

# ML-Webinar-01

## Conventional Machine Learning

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# Introduction

## What is this Webinar about?

- Quick introduction to conventional machine learning
- Dataset exploration, visualization and inference
- Classification and Regression tasks in context
- Path and resources to self-study machine learning

## GitHub Repository

All the code and this presentation for this webinar is hosted on the following GitHub repository.  
Further instructions are provided in the Readme.md of the repository.

**URL:** [ML-Webinars GitHub Repo](#)

## Survey

Please fill up the Google Forms survey to provide your valuable feedback about this session

**URL:** [Feedback Form](#)

# Libraries and Frameworks

- **Anaconda and Jupyter notebook** - Python, Conda Environment, Notebook Cells.
- **Numpy, Matplotlib, Pandas** - numerical operations, plotting/visualization, columnar data operations
- **Scikit-Learn** - Ready-to-use Machine Learning Algorithms
- **Tensorflow, Keras, PyTorch** - Deep Learning Frameworks
- **Ray, Ray-RLLib** - CPU and GPU Cluster scaling of process, Deep Reinforcement Learning framework
- **OpenCV** - Image Processing and Computer Vision

# Resources

## YouTube Channels

- **StatQuest** - For Statistics and algorithmic explanation of ML
- **3Blue1Brown** - Essence of linear algebra, Neural Network playlist - Good to visualize math
- **DeepLizard** - For Deep Learning and Deep Reinforcement Learning
- **DeepMind** - Search for David Silver lectures on Reinforcement Learning

## Free Courses/Sites

- **Coursera and Udacity** - Lots of free courses from basics to advance level
- **Fast.ai** - Practical Deep Learning
- **MIT OCW** - Open Courseware from MIT for Graduate Level Courses
- **OpenAI and Anyscale Academy** - Lots of resources and tutorials in Deep RL

# Machine Learning - 1

## Conventional Programming:

- The programmer understands the business logic and code it in programming language.
- It is possible to code business logic / business rules

## Machine Learning:

- Useful when it is **hard to code business logic** manually
- Business rules cannot be determined easily
- The idea is to **code learning algorithms** which can **learn** the business logic from **data**
- Useful only with good amount of **useful (correct) data**
- Data and models (algorithms), both are equally important to understand
- **Statistics** is huge part of ML - Khan Academy

# Machine Learning - 2

## Basic Categorization

- **Supervised Learning** - Ground Truth is known
- **Unsupervised Learning** - No ground truth, but clustering, collaborative filtering, anomaly detection, etc.
- **Reinforcement Learning** - Learning from experience (trial and error)

