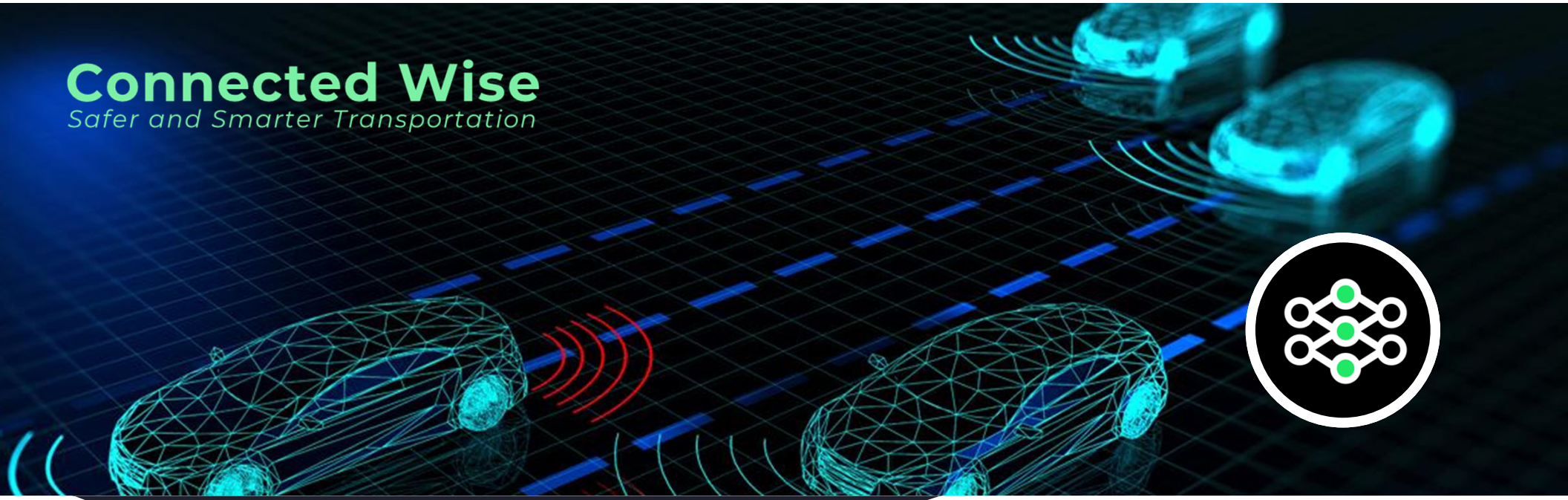



Presenter: Gustavo Diaz Galeas, MSc

# Is AI a Part of Connected Vehicle Technology and/or Automated Vehicles?

Connected Wise LLC @2024

The Team

# Executive Members

## Enes Karaaslan, PhD (Co-Founder)

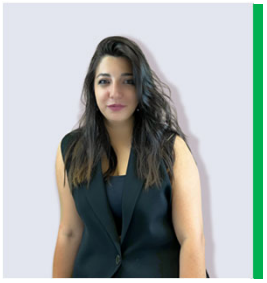
8+ years of experience in autonomous vehicle systems, vehicular communication and machine learning applications. Notable experience with technology transfer.

## Tolga Ercan, PhD (Co-Founder)

10+ years of experience in intelligent transportation systems, connected vehicle infrastructure, and transportation safety. PhD research on energy optimization and sustainability.

## Haluk Laman, PhD (Co-Founder)

10+ years of experience in transportation safety and connected vehicle technologies, and traffic operations. PhD research on traffic micro simulation & optimization.

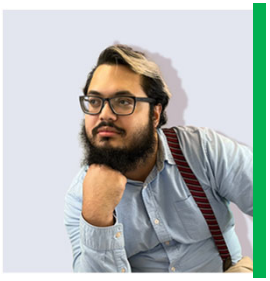


## Ece Mutlu, PhD (Marketing)

5+ years of experience in industrial engineering with marketing experience. Also, expert in process engineering, artificial intelligence, statistical analysis, and system optimization.

## Musa Ceylan, MSc (Engineering)

9+ years of experience in Autonomous vehicle engineering, specializing in automated driving, deep learning, data science, edge computing, computer vision and robotic systems.



## Gustavo Diaz, MSc (Engineering)

Expertise in embedded systems infrastructure, sensor and hardware design, and embedded software development.

