Object Detection

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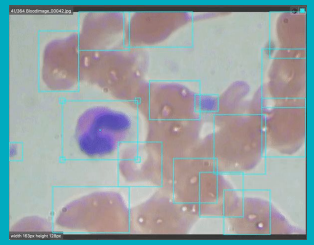
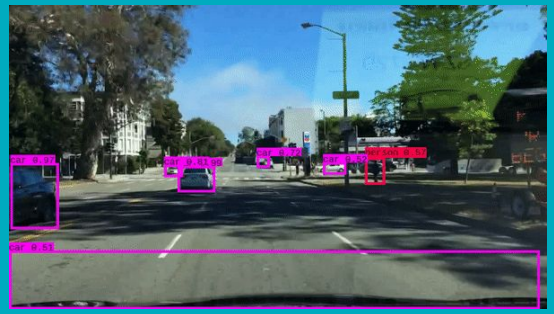
Applications





01

Self Driving Cars

02

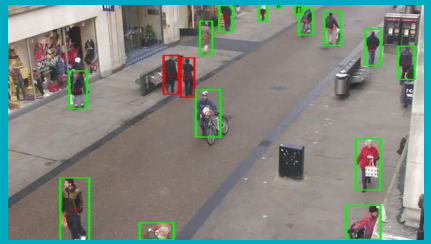
Surveillance cameras

03

Medicine

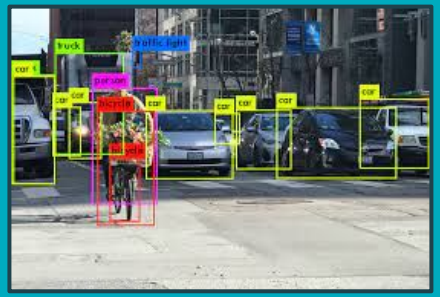
04

Human aid



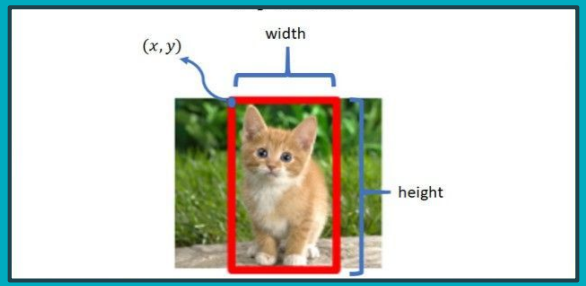
Object Detection

Computer Vision Technique



