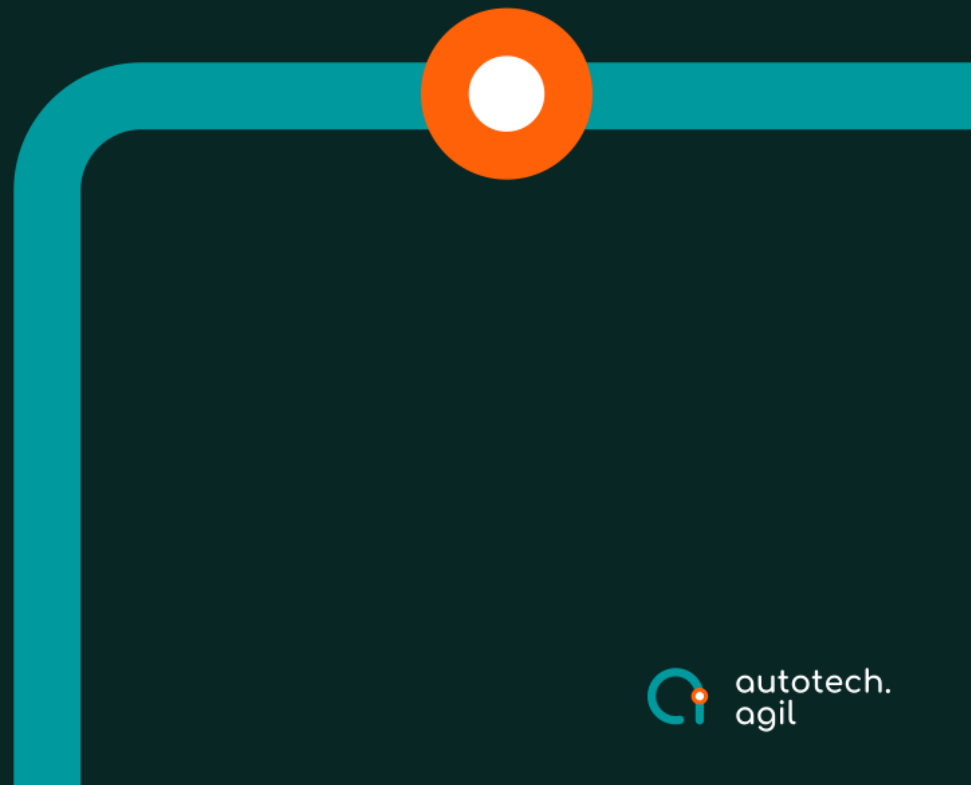
Felix Berkel

Robert Bosch GmbH

Robust Vehicle Automation



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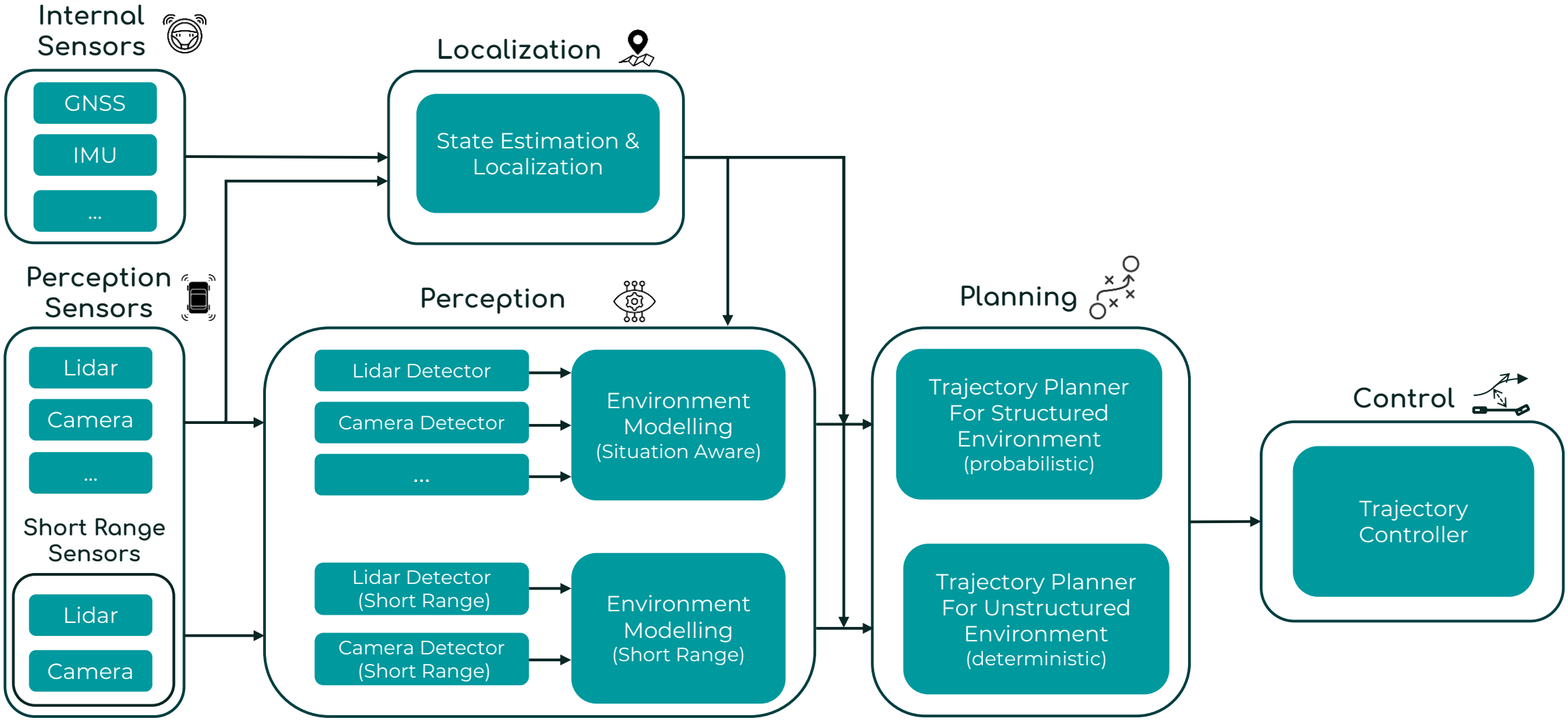
The autonomous driving stack



