#EUSpace

DREAM

EUSPA AI week 2026

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EUSPA
European Union Agency for the Space Programme

ANavS® – Advanced Navigation Solutions

Leading company in the development of high-precision positioning systems.

ANavS® positioning system is a modular and flexibly configurable sensor fusion of **GNSS, inertial, odometry, camera** and **lidar measurements**.

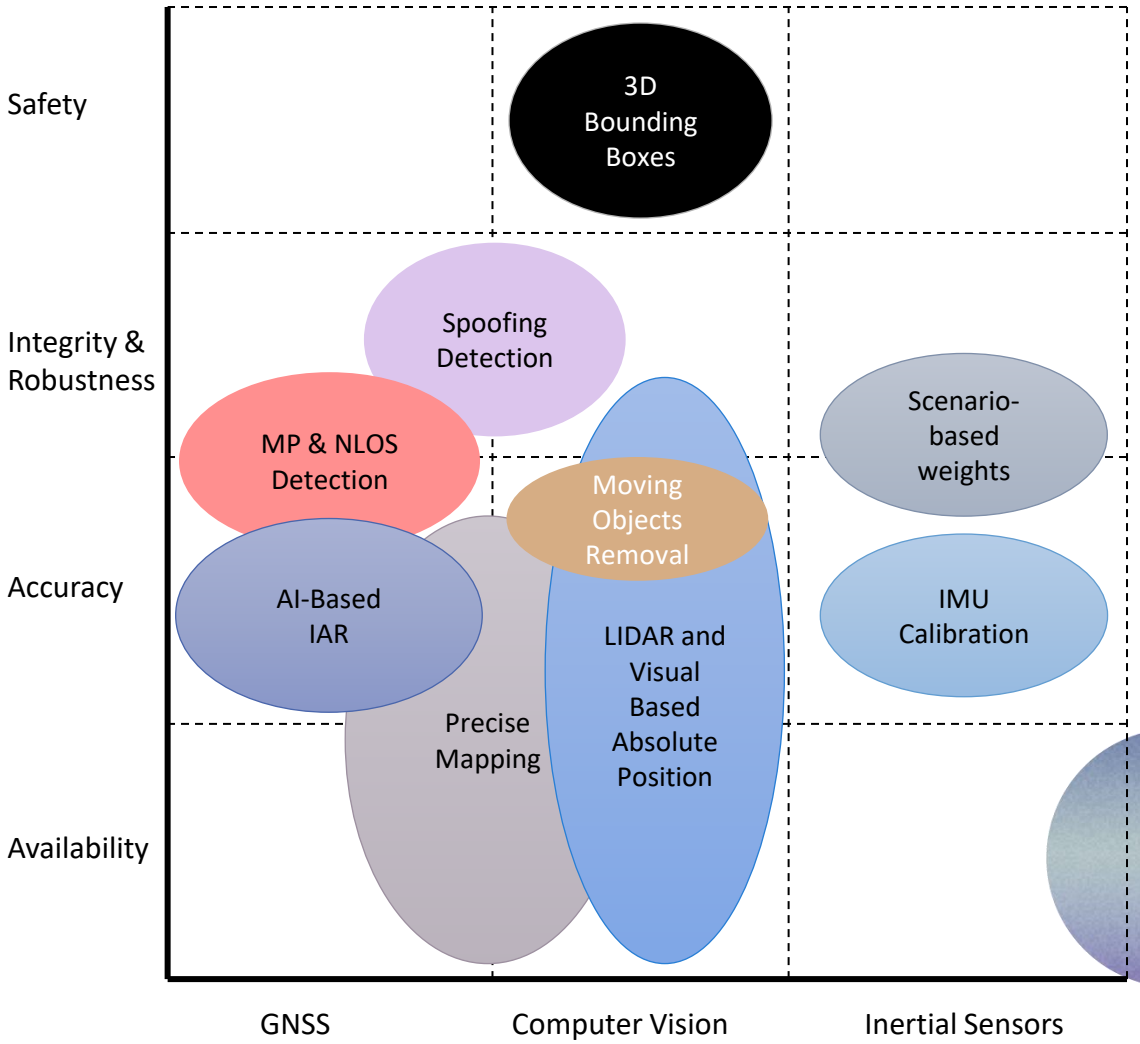
The innovative positioning algorithms have been developed and patented by ANavS® and incorporate the latest **RTK / PPP** technologies (including compatibility with Galileo HAS) as well as state-of-the-art **SLAM** algorithms and **object detection & tracking**.

Products Lines:

- **A-ROX:** GNSS-INS tightly coupled positioning for dynamic automotive, railway and maritime applications.
- **V-ROX:** Extension of A-ROX system with a powerful 128-channel LiDAR and a stereo camera, enabling e.g. SLAM-based localization for indoor or GNSS-denied environments
- **G-ROX** RTK reference station without service provider costs. It includes a cloud based RTCM service.

