

# DATA SCIENCE OF AUTONOMOUS VEHICLES

## ► THE FUTURE ON WHEELS

HOW SELF-DRIVING  
CARS ARE CHANGING  
TRANSPORTATION



—BUSHRA ALI

REDEFINING  
ROAD TRAVEL



# SMART MOBILITY

Smart mobility refers to innovative transportation solutions that enhance efficiency, sustainability, and accessibility. Self-driving cars are a key component of smart mobility; they are vehicles equipped with advanced sensors, data analysis capabilities, and autonomous decision-making systems, allowing them to navigate without human intervention.

# THE BRAINS BEHIND THE WHEEL



## SENSOR INTEGRATION

Lidar, radar, and cameras work together to scan road conditions and detect nearby vehicles, obstacles, pedestrians, and road signs in real time.

## AI ALGORITHMS

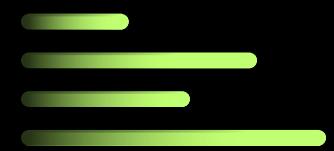
Autonomous systems use deep learning models to predict traffic behavior, interpret surroundings, and make safe, dynamic driving decisions without human input.

**CORE  
TECHNOLOGY**

Level 0 → No automation

Level 5 → Fully autonomous (no driver required)





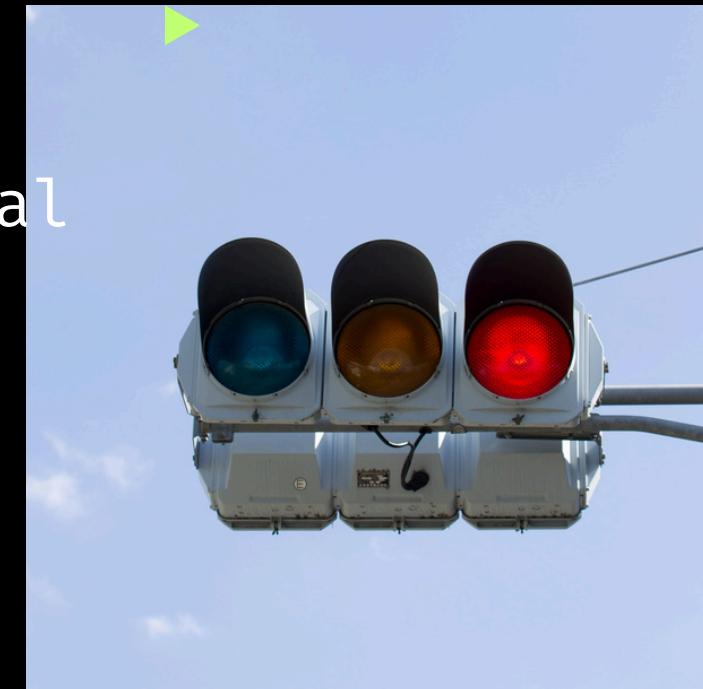
# SAFETY BENEFITS



## REDUCING HUMAN ERROR

### RAPID RESPONSE

Computerized driving systems react instantly to sudden changes or dangers, enhancing road safety and avoiding accidents through continuous situational awareness.



### CRASH REDUCTION

By eliminating distractions, fatigue, and impaired driving, autonomous cars can significantly lower accident rates and reduce injuries on bus roadways.

### PREDICTABLE BEHAVIOR

Autonomous vehicles consistently follow traffic rules and patterns, creating a more predictable and organized driving environment for all road users.