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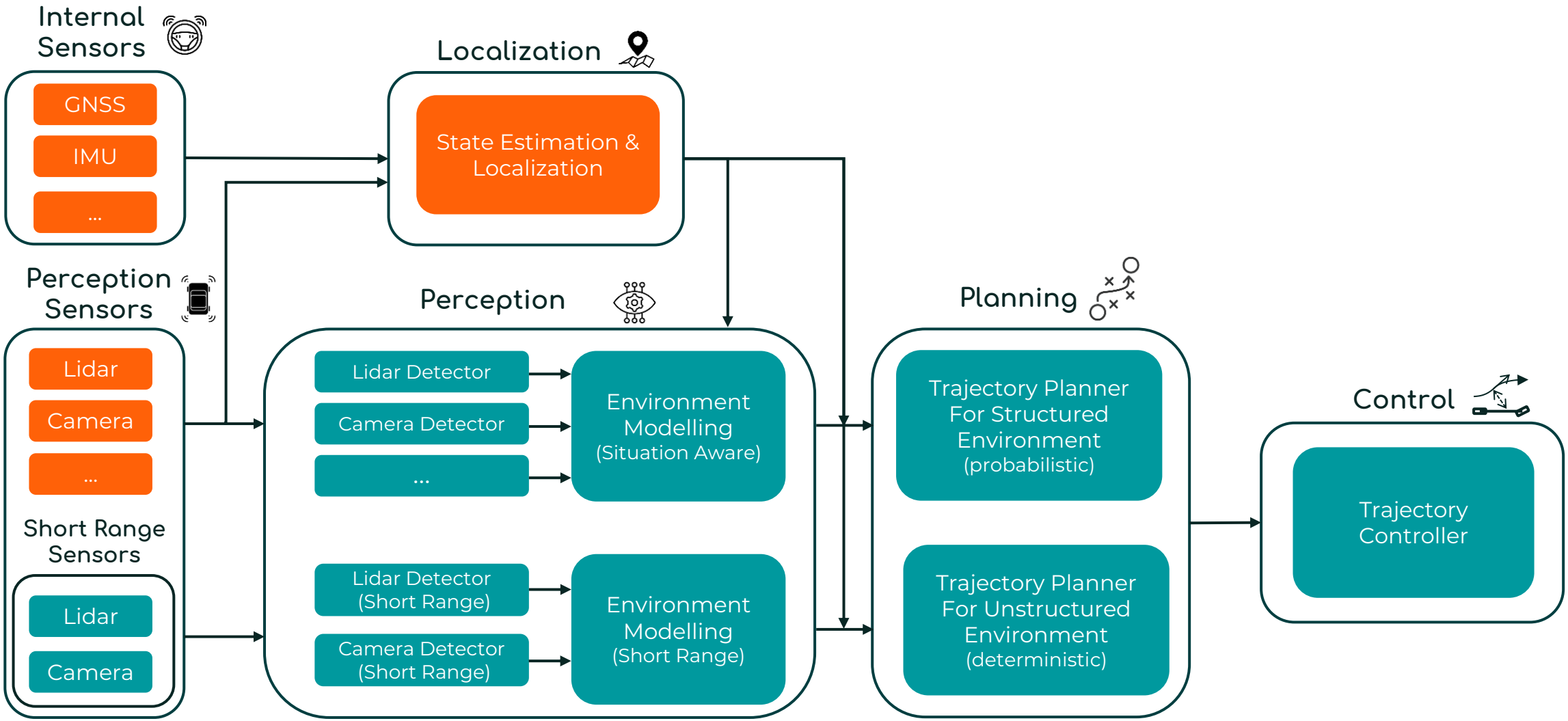
Bildquellen: Flaticon, TUM

