

The background of the slide is a dark, blue-tinted photograph. It shows a car, likely a Volvo SUV, equipped with a roof rack and LiDAR sensors, driving on a bridge. The bridge's steel truss structure is visible in the background, and the overall scene is dimly lit, suggesting dusk or dawn.

Apex.AI

A Brief Introduction to
LiDAR-Based Object Detection in
Autoware.Auto



01 / Object Detection and the Autonomous Driving Stack

Object Detection - What and Why

Why object detection?

What is it?

What is it supposed to do?

Use cases inform architectural and design decisions

A Prototypical Use Case

An autonomous vehicle should:

- Drive towards a goal, and
- Drive safely, meaning:
 - It doesn't hit things
 - It doesn't cause other participants to behave dangerously

Object Detection

Processed Detections

Object detection is needed to know where things are so you don't hit it

A Prototypical Autonomy Stack

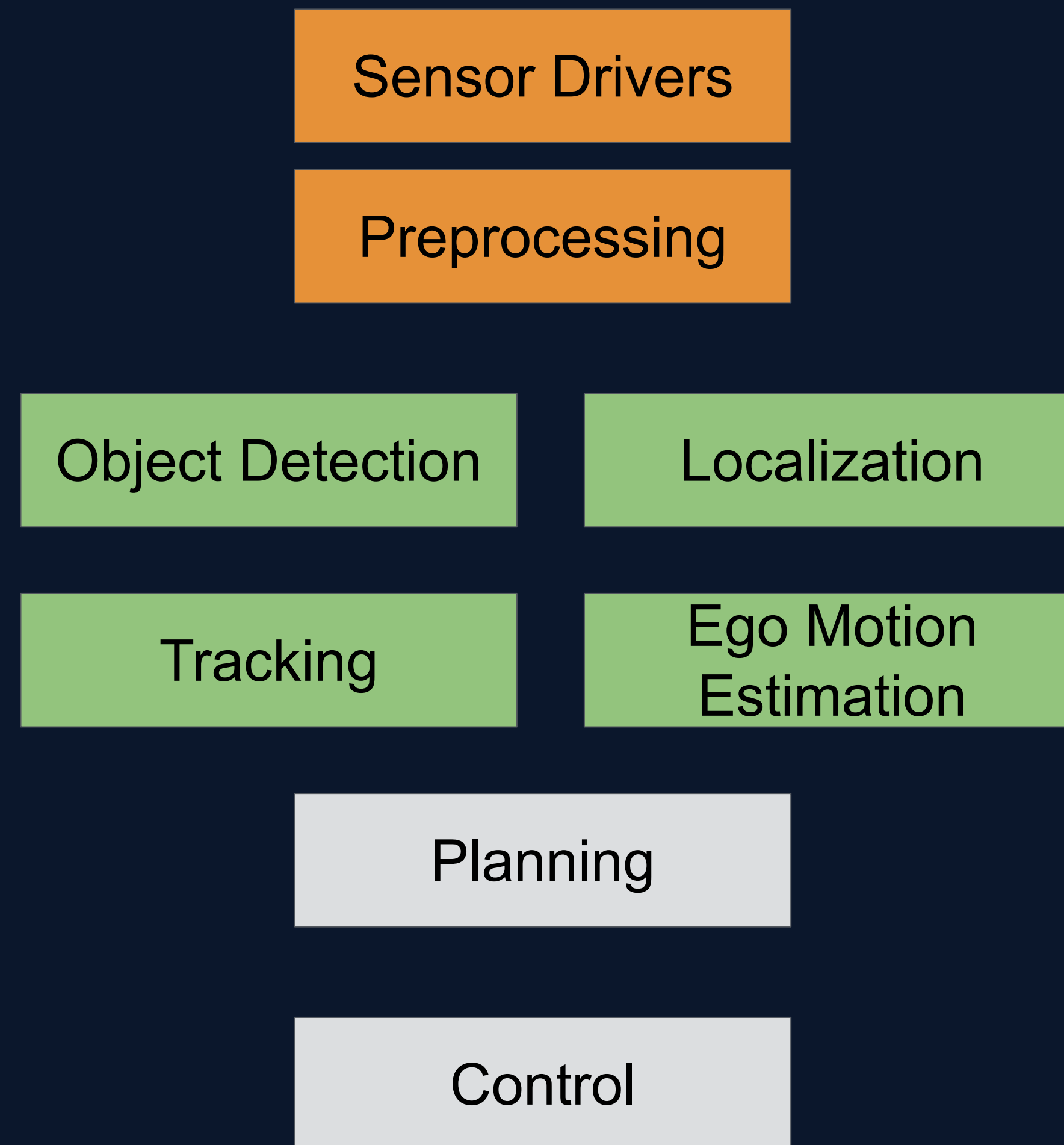
Sense

Understand

Plan

Act(uate)

