Duale Hochschule Baden-Württemberg Stuttgart

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Paper submission

Dear Editorial Board,

We are pleased to submit our manuscript entitled **"Data-Driven Object Tracking: Integrating Modular Neural Networks into a Kalman Framework"** for consideration in *IEEE Transactions on Intelligent Vehicles*.

This work emerges from a close collaboration between Daimler Truck AG Research, Esslingen University of Applied Sciences, and the Baden-Württemberg Cooperative State University (DHBW) Stuttgart. The manuscript presents a novel machine learning-based Multi-Object Tracking framework that integrates lightweight neural networks - SPENT, SANT, and MANTa - into a classical Kalman filter pipeline, addressing key challenges in real-time perception for Advanced Driver Assistance Systems.

Our approach aligns well with the scope and readership of *IEEE T-IV*, as it bridges the gap between academic research and deployment-ready solutions. The models are explicitly designed for embedded automotive environments, each with fewer than 50,000 parameters, preserving the modularity, interpretability, and computational efficiency required for production systems. By staying close to architectures currently deployed by OEMs, we ensure direct relevance to real-world applications.

The effectiveness of our framework is demonstrated on the KITTI benchmark, showing notable improvements in trajectory prediction and sensor-object association accuracy. Importantly, the contribution is strengthened by Daimler Truck AG's rare permission to publish internal insights and methodologies - offering a transparent look into industrial-grade tracking strategies.

We believe this work will be of particular interest to readers focused on perception systems, applied AI, and safety-critical software engineering in intelligent vehicles. It offers both methodological innovation and practical relevance, consistent with T-IV's emphasis on high-impact research at the intersection of theory and practice.

Thank you for your time and consideration. We look forward to the opportunity to contribute to *IEEE Transactions on Intelligent Vehicles*.

Sincerely,

(Prof. Dr. Matthias Drüppel)

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