Localization



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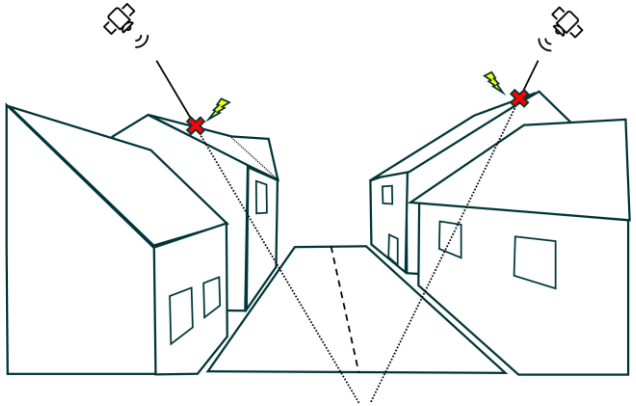
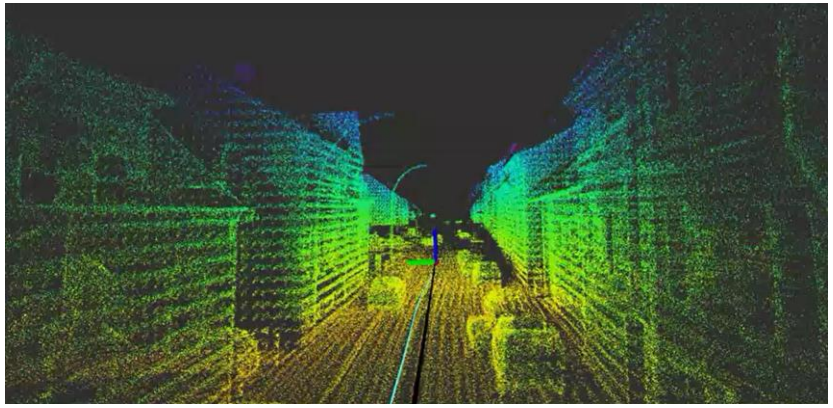
Bildquellen: Flaticon, TUM

How to localize ...

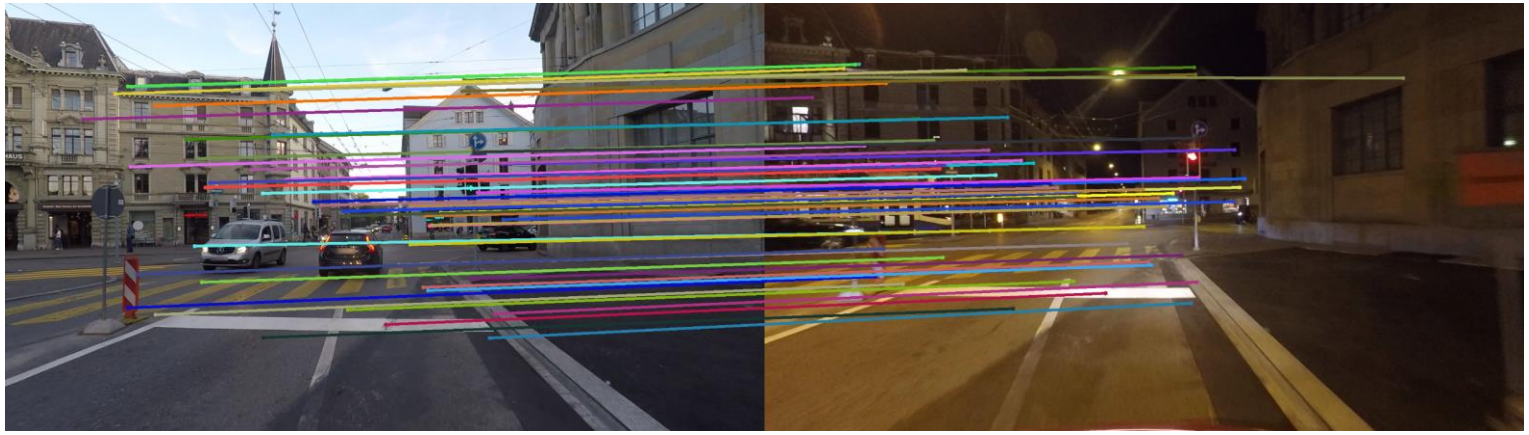
... without satellites?





LiDAR-Pointcloud

... in poor visual conditions?



