Xueting Deng

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Education

Stony Brook University, Stony Brook, NY, USA — August 2021 - Dec 2026 (Expected)
PhD Candidate in Mechanical Engineering, minor in Computer Science
- Research Interests: AI-aided Robot/Mechanism Design, Generative Models, Robotics, Rehabilitation Device Design
- Coursework: Computer Vision, Mechanism Kinematics & Dynamics, Mobile Robotics & Autonomous, Algorithm

Stony Brook University, Stony Brook, NY, USA — August 2020 - May 2021
Master of Science in Mechanical Engineering

Hefei University of Technology, Hefei, Anhui, China — September 2016 - June 2020
Bachelor of Science in Mechanical Design, Manufacturing And Automation

Skills

Programming Languages: Python, C++, Matlab, Mathmatica, Pytorch
Machine Learning/AI: Deep Generative Models (VAEs, Diffusion), CNNs, Transformer, etc
Robotics: ROS/ROS2, Micro-ROS, Gazebo, Linux, Docker; SOC (Nvidia Jetson), Micro-controllers (ESP-32, Arduino), Sensors (2D Lidar, IMU, RGB Camera), Motors (with encoder)
Mechanical Design: Autodesk CAD, Solidworks, ANSYS
Certification: Robotics Software Engineer, Udacity

Professional Experience and Projects

Robotic Linkage Mechanism Synthesis - Research Assistant — August 2021 - Present
Python, Machine Learning, Deep Generative Models, Simulator Development

- Developed a **general spatial linkage mechanism simulator** with **Python** supporting six joint types, capable of simulating motion for any spatial linkage topologies.
- Built a **large-scale mechanism database** that includes all topologies of 1-DOF spatial Four-Bar, with **3-5 million** mechanisms and paths in each topology.
- Designed and trained a **conditional β-VAE with Transformer-based attention mechanism**, achieving **70.8%** valid mechanism synthesis from arbitrary target paths.
- Derived a **unified analytical framework** using **dual quaternions** and **Lie group/algebra** formulations, integrating joint types, geometric, velocity, and acceleration constraints for multiple families of spatial four-bar mechanisms.

Autonomous Differential Drive Robot — Personal Project — June 2024 - September 2025
ROS, C++, Gazebo, SLAM, Navigation, Robotics Hardware

- Designed and built a **two-wheel drive mobile robot** using a NVIDIA Jetson Nano, an ESP32-S3 controller, a 2D RPLIDAR-A1, a L298N motor driver, and DC motors with encoders.
- Set up Jetson Nano–ESP32 communication pipeline with **Micro-ROS**, enable high-level missions such as SLAM and navigation on the SOC while delegating low-level motor controller to the microcontroller.
- **Created C++ packages** include differential-drive kinematics, odometry, and PID velocity control on the microcontroller.
- Built a full Gazebo simulation environment and a physical robot, integrated Lidar data with SLAM Toolbox for mapping and localization, and configured the Navigation2 stack for autonomous path planning and execution.

Human Limb Rehabilitation Mechanism Design - Research Assistant — August 2019 - May 2021

- Captured and analyzed upper and lower limb motion trajectories from human subjects using Kinect and Vicon systems; applied **B-spline smoothing** and **K-Means clustering** to extract representative rehabilitation motions.
- Designed a mechanism based on a four-bar linkage, using **kinematic mapping** to replicate upper-limb motion; built and deployed a prototype in a partner nursing home for patient rehabilitation.

- Optimized a Watt-I **six-bar mechanism** with NSGA-II + ARSBX **multi-objective algorithm**, achieving high-fidelity tracking of three lower-limb trajectories while maintaining structural simplicity; fabricated and tested prototypes.

Internship - Mechanical Engineer Assistant June 2020 - July 2020
Chengdu Taicen Intelligent Equipment Co.,Ltd., Chengdu, Sichuan, China

- Supported design and prototyping of an automatic oil tank filling mechanism, improving structural stability of the Y-axis arm via applying topology optimization in ANSYS and cross-bar reinforcement.
- Modeled the full intelligent oil-drum production line in SolidWorks and collaborated with manufacturers on technical reviews and cost negotiations.

Honors and Awards

- Broadening Participation Fellows Award - The American Society of Mechanical Engineers IDETC 2024, USA
- Outstanding Undergraduate of Hefei University of Technology, 2020, China
- The 3^{rd} Prize of The 8^{th} National College Students Mechanical Innovation Design Competition in Anhui Province, 2018, China (State Level)

Publications

1. **Deng.X**, Nurizada.A, Purwar.A, "Path Synthesis of Spatial RSCR Mechanisms Using Deep Learning," Springer Frontiers of Mechanical Engineering, 2025.
2. **Deng.X**, Purwar.A, "A Matrix-based Approach to Unified Synthesis of Planar Four-Bar Mechanisms for Motion Generation with Position, Velocity, and Acceleration Constraints," ASME Journal of Computing and Information Science in Engineering, 2024.
3. **Deng.X**, Purwar.A, 'A General Simulation Framework and Path Synthesis of Spatial Four-Bar Mechanisms Using Deep Generative Models," ASME IDETC, 2025.
4. **Deng.X**, Purwar.A, Ge, Q.J, "A Unified Design Equation to Represent Geometric Constraints of Spatial SS, ES and SE Dyads," ASME IDETC, 2023.
5. Zhao.P, Zhang.Y, Guan.H, **Deng.X**, Cheng.H, "Design of a Single-DOF Immersive Rehabilitation Device for Clustered Upper Limb Motion," ASME Journal of Mechanisms Robotics, 2021.
6. Zhang.Y, **Deng.X**, Zhou.B, Zhao.P "Design and Optimization of a Multi-mode Single-DOF Watt-I Six-Bar Mechanism with One Adjustable Parameter," Springer Advances in Mechanism, Machine Science and Engineering in China, 2023.
7. Zhang.Y, Zhao.P, Gong.L, **Deng.X** "Trajectory Synthesis and Sensitivity Analysis of Six-Bar Mechanism for Gait Implementation," Springer Advances in Mechanism and Machine Science, 2023.
8. Song.W, Zhao.P, Li.X, **Deng.X**, Zi.B, "Data-Driven Design of a Six-Bar Lower-Limb Rehabilitation Mechanism Based on Gait Trajectory Prediction," IEEE Transactions on Neural Systems and Rehabilitation Engineering, 2022.

Patents

- Portable Automatic Paper Cutting Machine, 2020, China — CN 108994899 B
- An Upper Limb Rehabilitation Based on Motion Mapping and Virtual Reality Robot, 2021, China — CN 113101137 A

Leadership and Volunteering

Teaching Assistant August 2021 - Present
Mechanical Engineering Department, Stony Brook University, Stony Brook, NY, USA

- Helped students in robotics projects, MATLAB coding, 3D printing, CNC machine operation.
- Taught an introduction to CAD software class independently

Graduate Student Organization Senator September 2022- April 2024
Stony Brook University, Stony Brook, NY, USA

Volunteer Teacher in Computer Programming June 2017 - August 2017
Yonghe Village Elementary School, Guangyuan, Sichuan, China