

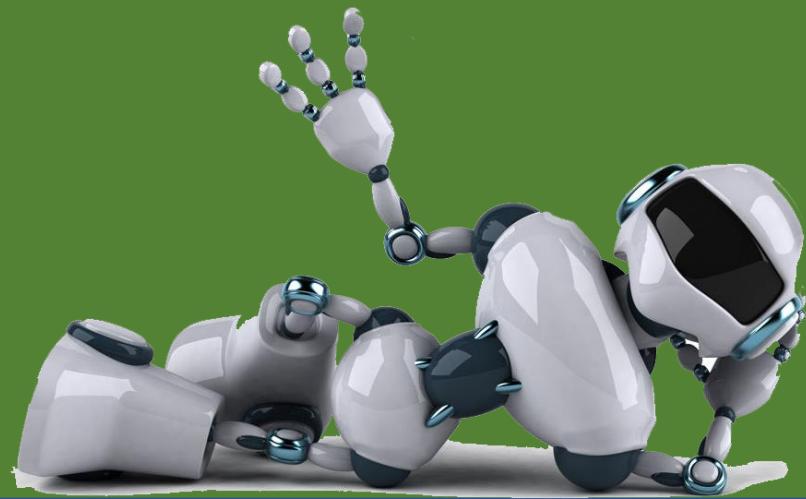
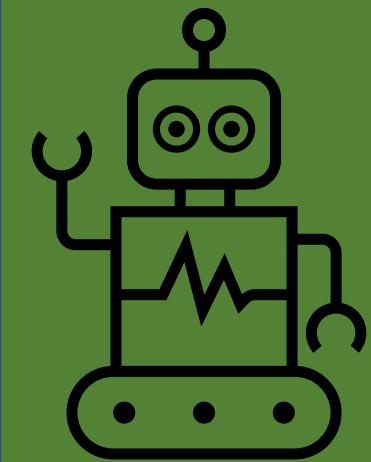
Robotic and Computer Vision

Harshal Verma
MTech Artificial Intelligence
Indian Institute of Technology Hyderabad



ROBOTICS

WORLD OF COFFEE AND CUROSITY



CURIOSITY

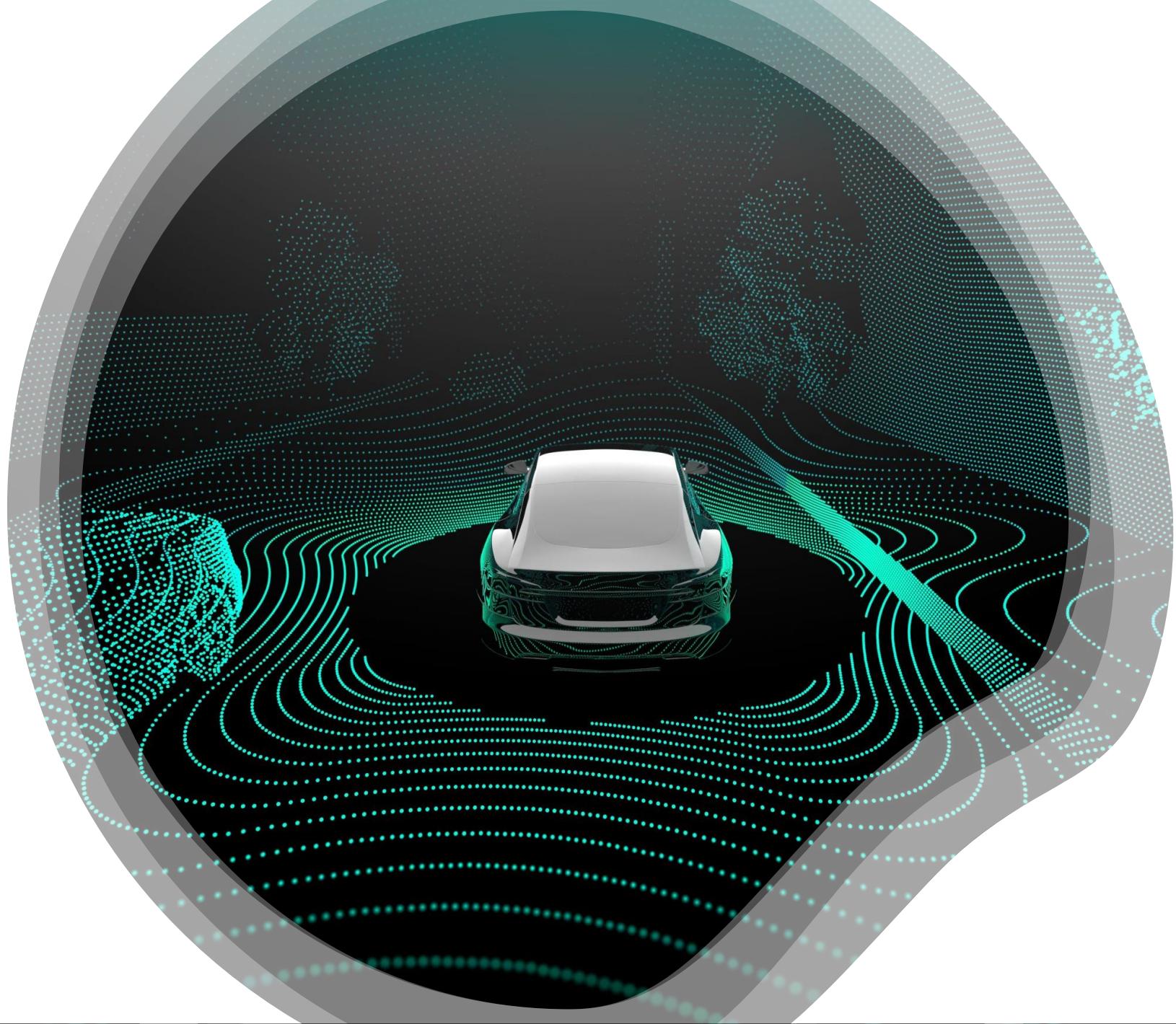


Why
How
?