Camera landmark detection

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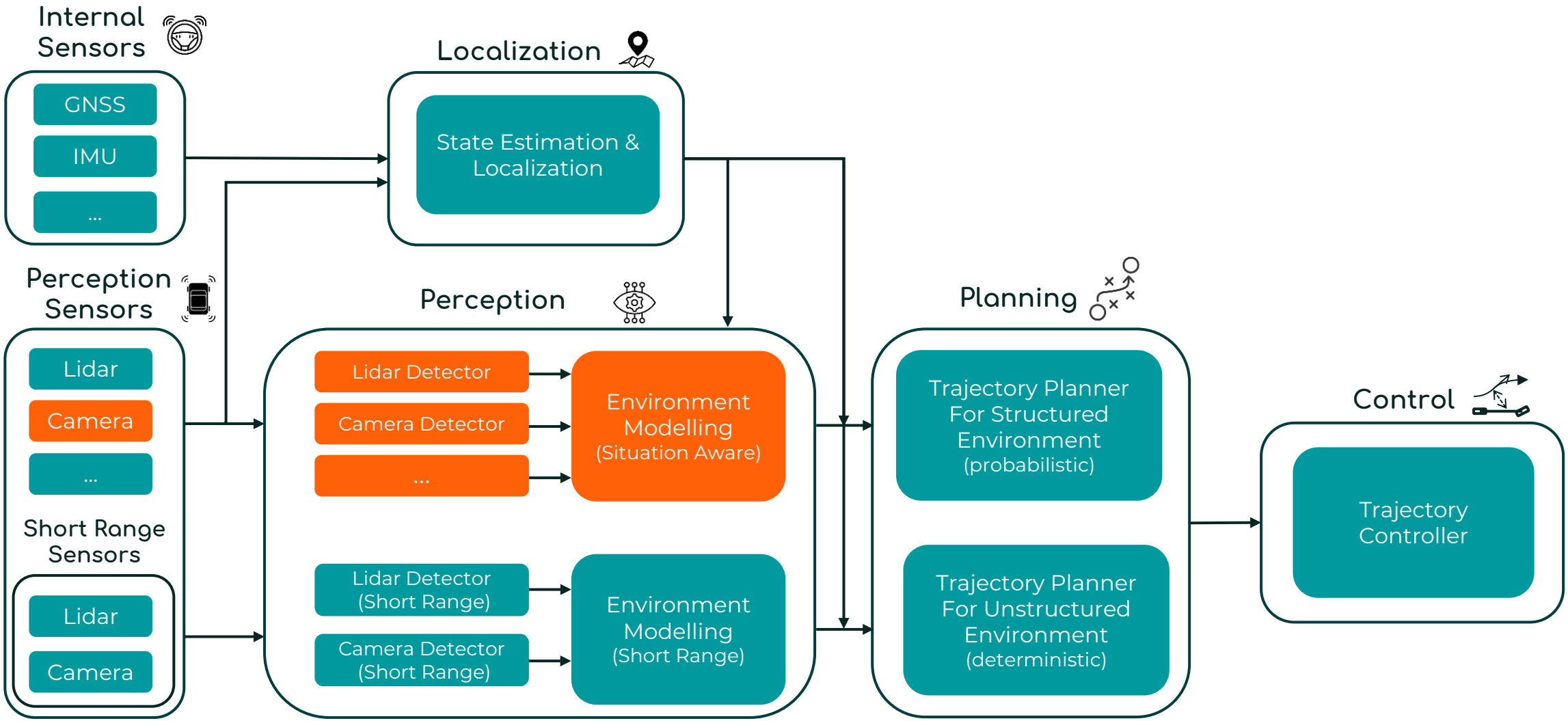
Perception



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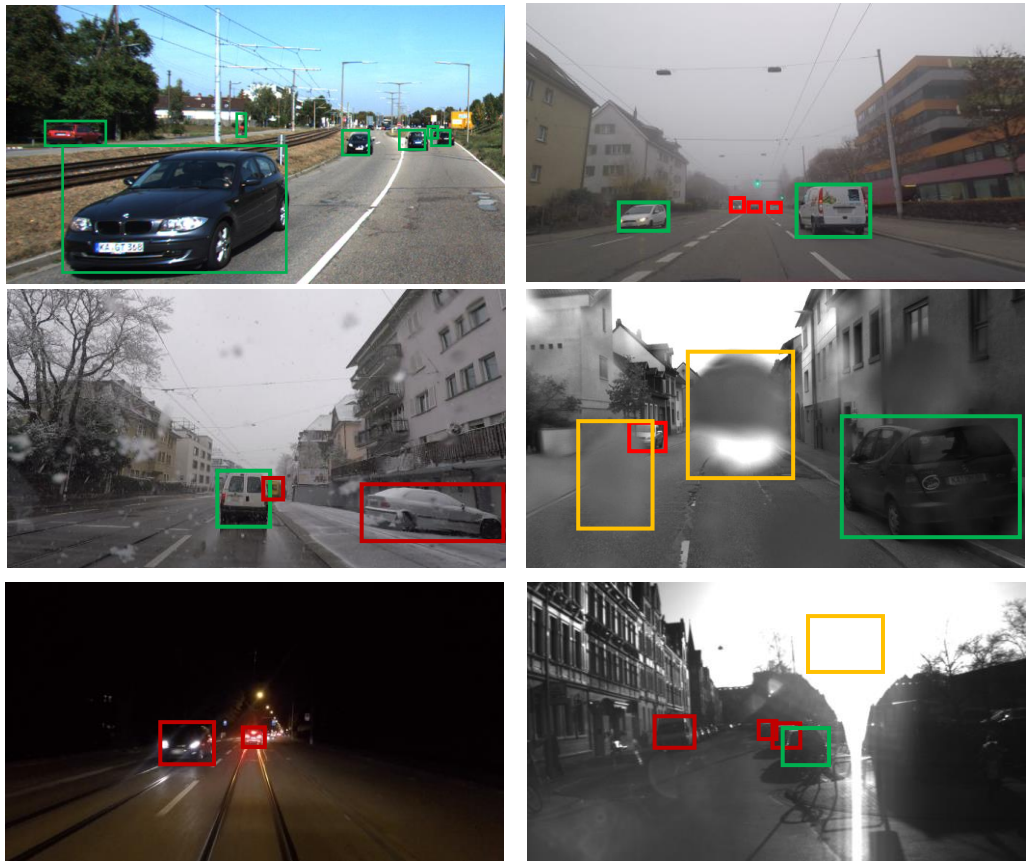
Robust Camera-Based Perception

