CHENGZHE JIA

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EDUCATION

University of California San Diego (UCSD) *California, USA*
M.S. in Mechanical and Aerospace Engineering *Sept. 2021 - Jul. 2023*

- **GPA:** 3.84/4.00
- **Selected Relevant Courses:** Topics in Engineering Science-Design of Haptic Systems (A), Robotics (A+), Linear Control Design (A+), Robot Motion Planning (A), Topics in Engineering Science-Electric Power System Modeling (A-), Advance Technics in Computational Math I (A)

Beijing University of Technology (BJUT) *Beijing, China*
B.S. in Measurement and Control Technique and Equipment *Sept. 2016 - Jul. 2020*

- **GPA:** 3.49/4.00
- **Selected Relevant Courses:** Computer Language Training (90/100), Fundamentals of Circuit Analysis(91/100), Fundamentals of Mechanical Accuracy Design (Bilingual)(80/100), Course Design of Precision Machine Design (86/100), Electrical and Electronic Technology Courses(97/100), Circuits for Measurement and Control (87/100), Course Design of Sensing and Testing Technology (87/100)

PUBLICATIONS

Controlling the Motion of Gas-Lubricated Adhesive Disks using Multiple Vibration Sources *Frontiers in Robotics and AI (Manuscript has been accepted)*

- First Author

- **Jia, C.**, Ramanarayanan, S., Sanchez, A., Tolley, M.,2023. Controlling the Motion of Gas-Lubricated Adhesive Disks using Multiple Vibration Sources. Frontiers in Robotics and AI(FRAI).

Vehicle Attribute Recognition Algorithm Based on Multi-task Learning *2019 IEEE SmartIoT Agu. 2019*

- Second Author

- Sun, J., **Jia, C.** and Shi, Z., 2019, August. Vehicle attribute recognition algorithm based on multi-task learning. In 2019 IEEE International Conference on Smart Internet of Things (SmartIoT) (pp. 135-141). IEEE.

Percussion Characteristic Analysis for Hydraulic Rock Drill with no Constant-Pressurized Chamber through Numerical Simulation and Experiment *Advances in Mechanical Engineering Apr. 2019*

- Third Author

- Ma, W., Geng, X., **Jia, C.**, Gao, L., Liu, Y. and Tian, X., 2019. Percussion characteristic analysis for hydraulic rock drill with no constant-pressurized chamber through numerical simulation and experiment. Advances in Mechanical Engineering, 11(4), p.1687814019841486.

PROFESSIONAL EXPERIENCE

Sim2Real Manipulation on Unknown Objects with Tactile-based Reinforcement Learning Xiaolong Wang's Lab, UCSD
Full-Time Research Assistant *Mar. 2023 - Present*

- ⋆ *The aim of this project is to utilize Reinforcement Learning techniques to train a robot arm equipped with tactile sensors. By learning specific operations on a range of objects within a virtual environment and testing the trained policy in the real world, the ultimate goal is to achieve the capability to complete specific tasks even when faced with unknown objects. In this project, my primary responsibility lies in the 'to real' component. This involves replicating the virtual world environment in the real world, conducting experimental tests on the existing policy, and iteratively refining it. Simultaneously, I*

learned the complete process of Reinforcement Learning projects, including building pipelines, constructing virtual testing environments, and drafting reward functions. I was also responsible for the final writing and editing of the article.⋆

- Supervisor: Prof. Xiaolong Wang.
- Manually crafting and setting up the experimental environment for sim2real testing.
- Designing experiments to validate policies trained in simulations.
- Conducting practical experimental operations, recording the results for further analysis.
- Learning about Reinforcement Learning Techniques.
- **Paper has been submitted** to ICRA 2024 (International Conference on Robotics and Automation).

Controlling the Motion of Gas-Lubricated Adhesive Disks using Multiple Vibration Sources Bioinspired Robotics and Design Lab, UCSD
Sole Project Leader *Feb. 2022 - Jun. 2023*

- *⋆ As the sole operator of the project, I independently designed and constructed a disk-shaped robot. Utilizing multiple vibration motors as the driving source, I achieved controlled motion of the robotic disk on inverted and upright surfaces. The underlying principles behind this project's motion dynamics have scarcely been analyzed. Consequently, this robot stood as the pioneering model that exclusively employs multiple vibration sources as its driving force. It also represented the first scientific exploration of such a design dynamic.⋆*
- Supervisor: Prof. Michael T. Tolley.
- Using CAD to design and manufacture different robot prototype models.
- Designing and constructing the experimental platform for data collection.
- Using Fusion-360 design and 3D-printed accessories for experiments.
- Designing experiments to investigate vibration-based locomotion.
- Using Tracker(video analysis and modeling tool) to gather data from recorded video.
- Using Matlab and Excel to process and analyze experimental data.
- Formulating hypotheses based on experimental results and further investigating the validity of these hypotheses.
- Constructing the article structure, creating visual-aid figures, and completing the writing of the academic paper.
- **The article has been accepted** by the FRAI journal (Frontiers in Robotics and AI).