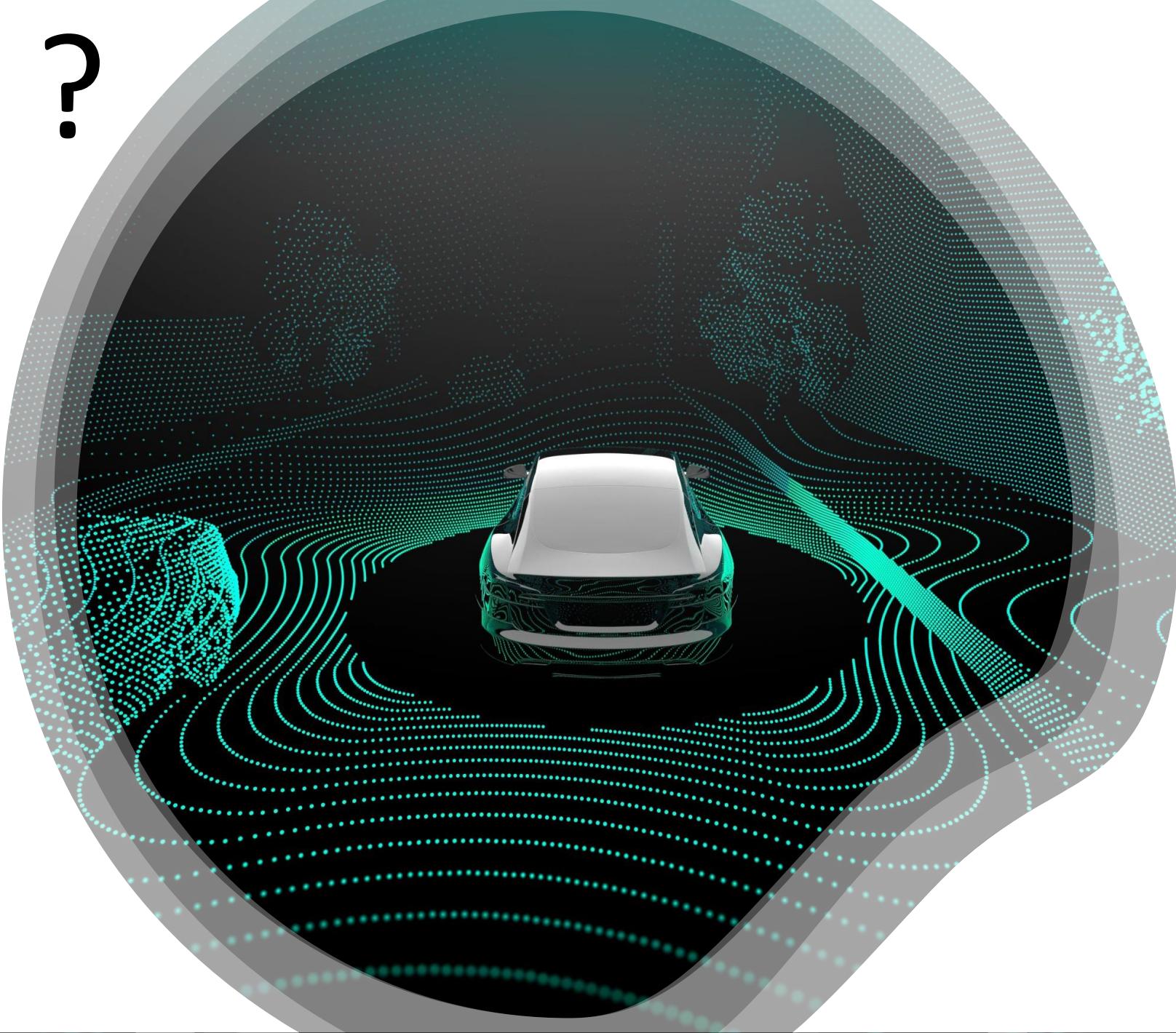
What now



Let's Learn with
an Example

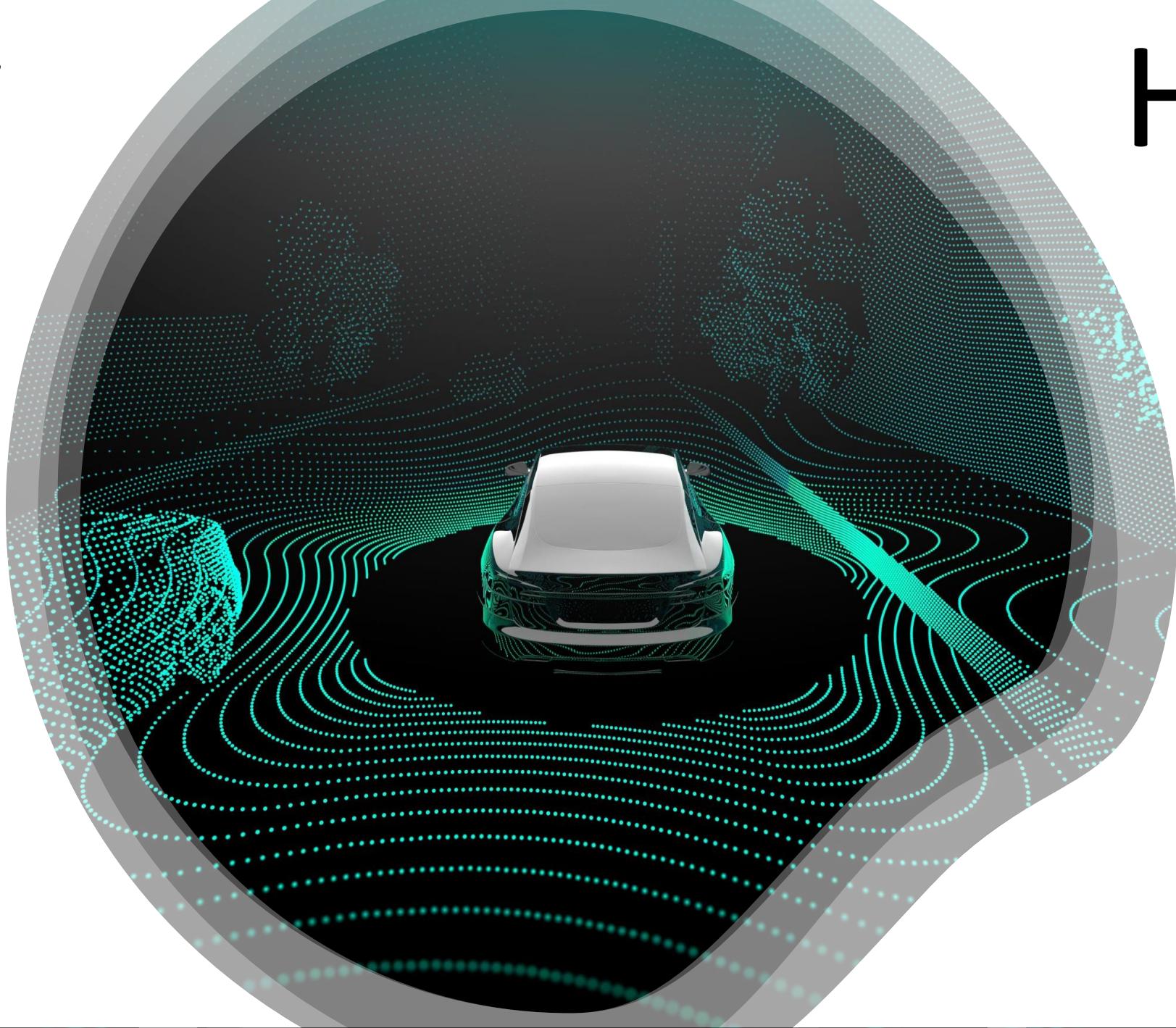


Why ?



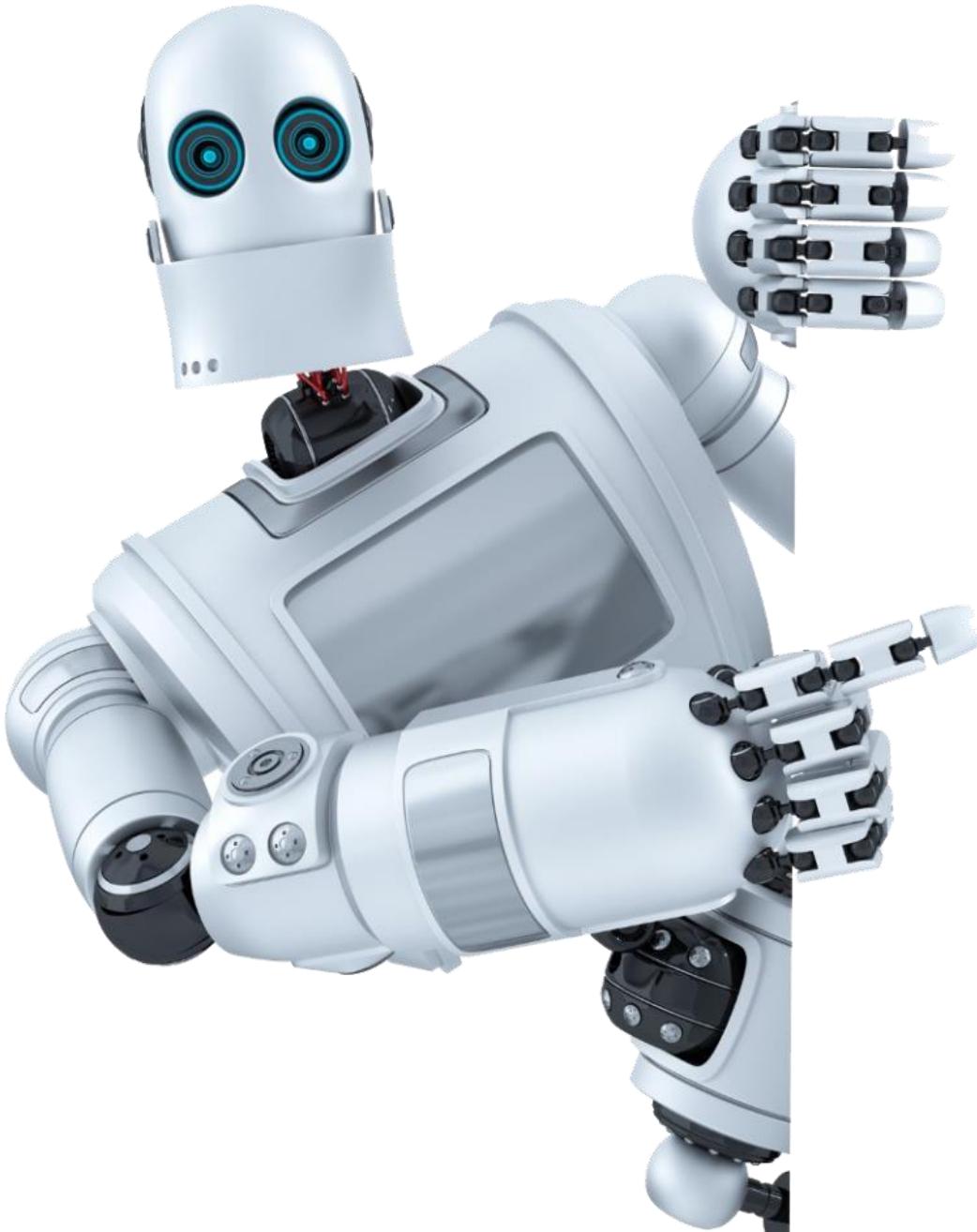
Why

How ?