DREAM Project

- DREAM aims to address the stringent requirements of **ADAS** systems in challenging urban environments by developing advanced AI solutions.
- **AI** techniques to detect **spoofing**, **multipath** and NLOS situations and ensuring correct **ambiguity resolution**
- For improved localization in GNSS denied scenarios, AI-driven methods will be applied for **IMU calibration and denoising**, as well as **LiDAR/Visual SLAM** (enhance with AI-based moving objects removal)
- It also features **3D bounding boxes** for object detection and **geo-referenced maps** supporting LiDAR/Visual localization and improving situational awareness.



GNSS

IMU

Odometer

LIDAR

Camera

Sensors Data

Sensors Data

Sensor Fusion

(AI for IAR, Spoofing Detection, MP and NLOS Mitigation, AI IMU Calibration and denoising)

Absolute Pose

Computer Vision

(3D-Bounding boxes, LIDAR & Camera Absolut Pose, Moving Objects detection)

Pos, Vel, Att

3D Objects

Collision Avoidance

Curve Speed Warning

Warning Systems

Red Light Violation

Wrong Way Driving

Pos, Vel, Att

3D Objects

Warnings

On Board Unit

Cloud

Geo-Referenced map data

Cloud

Geo-Referenced Maps

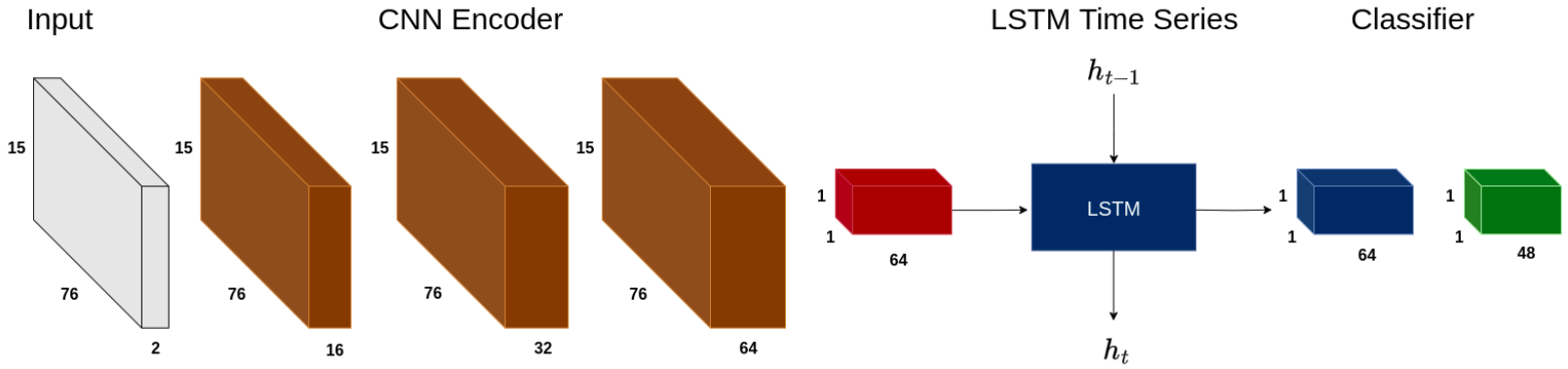
(Maps Optimization)

