Special Issue

Embodied Intelligence and Actuator Co-Design for Autonomous Vehicles

Message from the Guest Editors

Autonomous driving is shifting from modular pipelines to embodied intelligence powered by large models that reason over perception, prediction, and control in a closed loop. This Special Issue seeks work that connects foundation models and continual learning with vehicle behavior and actuation constraints, emphasizing software-centric co-design rather than hardware specifics. We welcome studies on policy learning and decision-making with risk-aware reasoning, safe RL/IL, lifelong/continual learning under distribution shift, multi-agent interaction, and sim-to-real transfer. Contributions may include large-model planning and control, tool-use/action grounding, policy distillation and compression for on-vehicle deployment, verification and interpretability of model decisions, dataset and benchmark creation for actuation-aware evaluation, and digital-twin or HIL validation frameworks that close the gap between model reasoning and vehicle dynamics. Both theoretical and empirical works are encouraged.

Guest Editors

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About the Journal

Message from the Editorial Board

We are just entering the Next Wave of Technology (NWT) where actuators will play the same role as the computer chip did for computers/social media approximately four decades ago. Just in the U.S., production of $1 trillion year of electromechanical systems (vehicles, orthotics, manufacturing cells, freight trains, aircraft, etc.) will be impacted by the NWT, all driven by actuators. Five key trends can be found for the future perspectives: “Performance to Reliability”, “Hard to Soft”, “Macro to Nano”, “Homo to Hetero” and “Single to Multi functional”. We invite papers that primarily impact these economic sectors; those illustrating basic scientific principles are also welcome.

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