# SENSORS USED

A self-driving car sees the world using:

Cameras → Detect roads, signs, lights

LiDAR → 3D depth map

Radar → Tracks speed & distance

GPS/IMU → Position & movement

Ultrasonic sensors → Parking / close

objects



## REVOLUTION IN DELIVERY

Self-driving relies on several ML tasks:

### 1. Computer Vision

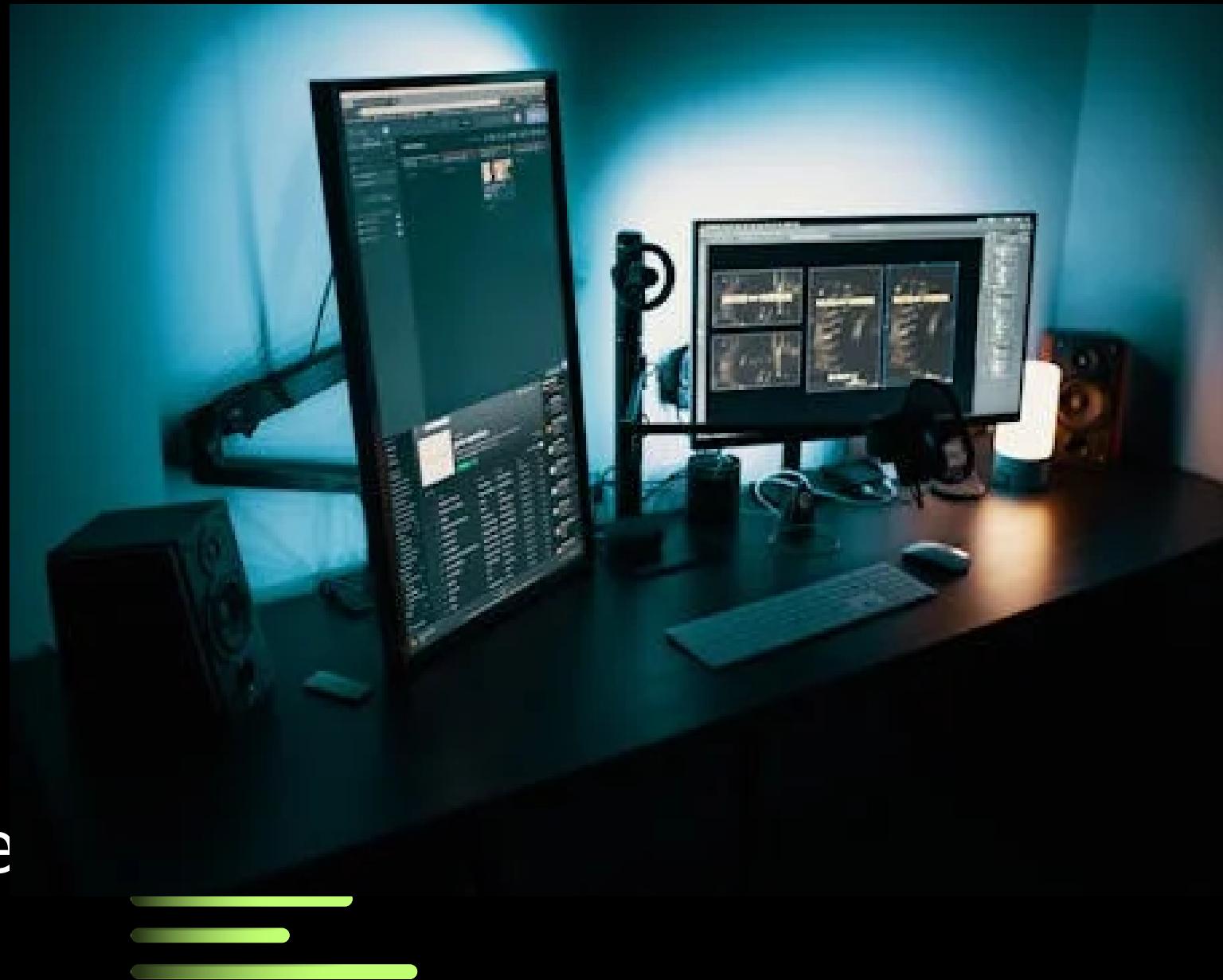
- Detecting pedestrians
- Recognizing traffic signs
- Lane detection

### 2. Prediction Models

- Predicting how other cars will move
- Predicting pedestrian intention

### 3. Decision Making (Reinforcement Learning)

When to brake, accelerate, change lanes



LOGISTICS  
SHIFT

# USER EXPERIENCE



## RELAXED JOURNEYS

Passengers can sleep, read, or work while the car autonomously navigates.