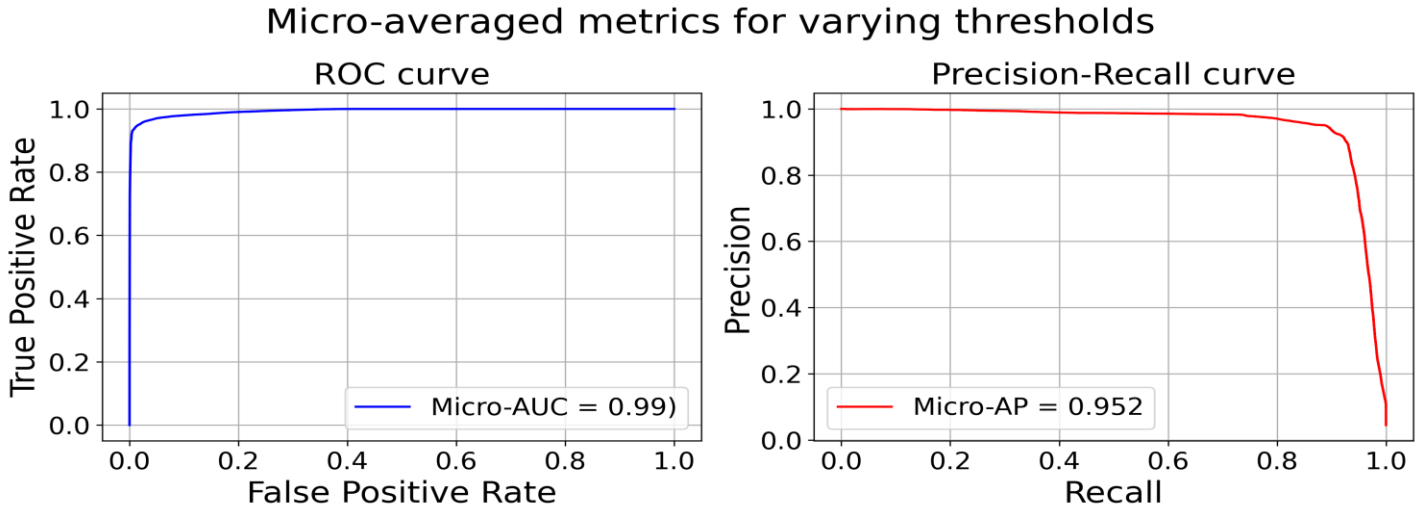
Geo-Referenced map

Spoofing Detection

Input features

- **Signal Characteristics**
  - Gain + Average CN/0
- \+ **GNSS Measurements**
  - Carrier-ratio + Double differenced Phase Measurements
- \+ **Multi-Sensor Information**
  - Raw angular rate & acceleration (IMU) + [optionally]: Odometry

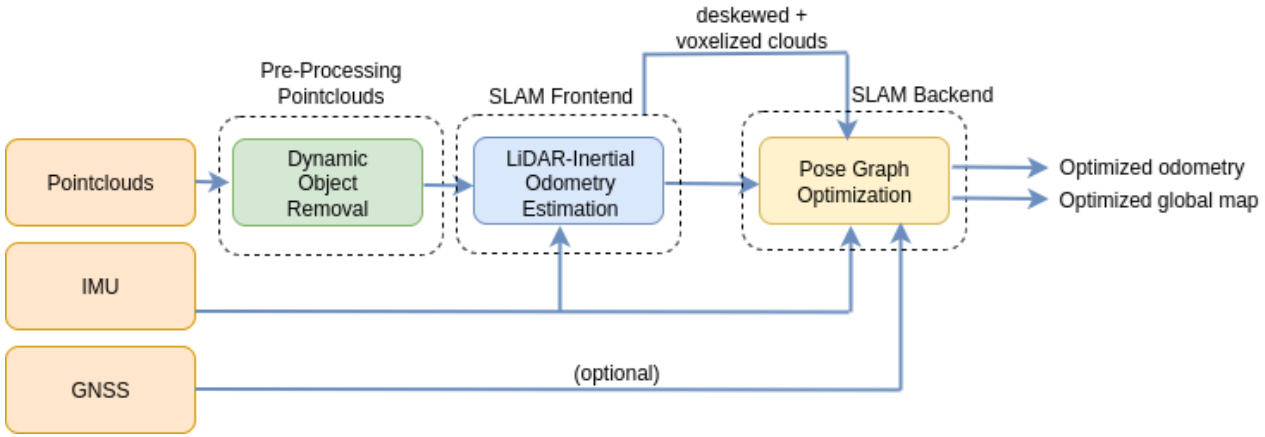


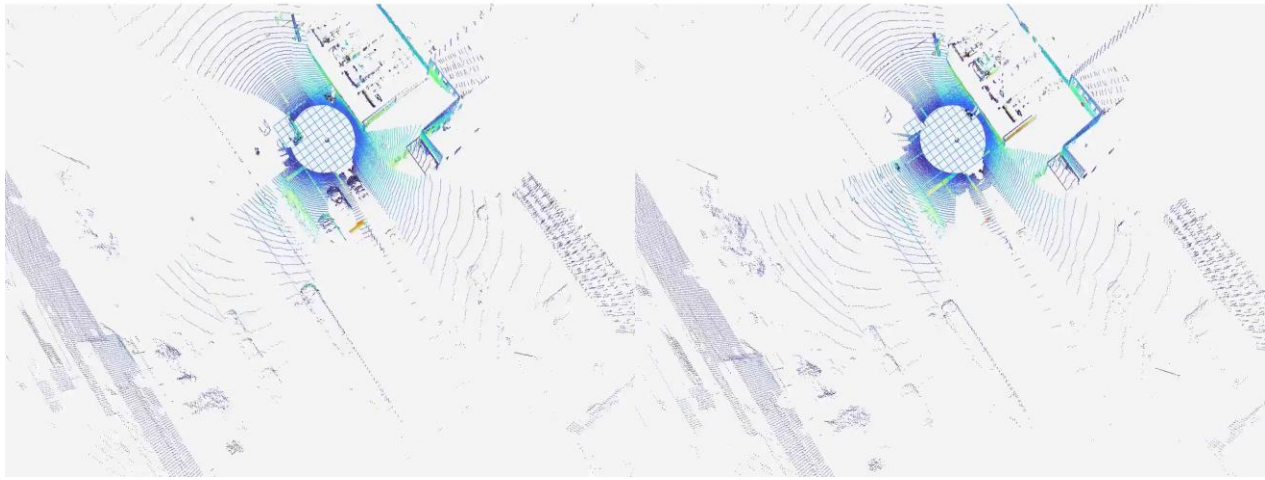


For further information, refer to ION GNSS+ 2025 paper: "Detection and Mitigation of Jamming, Meaconing, and Spoofing based on Machine Learning and Multi-Sensor Data"