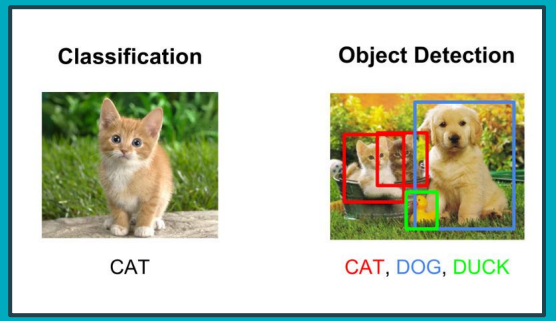
Localization

Identifying Location



Classification

Labeling Object



Input

Original Picture

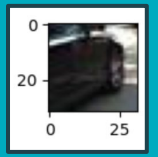
Split to RGB

Pixel Values: 0-255

Output

Background

Car



Truck

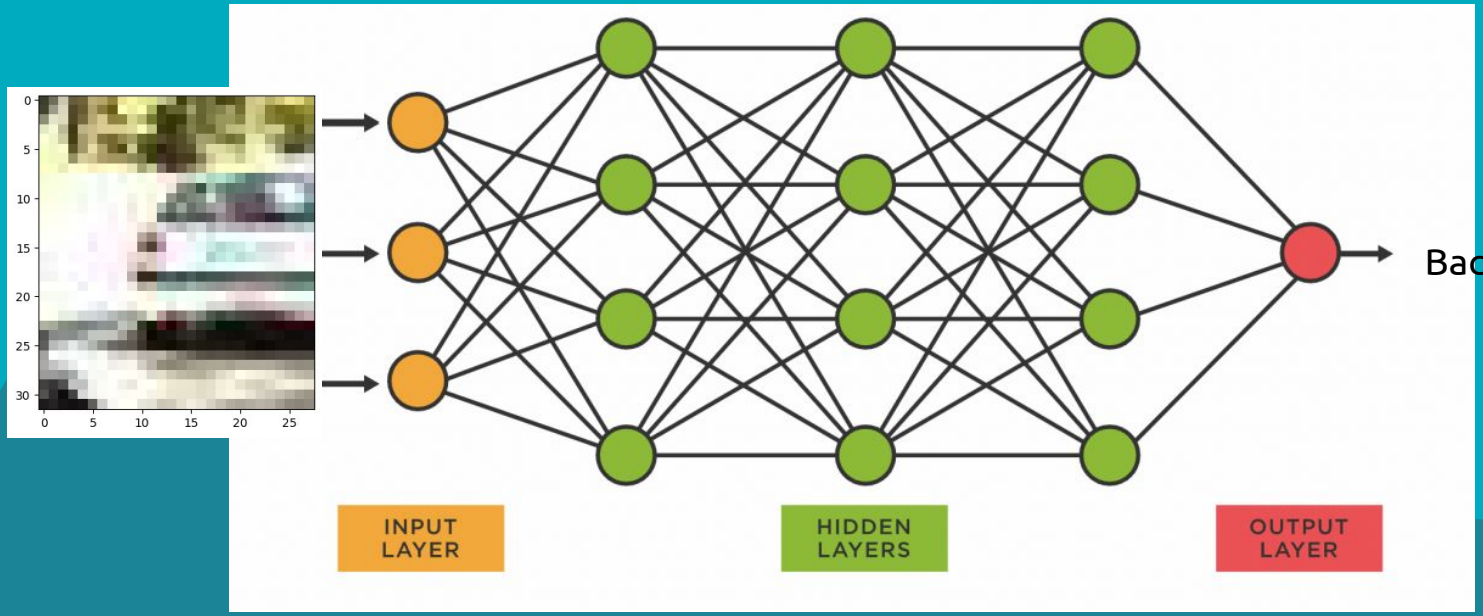
[0, 1, 2]

Neural Network Basics

What is a neural network?

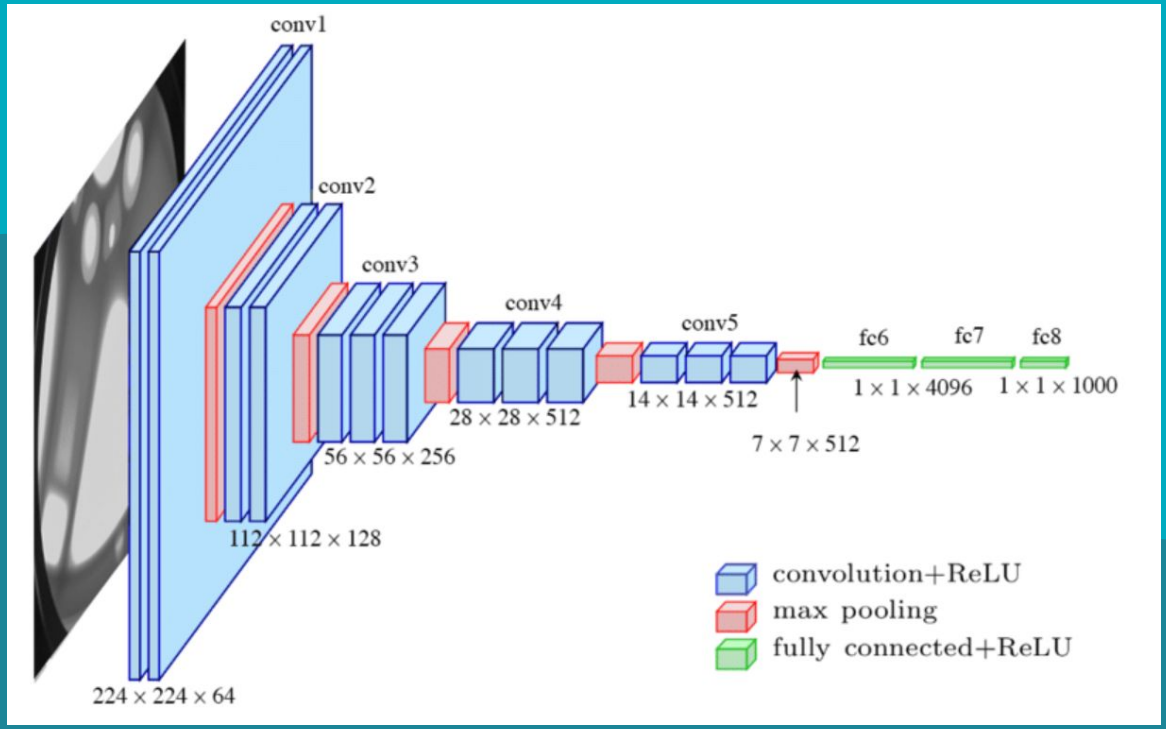
- Subset of machine learning.
- Inspired by the human brain.

