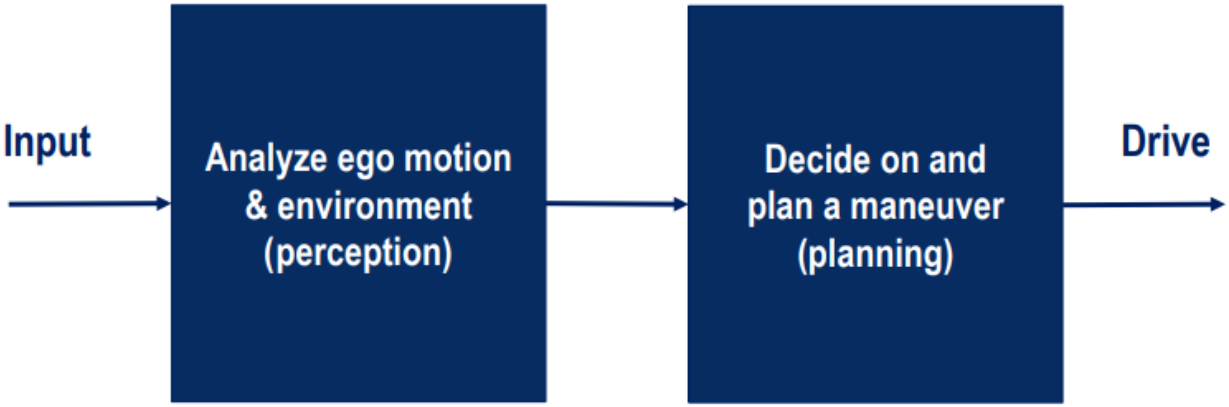
# Module 1 - Lesson 2

## Course 1 - Introduction to Self-Driving Cars

**Module 1**
Autonomy Requirements

**Lesson 2**
Requirements for Perception




**Ego Motion:**
Egomotion is defined as the 3D motion of a camera within an environment. **An example of egomotion estimation would be estimating a car's moving position relative to lines on the road or street signs** being observed from the car itself. The estimation of egomotion is important in autonomous robot navigation applications.

**What is perception ?**
We want to make sense of the environment and ourselves. We have to do two things in Perception,

1. Identification objects like cars, humans, sign boards.
2. Understanding motion of our vehicle, other moving objects.

**Why we need a Perception ?**
We pass these information to planning to take driving decisions

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**Goals for perception:**

**Static objects:**

1. Road and lane markings (on-road)
2. Curbs (off-road)
3. Traffic lights (off-road)
4. Road signs (off-road)
5. Construction signs, obstructions, and more (on-road)

**Dynamic Objects:**

1. Vehicles
2. Pedestrians
3. Ego localization - We need to be able to **estimate where we are and how we are moving at any point in time**. **Knowing our position and how we are moving in the environment is crucial to making informed** and safe driving decisions. The data used for **ego motion estimation comes from GPS, IMU, and odometry sensors**, and needs to be combined together to generate a coherent picture of our position.
    1. Position
    2. Velocity, acceleration
    3. Orientation, angular motion

**Challenges to perception:**

1. Robust detection and segmentation
2. Sensor uncertainty
3. Occlusion, reflection
4. Illumination, lens flare
5. Weather, precipitation