

# Jiachen Li

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## EDUCATION BACKGROUND

### Harbin Institute of Technology

2019.9 - present

- Automation, *undergraduate junior*
- GPA: 3.72/4, 86.54/100
- Related courses: Calculus, Probability and Mathematical Statistics, Automatic Control Theory, Automatic Control Practice, Machine Learning
- Institute of Intelligent Control and Systems, supervised by [Jianbin Qiu](#) and [Tong Wang](#)

### Nanyang Technological University Summer School

2021.7 - 2021.8

- Robotics, Automation and IoT Programme
- Distinction, supervised by [Ming Xie](#)

### Harbin Institute of Technology International Summer School

2021.8 - 2021.9

- Artificial Intelligence
- Lecture-based, supervised by [Jianwei Ma](#)

## REASERCH INTERESTS

Fuzzy control, event-triggered control, nonlinear control, fault-tolerant control, partial differential equations, game theory, decision-making and planning, robotics, reinforcement learning, computer vision

## PUBLICATIONS

- Zichen Yao, Zhanwen Yang, Yongqiang Fu, **Jiachen Li**. Asymptotical stability for fractional-order Hopfield neural networks with multiple time delays. Submitted to Mathematical Methods in the Applied Sciences. Accepted.
- Hao Zhang, **Jiachen Li**, Tong Wang, Jianbin Qiu. A Mixed Control Approach to Nonlinear Coupled Burgers' PDE-ODE Systems with Sensor Nonlinearities. 2022 the 41st Chinese Control Conference. Accepted.
- Runsheng Guo, **Jiachen Li**, Kangkang Sun, Tong Wang, and Jianbin Qiu. Output-Feedback Boundary Adaptive Fault-Tolerant Control for Scalar Hyperbolic PDE Systems with Actuator Faults. International Journal of Adaptive Control and Signal Processing. Under review.

## RESEARCH EXPERIENCES

### Asymptotical stability for fractional-order Hopfield neural networks

2020.9 - 2021.4

- Gave a boundary of the stability region for linear fractional-order differential equations with delay, which is an open problem for six years
- Established framework for stability analysis of fractional-order Hopfield neural networks with multiple time delays We obtained a necessary and sufficient condition in a coefficient-type criterion, which is delay-independent
- Compared with the existing results, our results not only covered  $\frac{\alpha\pi}{2} < |Arg(\lambda_M)| < \frac{\pi}{2}$ , but also improved the results for  $|Arg(\lambda_M)| > \frac{\pi}{2}$

### Control of Nonlinear Coupled Burgers' PDE-ODE Systems with Sensor Nonlinearities

2021.4 - 2021.9

- Proposed a mixed control approach to produce a fuzzy-model-based controller tackling the time dimensional nonlinearity and a boundary controller eliminating the space dimensional nonlinearity
- Applied the proposed mixed control approach to a nonlinear hypersonic rocket car to testify its validity

### Output-Feedback Boundary Adaptive Fault-Tolerant Control for Scalar Hyperbolic PDE Systems with Actuator Faults

2021.4 - 2021.9

- Considered both the combined multiplicative and additive actuator faults
- In the existing results, the FTC issues of PDE systems are mostly addressed via Lyapunov's direct approach. During our work, parameter updating laws of gradient type were developed to compensate actuator faults along with parameter uncertainties, based on which the adaptive FTC problem for scalar hyperbolic PDE system was effectively addressed.

### Tracking control of nonlinear discrete systems based on zero-sum games

2021.9 - present

- Due to the problem of causal contradiction in discrete-time domain, the commonly used methods in continuous systems cannot be used directly. An attempt was made to invoke a new method to circumvent this problem for the design.

## Spacecraft autonomous decision-making algorithm research

2022.1 - present

- Combined with from the perception module, we used reinforcement learning to make specific behavioral decisions. For example, the choice of avoidance or confrontation was based on other spacecraft, obstacles, and its own stated mission and fuel storage.
- Used Fuzzy Petri nets to fit this algorithm for easier use in simulation

## COMPETITION EXPERIENCES

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### National University Student Engineering Training Comprehensive Ability Competition

2020.12 - 2021.4

#### Intelligent Delivery Robot

- Designed a robot that can identify objects and automatically deliver

### National Undergraduate Electronics Design Contest

2021.10 - 2021.11

#### Appliance analysis and identification device

- Designed a device that determined the type and operating status of an electrical appliance by collecting the operating status and characteristic parameters of the appliance
- Used converter and filter circuits for signal processing and LSTM recognition analysis in Raspberry Pi

### National College Competition on Internet of Things

2022.1 - 2022.4

#### Disorderly gripping of robotic arms

- Identified object types and locations by 3D point clouds
- Gripping control of robotic arm by hand-eye calibration

## COURSE PROJECTS

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### Automatic Control Practice I

2021.11 - 2021.12

- Designed a specific motor control circuit with adjustable-speed drives (forward and reverse rotation), user-friendly operations, and a low cost (approximately 50 cents), and then completed the soldering
- Inspected the motor control circuit and corrected the errors occurring during the design and soldering
- Analyzed the relationship between input/output quantities by regulating the input signal (both its frequency and duty ratio) and measuring the corresponding output (rotational speed), then calculated the parameters of the controlled motor based on the data collected

### Automatic Control Practice II

2022.4 - 2022.5

- Used matlab and simulink to identificate the parameter of servo system in Webots virtual environment
- To control the pitch axis and yaw axis of simulated aircraft, the PID controller and the disturbance observer were adopted. Also, we used double closed-loop PID controller.

## SKILLS AND QUALIFICATIONS

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- **Proficient** : Python, PyTorch, Matlab, Simulink, Latex
- **Familiar** : C/C++, TensorFlow, Keras, Verilog, etc.
- **Duolingo**: 110
- **GRE**: 334/340+5/6.0 (Verbal 165, Quantitative 169, Analytical Writing 5)

## OTHERS / SUMMARY

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- Passionate about technology, love programming, solid foundation, good programming habits.
- Calm and steady, able to read manuals, query information, strong self-learning ability, self-management ability.
- Lively and polite personality, strong communication and collaboration as well as social skills, with some organizational leadership.
- Love writing, travel, good at organizing and summarizing.