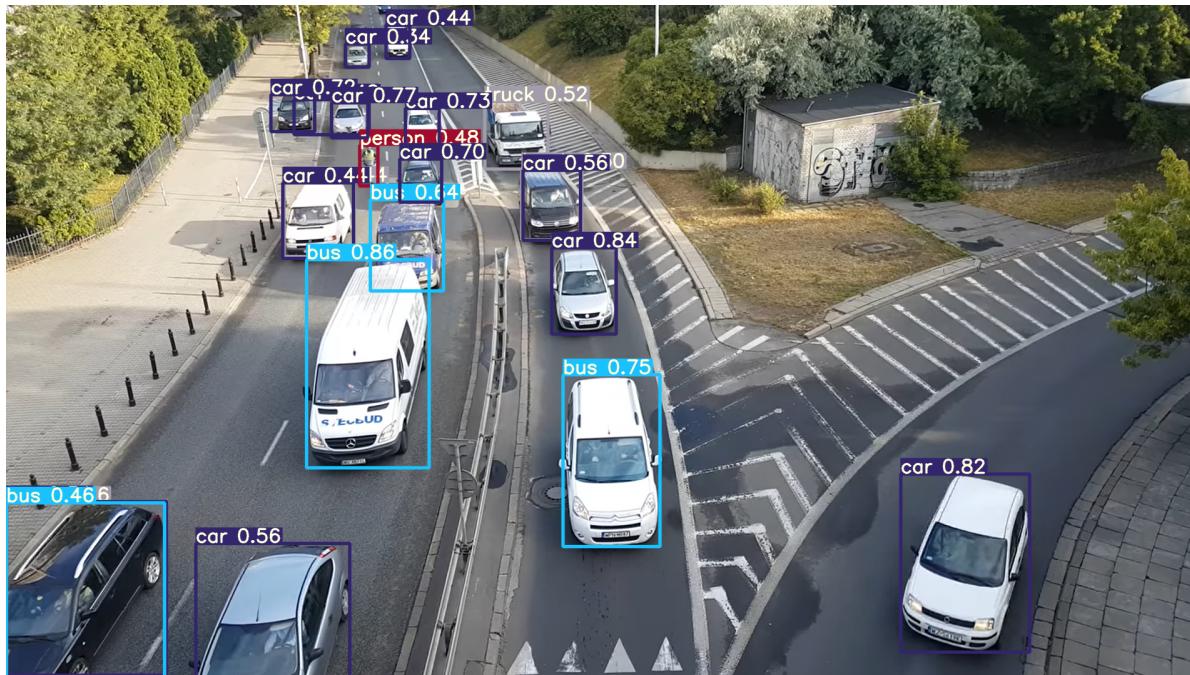
## Tasks in Supervised Learning

- **Classification** - Predict discrete value output / Predict from fixed number of categories
- **Regression** - Predict continuous value output

# Classification - Example

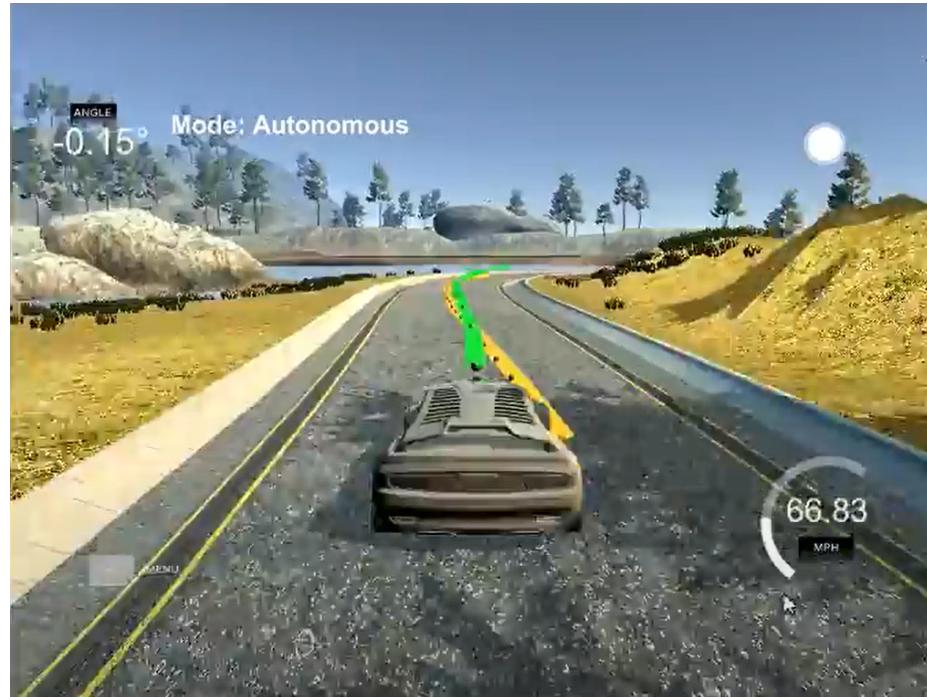
Yolo based Traffic Detection and Tracking