## Sector Experience:

Mercedes-Benz

TRANSCORE

HNTB

FDOT

Connected Wise

# My Qualifications

## Academic Background

- BSc in Computer Engineering
- MSc in Computer Engineering
  - Focus areas: computer systems, architecture, hardware security
  - Taken one course in ML, another in Neural Networks

## Professional Experience

- Nearly 3 years in embedded systems development
- Time at Connected Wise spent working on intelligent transportation systems

## More importantly…

- 2.5 years experience working as a tutor
- Spent 3 years volunteering at a local high school teaching programming concepts to students
- Occasional mentor to college students

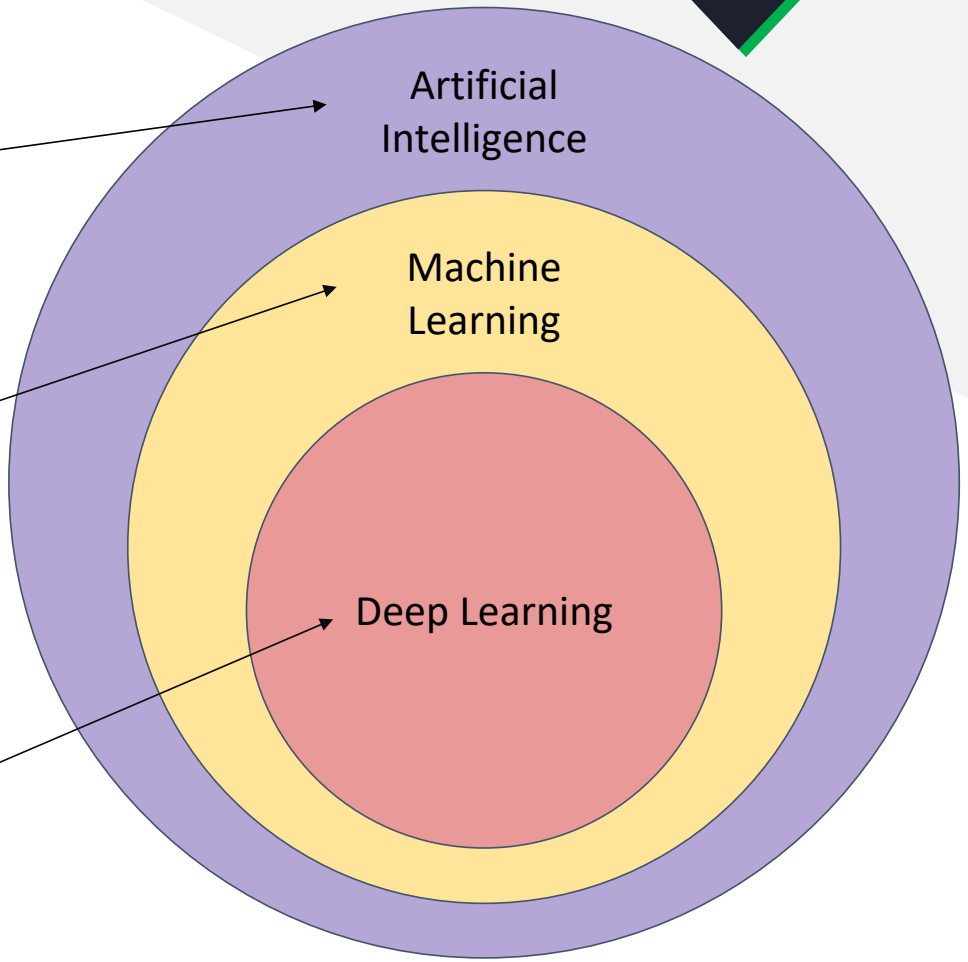
- Eternal student
- Engineer
- Educator

# Different Layers of AI

Machines being able to make decisions on their own

Learning features from data through a training process to use in making informed decisions

Makes use of multiple layers, each dedicated to learn specific features from data