## ELDERLY INCLUSION

Improves independence for elderly or disabled individuals.



## REAL-TIME NAVIGATION

Automatically adjusts routes based on live traffic.

## ONBOARD CONNECTIVITY

Entertainment and productivity options built into vehicle systems.

## LAWS AND COMPLIANCE

New driving codes must be developed to regulate how autonomous vehicles behave and interact with traditional traffic environments and emergency scenarios.

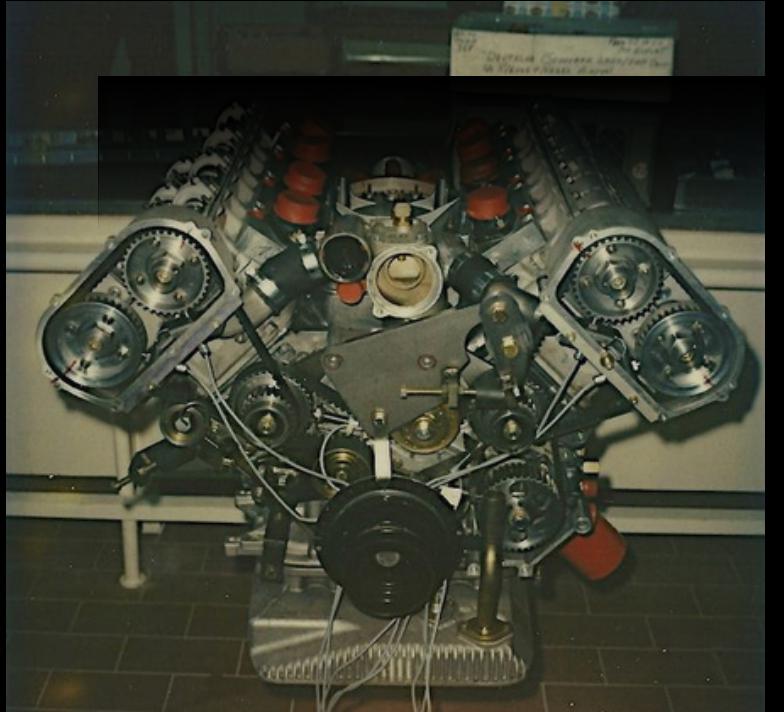
## DATA HANDLING

Privacy policies should protect personal and location data gathered through sensors, navigation logs, and vehicle communication systems.

## LIABILITY ASSIGNMENT

In case of accidents, determining fault between the user, vehicle software provider, and manufacturer must be clarified through legislation and industry standards.

# REGULATION NEEDS



# PUBLIC CONCERNs

## TRUST & TRANSITION



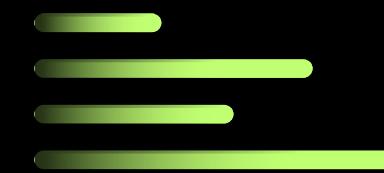
### ► EMPLOYMENT RISKS

Self-driving systems could displace millions of jobs, particularly in commercial driving, ride-hailing, logistics, and related transportation sectors.

### ► TECH RELIABILITY

Many still doubt the ability of machines to handle unpredictable situations, especially in extreme weather or complex driving conditions.

# FUTURE OUTLOOK



## TOWARDS FULL AUTONOMY

Breakthroughs in AI, edge computing, and 5G connectivity will make autonomous vehicles more capable and reliable. As infrastructure adapts, these vehicles will become a core part of modern transit systems.

The path to full autonomy is progressive, with semi-autonomous stages gaining traction. While challenges remain, innovation and investment are steadily driving the technology toward mainstream adoption across industries and regions.



Thankyou

----Bushra Ali