Measuring Instrument Operation Institute of Metrology, National Institute of Metrology, China
Lab Intern *Jun. 2019 - Jul. 2019*

- *⋆ During this internship period, I primarily focused on learning the operational procedures of various precision measuring instruments and was responsible for conducting inspections on a variety of sent-in equipment. The main function of the institution was to establish standards for different units of measurement and utilize high-precision measuring equipment to verify other metrological instruments. The inspection reports issued by this institution served as robust endorse for the credibility of specific surveying and mapping equipment.⋆*
- Supervisor: Dr. Yao Huang.
- Learned the practical operation of measuring instruments like angular gage block, dividing head, and autocollimation.
- Mastered the use of Trioptics and processed measured data by Excel.
- Conducted inspection instruments test.

Vehicle Attribute Recognition Algorithm Based on Multi-task Learning CCE Department, USTB
Research Assistant *Mar. 2019 - Jun. 2019*

- *⋆ The objective of this project was to develop a highly accurate image processing algorithm using convolutional neural networks. The aim was to achieve the identification of vehicle brands and colors within images or videos, enhancing the recognition capabilities in this context. In this project, I primarily focused on learning computer vision concepts and techniques. My responsibilities included constructing and augmenting the model database used for training neural networks.⋆*
- Supervisor: Prof. Zhiguo Shi.
- Absorbed the knowledge of computer visual identification system and convolutional neural network.
- Input images of various colors, brands, and types of vehicles to train the model and construct the database.

- Improved the accuracy rate of color recognition from 94.15% to 94.27%, the brand recognition from 98% to 99.50%.

Percussion Characteristic Analysis for Hydraulic Rock Drill with no Constant-Pressurized Chamber through Numerical Simulation and Experiment ME Department, USTB
Research Assistant *Aug. 2018 - Feb. 2019*

- ⋆ *The aim of this project was to establish a robust model for a Hydraulic Rock Drill, with the goal of optimizing its performance. The project's challenges predominantly stemmed from two aspects: the overall construction of the model and the fine-tuning of crucial parameters to achieve alignment with real-world behavior. In this project, my primary responsibility involved real-world data collection. By selecting appropriate sensors, setting up and optimizing the testing platform to minimize environmental noise interference, and effectively gathering relevant data. Further analysis of the collected data allowed for improvements to the existing computational model.*⋆
- Supervisor: Prof. Fei Ma.
- Installed the pressure sensor according to the sampling frequency.
- Collected the hydraulic data of dual-channel through acquisition instrument of LMS SCADAS Mobile and software of LMS Test Xpress 7A.
- Self-learned the Simulink of Matlab and built a model to analyze data.

Multifunctional Robot Design for Family Safety National University Student Innovation Program, BJUT
Core Member *in Group of Five* *Dec. 2017 - Jul. 2018*

- ⋆ *The goal of this project was to create a home-based robotic vehicle equipped with features like automatic obstacle avoidance, monitoring of environmental temperature and humidity, smoke detection with alarms, and a multimedia information board. I was responsible for developing all functionalities except for the automatic obstacle avoidance, as well as designing and constructing the overall structure of the robot.*⋆
- Supervisor: Senior Engineer Shuwen Sun.
- Adopted 51 SCM as the lower program control system and used Keil software to write the program.
- Employed STM32F103 SCM to the core control part, and controlled the skills of the environment configuration and library function call to complete upper computer program by C#.
- Modified the wireless remote control car with modules of temperature-humidity, smoke sensor, humidifier, monitoring, and obstacle avoidance.
- Awarded **the Second Prize** of the 12th iCAN International Contest of Innovation (BJUT Division).

Automatic Food Pickup Robot Design Spark Fund Project, BJUT
team Leader *in Group of Five* *Dec. 2016 - Aug. 2017*

- ⋆ *As the first project I engaged in upon entering university, our objective was to construct an automated cart capable of picking up fast food items and transporting them to the counter. Due to a lack of background knowledge at the time, the cart's grasping function could not be successfully realized. However, during this project, as the team leader, I became acquainted with the entire process of a project, from inception to final implementation and operation. This experience sparked my interest in the field of robotics, motivating me to embark on a path of scientific research exploration.*⋆
- Supervisor: Senior Engineer Shuwen Sun.
- Acquired the use of Keil software and 51 SCM (single chip microcomputer) and applied them to the installation and modification of the intelligence vehicle.
- Achieved the function of path recognition, line-tracking, and sign identification based on the infrared sensor using C.
- Awarded **the Certification** of 18th Spark Fund Project.

