Yurui DU

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Education

Southeast University - BEng in Mechanical Engineering Sep 2016 – Jun 2020

- GPA: 3.72/4.0 (Ranking: 8/168)
- Selected Awards: Principal Scholarship (2019, 1%), China National Scholarship (2017, 3%)

Delft University of Technology - MSc in Robotics Sep 2020 – Jul 2022

- GPA: 8.0/10.0

KU Leuven – PhD Student in Electrical Engineering Jul 2023 – Present

Research Experience

ELVIS: Ensemble-Calibrated Latent Imagination for Long-Horizon Visual MPC Oct 2024 – Dec 2025

KU Leuven, Electrical Engineering Department, Unit Processing Speech and Images, Leuven, Belgium

We propose a long-horizon, uncertainty-aware visual MPC method achieving state-of-the-art performance on DM Control vision benchmarks and zero-shot real-world tasks under extreme visual occlusions.

- Presented ELVIS, a latent model predictive controller designed to make long-horizon planning practical. ELVIS plans in a Dreamer-style recurrent state space **world model** and replaces standard unimodal model predictive path integral (MPPI) with a Gaussian-mixture (GMM) MPPI that maintains multiple coherent hypotheses over long horizons, avoiding mode averaging under branching rollouts.
- In parallel, ELVIS stabilizes deep imagination with a shared uncertainty-aware-return, adaptively trading off bootstrapping versus look-ahead to limit compounding error during planning. The same return is used both to train an actor-critic prior from imagined rollouts and to score candidate trajectories inside GMM-MPPI, aligning RL objectives with the planner's long-horizon optimization.
- On DeepMind Control Suite visual tasks, ELVIS establishes state-of-the-art performance compared with TD-MPC2 and DreamerV3. ELVIS transfers zero-shot to a real-world sand spraying task with severe occlusions, improving surface-quality metrics and demonstrating robustness beyond simulation.
- This work has been accepted by RSS 2026 and project code is publicly available.

AREPO: Uncertainty-Aware Robot Ensemble Learning Under Extreme Partial Observability Oct 2023 – Sep 2024

KU Leuven, Electrical Engineering Department, Unit Processing Speech and Images, Leuven, Belgium

This project is part of RoBetArme, an EU project that aimed to automate shotcreting, a challenging vision-based control task with robotics.

- Developed a differentiable shotcrete simulator validated with real-world shotcreting data in Pytorch and OpenAI Gymnasium;
- Proposed a principled approach to address visual control tasks that features visual occlusions with uncertainty-aware RL;
- Achieved state-of-the-art performance in sampling efficiency, training stability, and sim-to-real transfer.
- Relevant Links: Journal Version: Robotics Automation Letters, Project Code.

Learning from Demonstrations of Critical Driving Using Driver's Risk Field Oct 2021 – Oct 2022

Siemens Digital Industries Software, Engineering Solutions Department, ADAS team, Leuven, Belgium

This project aimed to improve safety and efficiency of imitation learning (IL) for autonomous vehicles' motion planning by learning from simulated critical interactions with realistic traffic agents.

- Developed a multi-agent traffic simulator with DRF agents based on Lyft l5kit and Pytorch;
- Generated synthetic data of critical scenarios from interactions between the IL ego vehicle and DRF agents;
- Retrained the IL model with the synthetic data and spline trajectory parameterisation to enhance safety and efficiency.
- Relevant Links: Full Master Thesis, Conference Version: International Federation of Automatic Control, Project Code.

Planning for Autonomous Vehicles via a Game-Theoretical Approach Dec 2019 – Jun 2020
Southeast University, Department of Mechanical Engineering, Nanjing, China
This project proposed a novel planning & control method for lane-merging manoeuvres of autonomous vehicles.

- Modelled the merging scenario as a two-agent collaborative game with complete information, implemented the planning algorithm in Simulink and confirmed its effectiveness via a Carsim-Simulink co-simulation;
- Transferred the planning and control algorithms to two miniature vehicles' onboard computers using ROS;
- Used an STM32 to convert the reference velocity and steering into control signals for the motor and servo, proved the proposed method's capacity to handle real-world scenarios.

Work Experience

Full-Time Autonomous Driving Engineer Dec 2022 – Apr 2023
Meituan, Autonomous Delivery Department, Planning, Control and Testing Team, Beijing, China
This work demands testing-centred development of planning algorithms for autonomous delivery vehicles.

- Reconstructed simulated traffic scenarios based on road test data;
- Developed planning algorithms via simulated/real testing of autonomous vehicles;
- Reduced false simulated collisions by 90% by implementing smart traffic agents that enhance realistic interactions between agents.

Full-Time Autonomous Driving Intern Jul 2021 – Oct 2021
Siemens Digital Industries Software, Engineering Solutions Department, ADAS Team, Leuven, Belgium
This project validated the capability of Driver's Risk Field (DRF) to act as realistic traffic agents in simulation.

- Implemented DRF in C++ and Python to fit into the software stack of Siemens Prescan;
- Established an automated identification-validation workflow for DRF-based traffic agent modelling;
- Validated DRF's ability to simulate realistic traffic agents with Lyft Prediction Dataset.

Part-Time Autonomous Driving Intern Jul 2020 – Oct 2020
Dongfeng Motor Corporation R&D Centre, Motion Planning Group, Wuhan, China
This project developed an expert decision-making system for autonomous vehicles on highway.

- Applied a Finite State Machine (FSM) as a rule-based expert to train a Gated Recurrent Units (GRU) network to mitigate covariate shift via Dataset Aggregation (DAgger);
- Generated predicted trajectories with GRU, followed by a safety layer of FSM to provide safety guarantee, achieved a 96% of reasonable decisions in validation.

Skills

- **Programming Languages:** Python, C/C++, Java, MATLAB
- **Tools and Frameworks:** Git, LATEX, Pytorch, JAX, Gymnasium, ROS

Personal Pages

- **Google Scholar**
- **LinkedIn**