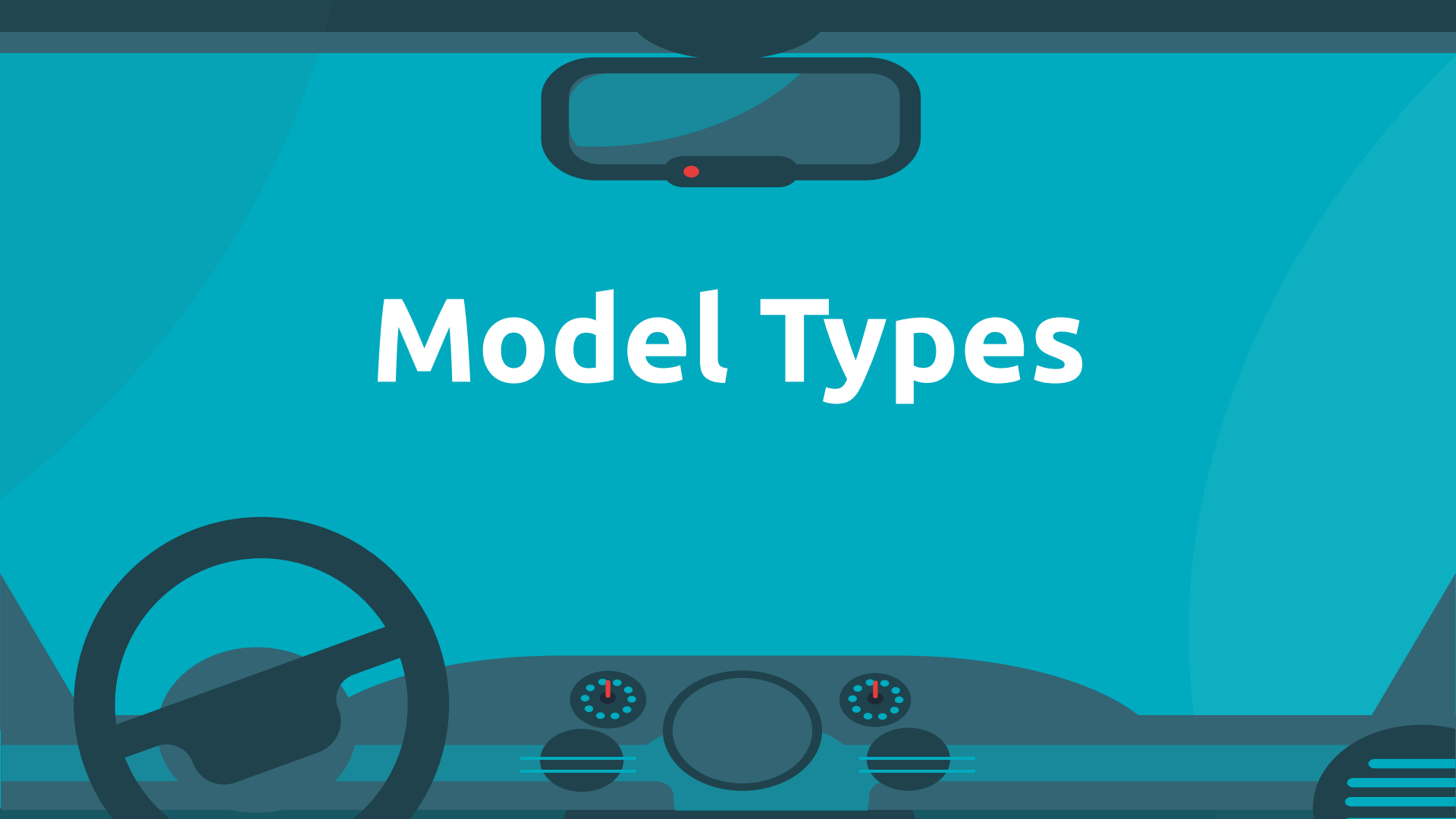
Neural Network Architecture



Background/Car/Truck

Convolutional Neural Networks

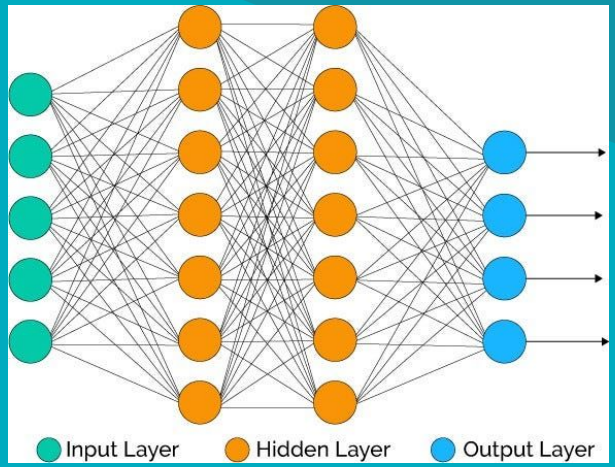


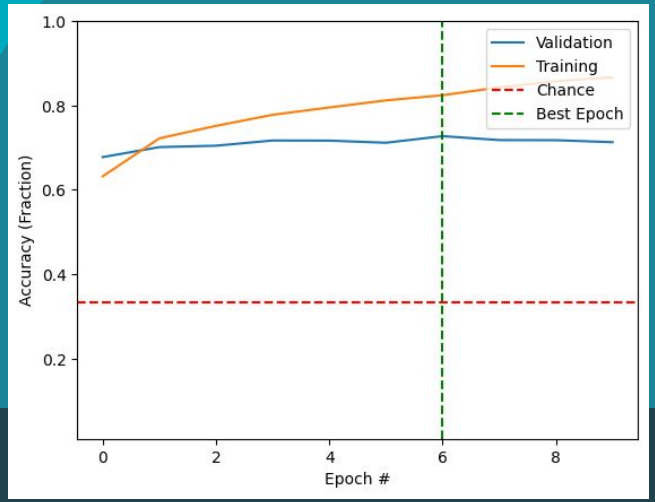

Model Types

Model Types: Perceptron

Perceptron

- A simple neural network
- Contains input layer, hidden layers, and output layers)
- Low accuracy





← the model's accuracy on test data (blue line) is quite low (around 70%)

