**Perception:**

SDCs perceive the world by achieving these four core tasks:

**Detection** – find where object is in the environment

**Classification** – what the object is and what it is doing

**Tracking** – observe moving objects across time

**Semantic Segmentation** - matching each pixel in image with semantic category

**Classification pipeline:**

Input data -> Pre-processing -> Feature extraction -> Classification model

LiDAR Images are created using point cloud where the points are the laser beams that got reflected back, 3 dimensions are needed to describe the position of a point in LiDAR image.

Machine learning, Neural Nets like methods are employed as algorithms to work through the features and images to perceive

**Detection & Classification:**

Detection CNN is used to find the location of objects within the image

This image is then sent to another CNN for classification

There are various others like R-CNN, Fast R-CNN, Faster-RCNN, YOLO, SSD

**Tracking:**

Local Binary Pattern(LBP) & Histogram Oriented Gradients(HOG) are examples of tracking algorithms

**Semantic Segmentation:**

Classifying each pixel in an image. It relies on Fully Convolutional Neural Network(FCNN).

Convolutional Layer, Encoder, Decoder are the different components in segmentation.

Camera, LiDAR and Radar have their own advantages and disadvantages under different scenarios but when clubbed together to work also known as **Sensor Fusion** provides the best of both worlds