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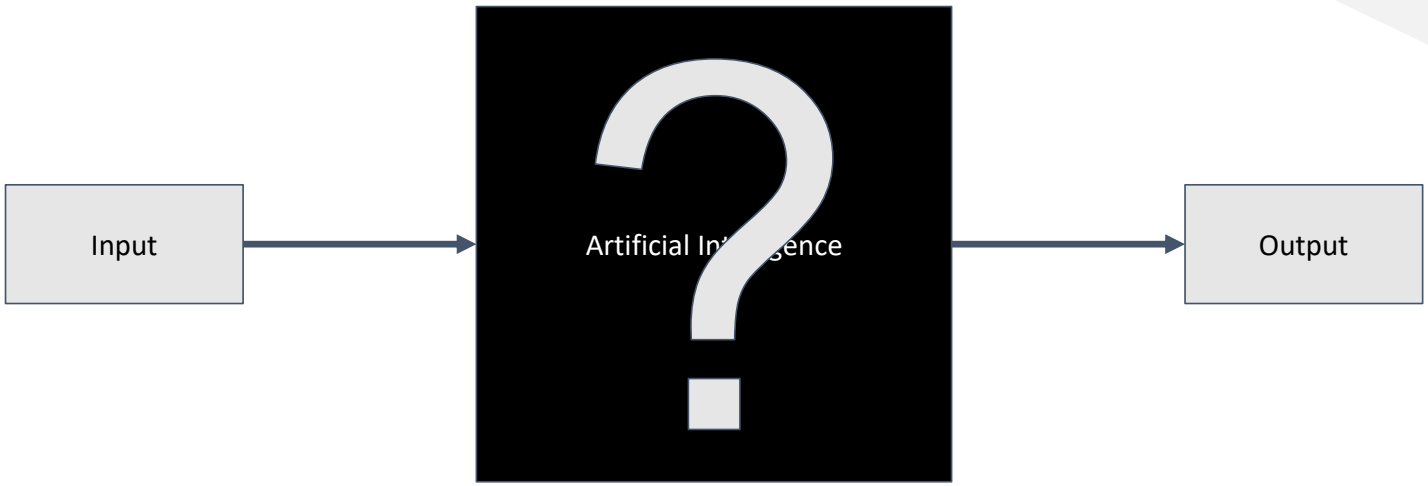