SELECTED COURSE PROJECTS

Advanced Planning Algorithms for Robots Motion MAE 242, UCSD
Solo independent project *SPRING 2022*

- ⋆ *In this course, we accomplished a motion trajectory planning task for robots. Within a 2D plane, we utilized Reinforcement Learning techniques to design motion trajectories for multiple robot agents. This involved helping them avoid 'dangerous' areas, obtaining goal 'rewards', and ultimately reaching their designed destinations.*⋆
- Course Title: Robot Motion Planning.
- Course Instructor: Prof. Sonia Martinez.
- Learning fundamental Reinforcement Learning concepts.
- Gaining insights into the impact of different learning algorithms on robot motion policy through coding practice.
- Designing and programming algorithms to solve specific problems.
- Optimizing and debugging the code to ensure smooth program execution.

Custom Haptic Device 'Hapkit' Building MAE 207, UCSD
Solo independent project *WINTER 2022*

- ⋆ *In this course, we took a hands-on approach to build a 1-DOF haptic device. The device was driven by a single motor and controlled through programming with Arduino. By altering the motor's operation, we achieved various tactile outputs, thereby enabling different tactile sensations. Building upon this foundation, we created a virtual environment using 'Processing' and combined it with the tactile output from a joystick. This allowed users to have a more intuitive sensory experience.*⋆
- Course Title: Design and Control of Haptic Systems.
- Course Instructor: Prof. Tania Morimoto.
- Fabricating and assembling the 'Hapkit' components through 3D printing
- Analyzing system kinematics and apply in MATLAB programming.
- Utilizing the 'Processing' software to build a virtual environment and achieve visualization of the device.
- Programming the 'Hapkit' device based on 'Arduino' to achieve various tactile outputs.
- Video demos could be found at: `https://jaking98.github.io/portfolio/MAE-207_Hapkit/`

"Steering Wheel"— A Haptic Joystick Controller with Force Feedback MAE 207, UCSD
Core members of a 2-person team *WINTER 2022*

- ⋆ *This project served as the final project for the course, where we designed a 2-DOF joystick controller capable of actively avoiding collisions. The device was controlled by four motors, enabling it to change direction just before a collision occurred. We constructed a virtual testing environment using 'Processing' and invited users to participate in testing, aiming to enhance the device's tactile performance.*⋆
- Course Title: Design and Control of Haptic Systems.
- Course Instructor: Prof. Tania Morimoto.
- Conceiving project content from scratch and conducting relevant background research.
- Designing the device structure based on envisioned functionalities, and iterating on selected components through multiple rounds of testing.
- Programming and debugging to implement device functionalities.
- Achieving hardware-software alignment through parameter adjustments.
- Testing device functionalities within a virtual environment constructed in 'Processing'.
- Inviting users for real-world testing, collecting user feedback to enhance the device.
- Video demo could be found at: `https://jaking98.github.io/portfolio/MAE-207_Steeringwheel/`

Controlling the Motion of a UR3 Robot-arm MAE 204, UCSD
Core members of a 2-person team *WINTER 2022*

- ⋆ *The final project of this course involved controlling a small vehicle carrying a robot arm in a virtual environment. The objective was to achieve the grasping and placing of objects at target positions. The software programming aspect was built entirely from scratch. It involved designing the motion trajectory for the gripper end-effector, establishing an inverse kinematic function to control the robot arm's joint angles, and ultimately designing a feed-forward control system to achieve the coordinated motion of both the vehicle and the arm.*⋆
- Course Title: Introduction to Robotics.
- Course Instructor: Prof. Michael Tolley.
- Learning foundational knowledge in modern robotics.
- Practically manipulating a UR3 robot arm to achieve predefined pick-and-place operations.
- Developing a kinematics simulator and reference trajectory generator from scratch to depict the trajectory of the robot arm.
- Develop a feed-forward controller to control the motion of the robot arm in the virtual environment.
- Programming calculations are implemented using MATLAB, and the virtual environment utilizes the 'CoppeliaSim simulator'.
- Video demos could be found at: `https://jaking98.github.io/portfolio/MAE-204/`

SKILLS

Mathematical & Computational Software:	MATLAB, Julia, LabVIEW, SPSS, Excel
Drawing & Modeling Software:	CAD, Fusion 360, SolidWorks
Computer Language:	Python, C#, Android Studio
Other Software & System:	Arduino, Processing, Keil, Blender, Tracker, Latex, Markdown, Ubuntu, Linux
Hands-on Skills:	Structural design, Prototype design and production, Circuit analysis and design, Silicone molding
Languages:	Mandarin Chinese (native), English (bilateral proficiency)
Interpersonal:	Teamwork, Communication, Mentor-ship, Leadership, Event planning, Project management

STANDARD TESTS

TOFEL	Total: 100	(Reading 27, Listening 27, Speaking 23, Writing 23)
GRE	Total: 331	(Verbal 161 /88%, Quantitative 170 /96%)