LiDAR SLAM

- LiDAR SLAM performs well under **static world conditions** since geometries across frames stay consistent
- Dynamic object removal reduces accumulated odometry drift since **scan registration** across frames improves with **consistent geometries**
- Dynamic object removal is performed by checking the voxel grids for consistency across **semantically aware frames**
- **Real-Time performance @20Hz** for an Ouster 128 with a 1024 horizontal resolution

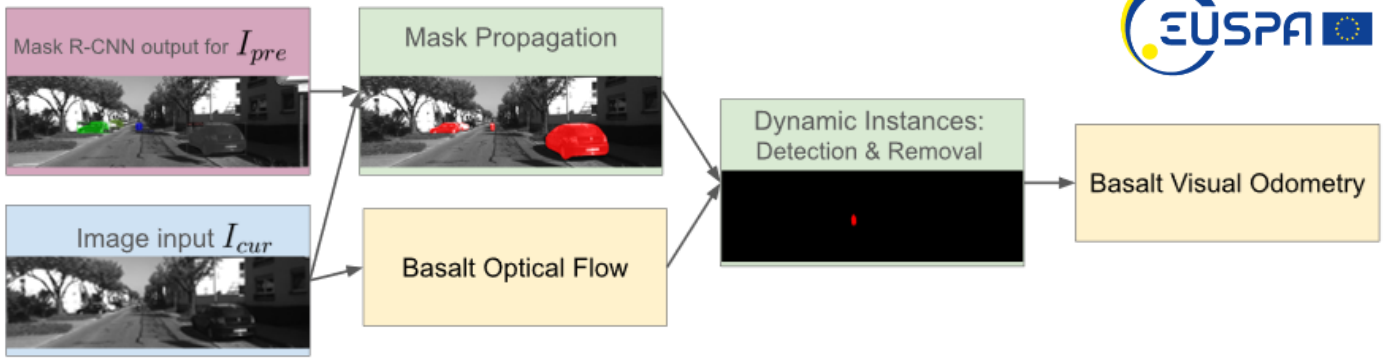


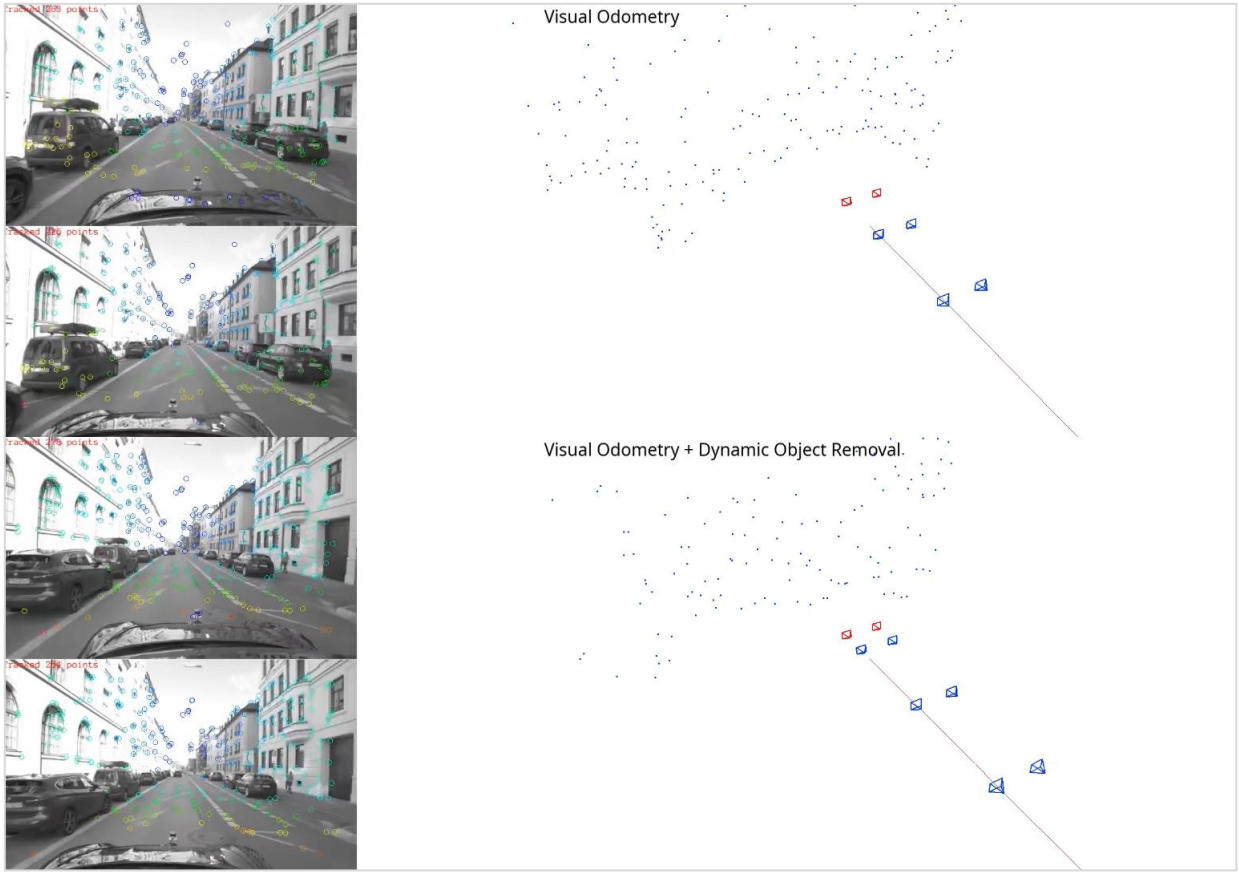


For further information, refer to ION GNSS+ 2025 paper: "Edge Device-Optimized LiDAR SLAM for Real-Time and Robust Localization in Dynamic Environments"

Visual Odometry

- VSLAM algorithms rely on static world assumption
- Dynamic objects in a scene can lead to 1) trajectory drift, 2) incorrect landmarks in map
- Methodology:
  - **Instance segmentation** using a pre-trained Mask R-CNN model (high computational load)
  - **Mask propagation** mechanism to estimate the segmentation masks for intermediate frames
  - Actual **Dynamic Objects Removal**, using optical flow to evaluate epipolar geometry consistency.





For further information, refer to ENC 2025 paper: "Robust real-time automotive Visual SLAM with dynamic object removal"