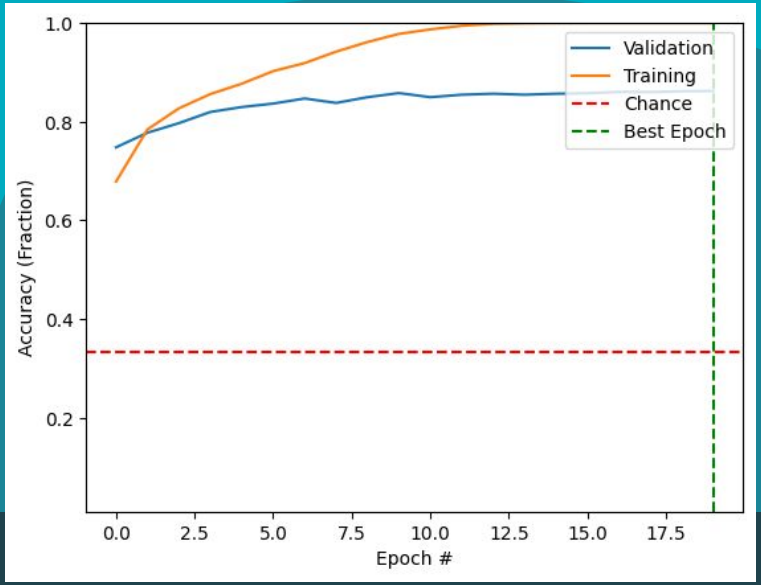
the model's accuracy on training data is shown by the orange line

Overfitting: when the orange line continues to increase but the blue line stays constant → means the model is memorizing the training data rather than learning patterns from it

Model Types: Convolutional Neural Network (CNN)

Convolutional Neural Network (CNN)

- Performs better on images (especially compared to perceptron)