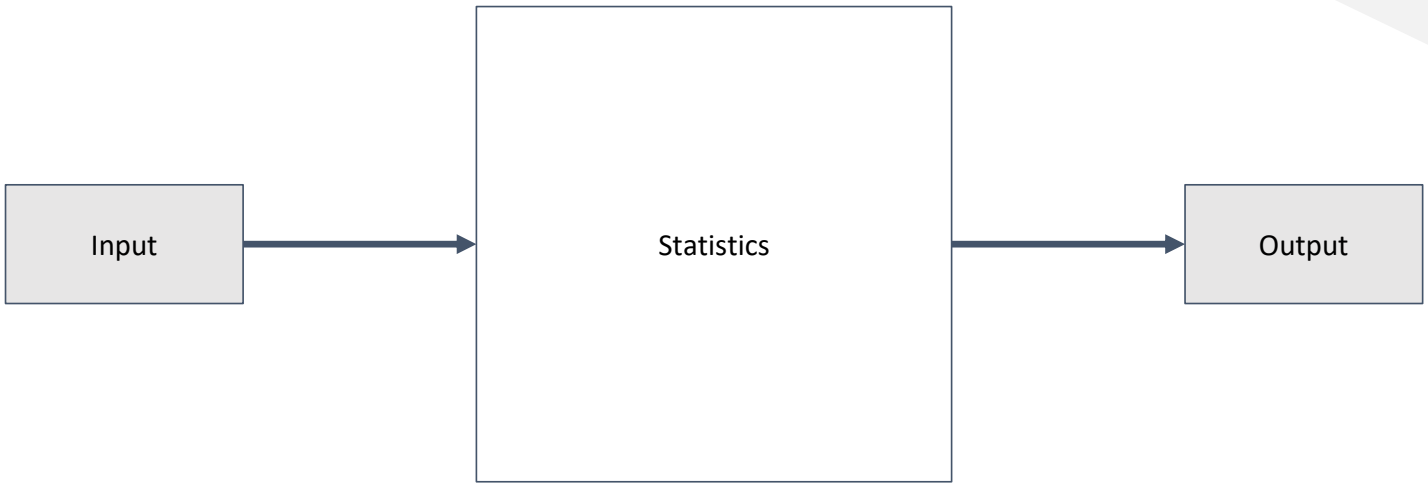
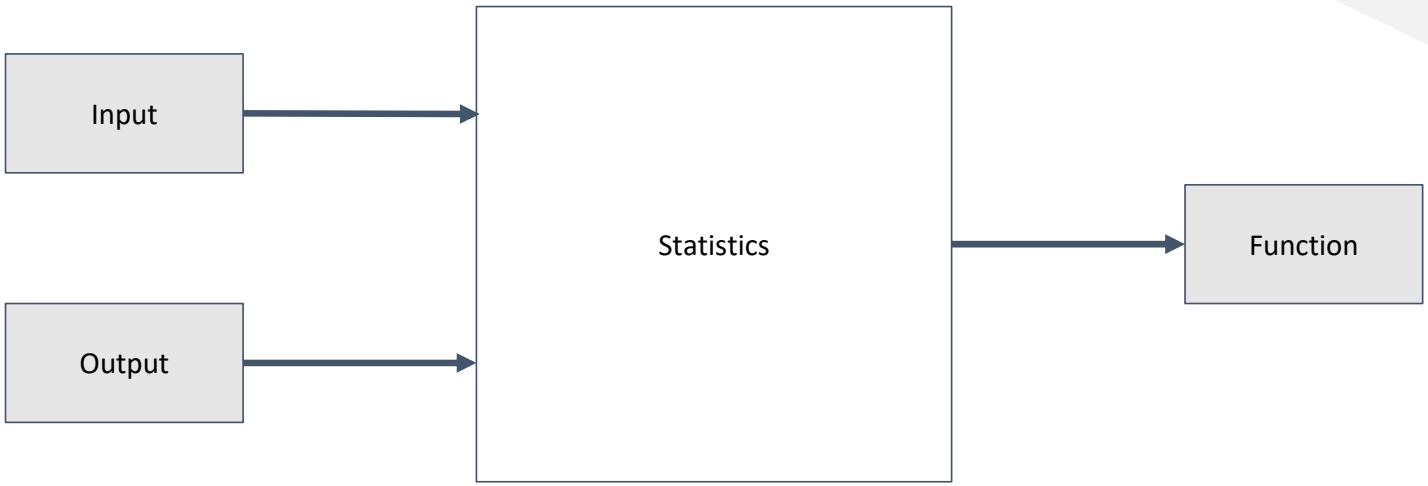
# How is AI Implemented?



