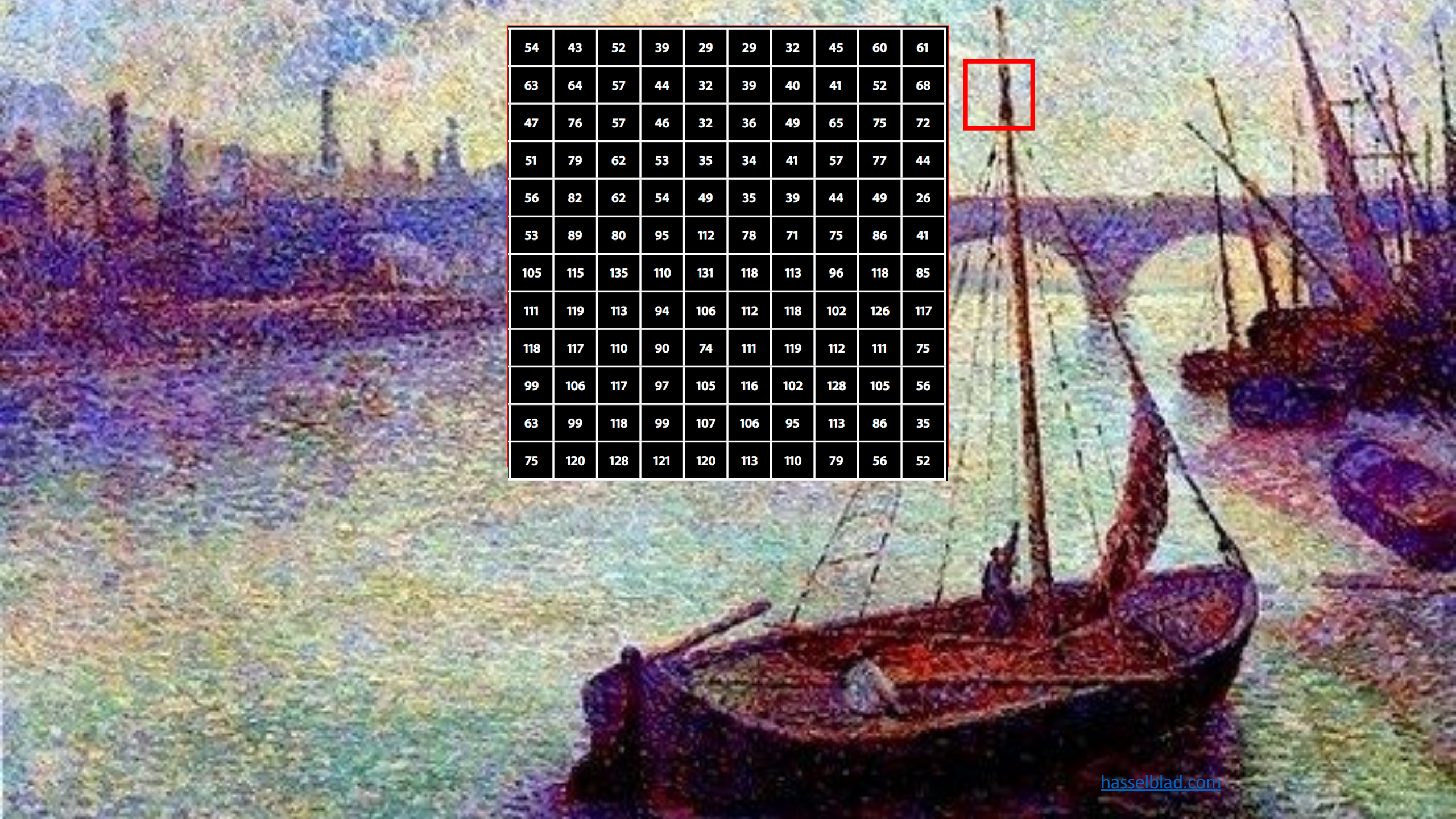
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105 115 135 110 131 118 113 96 118 85
111 119 113 94 106 112 118 102 126 117
118 117 110 90 74 111 119 112 111 75
99 106 117 97 105 116 102 128 105 56
63 99 118 99 107 106 95 113 86 35
75 120 128 121 120 113 110 79 56 52
hasselblad.com