Motivation



Results

Red: False Negative
Green: True Positive
Orange: False Positive

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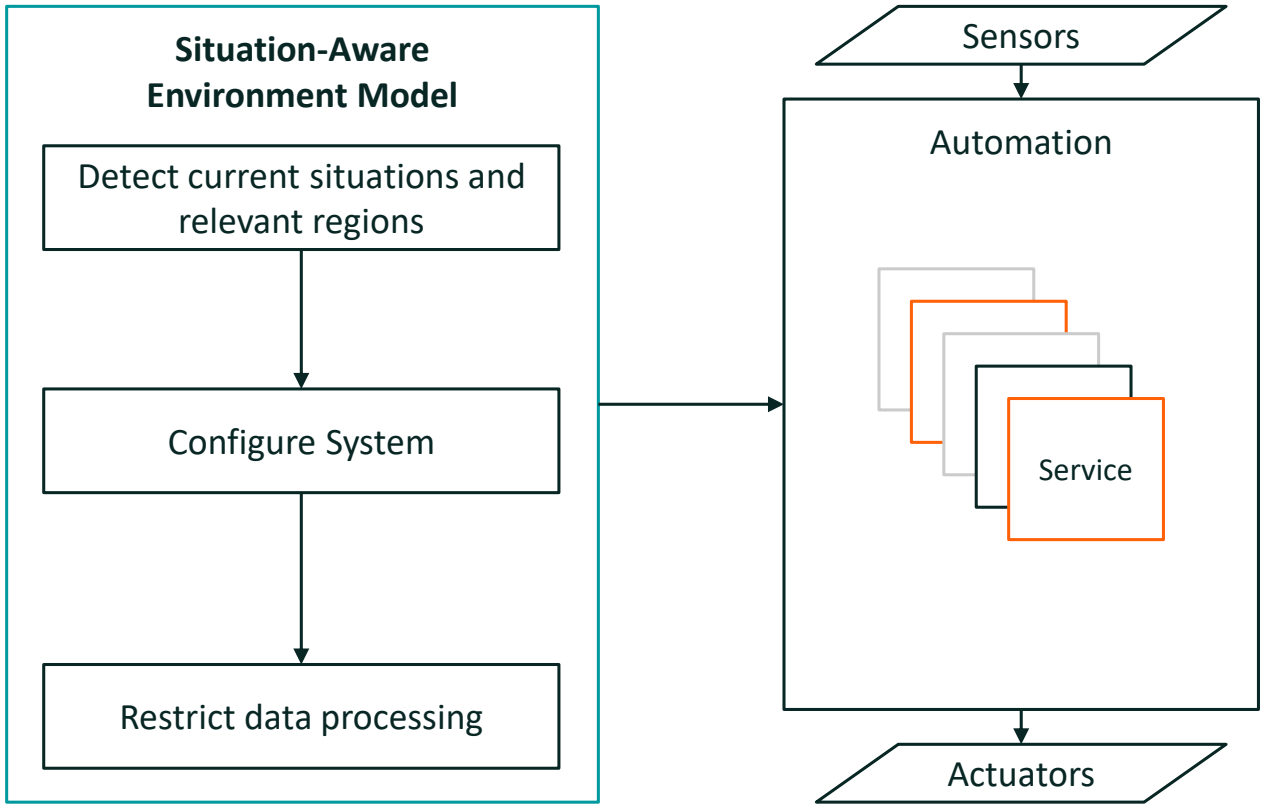
Situation-Aware Environment Model



- Idea: Save energy by restricting data processing to relevant regions
- Three main steps:
  - Detect current situation and relevant regions
  - Configure system based on identified regions
  - Restrict data processing of specific services
- Advantages:
  - Energy-efficient processing
  - Increased range of automated operation

