

# Object detection with TensorFlow

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Caglar Özel

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HTW Berlin

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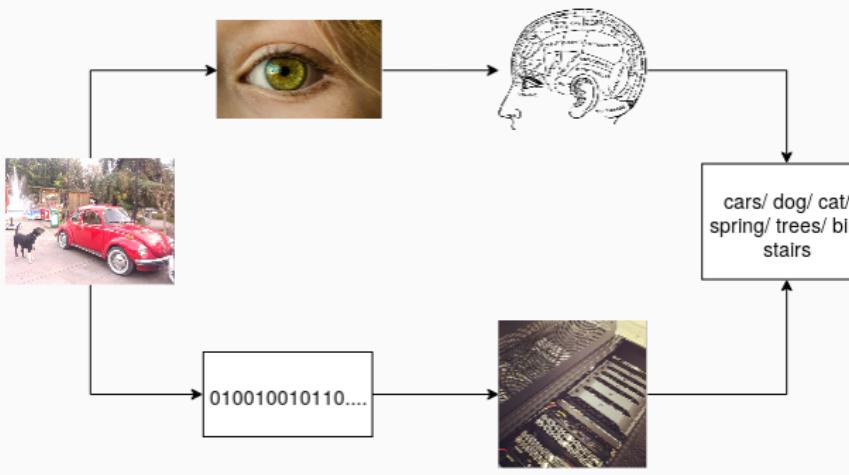
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# Introduction

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# What is computer vision?

- Images are a bunch of colored dots (pixels)
- Videos and Streams are a bunch of images in a loop

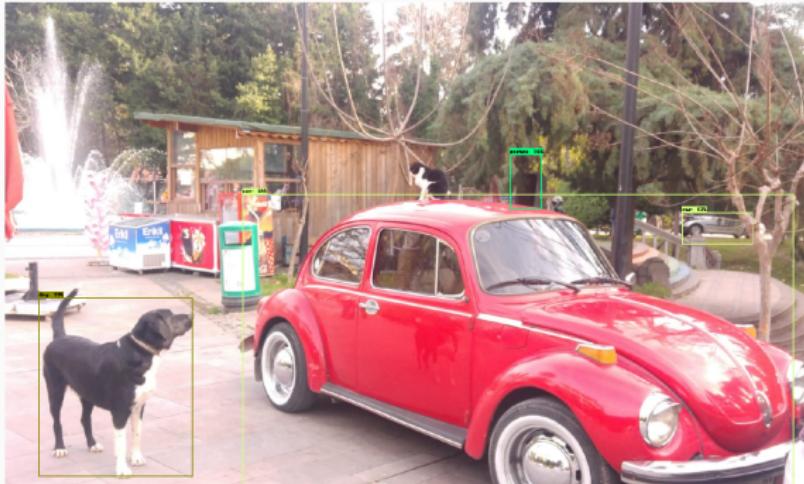


[1–3]

- Easily understood by the brain, impossible for the computer

# What is object detection?

- Computer Vision: what is an image about (general topic / content)
  - Object classification
- Object Detection: where are the objects (content + location)
  - Object localization & Object classification



# Common problems in object detection

- Unknown number of objects
  - Requires post-processing to compensate
  - Adds complexity to model
- Scale, View point, Illumination, Occlusion
  - Same objects may vary in size
  - Object shape may change according to view point
  - Object may look different under lighting
  - May be covered by other objects
- Modeling
  - Concept of the model
  - Perform multiple tasks
    - in one layer vs multiple layers

# Current object detection models

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- R-CNN
- Faster R-CNN
- Yolo
- SSD
- R-FCN

# TensorFlow

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# TensorFlow

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- Open source Machine Learning platform by Google
- Easy model building
- Robust ML production anywhere
- Powerful for prototyping

# Requirement for TensorFlow training

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- Image set
- Ground truth data
- CSV containing the ground truth information
- Generated ".record" files out of the csv
- Configuration file for training

# Model of TensorFlow

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- Training results stored in Checkpoints
  - Free choice of state usage
  - Results can be consulted on TensorBoard
    - Results for each checkpoint
    - Sample image detections

# Application

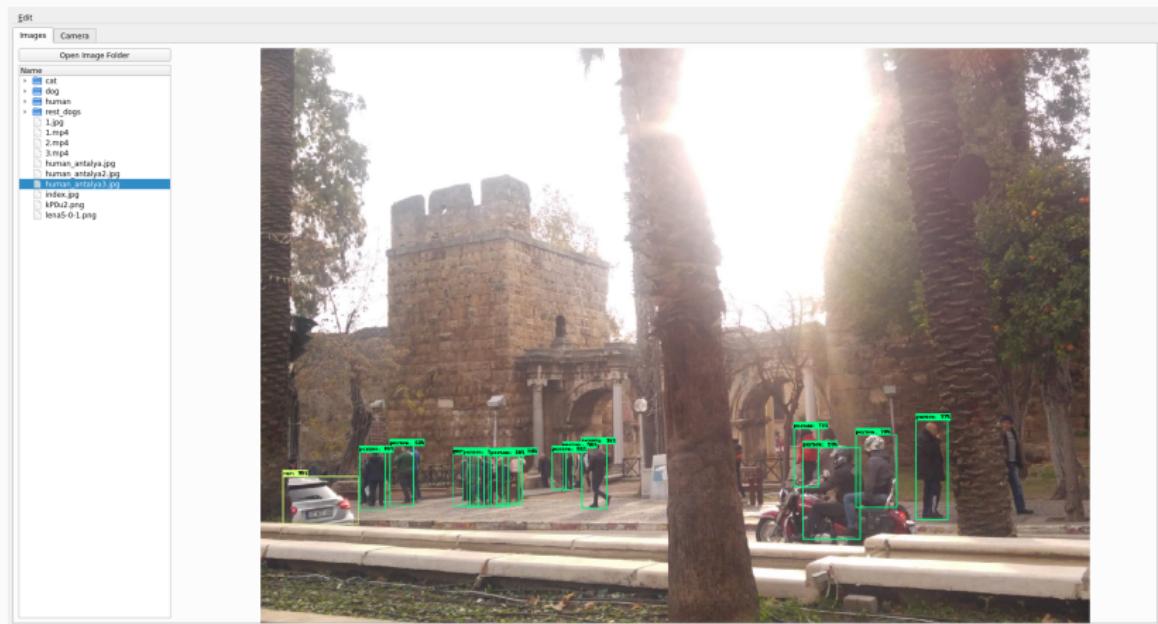
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# Application work flow

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- Set up configuration for TensorFlow model
  - In runtime
- Create TensorFlow model for object detection
  - In runtime
- Change root for files
- Image, video, web camera selected
  - Perform object detection

# Demo



## References

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- [1] [https://cdn.pixabay.com/photo/2017/02/01/10/11/brain-2029363\\_960\\_720.png.](https://cdn.pixabay.com/photo/2017/02/01/10/11/brain-2029363_960_720.png)
- [2] [https://images.pexels.com/photos/32267/pexels-photo.jpg?cs=srgb&dl=close-up-eye-eyelid-32267.jpg&fm=jpg.](https://images.pexels.com/photos/32267/pexels-photo.jpg?cs=srgb&dl=close-up-eye-eyelid-32267.jpg&fm=jpg)
- [3] [https://cdn.pixabay.com/photo/2015/04/03/16/48/server-farm-705448\\_960\\_720.jpg.](https://cdn.pixabay.com/photo/2015/04/03/16/48/server-farm-705448_960_720.jpg)