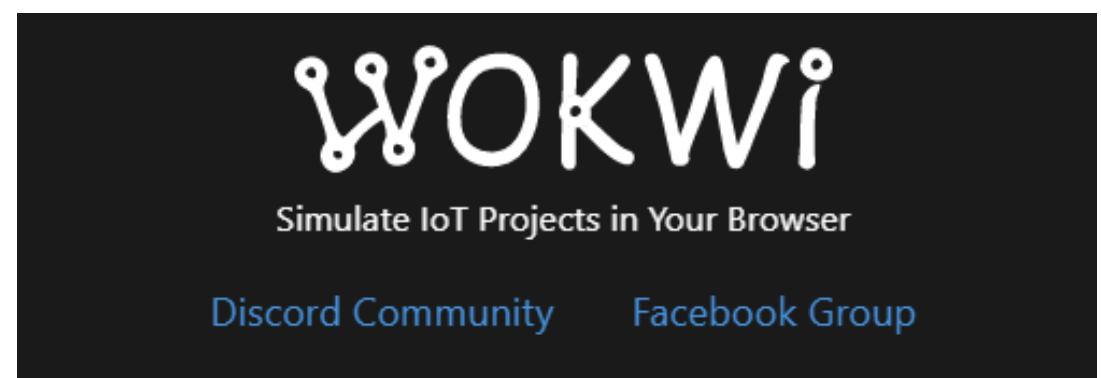
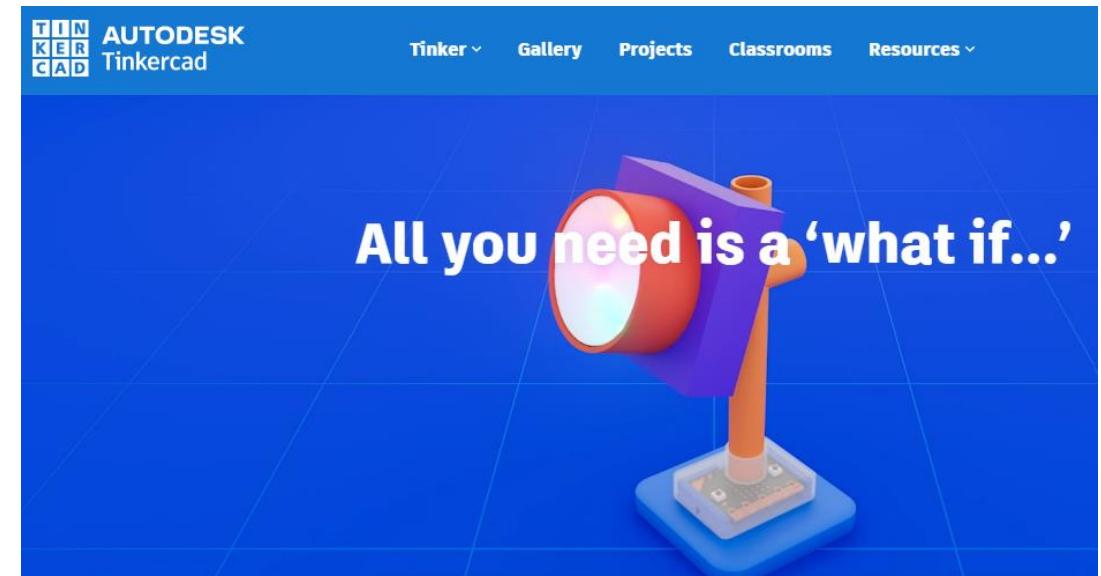
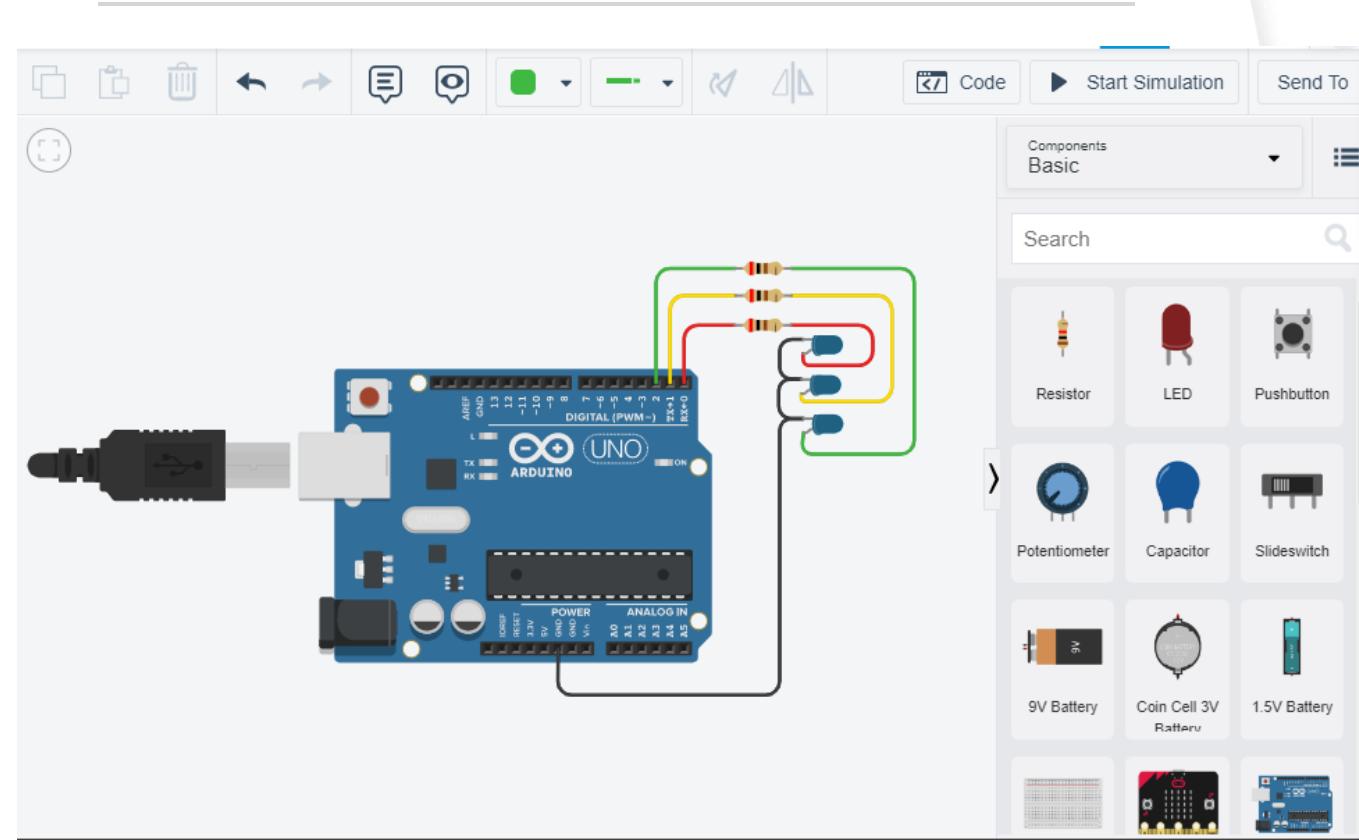


Basic rules

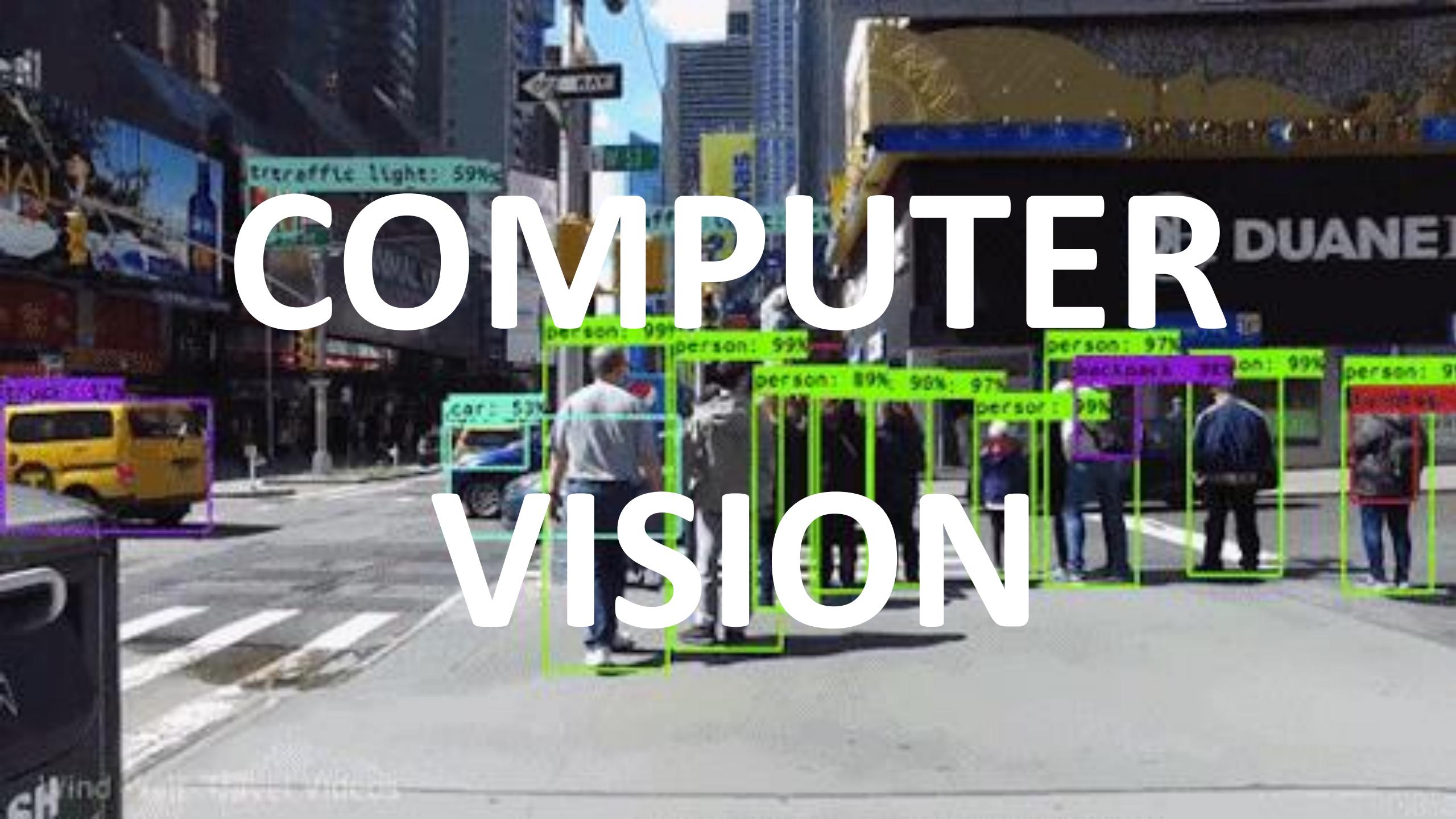
- Define the problem statement
- Research and gather information
- Break down the problem
- Design the system architecture
- Algorithm Development
- Implement and iterate
- Integration and testing
- Optimization and refinement
- Documentation
- Continuous Learning and adaptation

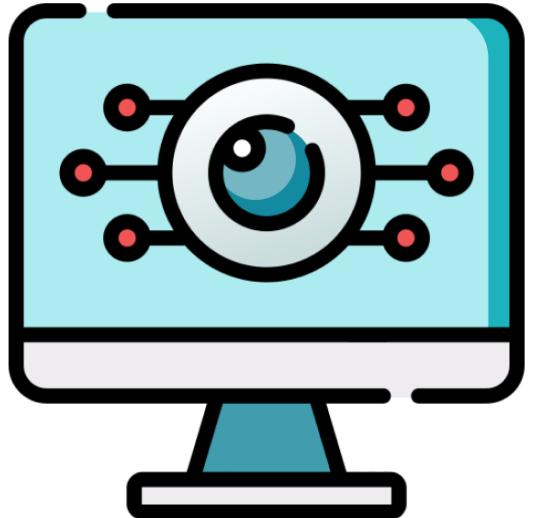


Hardware as Simulation



COMPUTER VISION



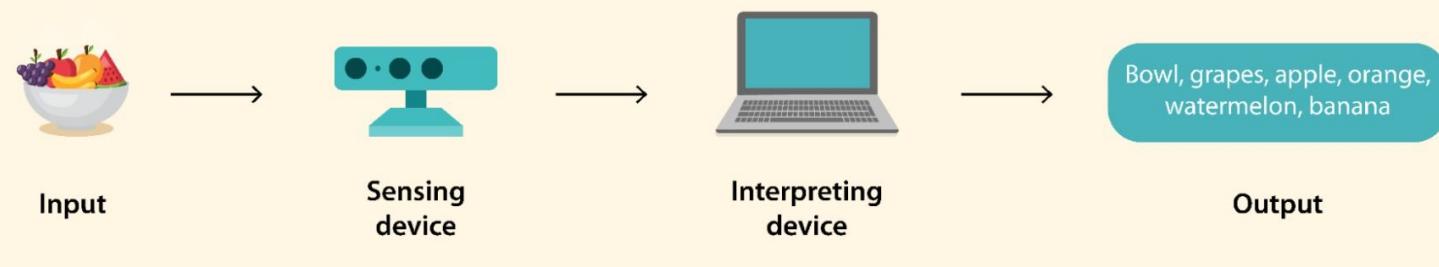


What is Computer Vision?