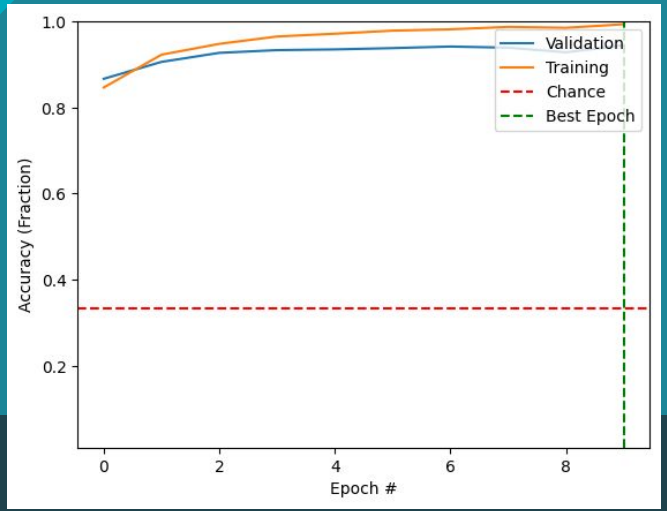


← This graph shows that the model's accuracy (blue line) is around 80%

Model Types: Transfer Learning (VGG16)

Transfer Learning

- The technique of using models that are already trained, and training it even more
- Performs better than CNN
- Compare this to CNN, in which we made models from scratch
- (VGG16 is one of the transfer learning networks)

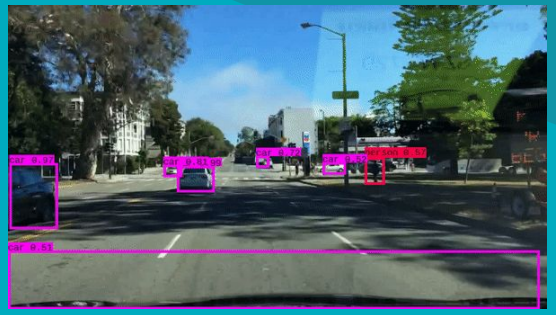


← This graph shows that the model's accuracy (blue line) is very high (around 95%)

Model Types

YOLO (v3)

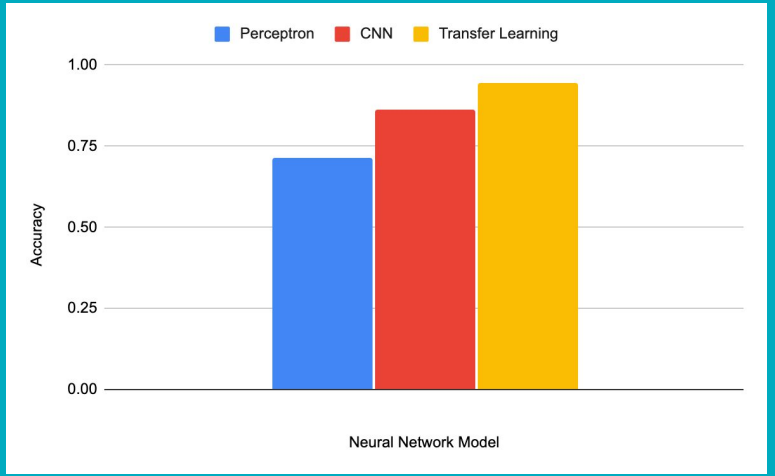
- “You Only Look Once”
- Designed for fast object detection
- Uses bounding boxes and class (category) probabilities from images in one evaluation
- Combines the two steps of image classification (localization and classification) into one evaluation, making it faster



Comparing the Models

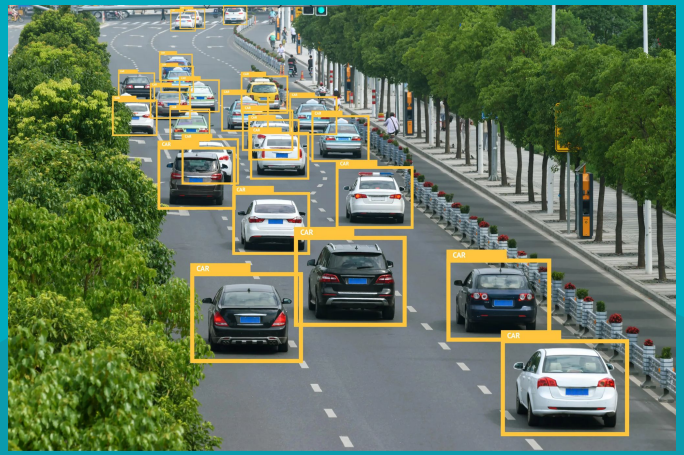
	Perceptron	CNN	Transfer Learning	YOLO v3
Image Classification Accuracy	0.7130	0.8623	0.9447	X

