

Tianyi Xiang

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EDUCATION

- **Yale University** New haven, US
Master of Science (MS) in Mechanical Engineering & Material Science *Aug.2024 – Jun.2025*
Core Modules: Neural networks & Learning System, Intermediate Machine Learning, Computer-Aided engineering, Intelligent Robotics Lab.
- **Xi'an Jiaotong-Liverpool University (XJTLU); Rank 1/36** Suzhou, China
BEng Mechatronics and Robotic Systems; Major GPA: 4.0/4.0 *Fall 2020 – Summer 2024*
Core Modules: Dynamic Systems, Instrumentation and Control, Mechanical Engineering Design, Machine Learning, Industrial Automation and Robot Control, Robotic Systems, Pattern Recognition

PUBLICATIONS

- [1] **Tianyi Xiang¹, et al.**, "A Novel Approach to Grasping Control of Soft Robotic Grippers based on Digital Twin," 29th International Conference on Automation and Computing (ICAC 2024)(Accepted) ;
- [2] **Tianyi Xiang¹, et al.**, "Development of a Simple and Novel Digital Twin Framework for Industrial Robots in Intelligent Robotics Manufacturing," 20th International Conference on Automation Science and Engineering (CASE 2024)(Accepted) ; [Video](#)
- [3] **Xie, B., Xie, Y., Ma, Y., Luo, N., Xiang, T. , et al.**, "High performance ($Zn_{0.5}Mg_{0.5}$)TiO₃ ceramics based composite films for powering multi-mode translation unit and human motion monitoring", ACS Applied Materials & Interfaces. [Manuscript submitted for publication].;

RESEARCH EXPERIENCE

- **liquid handling task with PDDLstream Task and Motion planning (TAMP)**
Group Project, Yale University, Advisor: Prof.brian scassellati ; [video](#) *Aug.2024 - present*
 - Leveraging the Task and Motion planning (TAMP) with PDDLstream method to liquid handling scenario
 - Constructing the single motion planning skill based on [Deep Object Pose Estimation](#) perception method and sampled-based RRT planning with UR5 practical robot
- **Behaviour cloning (BC) learning-based Block Pushing task**
Independant Research, Yale University; [video](#) *May.2024 - Aug.2024*
 - Developed a behavior cloning model based on a multi-layer perceptron (MLP) architecture in the PyBullet simulator, integrating image observations and prior actions to inform the policy, as opposed to traditional behavior learning approaches.
 - Addressed optimization challenges arising from discontinuities in the action space, achieving competitive or superior results compared to state-of-the-art offline reinforcement learning methods on human-expert tasks within the D4RL benchmark suite, without utilizing reward signals.
- **A Novel Approach to Grasping Control of Soft Robotic Grippers based on Digital Twin**
Research Assistant, XJTLU, [Pdf](#) *Apr.2024 - Jun.2024*
 - Proposed a Digital Twin (DT) framework for real-time motion and pose control of pneumatic flexible gripper in Unity3D, while the result satisfy industrial application manipulation
 - Constructed the four-section piecewise constant curvature flexible gripper model kinematics and pure mathematical simulation in Unity3D, achieved maximum task space error 3.4%
 - Implemented specific mapping by OpenCV image processing calibration method with gemini-pro 3D depth camera
- **Development of a Simple and Novel Digital Twin Framework for Manufacturing Robots**
Research Assistant, XJTLU, Advisor: Dr.Quan Zhang; [Pdf](#); [Video](#) *Jun.2023 - Apr.2024*
 - Enabled a Simple and Novel Digital Twin System based on C# and Robot Web Service (RWS) in Unity 3D and Web-based Platform, discarding the traditional 3rd party tools like ROS and costly device like PLC, but achieving efficient communication with 17ms Refreshing Rate.
 - Integrated the real-time path planning based on Levenberg-Marquard Inverse Kinematics Numerical Solution executed in MATLAB, achieving X-Y-Z Global Linear Motion Control and Multi-Joint Motion Control with Reachability 100%, and Accuracy 100%.

