Hongbo Yang

Tel: +86 18697718565

E-Mail: hongbo_yang_alex@qq.com

Homepage: https://kntcs.github.io/

Research Interests

Cyber-Physical System, Learning-Based Control, Optimization-Based Control, Temporal Logic, Multi-Agent System

Education

Shanghai Jiao Tong University - Master's Degree

September 2022 - March 2025

Department of Automation

School of Electronic Information and Electrical Engineering

- **Major**: Control Science and Engineering (academic-focused master's program)
- **Research direction:** Distributed cluster control under complex spatio-temporal constraints
- **Core courses:** Stochastic Methods, Adaptive Control, Robust Control, Optimization in Control and Learning, Graphs and Networks (all scored A)
- **Additional roles:** Teaching Assistant for AI class in Control Theory

Shanghai Jiao Tong University - Bachelor's Degree

September 2018 - June 2022

IEEE Pilot Class (Artificial Intelligence track)

School of Electronic Information and Electrical Engineering

- **Academic achievements:** Ranked 94th in Henan Province' s college entrance exam; ranked 3/30 in undergraduate major academic credits, first place in graduate recommendation exam scores; received two Annual Academic Excellence Scholarships, Weichai Power Scholarship in 2021, etc.
- **Core courses:** Linear Algebra, Mathematical Analysis, Discrete Mathematics, Information Theory, Principles of Algorithms, Signals and Systems, Control Theory, Mobile Robotics, etc.
- **Competition results:** Participated in the 2018 RoboMaster intra-university competition, responsible for electric control design of robots, leading the team to third place among 30 teams

Publications

- **Hongbo Yang**, Yuanyuan Zou, and Shaoyuan Li, "Distributed Predictive Control under Multiple Sub-formula STL Specifications with Temporal Relaxation," 2024 Annual Conference of the IEEE Industrial Electronics Society (IECON). (accepted)
- **Hongbo Yang**, Yuanyuan Zou, and Shaoyuan Li, "Temporal Relaxation of STL Specifications in Distributed Multi-Agent Systems," 2023 IEEE 2nd Industrial Electronics Society Annual On-Line Conference (ONCON). (published)
- **Hongbo Yang**, Peng Lv, Xiang Yin, and Shaoyuan Li, "Output Regulation of Discrete Event Dynamic Systems," [J] Journal of Xiamen University(Natural Science). (published)
- **Hongbo Yang**, Yuanyuan Zou, and Shaoyuan Li, "Resilient Control Preserving Collaborative Spatio-Temporal Specifications"(Preparing)

Research Experience

Distributed Multi-Agent Control under Collaborative Temporal Logic Tasks

Institute: Institute of Automation, Shanghai Jiao Tong University

Advisor: Prof. Yuanyuan Zou

June 2022 - March 2025

Key Achievements:

- Enhanced computational efficiency and scalability of distributed model predictive control (DMPC).
- Implemented short-term Signal Temporal Logic (STL) tasks and reduced optimization variables.
- Addressed clock synchronization in multi-agent systems, contributing to academic publications.

Parameterized Distributed Predictive Control via Reinforcement Learning

Institute: Center for Intelligent and Networked Systems, Tsinghua University

Advisor: Prof. Yilin Mo

April 2024 - June 2024

Key Achievements:

- Applied offline reinforcement learning to linear systems, adapting CQL and SAC algorithms.

- Developed parameterized MPC controllers integrating reinforcement learning techniques.
- Designed and validated a non-convex collision avoidance scheme for multi-agent control.

Sampling-Based Linear Temporal Logic Multi-Agent Control Algorithm (Undergraduate Thesis Project)

Institute: Institute of Automation, Shanghai Jiao Tong University

Advisor: Prof. Xiang Yin January 2022 - June 2022

Key Achievements:

- Implemented STyLuS* for scalable multi-agent path finding, enhancing large-scale system performance.
- Introduced a Büchi automata-based replanning strategy, tested using ROS and TurtleBot platforms.

Output Regulation of Discrete Event Dynamic Systems (DEDS)

Institute: Institute of Automation, Shanghai Jiao Tong University

Advisor: Prof. Xiang Yin June 2020 - June 2022

Key Achievements:

- Formulated output regulation problems for DEDS and devised novel safe path algorithms.
- Achieved output specifications without internal system information, leading to a related publication.

Selected Course Projects

PI-Measure: A Set-Theoretic View of Partial Information

Advisor: Fan Cheng, Information and Computing Lab, Shanghai Jiao Tong University March 2020 - May 2020

Explored I-Measure for partial information measurement, establishing a theoretical correlation between Shannon's information metrics and set theory, simplifying information diagrams for easier application.

Dance2Music: Research of Nao-Based Dance Generation

Advisor: Yue Gao, Reinforcement Learning & Robot Learning Lab, Shanghai Jiao Tong University December 2020 - January 2021

Conducted research on choreographing dance moves for the Nao robot based on music types using MLP classifiers and LSTM networks, culminating in a sound-driven robotic movement demonstration.

Internship Experience

Momenta: End-to-End Driving Scene Optimization

Company: Momenta, MSD UNP/OBP Department July 2024 - October 2024

Position: MSD R&D Intern

Key Achievements:

- Leveraged Voronoi diagrams for lane topology recognition to improve algorithm performance in complex driving scenarios.
- Diagnosed and addressed safety issues, such as U-turn mishaps, by innovating obstacle-aware Voronoi graph techniques.
- Developed an enhanced approach using Voronoi diagram topology to better detect Merge and Split situations, facilitating smoother trajectory planning.
- Advanced test automation by integrating ROS-based communication for scene classification data utilization.

Technical Skills

- **Cloud-based machine development:** Ubuntu, Git, Docker
- **Academic writing tools:** LaTeX, TikZ
- **Simulation programming languages:** Python, ROS, C, C++, MATLAB, Simulink, Julia
- **Data analysis tools:** Numpy, Pandas, SPSS, STATA
- Other skills: HTML5, PHP, JS, Gephi, Verilog, CAD, SolidWorks, CAXA, Arduino

Control algorithms: Model Predictive Control, Optimal Control, Adaptive Control, Kalman Filter, Particle Filter, Sampling Algorithms, Formal Methods, etc.

Machine learning techniques: SVM, Linear Regression, Logistic Regression, KNN, Bayesian Classification, K-means, EM Algorithm, Decision Trees, etc.

Deep learning frameworks: MLP, CNN, RNN, LSTM; proficient in principles of backpropagation, knowledgeable about optimizers such as SGD; familiar with PyTorch framework

Robotics full-stack competencies: Design and manufacturing (SolidWorks, CAXA, CAD), operation platform(Arduino, ROS, Moveit!), regulation algorithms (Hybrid A*, RRT*, MPC, ILQR)