# How is AI Implemented?

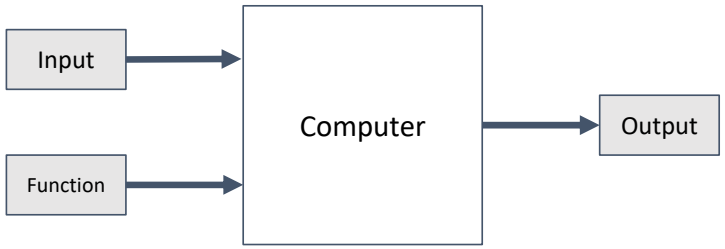


# AI is Statistical Optimization

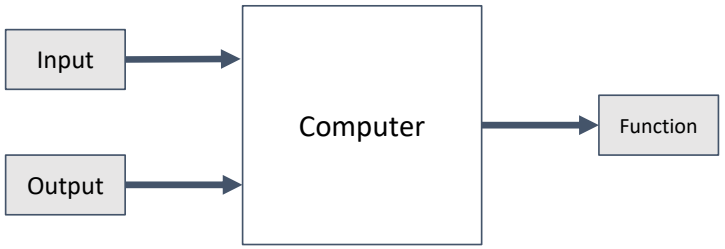


# AI is Statistical Optimization

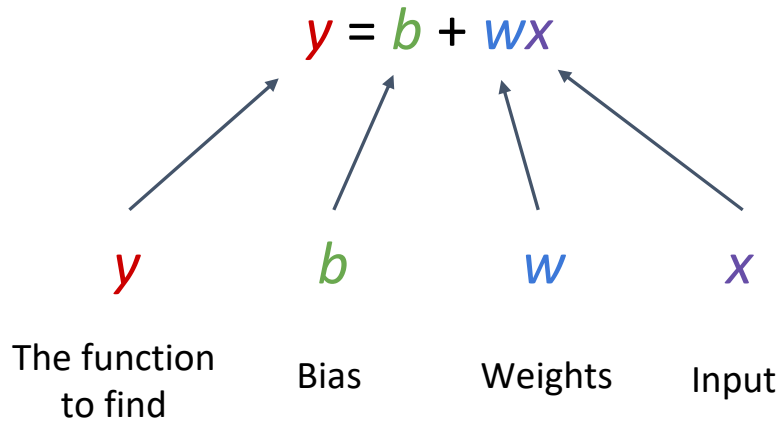
## Traditional Approach




## Machine Learning Approach



# AI is Statistical Optimization



## The Learning Process

### Variables We Control

| | |
|---|---|
| Bias | $b$ |
| Weights | $w$ |

### Variables We Can't Control

| | |
|---|---|
| The function to find | $y$ |
| Input | $x$ |

## The Learning Process

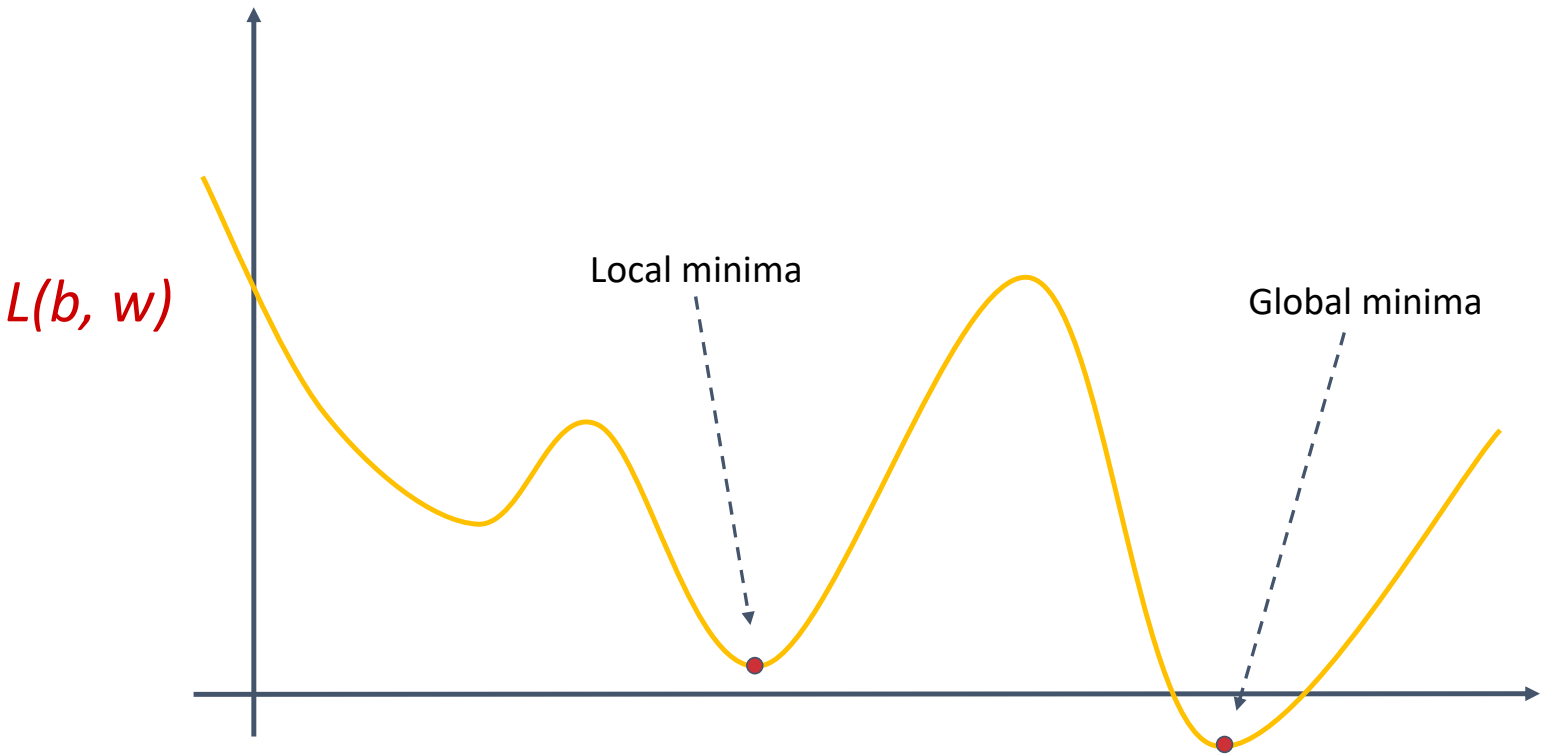
### Defining “loss”

| | |
|---|---|
| Expected output | $y$ |
| Actual output | $y^*$ |
| Error | $e = \lvert y - y^* \rvert$ |
| Loss Function | $L(b, w) = e$ |