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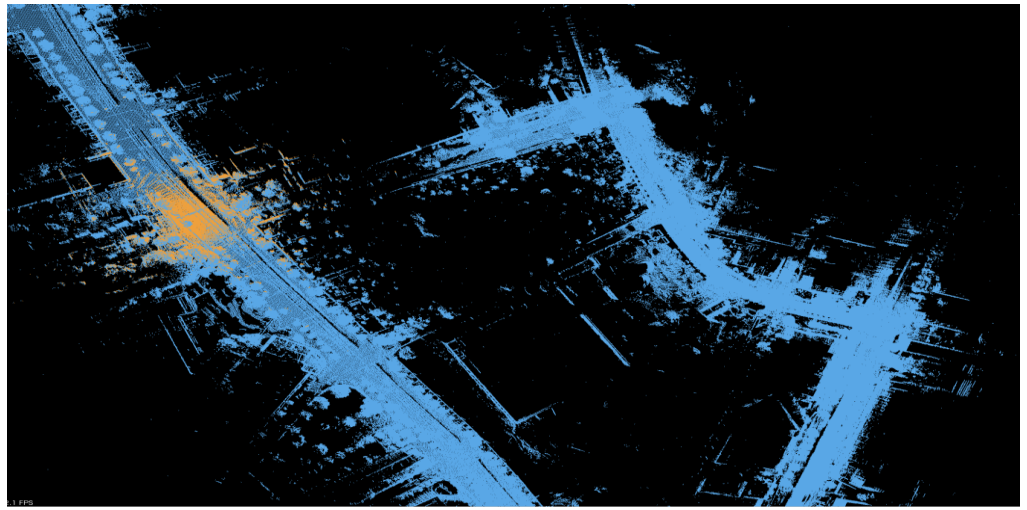