(YOLO doesn't have an accuracy because since it did not use predetermined models, it did not have a reference to calculate its accuracy with)

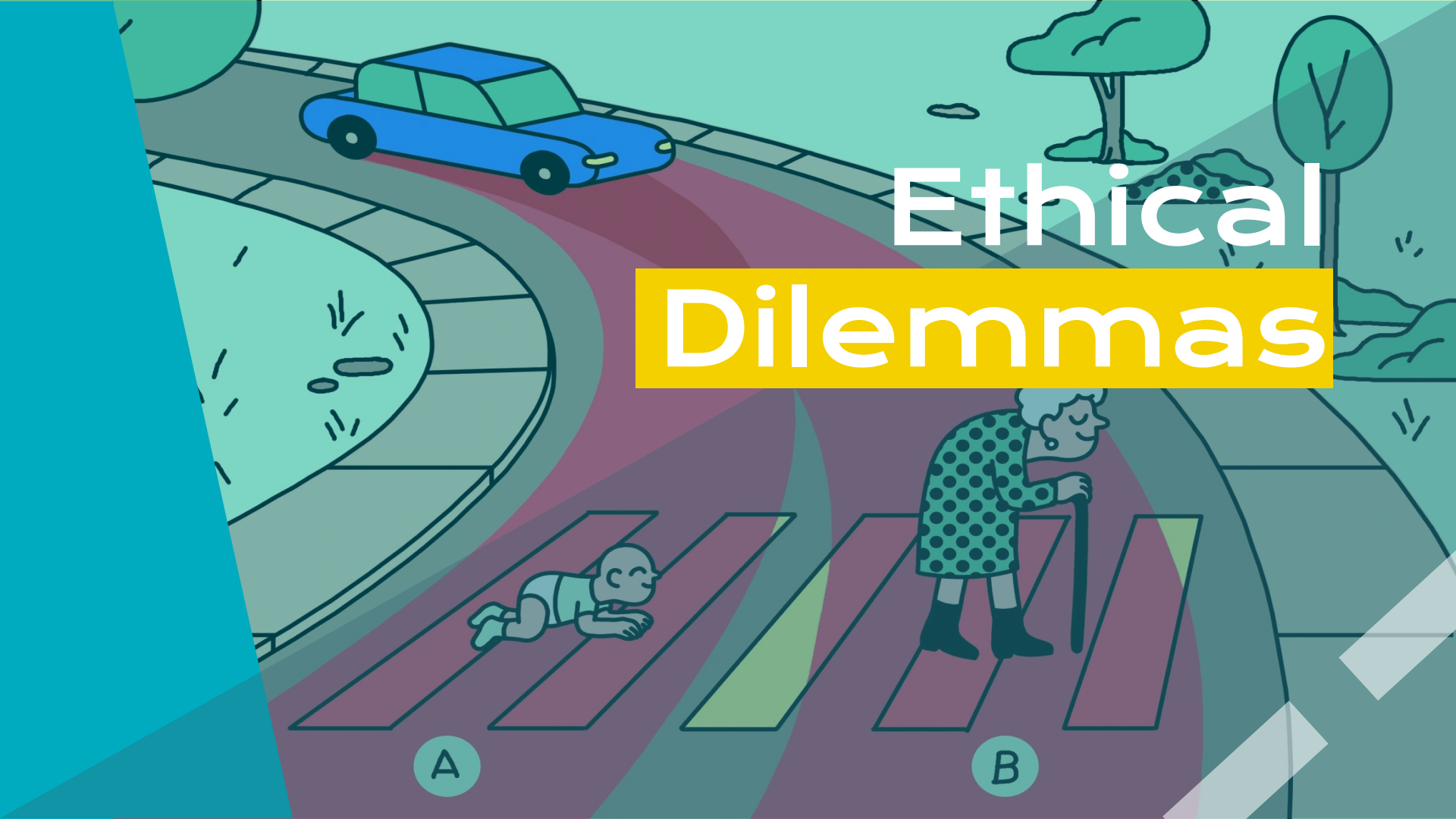


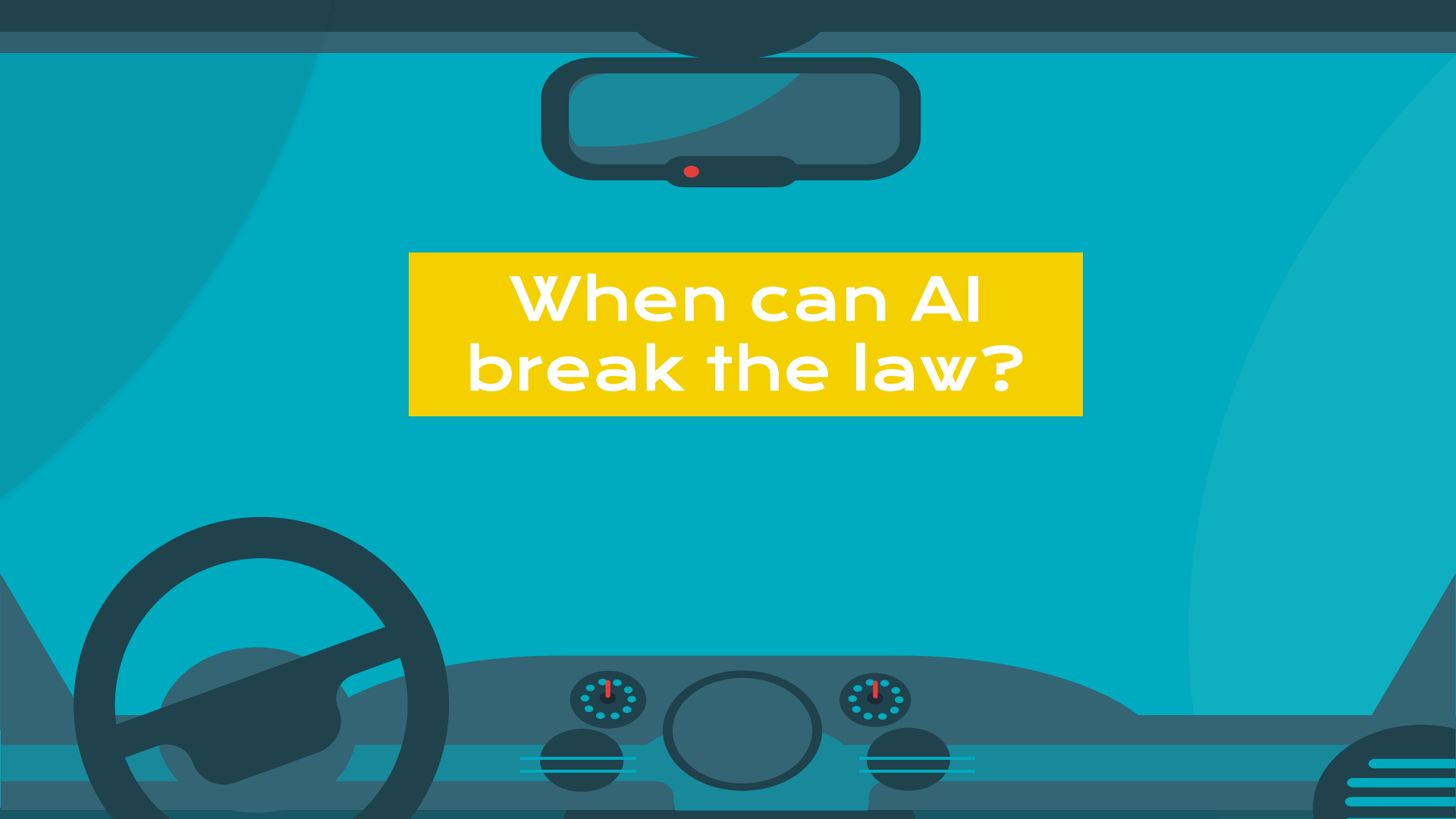
Pros/Cons

- Automation and efficiency
- Advancements in deep learning
- Wide range of applications
- Improved safety



- Reliance on external factors
  - Weather can affect sensors
- Accuracy
- Dependency on training data
- False Positives


Ethical
Dilemmas
A
B


When can AI
break the law?