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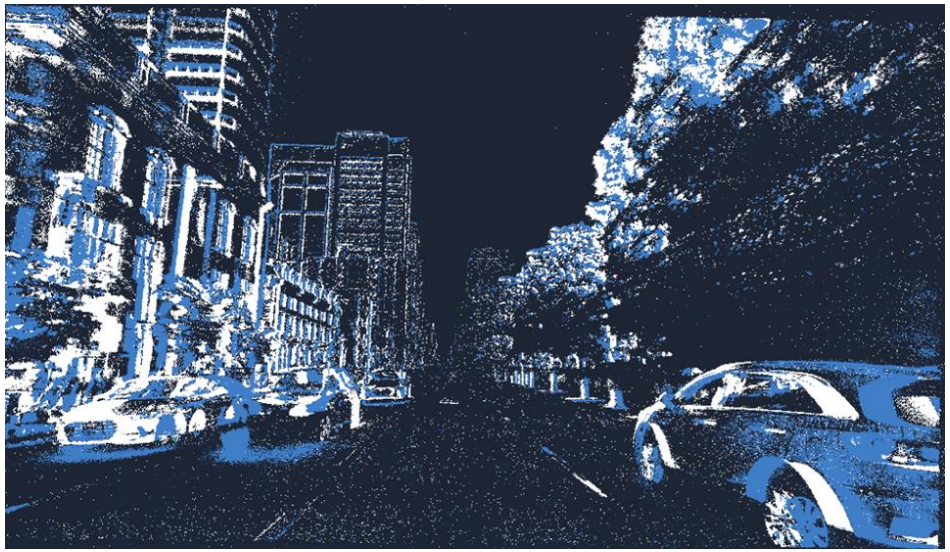
Neuromorphic Sensing and Computing

- Energy efficient sensor data processing with neuromorphic
- Analysis of the energy saving potentials and how to achieve them
- Latency reduction with event-based sensing



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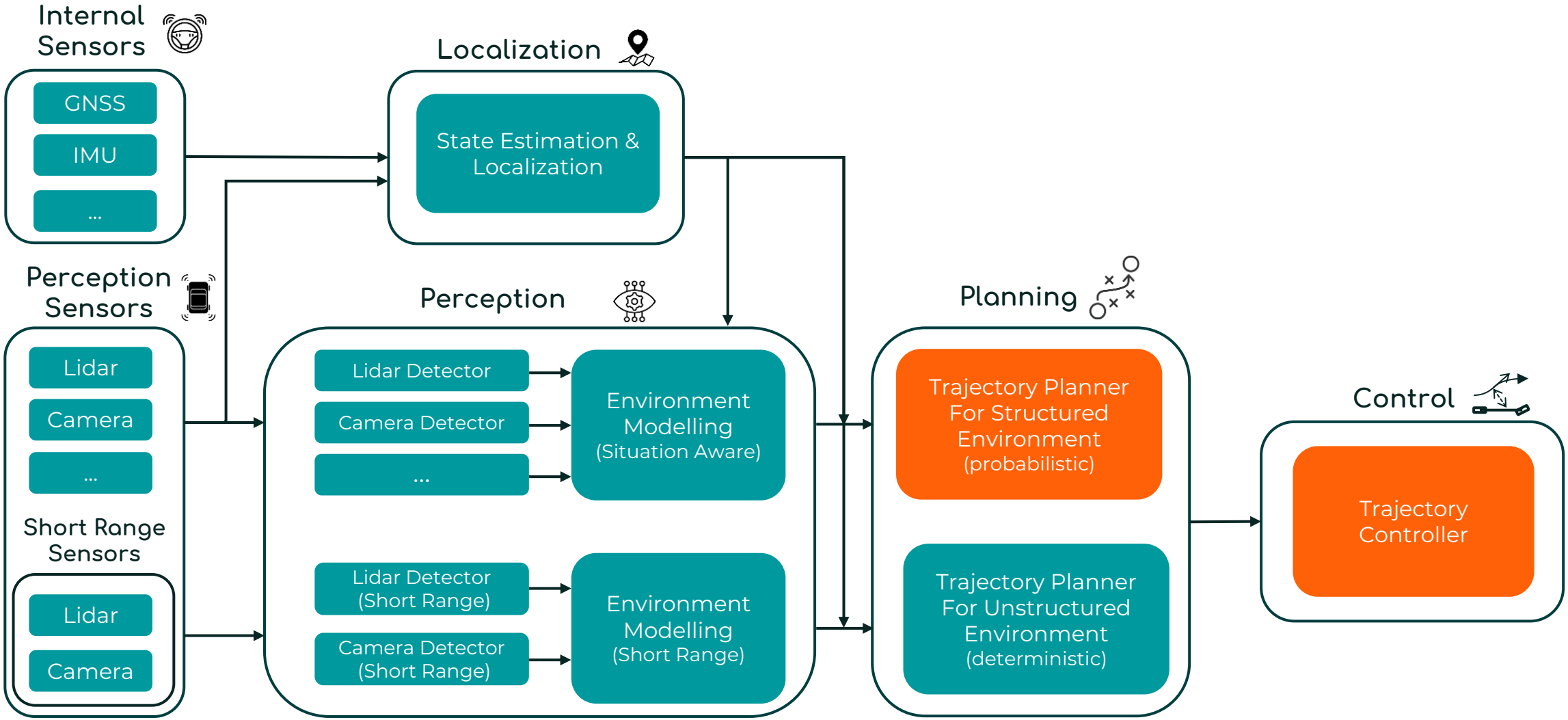
Planning & Control