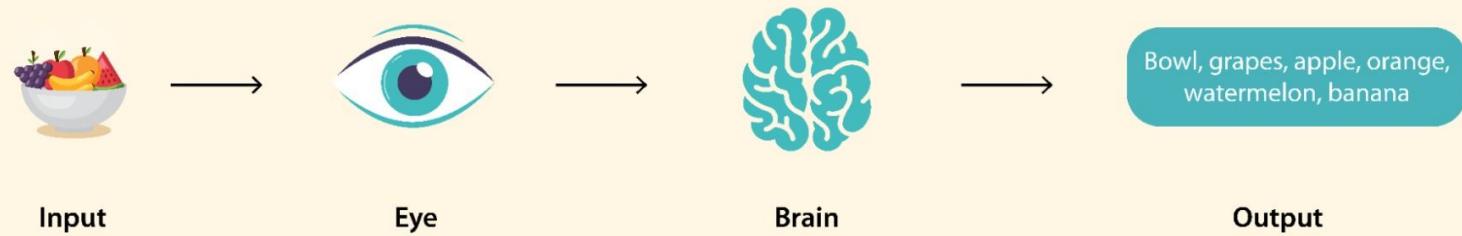
A field of AI that trains computers to interpret and understand the visual world

How Does Computer Vision Work?