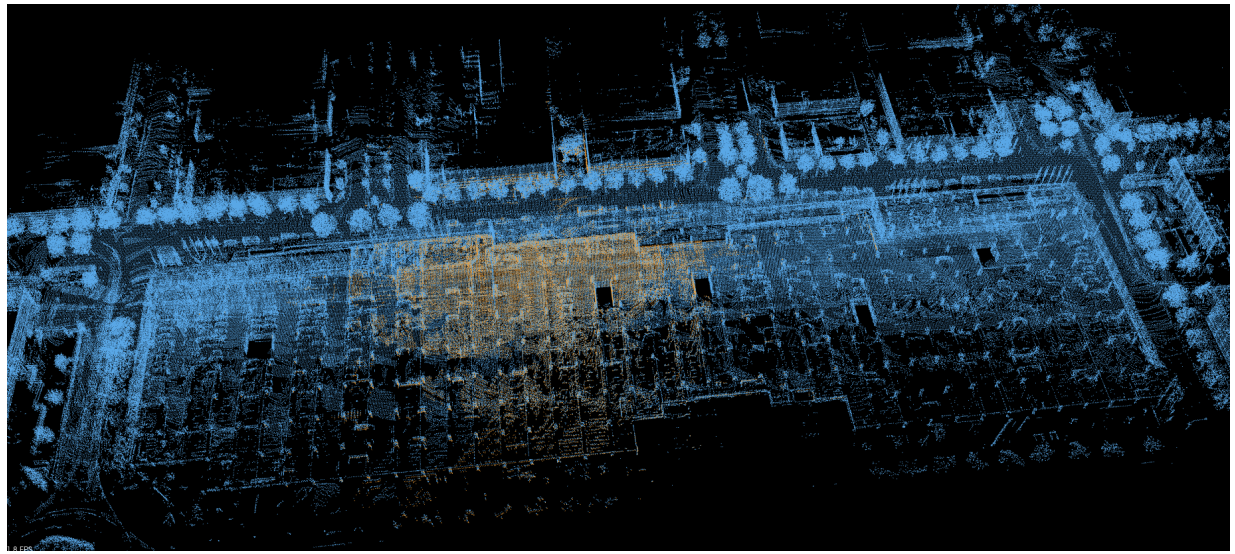
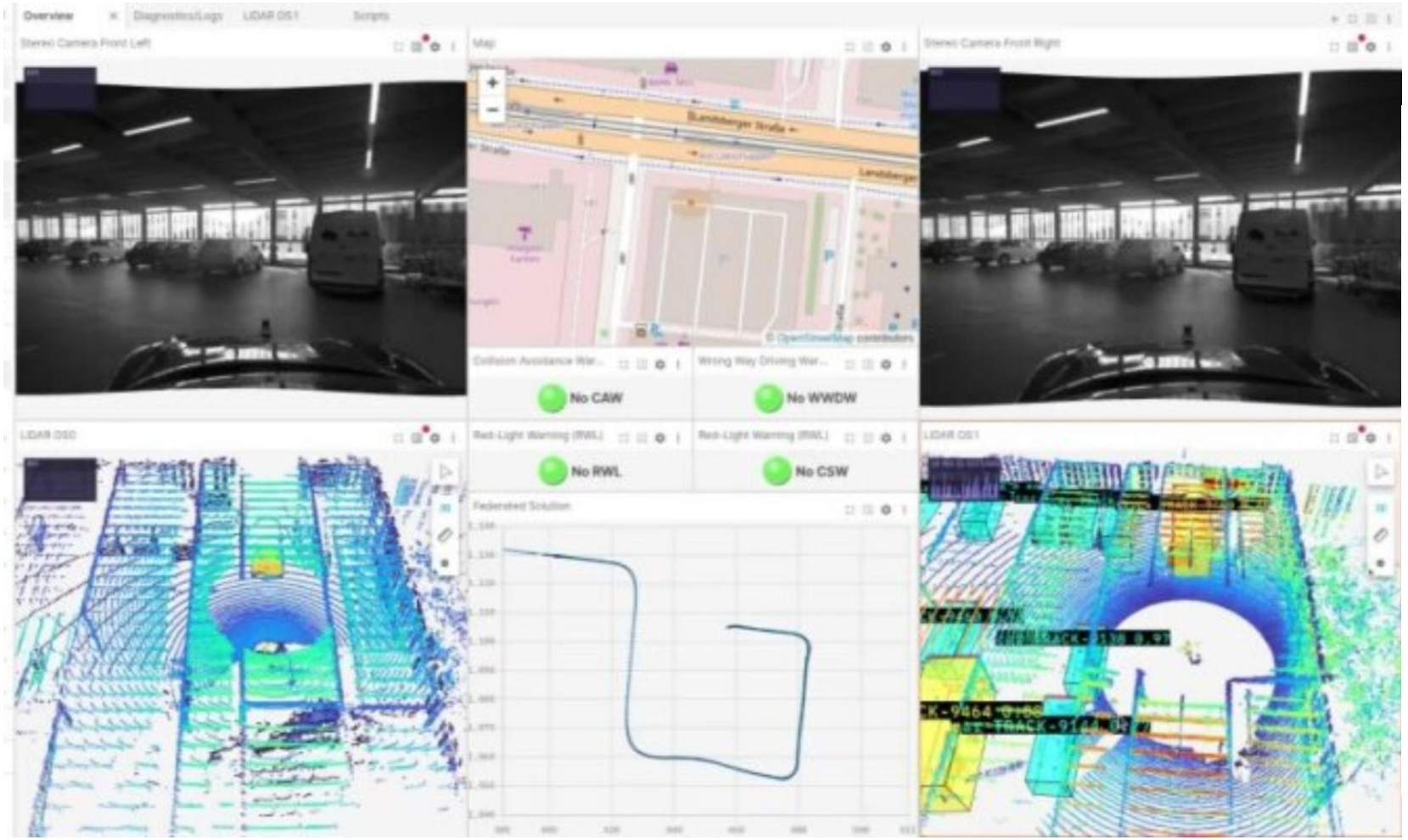
Scan to Map Global Registration for Re-Localization