Images are highly complex functions of several variables

Slide credit: K. Derpanis

3D Lego Terracotta Army

Leon Keer, Ruben Poncia, Remko van Schaik and Peter Westerink


Slide credit: K. Derpanis


Slide credit: K. Derpanis

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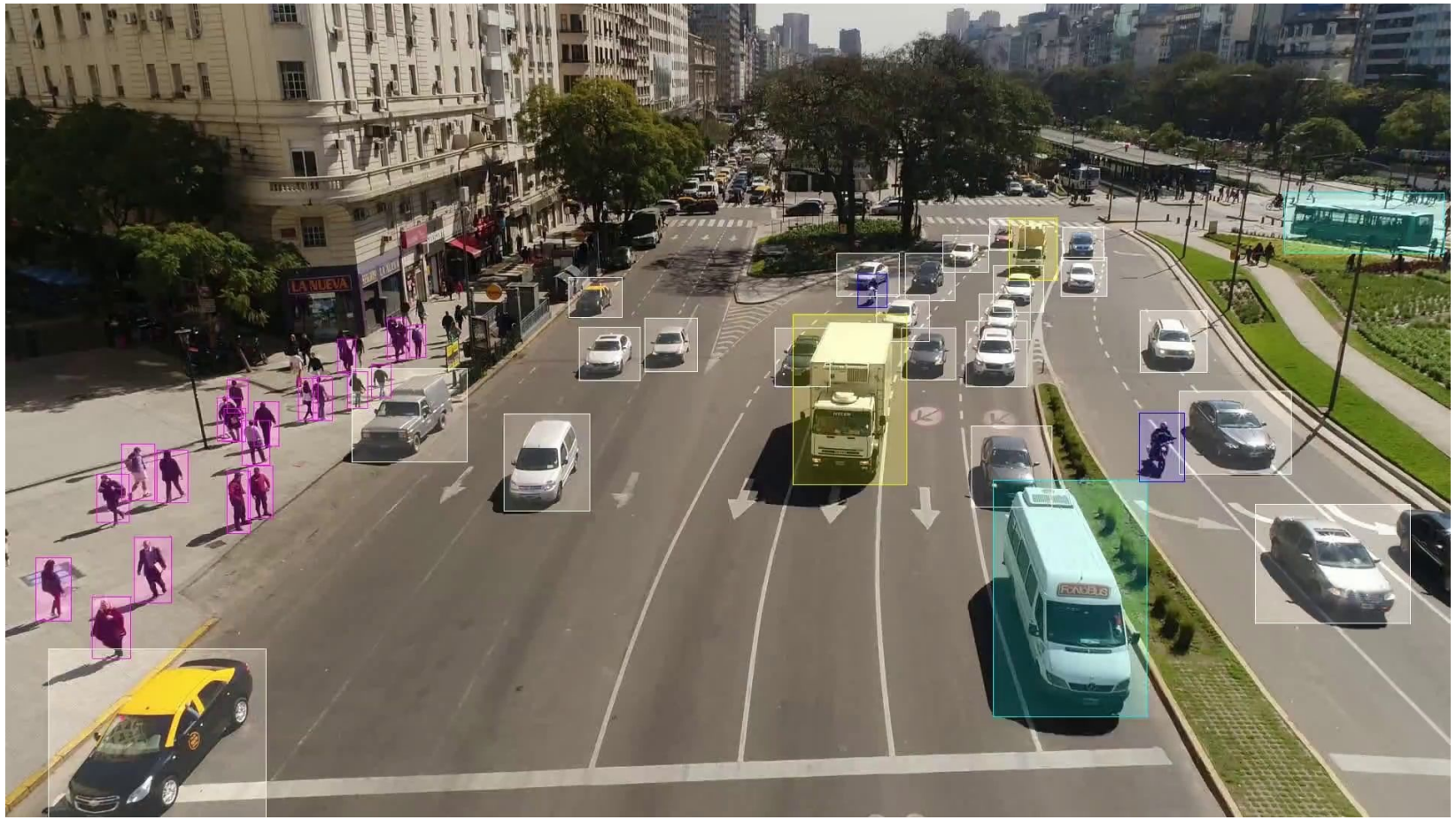
Slide credit: K. Derpanis