A Generic Autonomous Driving Stack



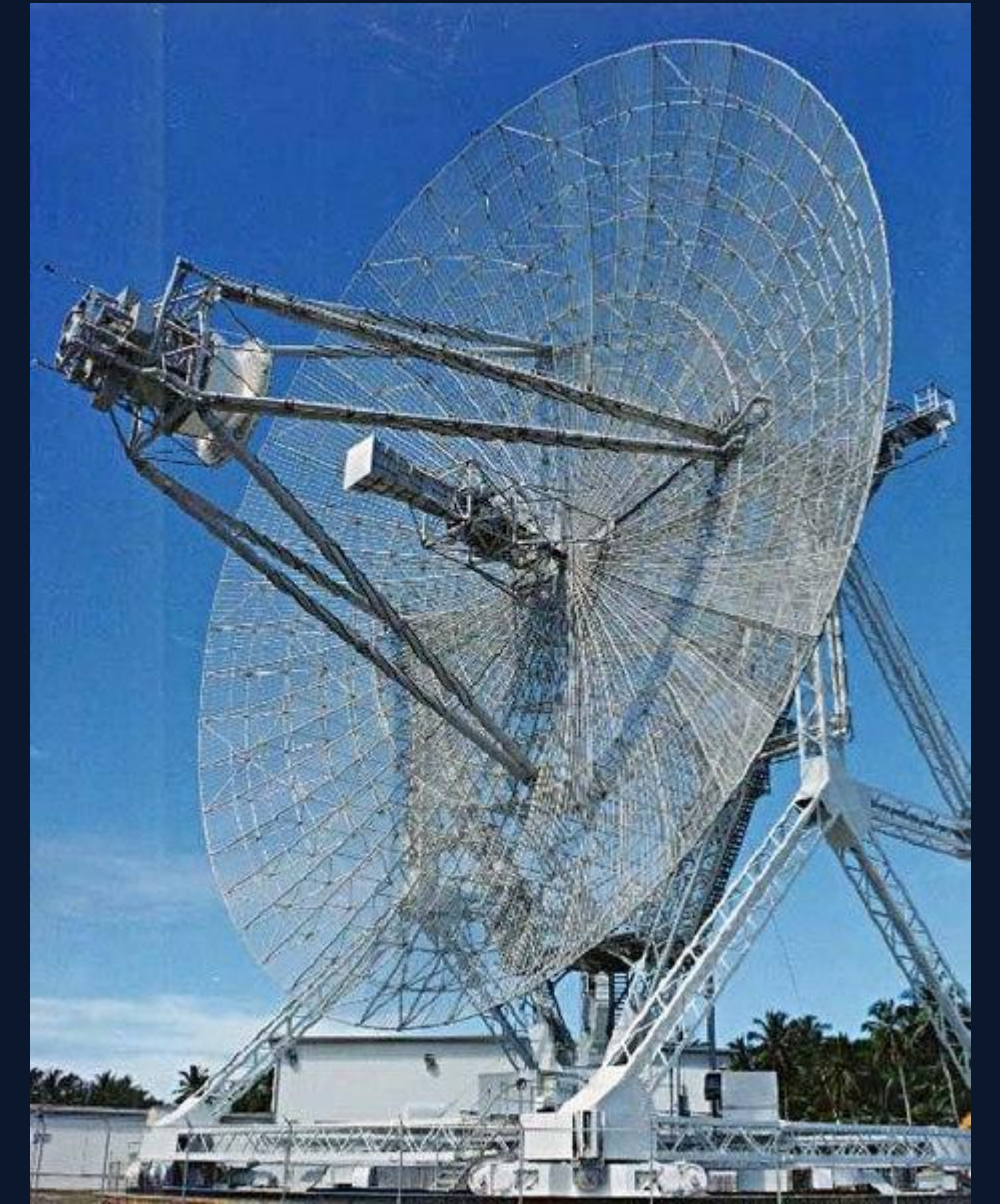
Planning is the main recipient of object detection

Ways to Produce 3D Measurements

Planning requires a 3D representation of objects

Some example sensing modalities that satisfy this:

- LiDAR
- RaDAR
- Stereo Cameras
- Depth Cameras
- Structure from motion + scale estimator
- Deep learning
- Some combination of the above



Object Detection and the Autonomous Driving Stack - Summary

Object Detection is needed for a vehicle to act in a safe manner

There are many sensing modalities which can support 3D object detection

Object Detection talks to and informs:

- Planning (via collision detection)
- Tracking (which in turn talks to planning)
- Classification (which in turn talks to tracking)
- Other forms of preprocessing

The key use cases of object detection are collision detection, tracking, and preprocessing