Computer Vision

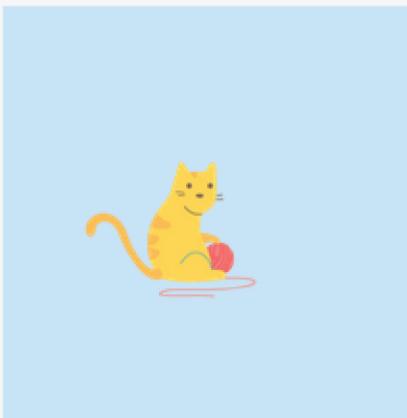


Human Vision



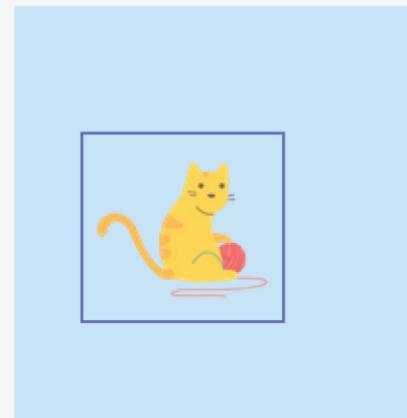
Computer Vision Problem Types

Classification



CAT

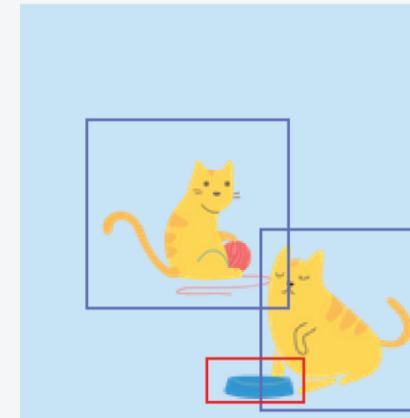
Classification
+ Localization



CAT

Single Object

Object Detection



CAT, CAT, BOWL

Multiple Objects

Semantic
Segmentation



CAT, CAT, BOWL

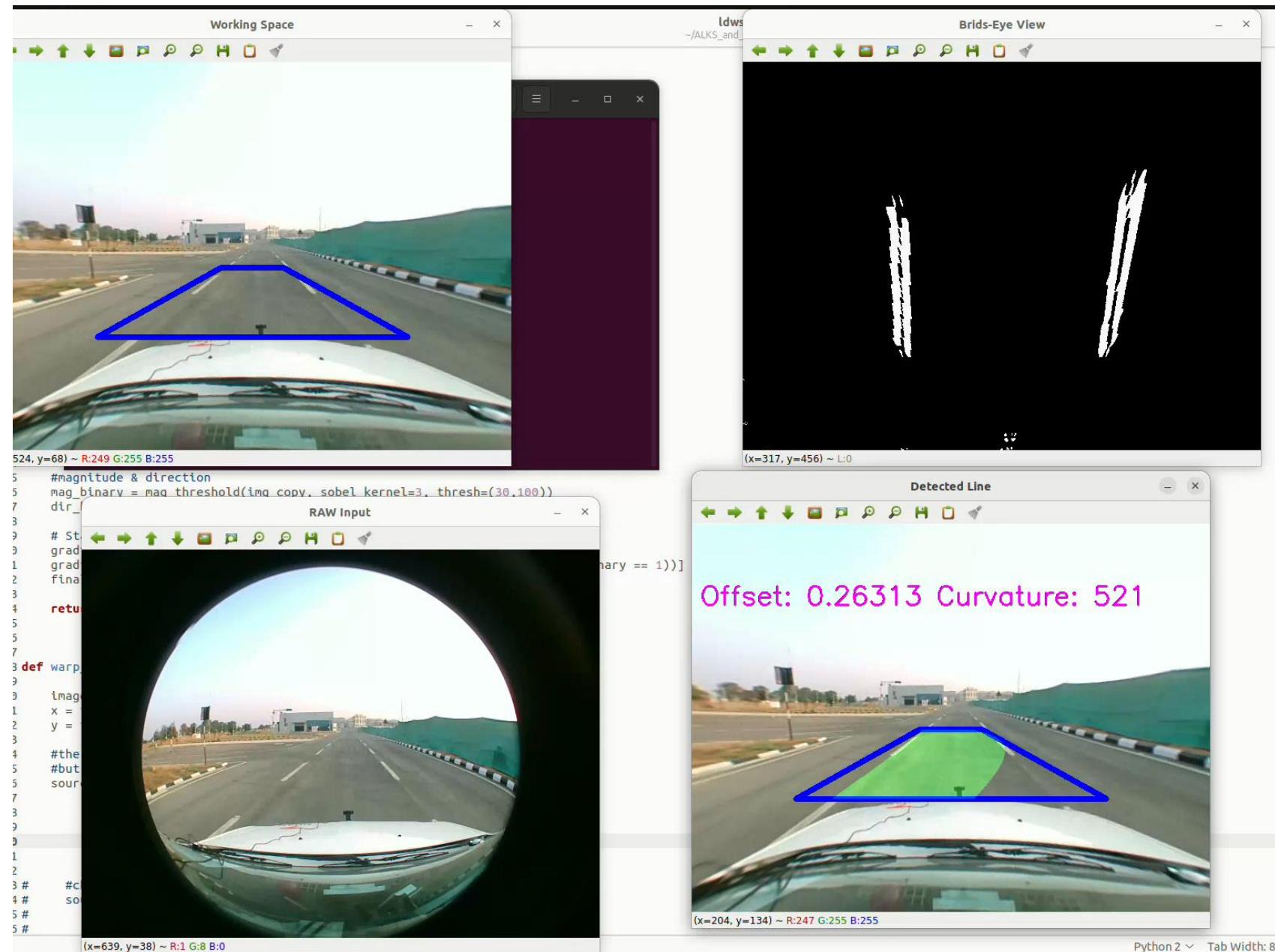
roboflow

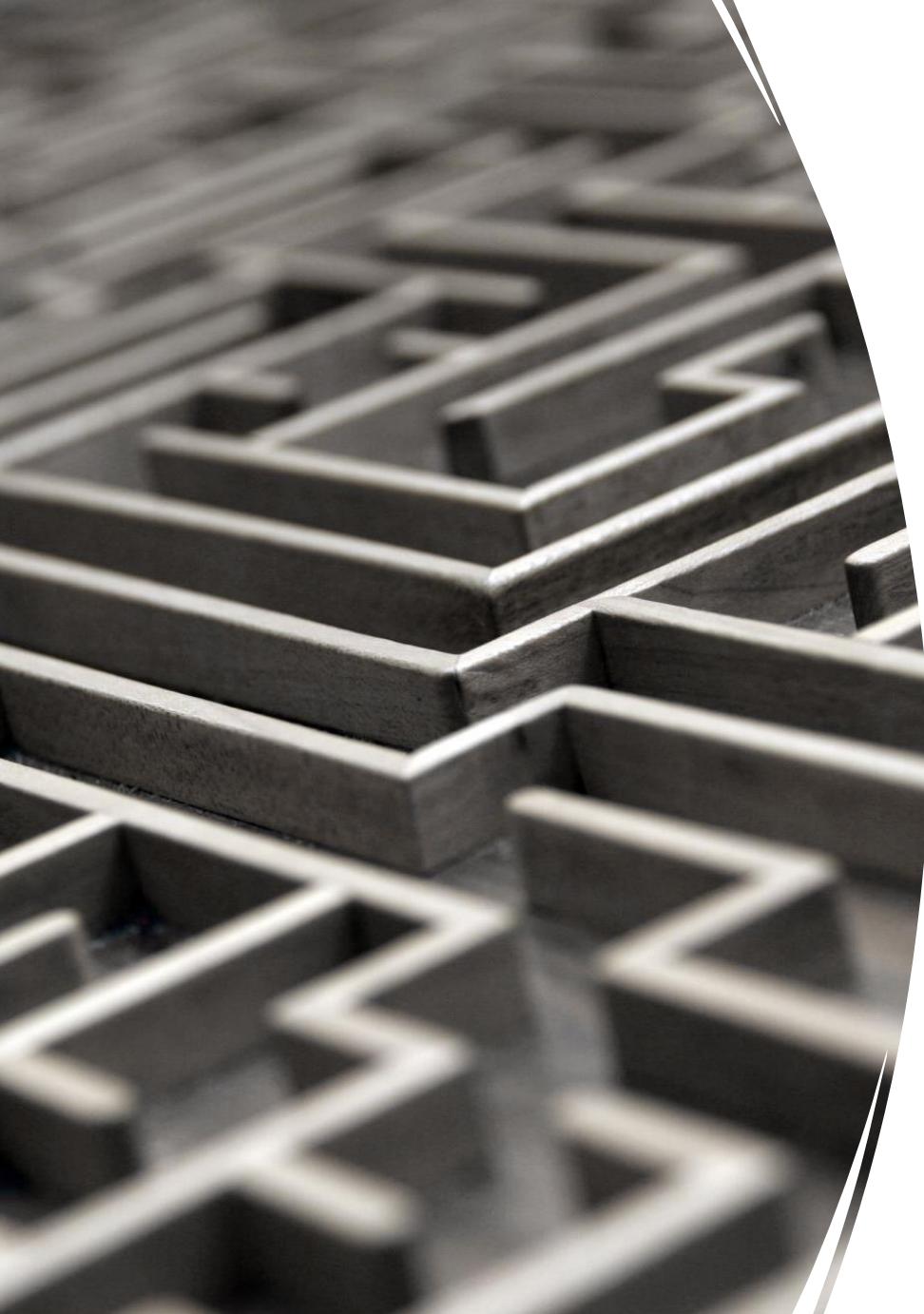


Approaches to a Computer Vision problem

- Classical Approaches
- Machine Learning Approaches
- Deep Learning Approaches

Solving by Classical Approach



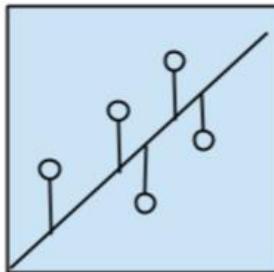


Demo

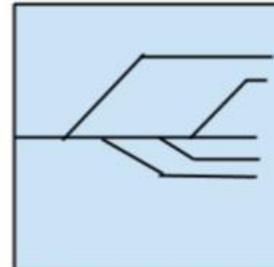
Classical Perception Applications

- Pose Estimation
- Facial Points Recognition

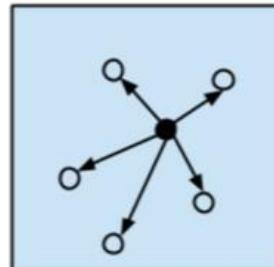
Machine Learning approaches