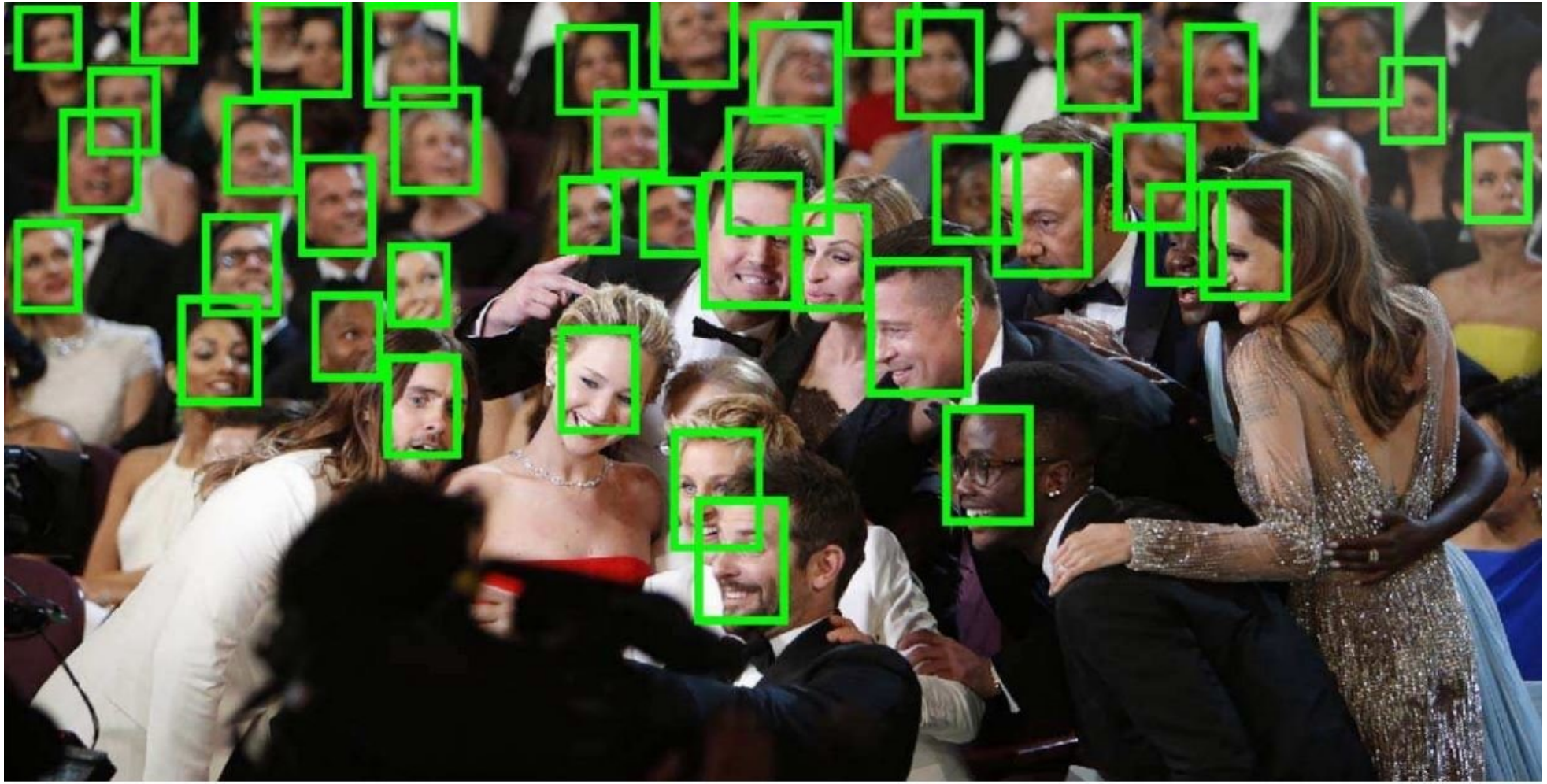

https://a2ua.com/

Traffic analysis



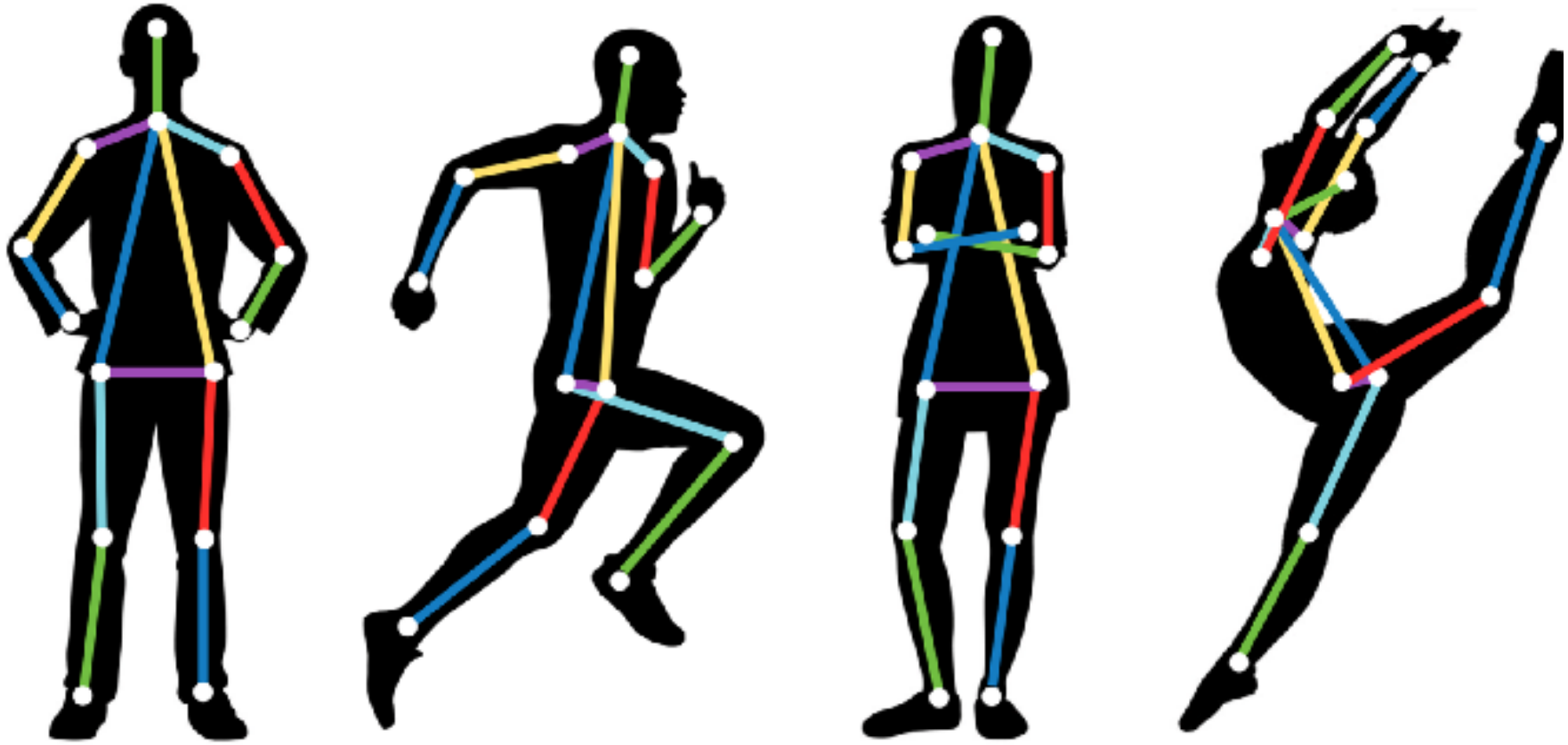
Credit: augmentedstartups.com

Face analysis



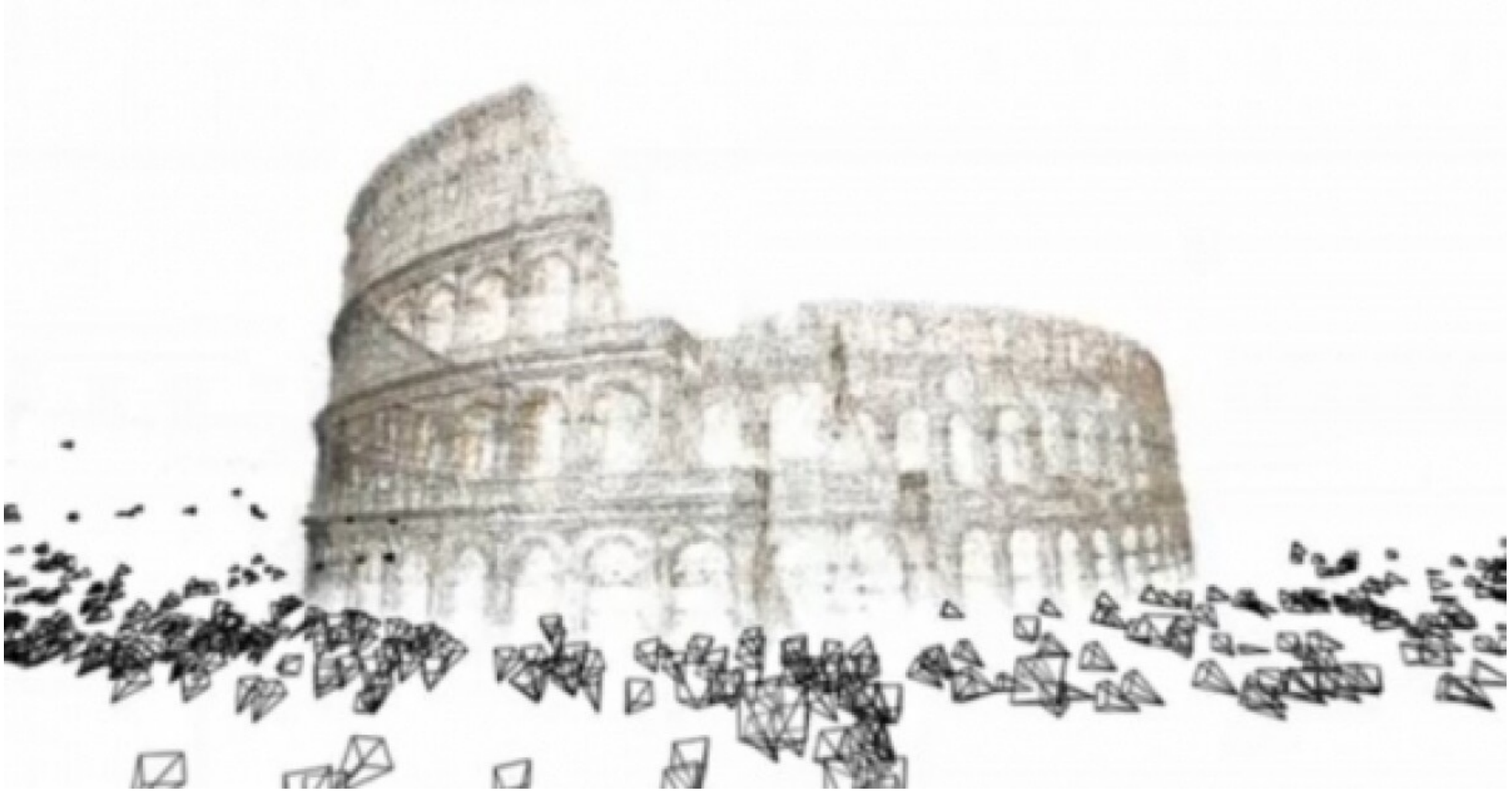
Credit: viso.ai

Human pose and activity analysis



Credit: analyticsvidhya.com

3D scene analvsis



Credit: newatlas.com

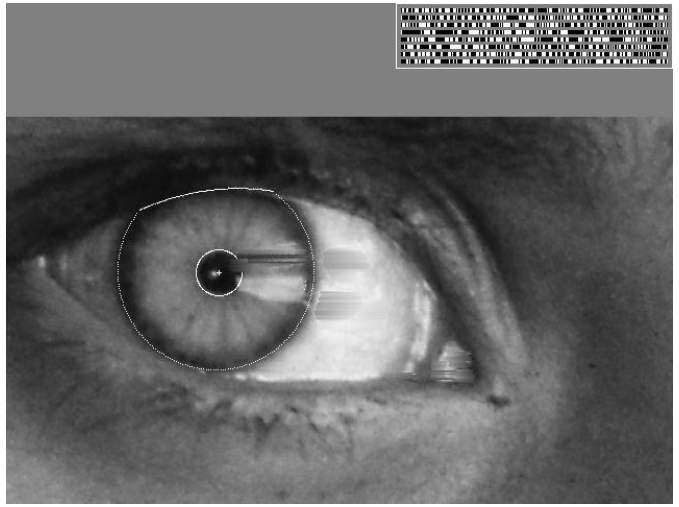
Retail

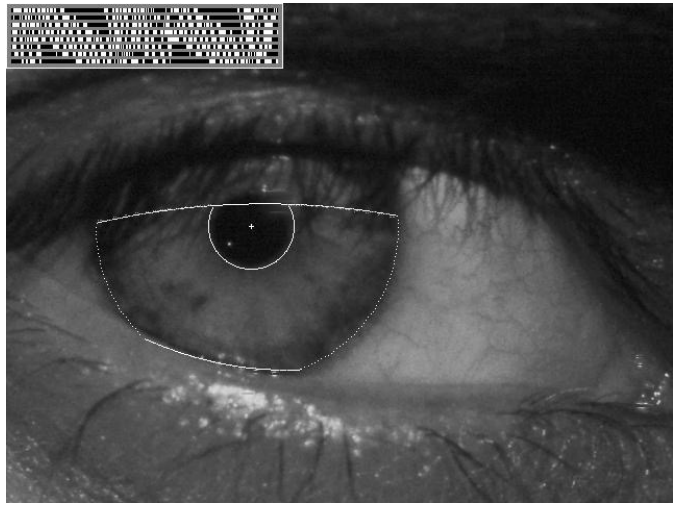
Credit: augmentedretails.com

Biometrics

Credit: biometricupdate.com

Biometrics





Credit: nationalgeographic.com

