02 / A Classical LiDAR Object Detection Stack

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Deep Learning vs Classical Approaches

Deep Learning

- Cool
- Cutting edge performance
- Requires lots of labeled data
- Generally requires GPU for any hope of handling live data
- Black magic?
- Generally relies on huge, complex frameworks
- Vulnerable to adversarial attacks
  - Tu et al
  - Cao et al

Classical

- Boring
- Easy to understand
- Tuning parameters
- Pretty simple

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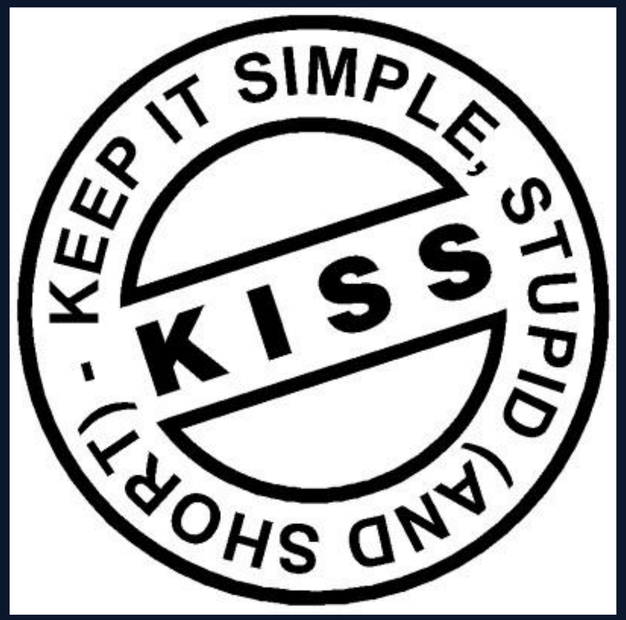
Why Classical 3D Perception?



- Simple, easy to understand
- Easier to implement
- Fewer (no) dependencies
- More robust to adversarial attacks
- Lower computational overhead (potentially)

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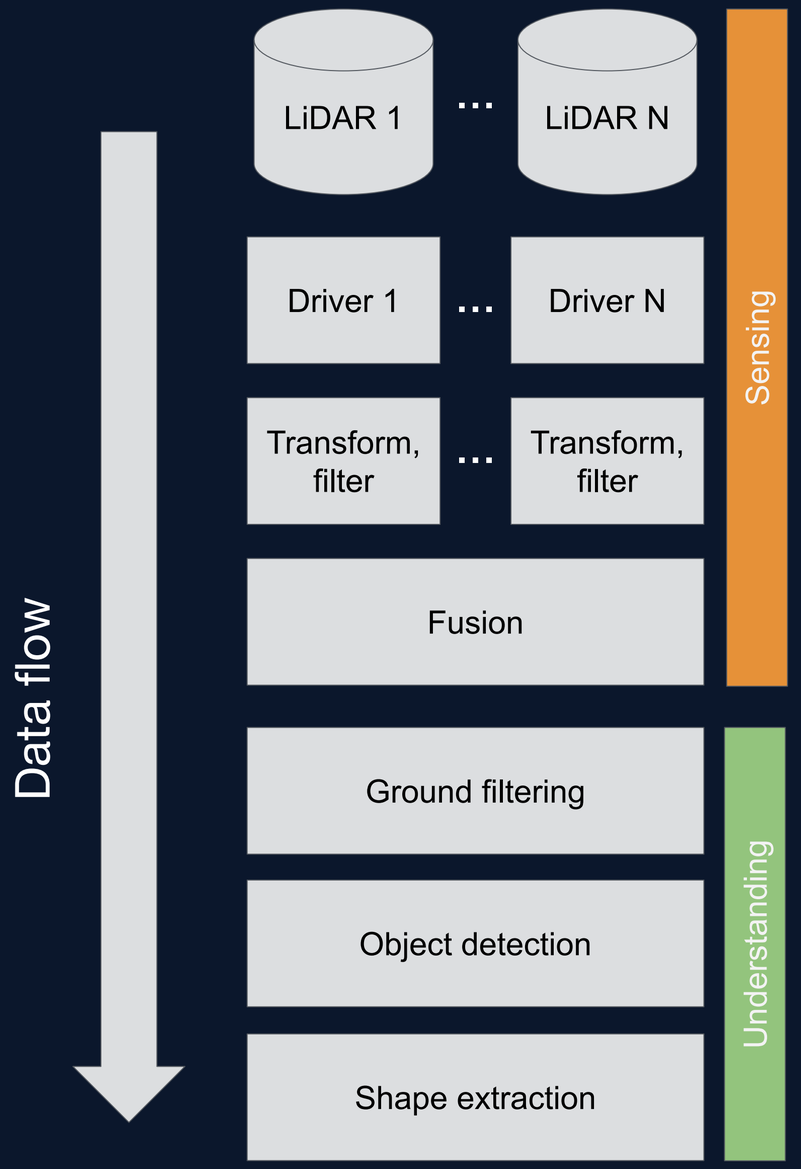
A Classical 3D Object Detection Stack



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Classical LiDAR Perception - Summary

Autoware.Auto uses a classical stack because:

- It’s simpler
- Faster
- Fewer dependencies

The classical stack has the following key algorithmic steps:

1. Drivers - Translate raw data
2. Preprocessing - Clean up inputs
3. Ground Filtering - Remove noise
4. Clustering - Detect objects
5. Shape Extraction - Simplify representation