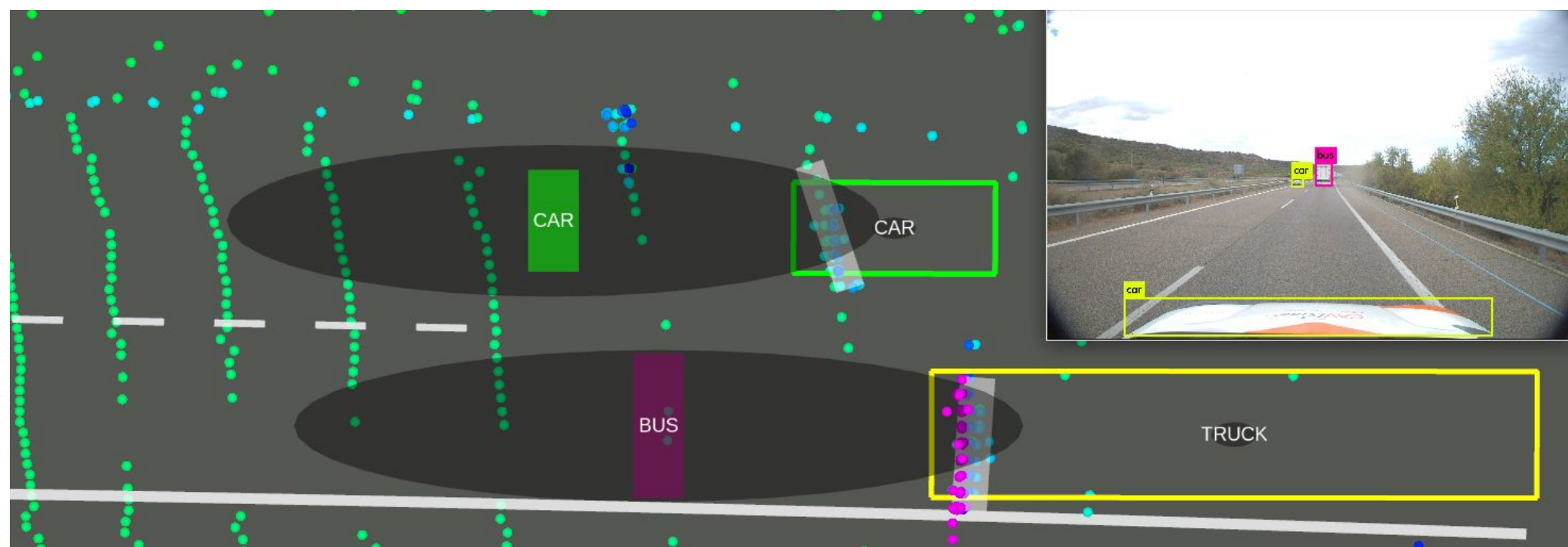
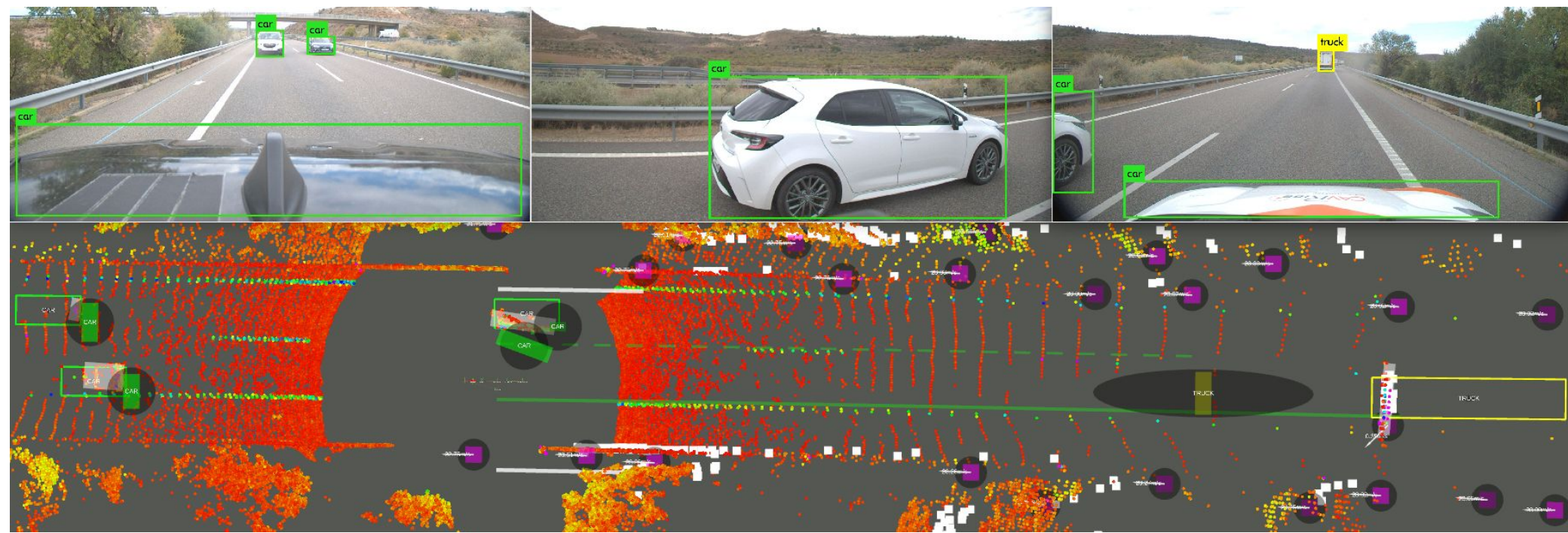