**Detections:** 1 person, 13 cars, 4 buses, 4 trucks.



# Regression - Example

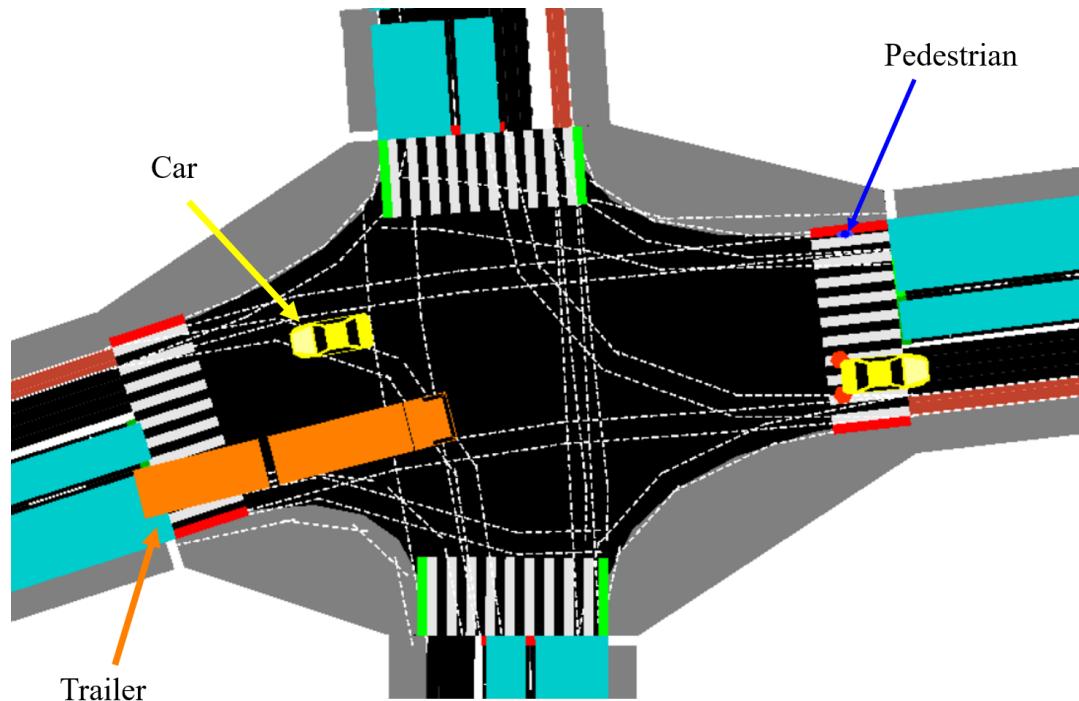
Nvidia's End-to-end Behavioral Cloning



# Deep Reinforcement Learning - Example

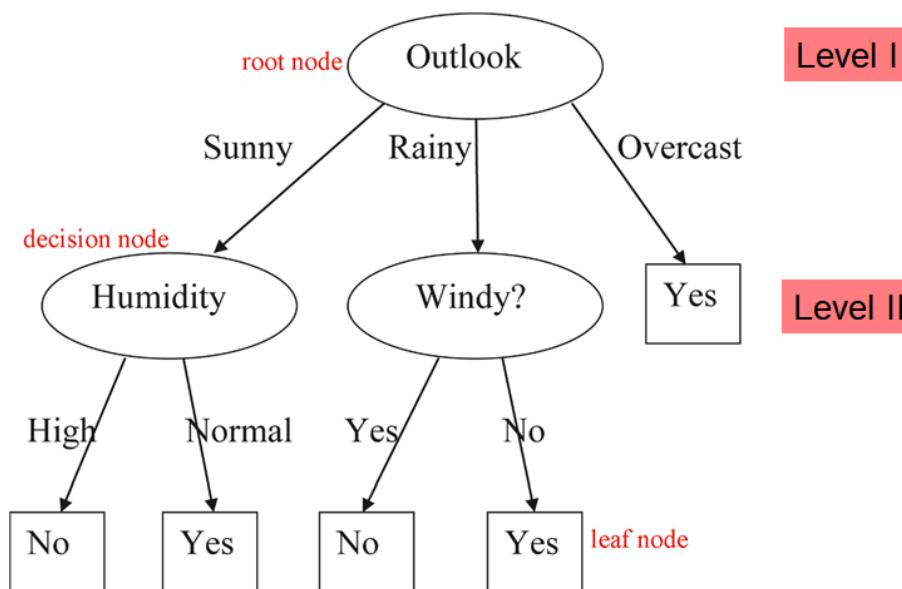
LemgoRL (Courtesy: Fraunhofer IOSB-INA, Lemgo | RL-INA)

GitHub: [LemgoRL Code Repo](#)



# Decision Tree

- Two-level decision tree for determining whether to play tennis
- Non-metric method (non-numerical data)



© book: Dougherty, G. Pattern Recognition and Classification. Springer, 2013

# Decision Tree - Code Example 1

## Iris Dataset

- **Features / Attributes:** Sepal Length, Sepal Width, Petal Length, Petal Width - (in cm)
- **Labels / Target:** Iris-Setosa, Iris-Versicolour, Iris-Virginica
- **Datapoints:** 150 Samples (50 in each class)
- **Columns** = Features + Labels
- **Rows** = Datapoints

# Decision Tree - Code Example 2

## Online Shoppers Purchasing Intention Dataset Data Set

- **Data set provided by:** Sakar, C.O., Polat, S.O., Katircioglu, M. et al. Neural Comput & Applic (2018)
- **URL:** [Link to UCI Repository](#)

# References

1. [Yolo v5 for Object Detection](#)
2. [Nvidia End-to-end Learning for Self-Driving Cars](#)
3. [LemgoRL: An open-source Benchmark Tool to Train Reinforcement Learning Agents for Traffic Signal Control in a real-world simulation scenario](#)
4. [Iris Flower Dataset](#)
5. [Online Shoppers Purchasing Intent Dataset](#)
6. [Python Datascience Handbook](#)