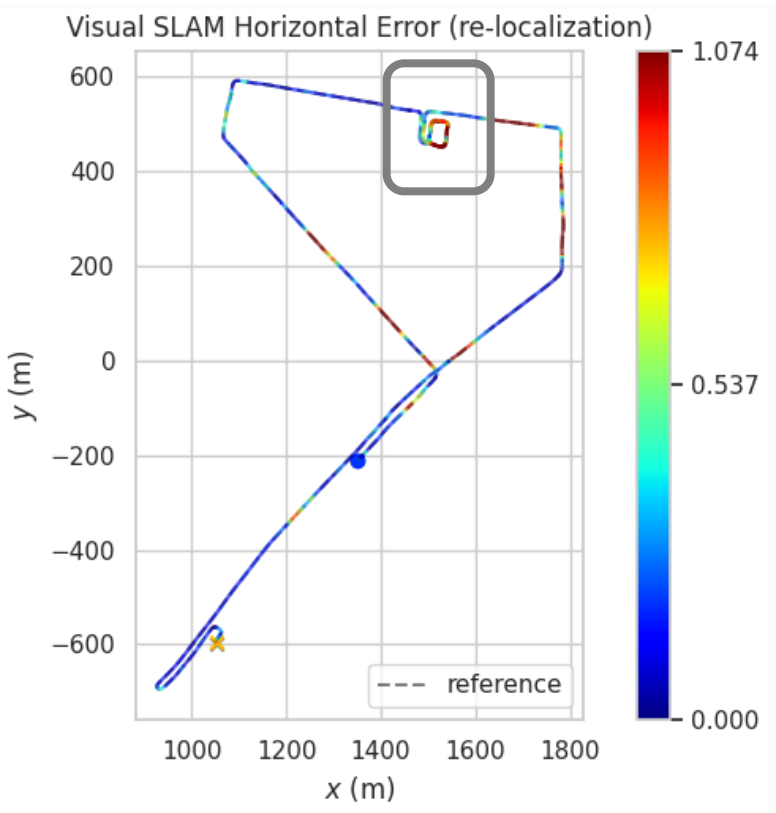
- Re-Localization provides a **drift free odometry**
- Global initialization is critical for **positional awareness** within the global map
- Voxelized input pointclouds + voxelized global map + **Fast Point Feature Histogram Descriptors** → Global Init Estimate
- Global Init Estimate + Loop Closure with surrounding keyframes → **Optimized Global Init**
- Segmented global map coupled with multi-threading provides quick estimation → ~6 s for a 4 km wide map
- **Scan-to-Submap registration** then helps estimate odometry





Multi-Sensor Fusion Performance (Urban & Indoor Scenario)