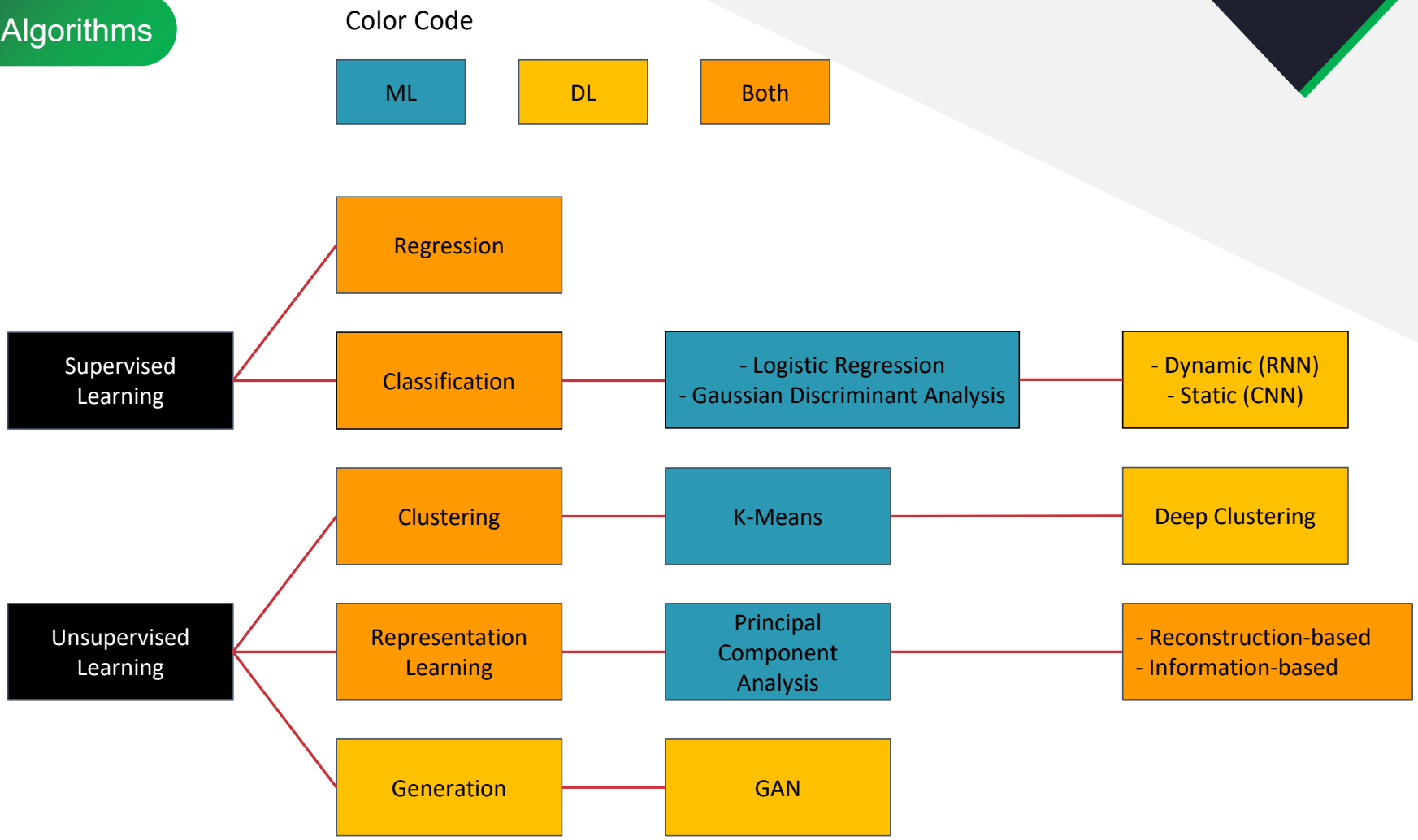
### Optimization

1. Determine the “sensitivity” of the loss with respect to both the bias and the weight
2. Depending on the magnitude and “direction” of the sensitivity, adjust the values of the bias and weight
3. Test out new function with your new parameters!
4. Repeat

## Optimization



# Types of Algorithms

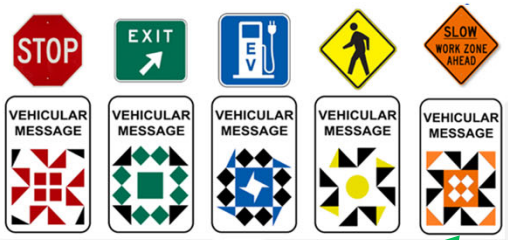


How Does AI Fit Into CAV?