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Bildquellen: Flaticon, TUM

Planning & Control

Probabilistic planning

Ego prediction using hybrid approach (physics + data-based)

Environment prediction based on Motion Transformers

Map & route

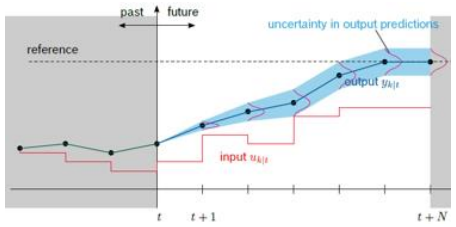
Planning algorithm using sampling-based strategy

reference

Controller

Uncertainty-aware model predictive control

contract



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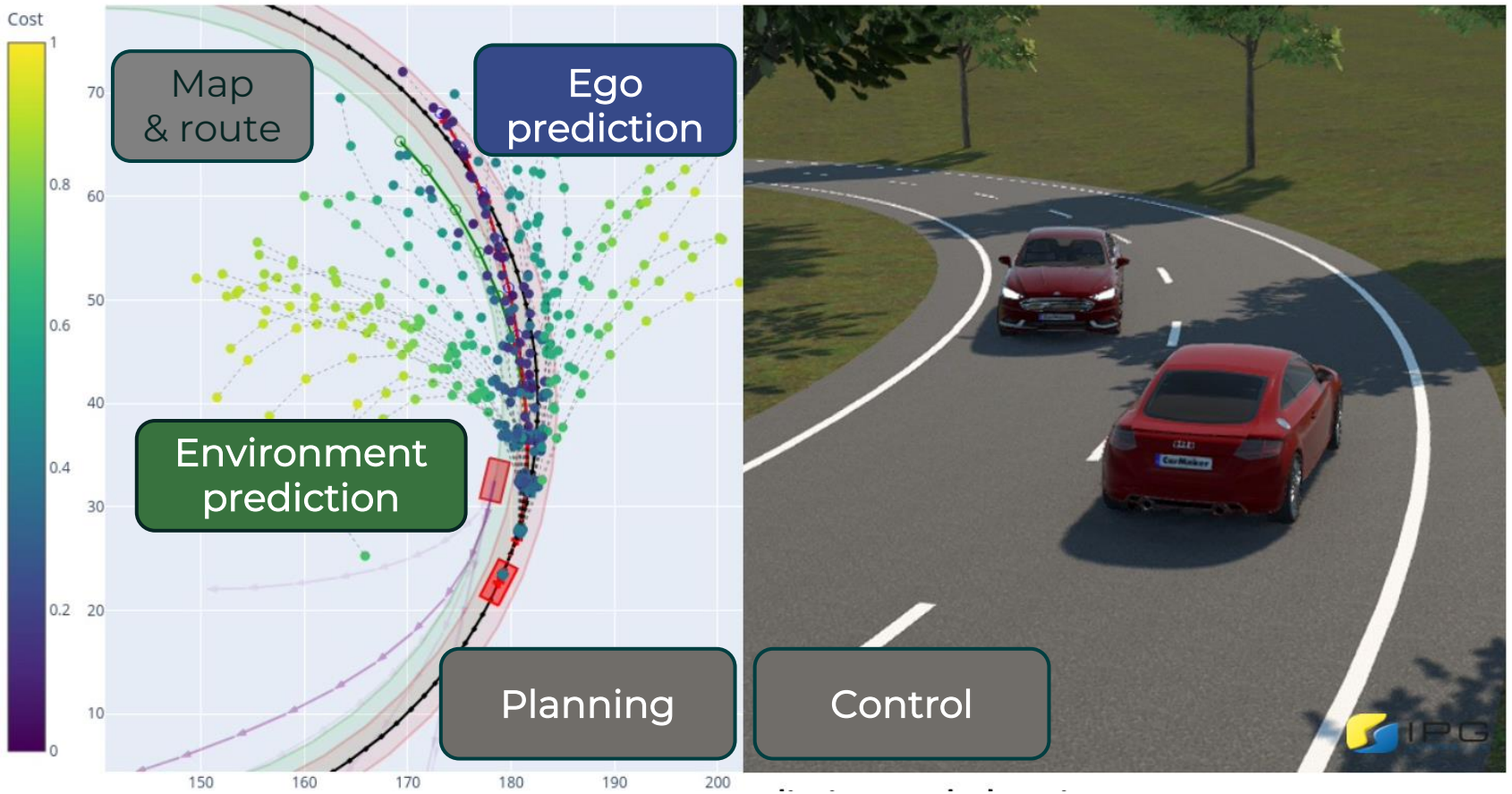
Probabilistic Planning & Control