Special effects

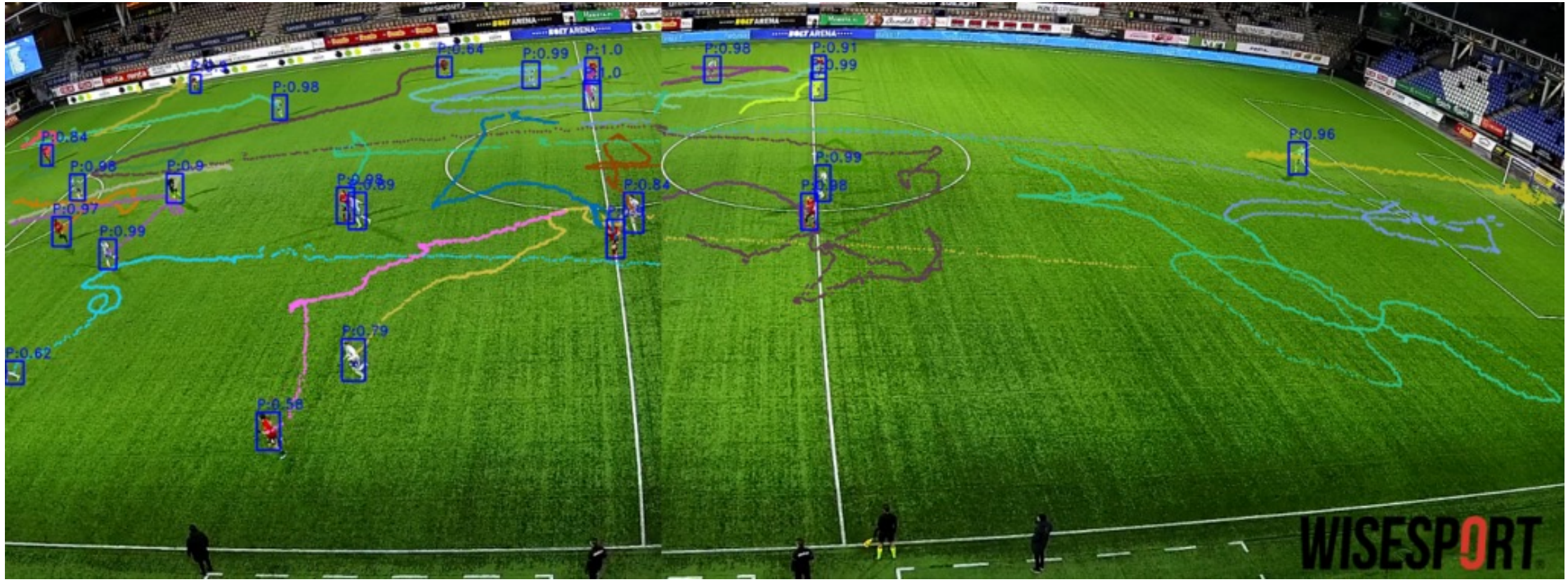
Credit: nationalgeographic.com

Sports

Credit: ox.ac.uk

Credit: Pokemon Go

Sports



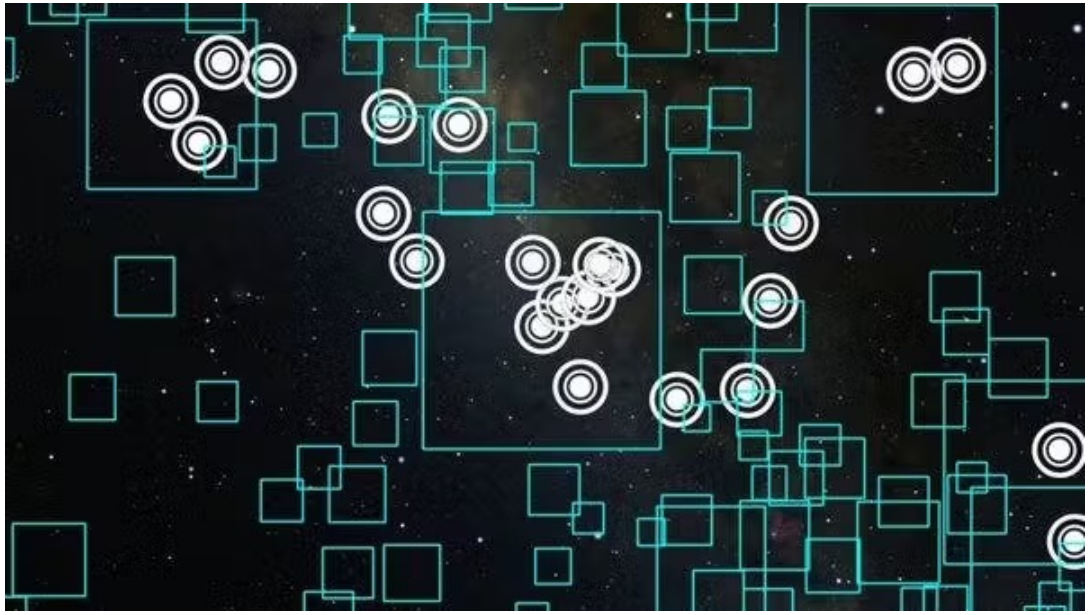
Credit: wisesports.com

Mapping and Navigation

Credit: rd.com

Space exploration

Credit: zbigatron.com



Credit: Hackster.io

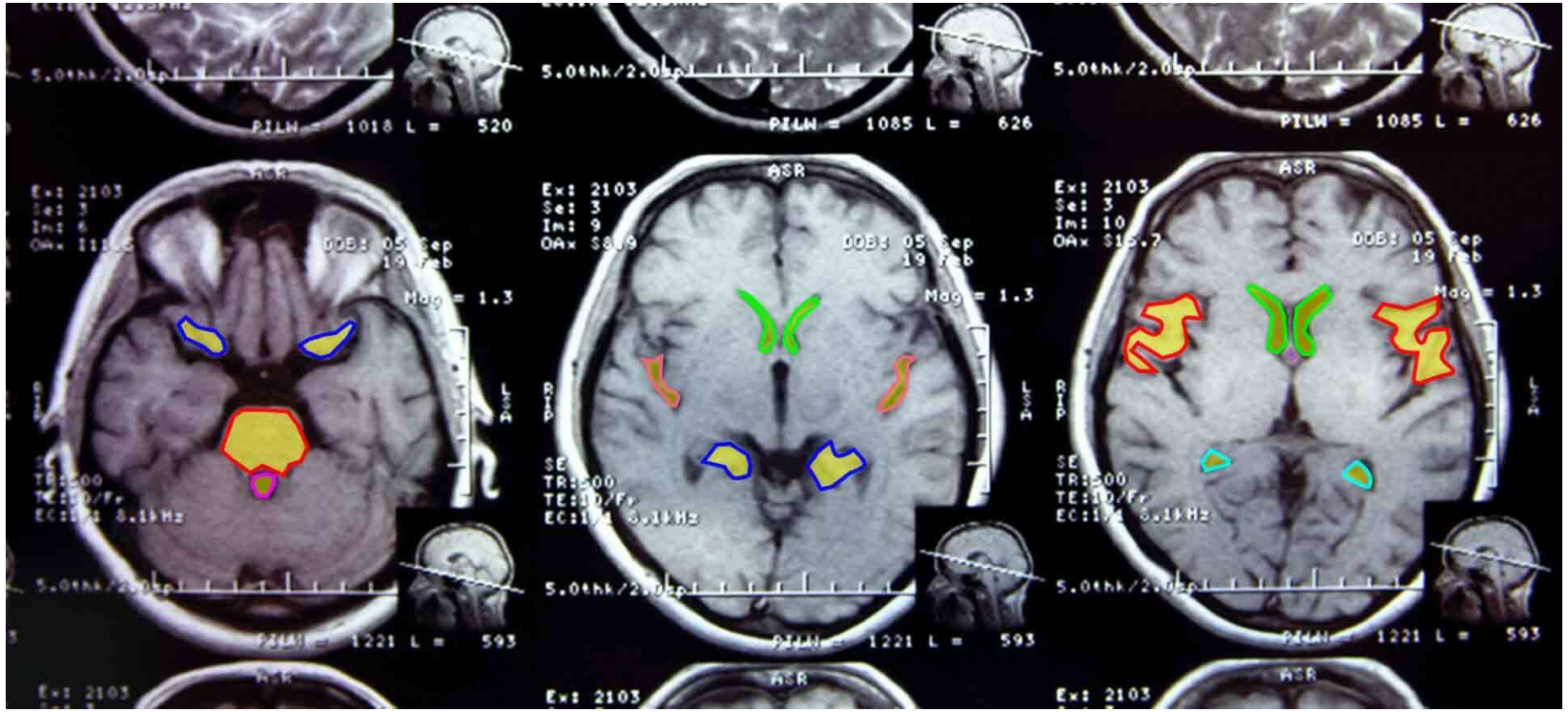
Industrial robots

Credit: labellerr.com

Robots

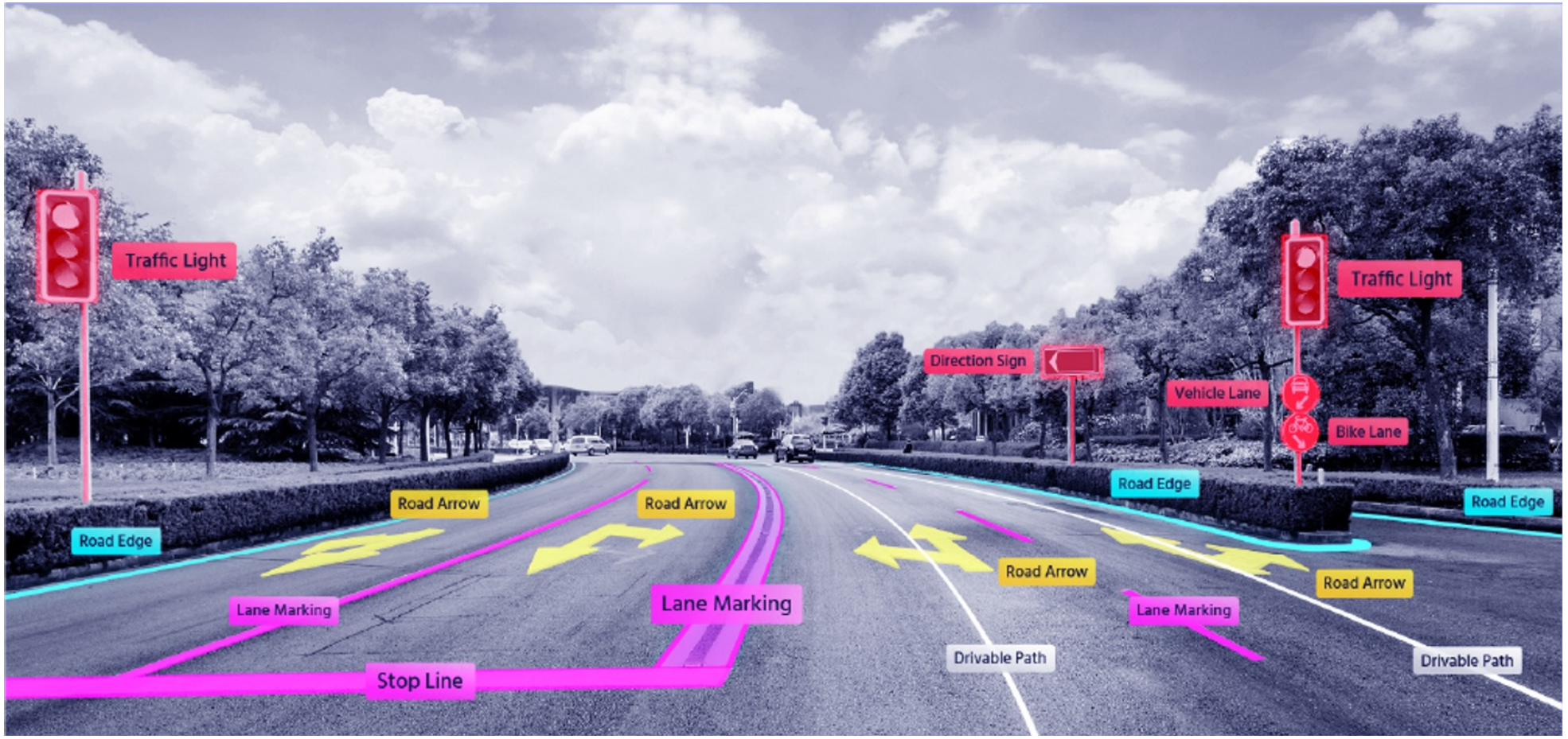
Credit: labellerr.com

Medical imaging



Credit: bitrefine.com

Self-driving cars



Credit: mobileye.com

