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EDUCATION

Harbin Institute of Technology (HIT, enlisted in "985 Project" and "211 Project")　　　　　Harbin, CHN
Bachelor of Engineering in Automation　　　　　Sep. 2015 - Jun. 2019
- Undergraduate Cumulative GPA: 3.79/4.0, major GPA: 3.95/4.0
- 3rd Prize People Merit-based Scholarship (top 10%), Jun. 2017, Sep. 2017, Jun. 2018
- 2nd Prize People Merit-based Scholarship (top 7%), Jun. 2016

University of Michigan　　　　　Ann Arbor, US
Master of Science in Electrical and Computer Engineering　　　　　Jan. 2020 - Dec. 2021
- Graduate GPA: 4.0/4.0

University of Wisconsin - Madison　　　　　Madison, US
Ph.D. student in Mechanical Engineering　　　　　Sep. 2022 - Till Now
- Research Focus: Control theory and learning method, with application in safety verification for safety-critical systems.
- Graduate GPA (till now): 4.0/4.0

RESEARCH EXPERIENCES

UW Autonomous & Resilient Controls (ARC) Lab　　　　　Sep. 2022-Till Now
- Focusing on backward reachability analysis for neural network systems.

Collins Aerospace project for machine understanding of human behavior　　　　　Sep. 2021-Aug. 2022
- Injected the description of abnormal behaviors from human-domain expert knowledge into learning methods via the introduction of parametric Signal Temporal Logic (pSTL) formulas.
- Implemented a deep learning algorithm to obtain learned STL formula for describing or classifying different human behaviors.
- Solved human behavior classification problems via the learned STL criterion from deep neural network models with the IMU data from human behaviors.

Reachability analysis for falsification of Baron58 airplane linearized system　　　　　Mar. 2021-Jun. 2022
- Used Hamilton-Jacobi-Bellman (HJB) level set method to compute backward reachable sets, which is used for safety verification and falsification, for the identified system.
- Compared various reachability analysis methods such as the HJB method and the zonotope-based method, and study the differences between them.
- Implemented sequential linearization and splitting procedure to extend the zonotope-based reachability analysis method, which is used for linear systems, to nonlinear systems.
- Implemented sequential linearization and splitting procedure to extend the zonotope-based reachability analysis method to constrained-zonotope-based reachability analysis.

HIT Intelligent Control Lab　　　　　Mar. 2017-Sep. 2019
- Implemented an objective extraction algorithm for manipulator cameras based on traditional computer vision techniques.
- Learned system identification methods and machine learning methods, and implemented them for the programs concerning identifying control systems and conducted simulation in MATLAB.
- Programmed the interactive interface of the painting robot system, which is used to read and operate rhe coordinates of robotic manipulators, based on Point Cloud Library (PCL) in C++.

SYSTEM DESIGN PROJECTS

Particle filter based localization using NCLT and KITTI dataset   Apr. 2021
(Project for EECS 568 - Mobile Robitics)
- Implemented poles extraction algorithm based on KITTI dataset and NCLT dataset.
- Implemented particle filter and unscented Kalman Filter based (UKF-based) particle filter to estimate the position of the robot.
- Implemented an algorithm to generate global landmarks maps with the combination between extracted poles and estimated positions.
- Evaluated the performance of both the particle filter and the UKF-based particle filter.

Transformer-based image to LaTeX OCR   Apr. 2021
(Project for EECS 545 - Machine Learning)
- Constructed CNN-Transformer network to train the sequence prediction model.
- Made comparisons between our model and traditional natural language processing models such as RNN and LSTM.
- Achieved the goal that given the formula image as input, the prediction of corresponding LaTeX codes can be obtained via the trained model.

Gaming AI for Jump King based on Reinforcement Learning   Dec. 2020
(Project for EECS 598-003 - Reinforcement Learning Theory)
- Used DDQN and TD3 algorithm to train the gaming agent.
- Achieved the goal that the agent can jump to higher platforms and avoid invalid jumping or falling down.