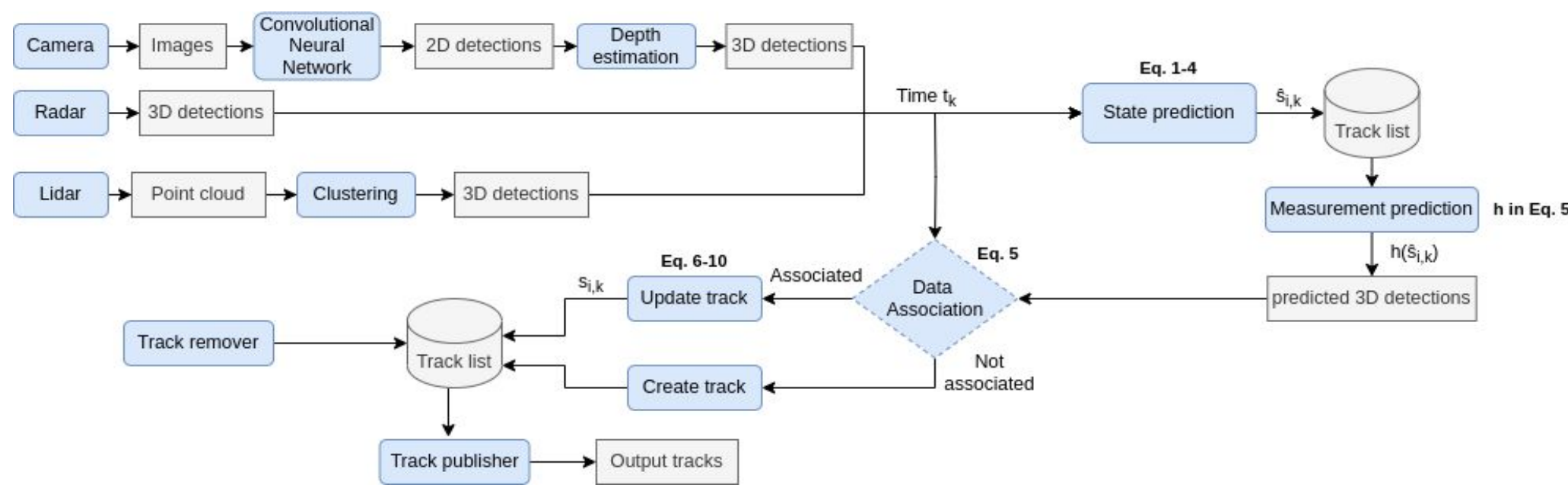