Course website

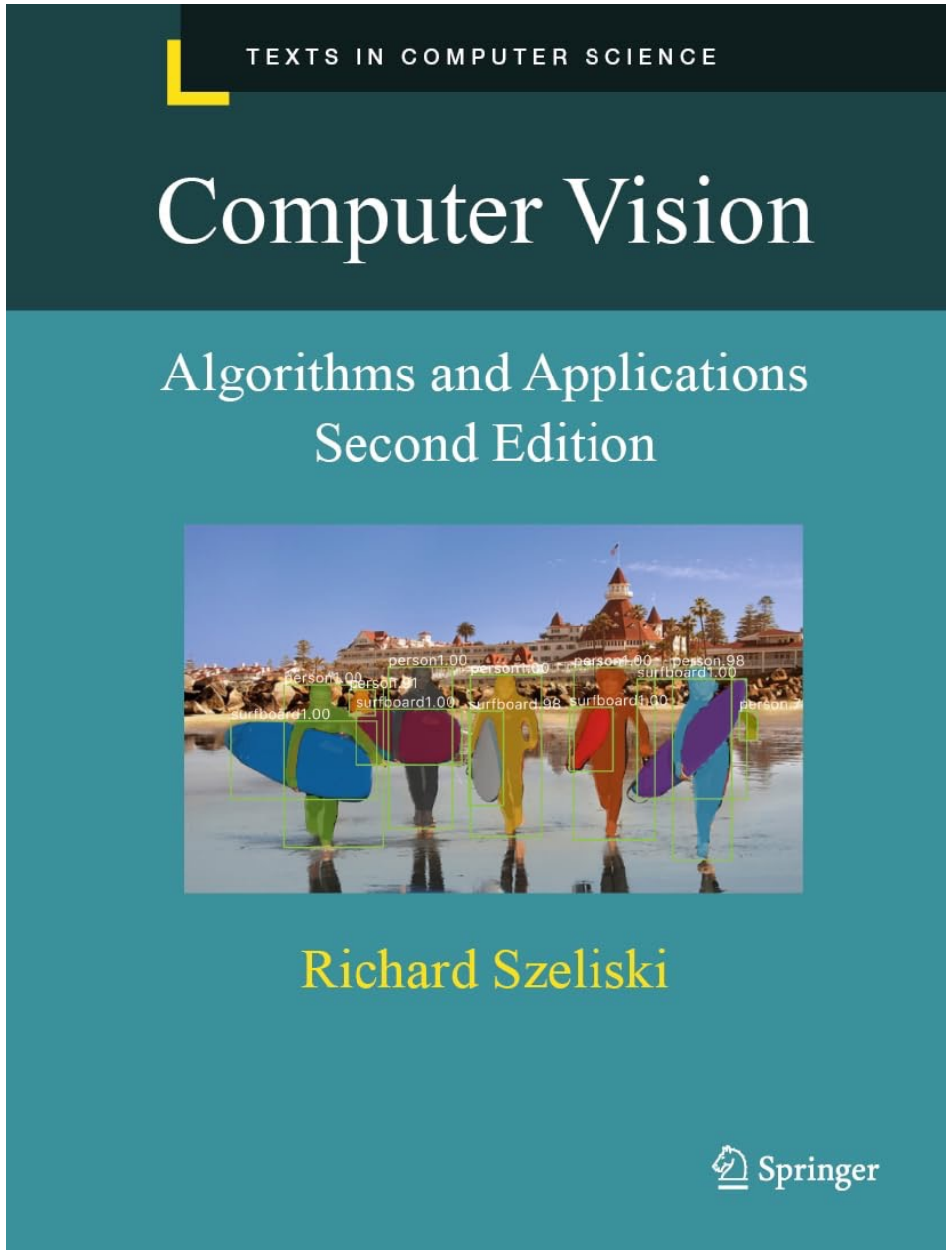
http://csundergrad.science.uoit.ca/courses/csci4220u/

Piazza

https://piazza.com/uoit.ca/winter2024/csci4220u73782/home

Text book

Available at
https://szeliski.org/Book/



(Tentative) outline

- Week 1 and 2
  - Introduction
  - Image representation and image processing
- Week 3 and 4
  - Optimization
  - Least squares
  - Robust least squares
  - RANSAC
- Week 5 and 6
  - Deep learning for computer vision
  - CNNs for object detection
- Week 7
  - Image classification and object detection