Design of optimal switching sequences of fixed DMPs for optimal path generation   Dec. 2020
(Project for EECS 563 - Hybrid Control)
- Defined the cost function and searched for the optimal switching sequence in one-switching case via nonlinear programming method.
- Used SARSA algorithm to find the optimal switching sequence and optimal path in multi-switching case.

Semantic mapping with LiDAR point cloud and RGB images   Apr. 2020
(Project for EECS 504 - Foudations of Computer Vision)
- Used U-Net to implement semantic segmentation of mapping images.
- Constructed 3-D maps based on segmentation and LiDAR information

Design of visual servo system for UAV   Sep. 2019
- Used computer vision tool (OpenCV) to find the geometric center of a moving object simultaneously.
- Designed the PID controller to track the moving object.
- Simulated the trajectory in Webots and computed the tracking errors in MATLAB.

PROFESSIONAL EXPERIENCES

University of Wisconsin - Madison   Madison, US
Faustin Prinz Fellow   *Sep*. 2022-Till Now
- Pursuing Ph.D. degree and engaging in control society under my advisor Prof. Xiangru Xu.

University of Michigan   Ann Arbor, US
Graduate Student Research Assistant, 20 hours/week   Oct. 2021-Till Now
- Worked on the project from Collins Aerospace under the supervision of Prof. Necmiye Ozay
- Implemented a logic-based method to describe or classify different human behaviors.

*Grader for ROB 501 (*Mathematics for Robotics*), 10 hours/week*   Sep. 2021-Oct.2021
- Graded assignments for students and clarify the mistakes in assignments.

Grader for EECS 560 (Linear System Theory), 12 hours/week   Jan. 2021-May 2021
- Graded assignments for students and clarify the mistakes in assignments.

Emerson Process Control Co., Ltd., Power & Water Solution Department   Beijing, CHN
Intern PWS Proposal Engineer, 40 hours/week   Jul. 2018-Aug. 2018
- Got trained about Ovation System and DCS.
- Provided pre-sales technical support, helped the supervisor to develop bidding documents and proposals.
- Helped the mentor to choose the proper equipment so as to meet the industrial demand.

The 3rd China Aerospace Science and Technology Institute, No. 33 Research Institute   Beijing, CHN
Trainee, 36 hours/week   Jul. 2018
- Learned knowledge about platform inertial navigation system and strap-down inertial navigation system.
- Learned basic principles and the productive processes of various kinds of gyroscopes and accelerometers.
- Implemented basic Strap-down inertial navigation algorithm.

EXTRACURRICULAR ACTIVITIES
- The Tutorial Class for Students with Obstacles in Academic Courses, *Tutor*, Sep. 2015-Sep. 2018
- The Welcome Event for freshmen, HIT, *Volunteer*, Sep. 2015-Oct. 2015

PUBLICATIONS
- Xin Liu, Hang Zhang, Pengbo Zhu, Xianqiang Yang, Zhiwei Du, Identification of Nonlinear State-space Time-delay System, Assembly Automation, ISSN 0144-5154, Jun. 2019
- Zhu, Pengbo, Xianqiang Yang, and Hang Zhang. "Mixture robust L1 probabilistic principal component regression and soft sensor application." The Canadian Journal of Chemical Engineering 98.8 (2020): 1741-1756.
- Liren Yang, Hang Zhang, Jean-Baptiste Jeannin, and Necmiye Ozay. "Efficient Backward Reachability Using the Minkowski Difference of Constrained Zonotopes." IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems 41.11 (2022): 3969-3980

AWARDS & HONORS
- Faustin Prinz Fellowship, Sep. 2022

ADDITIONAL INFORMATION
- Language: native speaker of Mandarin, proficient in English
- Computer skills: MATLAB, C, C++, CUDA programming, Python.