Multimodal Data Fusion for Multiple Object Tracking: A Reference Perception System for ADAS and AV Functions Validation

Author: Marc Perez Quintana
Supervisor(s): Antonio Agudo Martinez

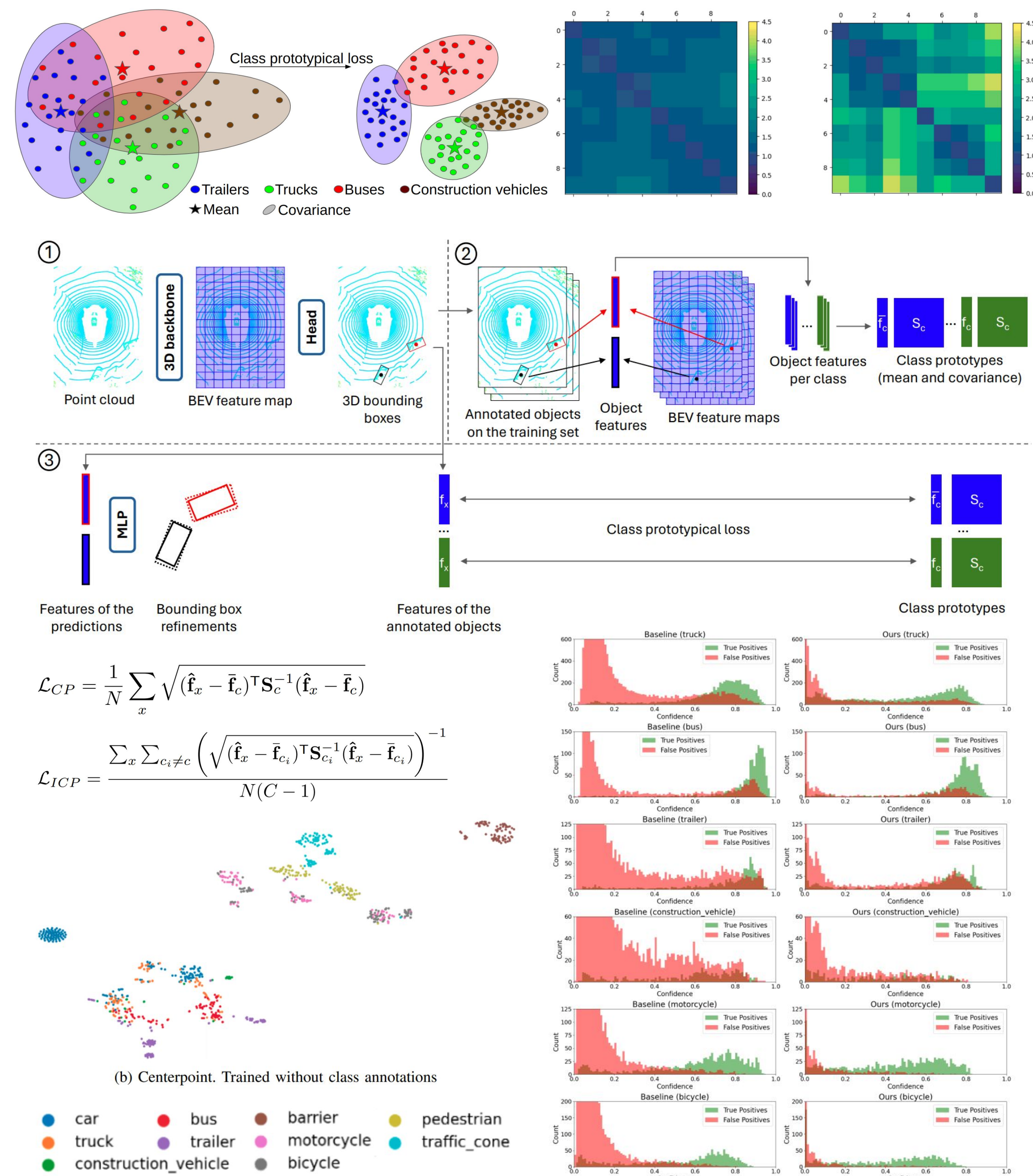
Multimodal Multi-Object Tracking [1,2]

- Sensor-agnostic multimodal fusion framework for multiple object tracking that can seamlessly integrate information coming from different object detectors, sensors, and vehicle-to-everything messages, either from other road users or from the infrastructure.
- All the information received is converted to a standardized set of detections that are then combined using a Kalman Filter with a constant velocity model.
- To ensure robustness, we propose methods to handle errors in classification and incorrect bounding box reconstruction.

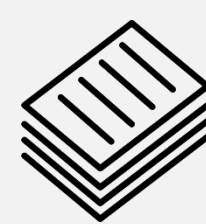


3D Object Detection [3]

- **Hypothesis:** If we can make the feature distributions of the classes more separated, then the overall performance of the object detector will improve.
- **Class prototypes:** The mean and covariance of the feature vectors extracted from the annotated objects of each class.
- **Class Prototypical Loss:** The Mahalanobis distance from the feature vector of annotated objects to the corresponding class prototype. This is used as an auxiliary loss.



Start date: March 2021
Research Plan defense: January 2022



Publications

[1] M. Perez, A. Agudo. **Sensor-Agnostic Multimodal Fusion for Multiple Object Tracking from Camera, Radar, Lidar and V2X**. FISITA World Congress 2023

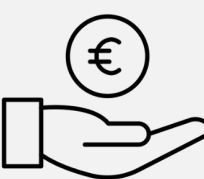
[2] M. Perez, A. Agudo. **Robust Multimodal and Multi-Object Tracking for Autonomous Driving Applications**. ICAR 2023

[3] M. Perez, A. Agudo, G. Dubbelman, P. Jancura. **Class Prototypical Loss for Enhanced Feature Separation in 3D Object Detection**. ITSC 2024 (in review)



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- Research stay in 2023 in the Eindhoven University of Technology (TU/e), Netherlands



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