- Created a User-friendly Web-based Platform by WebGL with a Remote Surveillance Camera, and easy accessible Graphical User Interfaces (GUI) including functions like Pointer Operation, I/O System Operation in real-time control
- **Trajectory Planning, intelligent control and rocker-bogie Coordination of Mars Rover**
Independent Research , XJTU, [Video](#) Sep.2023 - Feb.2024
 - Recreating the rover's rocker-bogie suspension dynamic modeling system with servo and DC motor
 - leveraging Radar, Depth Cameras, and Simultaneous Localization and Mapping (SLAM), incorporating deep Reinforcement Learning for obstacle detection and avoidance
 - Designing and optimizing the trajectory strategy based on the Genetic Algorithm(GA) and geometrical interactions
- **The dynamic optimization of Automated Guided Vehicle (AGV)**
2022 ABB Smart Innovation Competition: First prize; [Intro](#) Jun.2022 - Sep.2023
 - Applied dynamic optimization of local trajectory planning through LQR, Dual-loop PID, stanely method, and MPC Motion control algorithms to AGV incorporating B-spline and A-star method, with simulation and modelling in Automation studio, MapleSim, and Scene Viewer
 - Designed self-supervised spline interpolation techniques to generate control points, achieving a maximum deviation of lower 50%(in unit) in critical turning areas in rare 3% occurrence probability
 - Innovatively utilized intelligent visual distance-refresh methodology to compensate the non-completely homogeneous trajectory points due to B-spline planning incorporating with dual-loop PID
 - Obtained the sliding friction coefficient 0.2, by tire Magic Fomula to render the control algorithm designed applicable
- **Dynamic Optimization of ROS SLAM for Autonomous Vehicles**
Independent research, XJTU, [video](#) Jun.2022 - Aug.2022
 - Developed and implemented a SLAM-based navigation system for an autonomous vehicle with radar using ROS and Gazebo
 - Leveraged AMCL for adaptive localization and differential drive controllers, combining with Move_Base for efficient navigation in simulated environments.
 - Optimized traditional path planning methodologies (e.g., A* and RRT), achieving a 30% increase in localization accuracy and a 25% reduction in computational overhead, significantly enhancing both precision and efficiency.

AWARDS AND HONORS

2024	<i>Best Overall Academic Performance (Rank 1 Overall)</i>	<i>Xi'an Jiaotong-Liverpool University</i>
2023	<i>University Academic Excellence Award (Rank 1/36)</i>	<i>Xi'an Jiaotong-Liverpool University</i>
2023	<i>University Summer Undergraduate Research Fellow</i>	<i>Xi'an Jiaotong-Liverpool University</i>
2022	<i>ABB Smart Innovation Competition: First prize(Rank 3/275)</i>	<i>ABB, B&R Industrial Automation</i>
2022	<i>University Academic Excellence Award (Rank 1/64)</i>	<i>Xi'an Jiaotong-Liverpool University</i>
2022	<i>University Summer Undergraduate Research Fellow</i>	<i>Xi'an Jiaotong-Liverpool University</i>

TEACHING EXPERIENCE

- **Research Assistant**
XJTU, Suzhou, China Fall 2023 – Spring 2024
 - * PID parameterization and tuning for the servo motors which drive for the Cartesian robot station and Tripodworkstation, respectively
 - * Designed the coding and implementation platform in Automation Studio affiliated to B&R Co.
 - * Applied servo motor control system and mastered the basic operation of its maintenance

SKILLS

- **Programming:** PDDL, ROS(noetic), Python, C/C++/C#, MATLAB, RAPID(ABB)
- **Tools:** ROS, Ubuntu20.04, Pybullet, Visual Studio, Blender, Unity 3D, SolidWorks, Fusion 360, PTC cero, CAD, Origin, MATLAB, SIMULINK,
- **Language:** Mandarin(Native), English(Fluent, IELTS 7.0)