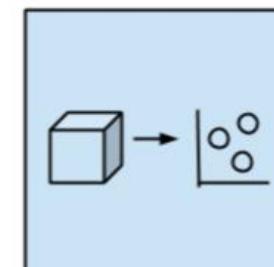
Regression Algorithms



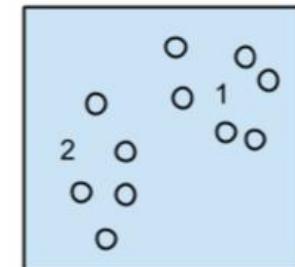
Regularization Algorithms



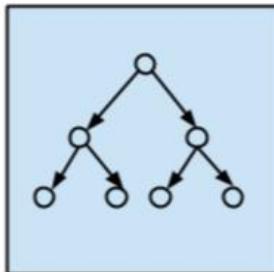
Instance-based Algorithms



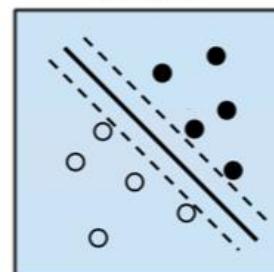
Dimensional Reduction Algorithms



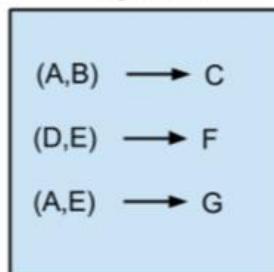
Clustering Algorithms



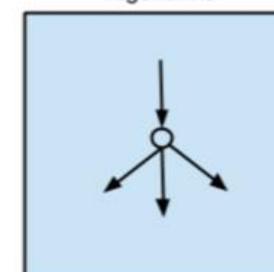
Decision Tree Algorithms



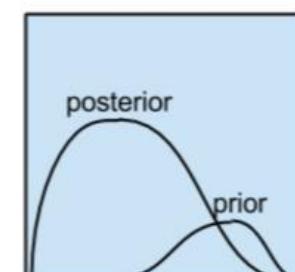
Support Vector Machines



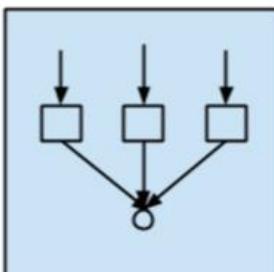
Association Rule Learning Algorithms



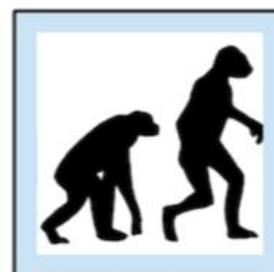
Artificial Neural Network Algorithms



Bayesian Algorithms

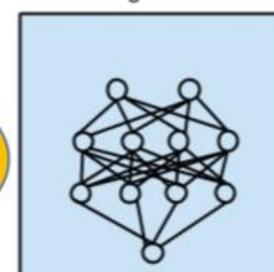


Ensemble Algorithms

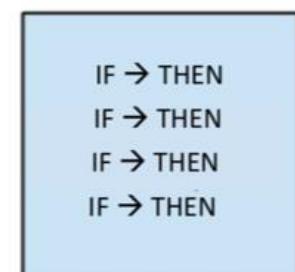


Evolutionary Algorithms

Non-exhaustive
list of ML families