Traffic Laws

Accountability

Accountable to humans

Laws are the metric

Not fully accepted in the industry

Naturalistic Driving

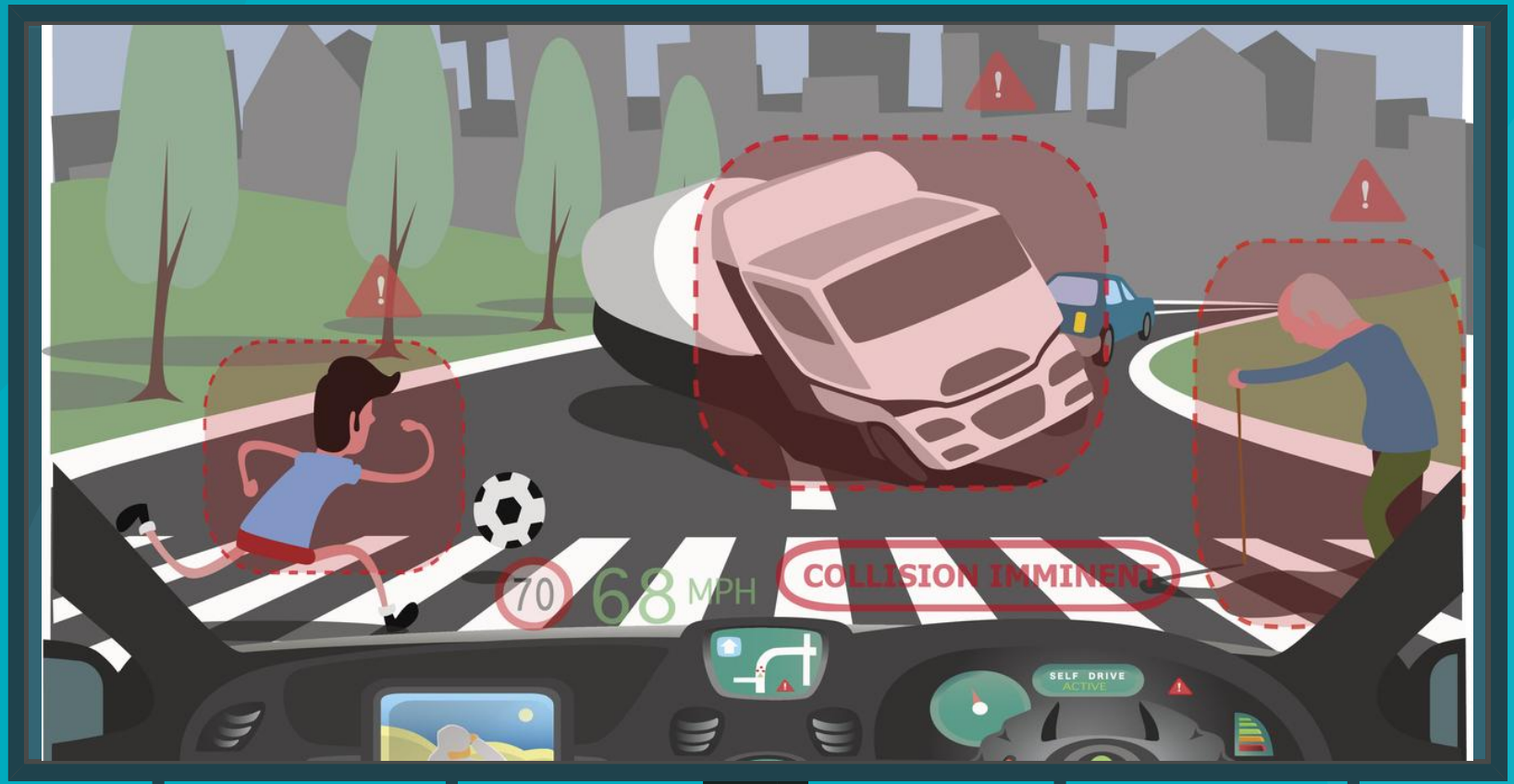
If other people are speeding, can the av speed too?

Saving Lives

What if breaking the law is necessary to avoid a collision?

What if a car need to cross over double yellow lines to avoid hitting a biker?

What would you do?



Who gets to decide?

Politicians?

Manufactu

Ethicists?

Drop your thoughts in the chat

Conclusion

THANK YOU

Questions?