- Week 8 and 9
  - Feature detection and matching
- Week 10 and 11
  - Motion estimation
- Week 12
  - Depth estimation

Important dates

- Midterm 1, Monday, February 5, in class.
- Study break during the week of February 19.
- Midterm 2, Monday, March 18, in class.
- Project selection by March 4
  - You may lose up to 10% of the course project grade if project selection isn't finalized by Mar 4. You may lose up to an additional 20% of the course project grade if the project selection isn't finalized by Mar 11. If the project isn't selected by Mar 11, you'll be asked to provide a written explanation for the delay.
- Project topics presentations, March 6
- Project report due by April 5, 11:59 pm

Grading

- Class participation and exercises 10%
- Lab participation and completion 20%
- Midterms 50%
  - A student must get 50% in the midterm examinations to pass this course.
- Project 20%

First lab during the week of Jan 15

How do I get an A+ in this course?

From ChatGPT

- Understand the Course Objectives
- Stay Consistent with Coursework
- Master the Theoretical Concepts
- Hands-on Practice
- Stay Updated
- Seek Feedback
- Form Study Groups
- Utilize Resources
- Manage Your Time
- Prepare for Exams
- Work on Projects with Passion
- Engage Beyond the Classroom

Lastly, always maintain a positive and curious mindset. Be proactive in your learning and seek opportunities to apply what you've learned. Remember, the ultimate goal is not just the A+ grade but gaining a deep understanding of computational photography and its applications.

Check course webpage often

http://csundergrad.science.uoit.ca/courses/csci4220u/