# Smart Vehicles & Smart Infrastructure

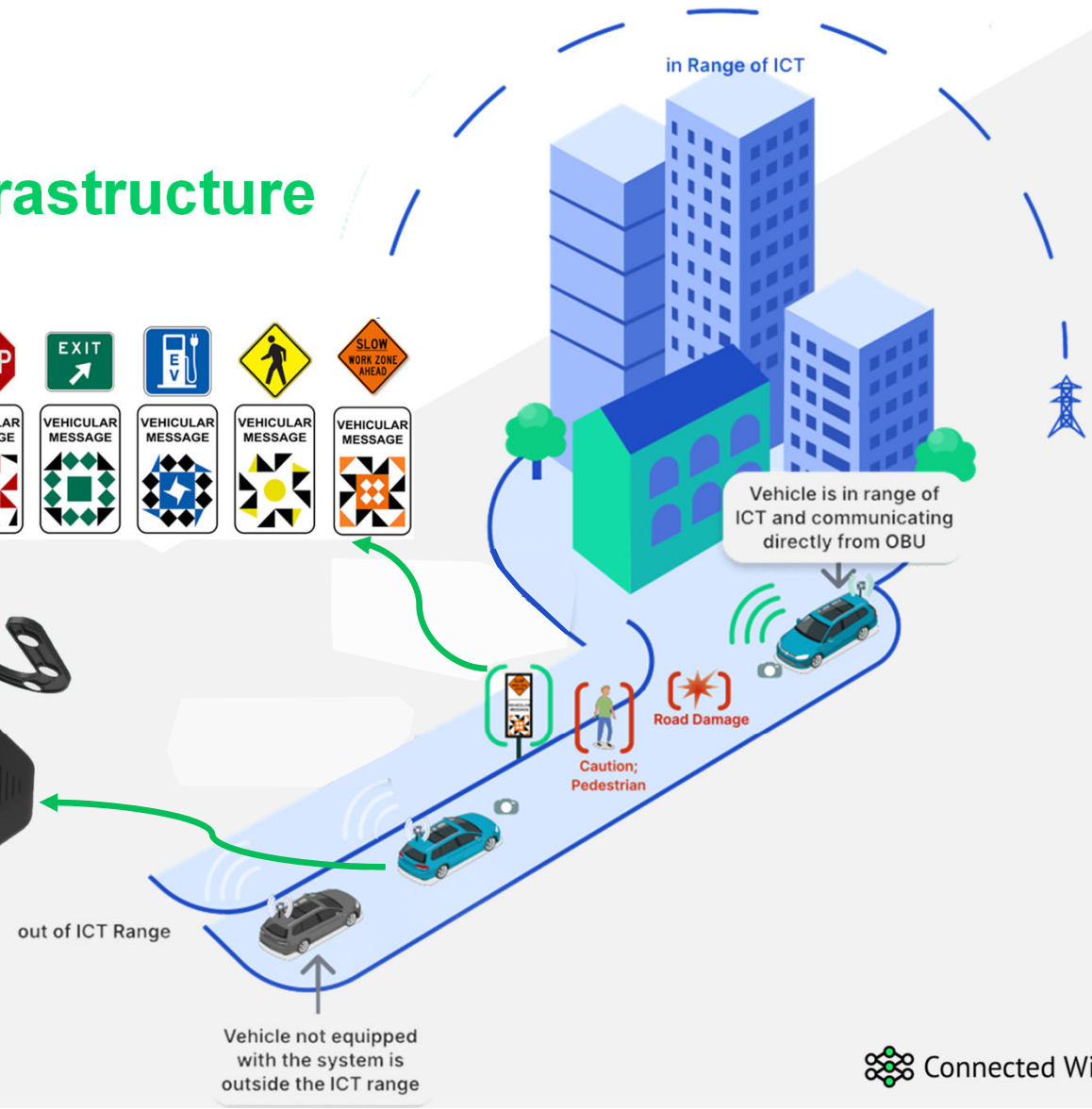
## VisionSign (*Patented*)

Smart Traffic Signs using vision-based communication and visual hashing algorithm and AI object detection models



## VisionConnect

ADAS solution providing optimized AI-empowered driving safety and connectivity for all vehicles.

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