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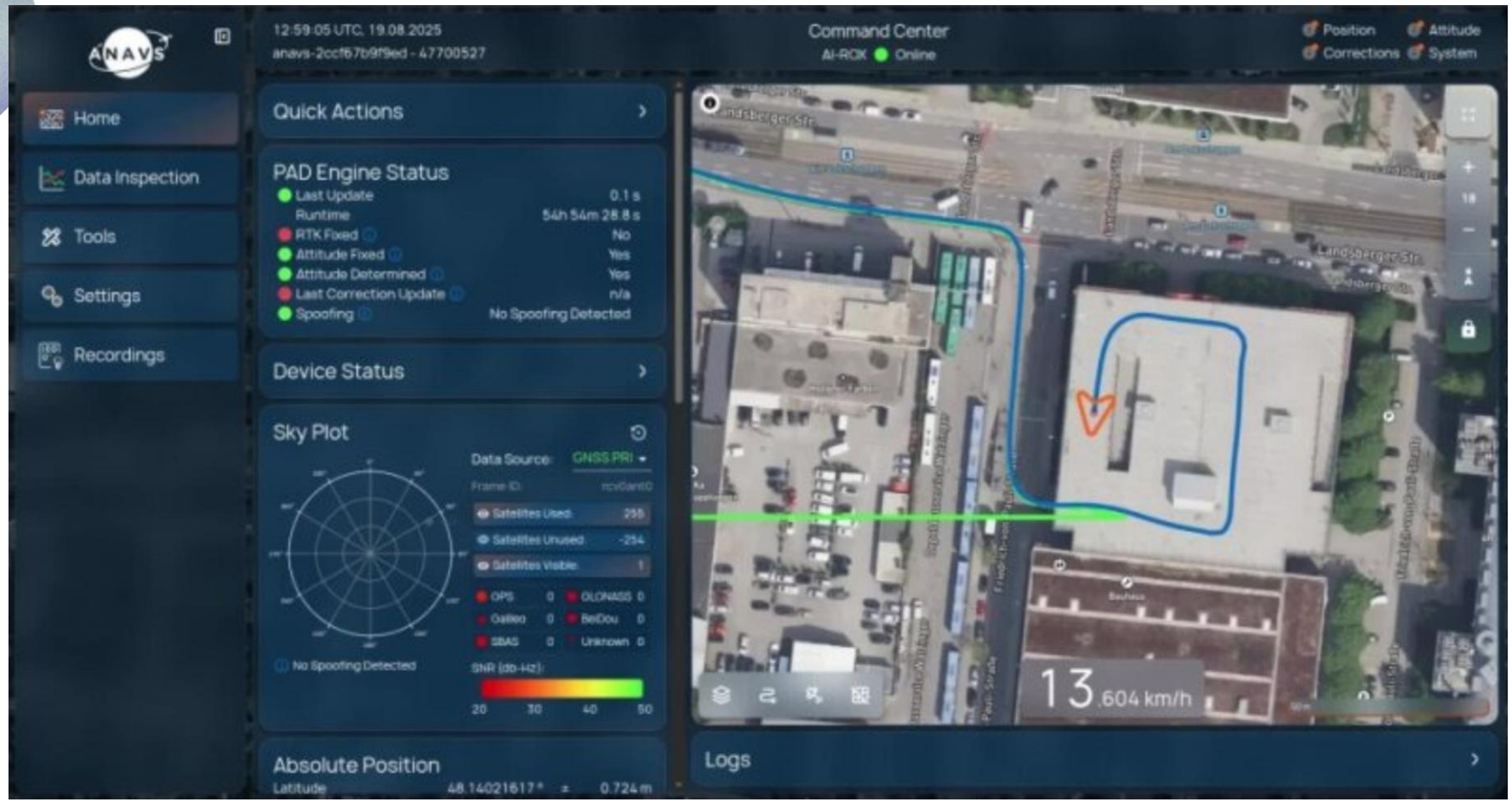

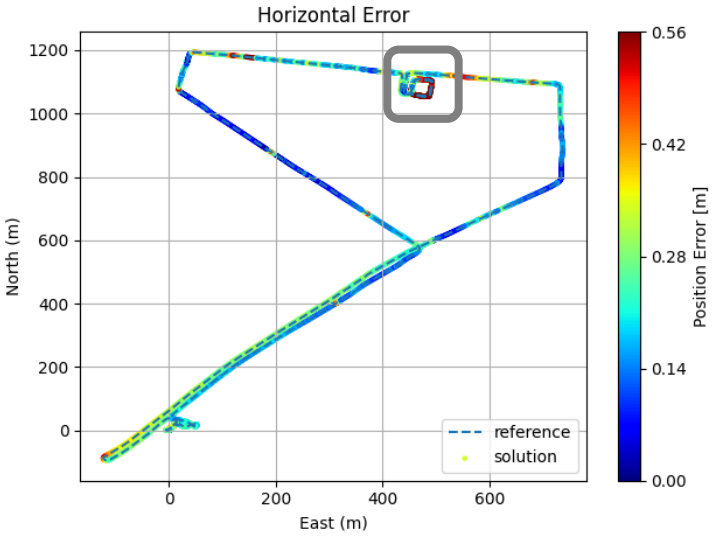

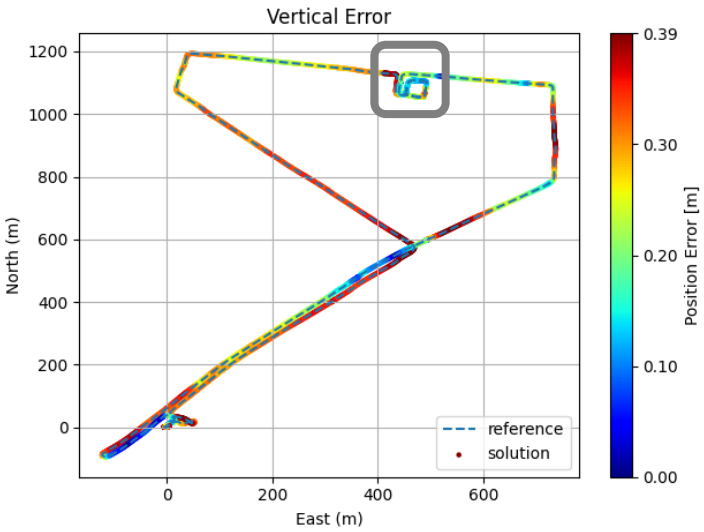

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