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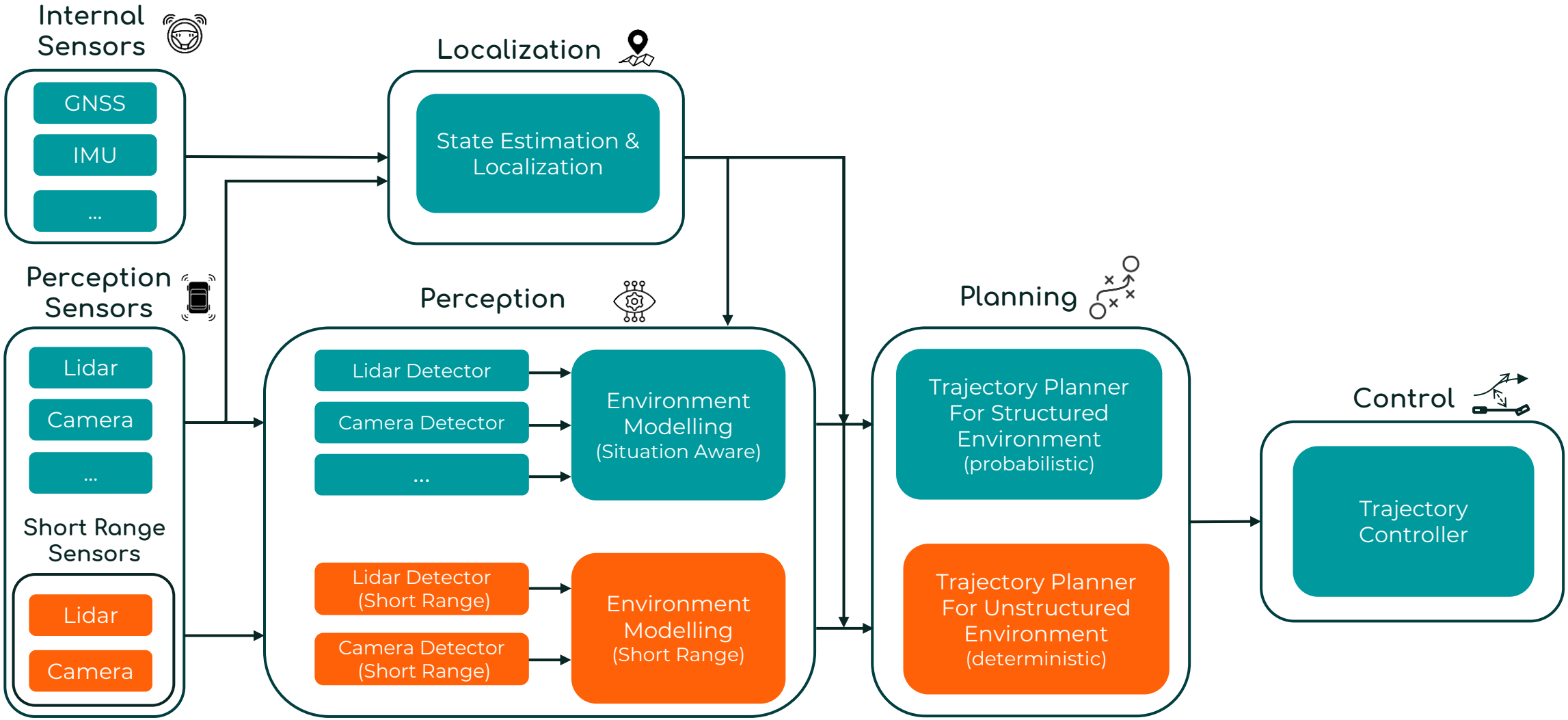
Automated Low-Speed Function



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Bildquellen: Flaticon, TUM

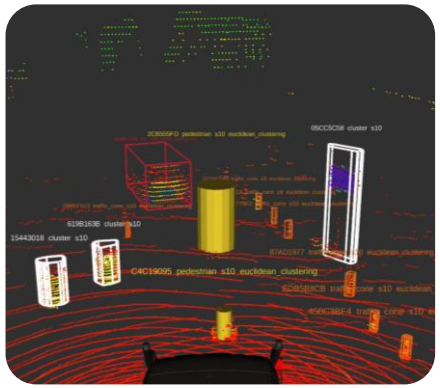
Automated Low-Speed Function

Goal

- Generalized AD-function for low speeds → max. 25 km/h
- Diverse low-speed applications in one reference architecture
  → e.g. Automated Valet Parking, Traffic-Calmed Area, Shuttle

Realization on autoELF

- Dedicated short range sensor setup → Lidar & Camera
- Focus on robust Perception algorithms for small objects
  → e.g. infant
- Two trajectory planners (structured & unstructured environments)



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