KAIGE TAN

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EDUCATION

Ph.D candidate | ***Division: Mechatronics*** — Dec. 2020 – Nov. 2024 (est.)
Royal Institute of Technology — Stockholm, Sweden

Master of Science | ***Program: Mechatronics*** — Sept. 2017 – Sept. 2019
Royal Institute of Technology — Stockholm, Sweden

Bachelor of Science | ***Major: Mechatronics*** — Sept. 2014- June. 2017
Harbin Institute of Technology — Harbin, P. R. China

RESEARCH INSTERSTS

- Connected and Automated Vehicles
- Soft Robotics and Soft Sensors
- Optimal Control and Reinforcement Learning
- Edge Computing Systems and Applications

TECHNICAL SKILLS

- Python, MATLAB/Simulink, Embedded C Programming, Docker, Git

RESEARCH PROJECTS

Data-driven Optimal Control for Soft Robotic Systems — Sept. 2021 - Present

- Proposed a method for pose estimation in a soft actuator-sensor system using adaptive Kalman filters and edge computing for task offloading and online control (paper1, paper2).
- Designed and 3D-printed a soft quadruped robot, implementing optimal gait control using reinforcement learning and complex task processing with edge computing (paper1, paper2, paper3).

Edge Computing for Real-Time Control of Connected Vehicles — Dec. 2020 - Present

- Proposed an optimization strategy for task allocation using edge servers to achieve optimal response time and energy consumption (paper).
- Developed a distributed controller for multi-vehicle coordination using edge servers in intersection scenarios, addressing stochastic optimization issues caused by communication delays (paper).
- Implemented vehicle collaborative sensing and real-time warning functions on KTH campus using a 5G network with virtualized edge servers and multiple roadside sensors (demo).

Adaptive Energy Management Strategy for Parallel Hybrid Electric Vehicles — Mar. 2021 - Jan. 2023

- Participated in the research on the energy management system control of a parallel hybrid race car, focusing on the design and implementation of optimal control and online learning algorithms (paper1, paper2, paper3).

WORK EXPERIENCE

MIL system engineer — Aug. 2019 – Sept. 2020
BOSCH Group — Shanghai, China

- Worked at ETAS department in BOSCH Group as a model-in-the-loop engineer, developed and validated model of fuel cell control unit (FCCU) in Simulink and carried out open loop and closed loop test for the controller.

VESC (Volvo Cars Engineering Student Concept) program student — June. 2018 – July. 2019
Volvo Cars — Gothenburg, Sweden

- Worked at Volvo Cars Active Safety CAE team for the summer internship and master thesis project. The project focused on functional safety and investigated a method for building a test database for an Autonomous Driving (AD) function on a virtual platform and how to extract critical scenarios from the test database to finish test case reduction through optimization. The virtual platform under study is the model-in-the-loop (MIL) based Simulation Platform Active Safety (SPAS) environment.
- The thesis work at Volvo Cars contributes to the publication of two academic papers (paper1, paper2).

Selected Academic Publications

1. **Tan, K**, Q. Ji, L. Feng, and M. Törngren, "Edge-enabled adaptive shape estimation of 3-D printed soft actuators with Gaussian processes and unscented Kalman filters," *IEEE Transactions on Industrial Electronics*, vol. 71, no. 3, pp. 3044–3054, 2023

2. **Tan, K**, L. Feng, G. Dán, and M. Törngren, "Decentralized convex optimization for joint task offloading and resource allocation of vehicular edge computing systems," *IEEE Transactions on Vehicular Technology*, vol. 71, no. 12, pp. 13226–13241, 2022

3. **Tan, K**, Q. Ji, L. Feng, and M. Törngren, "Shape estimation of a 3D printed soft sensor using multi-hypothesis extended kalman filter," *IEEE Robotics and Automation Letters*, vol. 7, no. 3, pp. 8383–8390, 2022

4. **Tan, K**, L. Feng, and M. Törngren, "Collaborative collision avoidance of connected vehicles using admm with pi-regulated lagrangian multipliers," in *2023 IEEE 19th International Conference on Automation Science and Engineering (CASE)*, pp. 1–8, IEEE, 2023

Professional Services

- Journal Reviewer: IEEE Robotics and Automation Letters, Robotics and Autonomous Systems, IEEE Transactions on Wireless Communications, IEEE Transactions on Mobile Communications, IEEE Transactions on Computers, Journal of Cleaner Production, Foundations and Trends in Electronic Design Automation, etc.
- Master Thesis Supervisor, Teaching Assistant

Honors and Awards

Chinese Government Award for Outstanding Self-financed Students Abroad	July 2024
Jubilee appropriation from the Wallenberg Foundations Travel Scholarship Awardee	Mar. 2024
IEEE Robotics and Automation Society Travel Grant Awardee	July 2023
Karl Engver's Foundation Travel Scholarship Awardee	2022, 2023
The First Prize in China Undergraduate Mathematical Contest in Modeling (CUMCM)	Sept. 2016
Excellent Undergraduate Scholarship	2014 - 2015

References

Martin Törngren — Professor
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Lei Feng — Associate Professor
lfeng@kth.se — Mechatronics Division, Royal Institute of Technology (KTH)