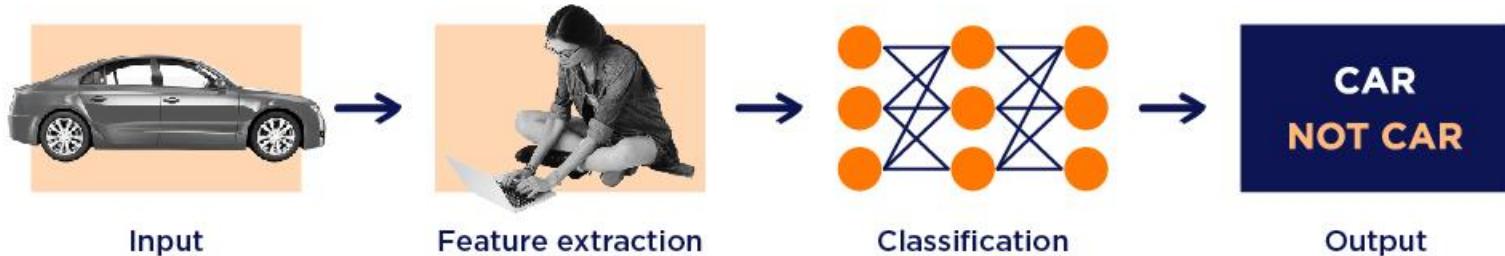


Deep Learning Algorithms



Learning Classifier Systems

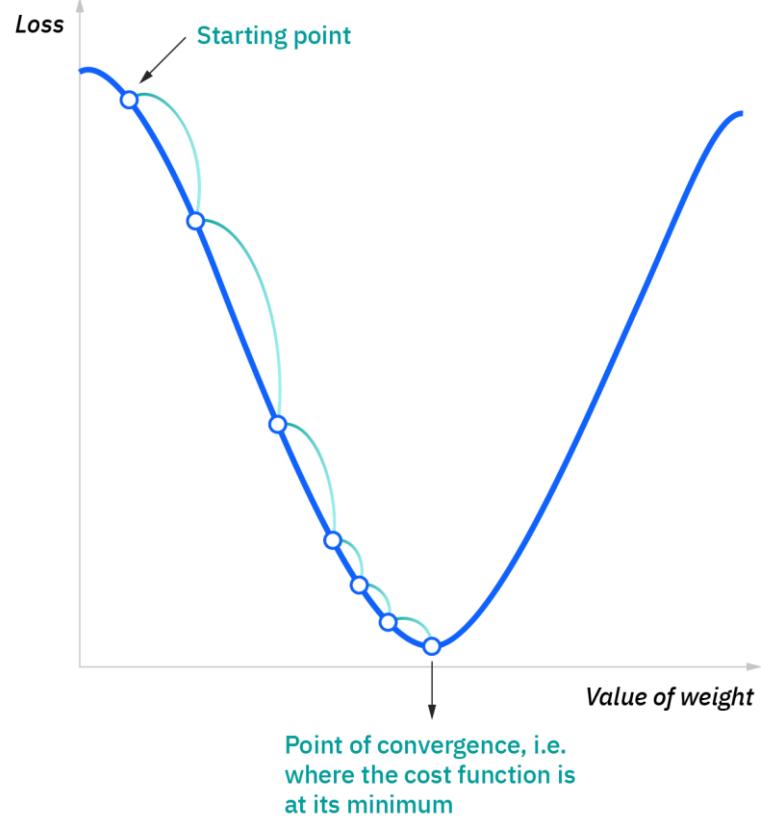
MACHINE LEARNING



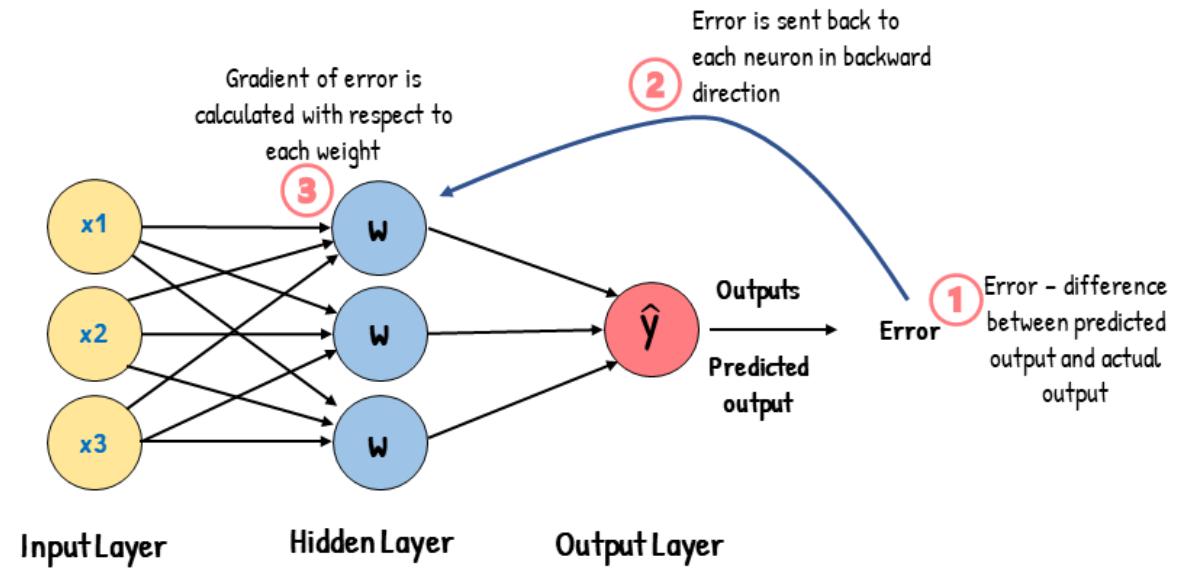
DEEP LEARNING



Math Behind Deep Learning



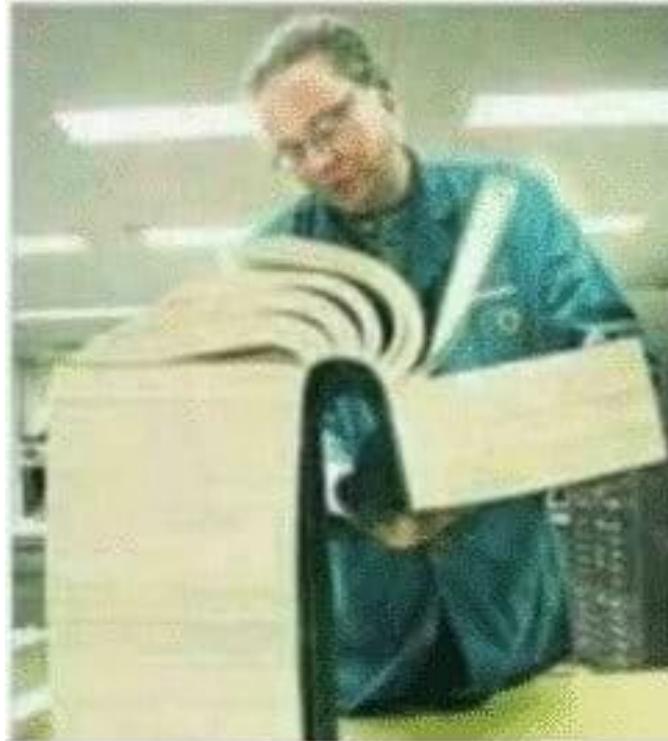
Backpropagation



Math Behind
Deep
Learning

THE MATHS BEHIND DEEP LEARNING

import keras

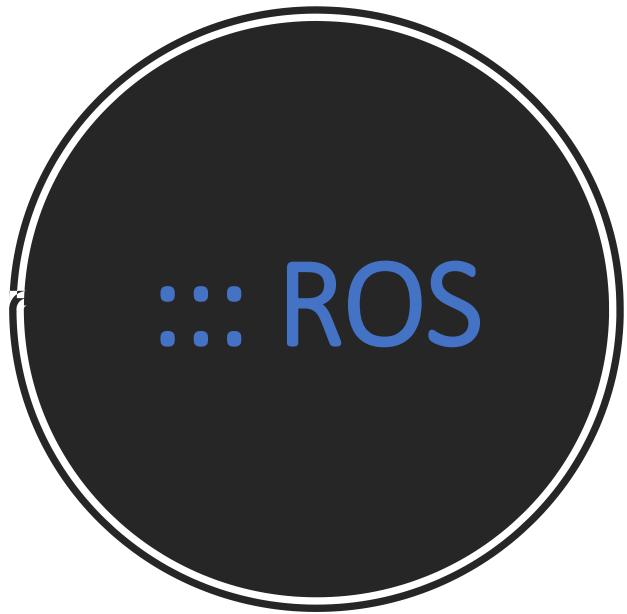


Machine learning be like

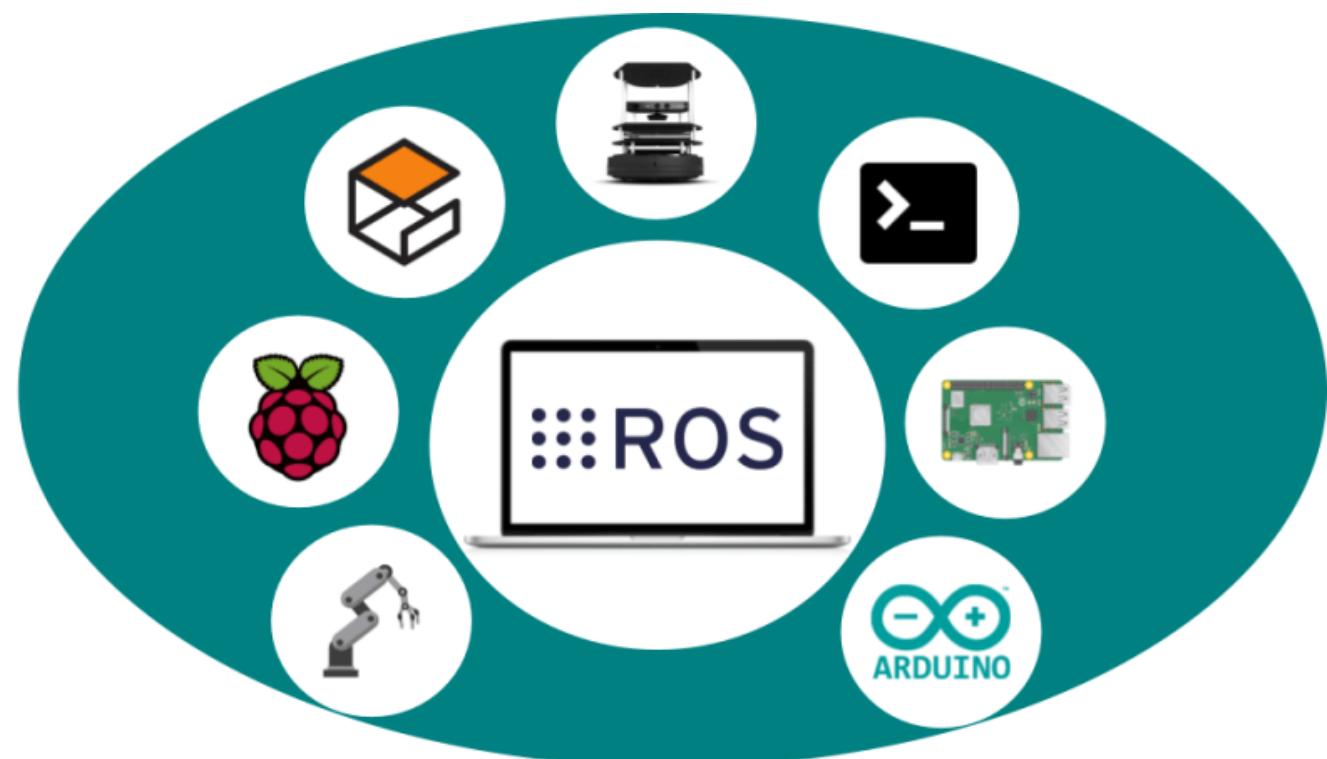
Training a Deep Learning Model

New Era of Generative AI

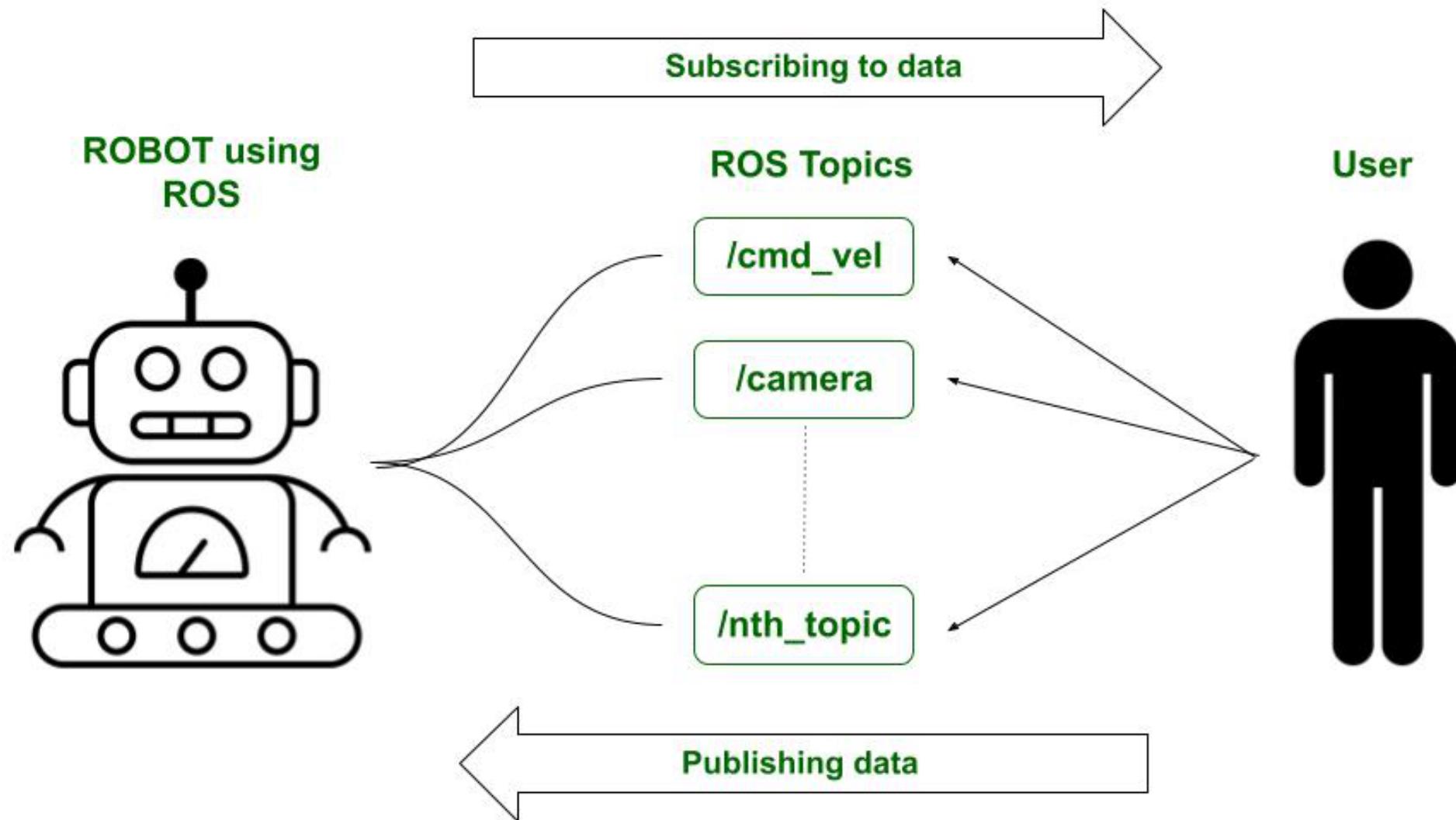




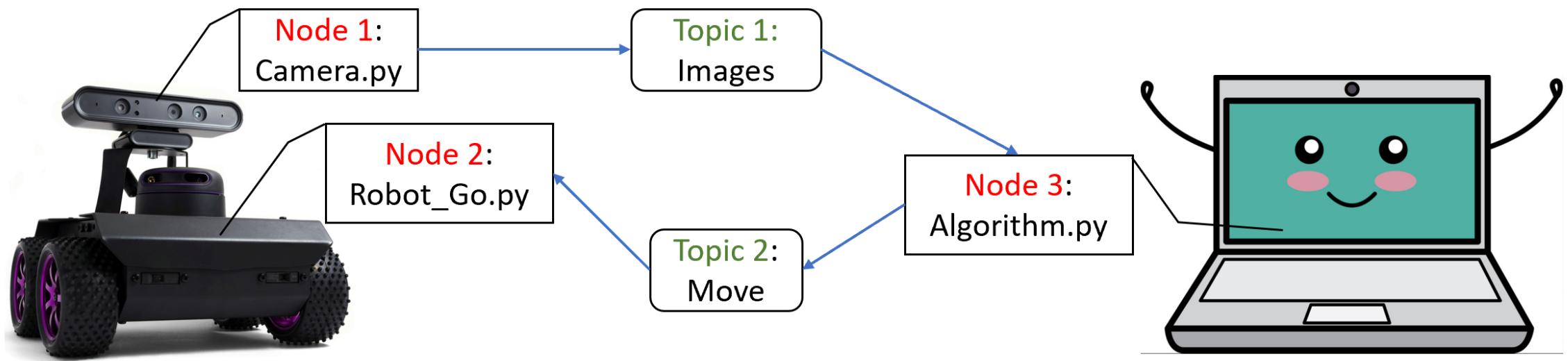
ROS::: Kitani Hawa hai ?



:::ROS Working



::: ROS Working





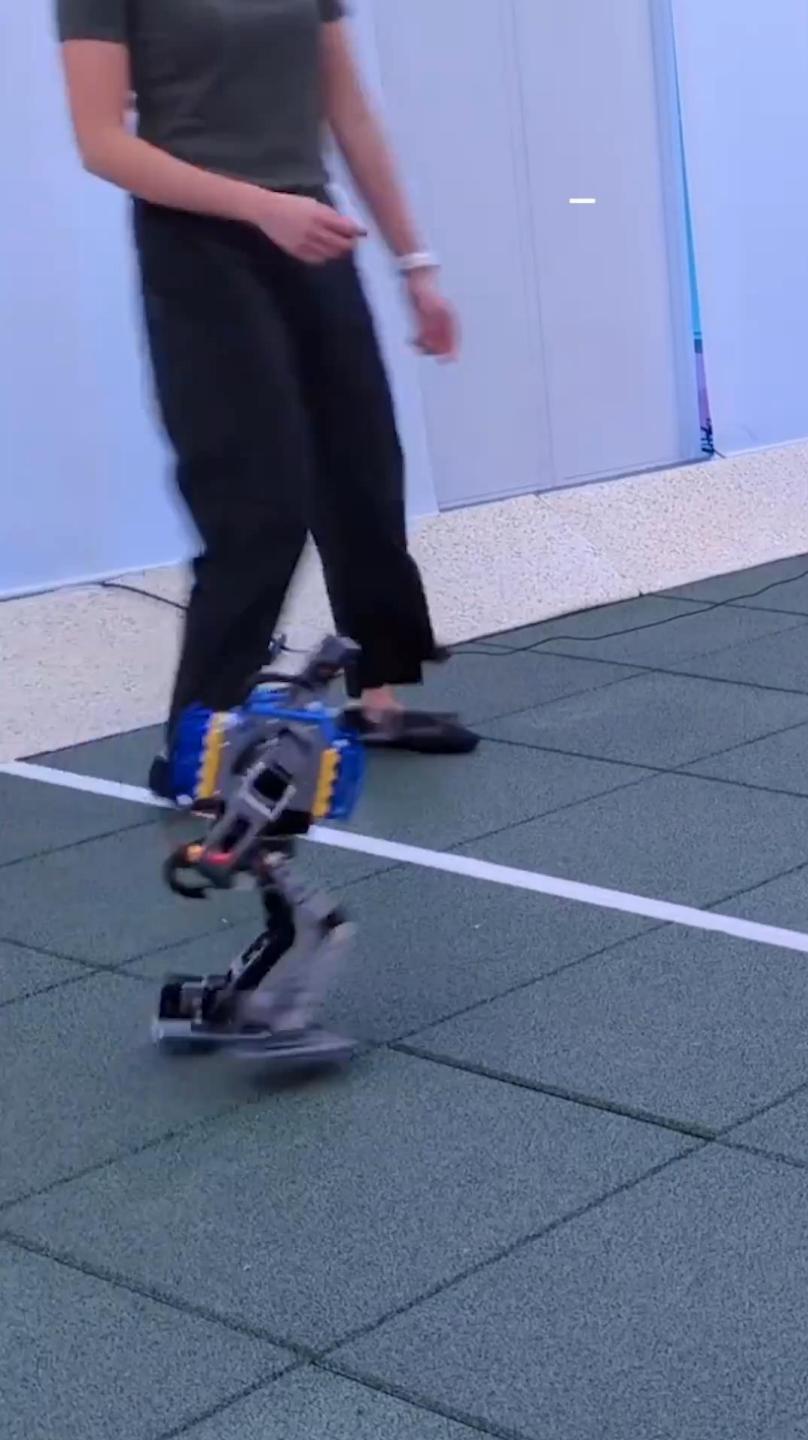
A Rover Navigation challenge



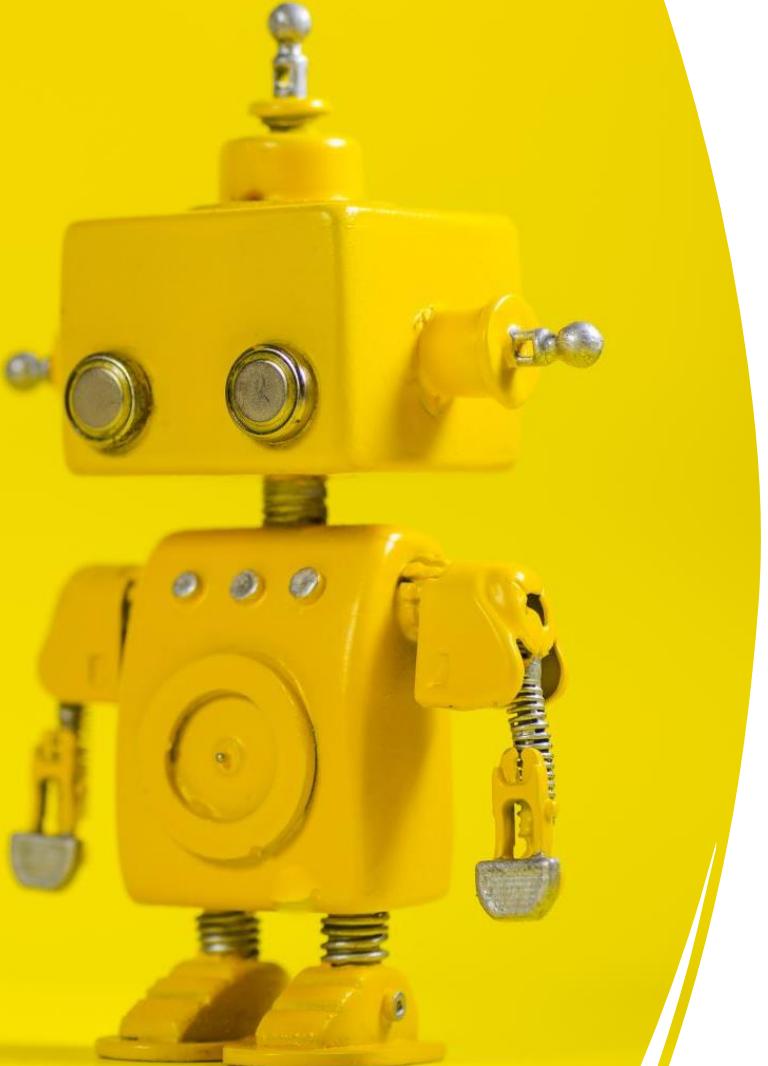
Control your hardware |
Ease your software



Agriculture Robot



When Robotics and
Computer Vision
meets Reinforcement
Learning



When robotics meet Computer Vision

A match made in heaven



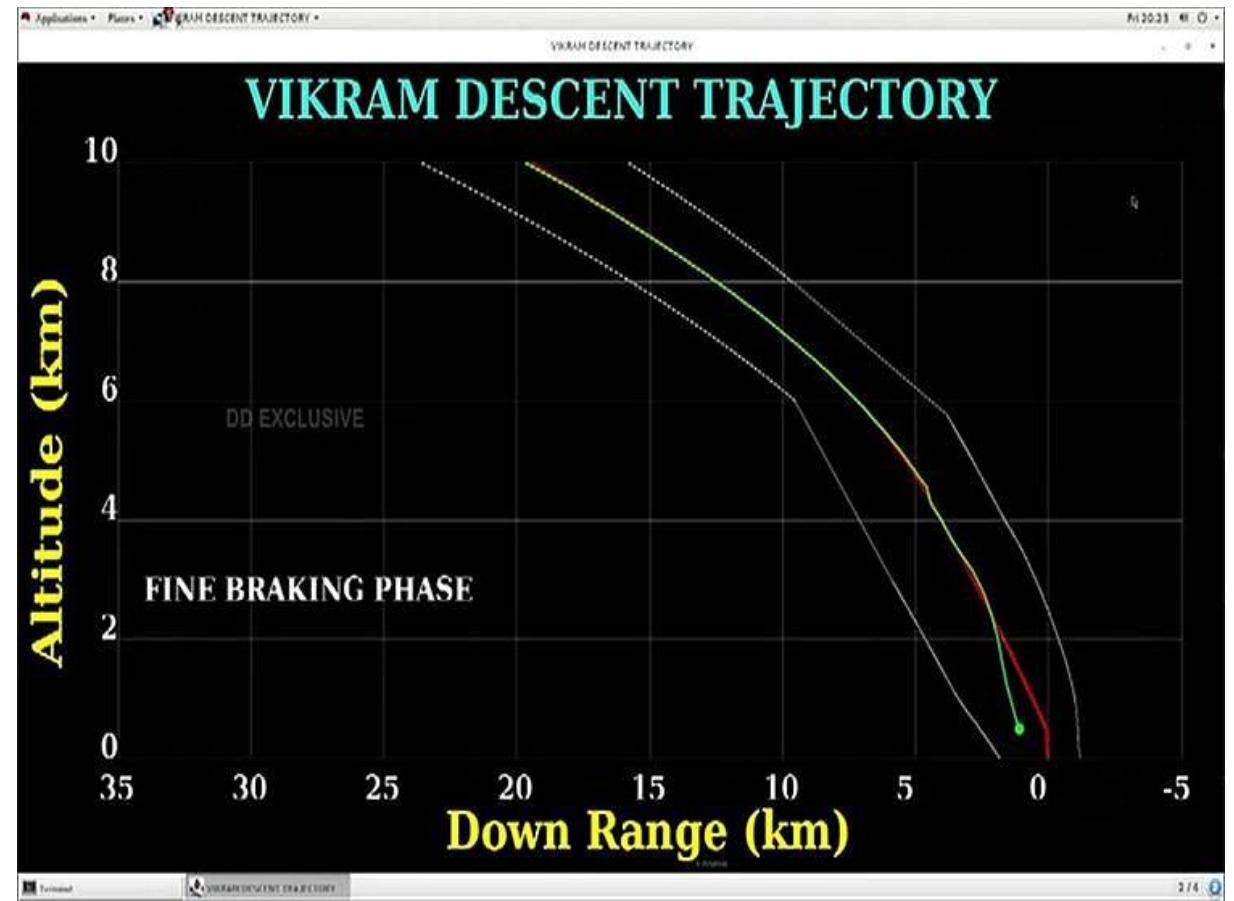
at
National Automotive Test Tracks (NATRAX)

Most Touching moments in robotics



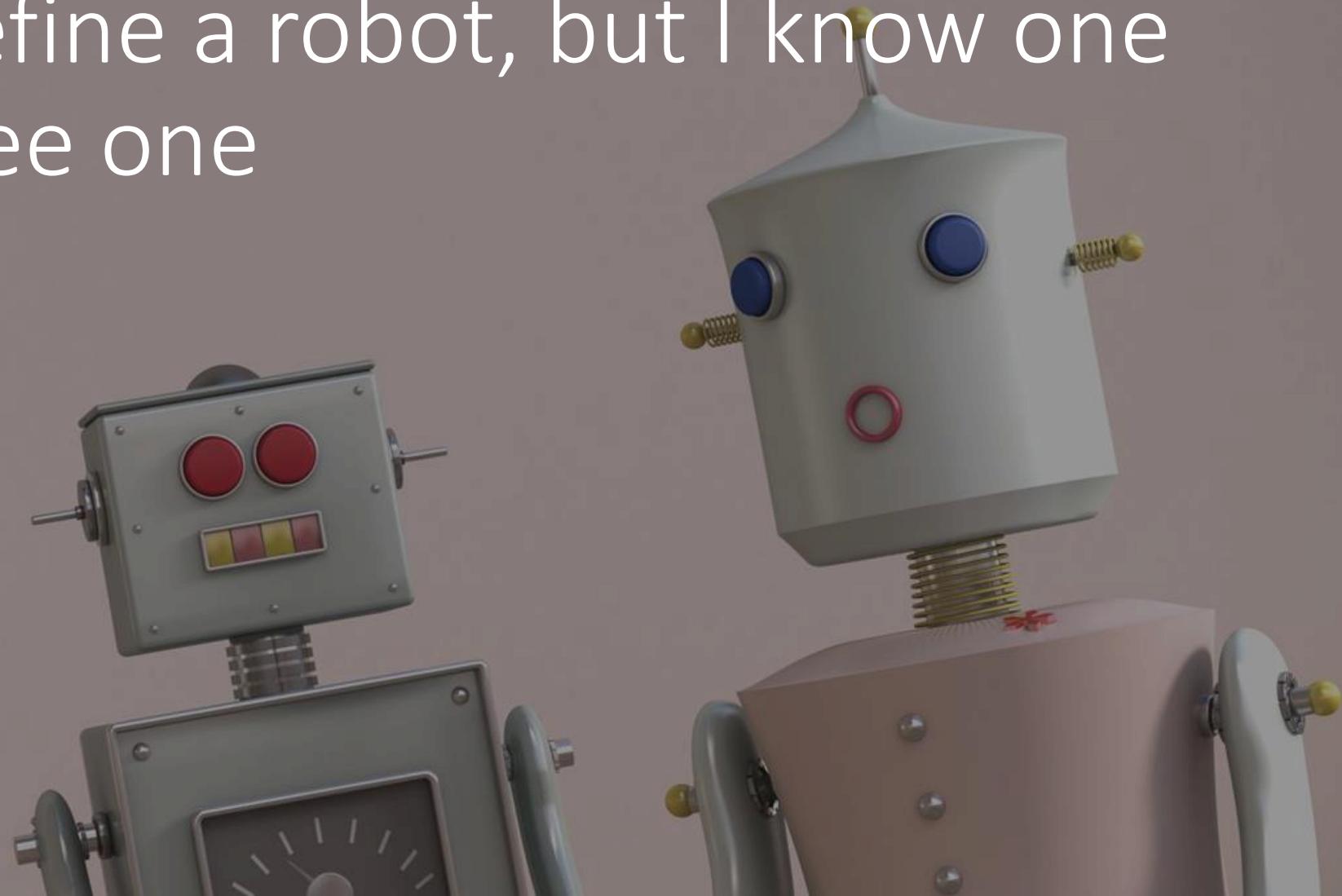
Jacob Margolis ✅
@JacobMargolis

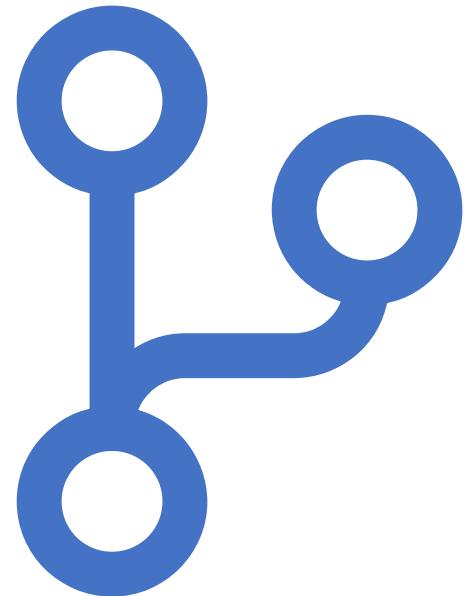
The last message received was
“My battery is low and it’s getting dark.”



I can't define a robot, but I know one
when I see one

Joseph Engelberger





Thankyou and
Open for
Questions
