Xueting Deng

xuetingdeng98@gmail.com 631-710-9586 xueting-deng-ddw Xueting-Deng

Education

Stony Brook University, Stony Brook, NY, USA — August 2021 - August 2026
PhD Candidate in Mechanical Engineering — (Expected)
Master of Science in Mechanical Engineering — August 2020 - May 2021

- Research Interests: AI-aided Robot/Mechanism Design, Generative Models, Robotics, Rehabilitation Device Design
- Coursework: Robot Kinematics & Dynamics, Mobile Robotics & Autonomous, Computer Vision, Algorithm

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

Professional Summary

Robotics engineer focused on intelligent mechanism design and full-stack robotic system integration. Experienced in co-designing mechanical morphology and machine learning models to enable adaptive, data-driven robotic behaviors. Skilled in translating modeling, optimization, and generative learning into deployable robotic hardware systems.

Skills

Mechanical Design: SolidWorks, Onshape, Autodesk CAD, ANSYS, Rapid Prototyping (3D Printing, Laser cutting, CNC)
Robotics: ROS/ROS2, Micro-ROS, Gazebo, Linux, Docker; SOC (Nvidia Jetson), Micro-controllers (ESP-32, Arduino), Sensors (Lidar, IMU, RGB Camera), Motors (with encoder)
Programming Languages: Python, C++, Matlab, Mathmatica, Pytorch
Machine Learning/AI: Deep Generative Models (VAEs, Diffusion), CNNs, Transformer, etc
Certification: Robotics Software Engineer, Udacity

Selected Projects

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

- Designed and built a complete mobile robotic platform, including compute (Jetson Nano), microcontroller (ESP32-S3), sensors (LiDAR, IMU, RGB Camera), motor drivers, and DC motors with encoders.
- Designed Micro-ROS communication architecture in between Jetson Nano and ESP32 to separate high-level autonomy (SLAM, sensor diffusion) from low-level motor control.
- Implemented differential-drive kinematics and closed-loop PID velocity control on an embedded microcontroller with encoder feedback. Calibrated wheel radius and track width parameters to reduce odometry drift by 35% over 10m traversal.
- Developed a full Gazebo simulation environment to validate system behavior before hardware deployment.
- Deployed SLAM (SLAM Toolbox) and Navigation2 stack for real-world autonomous mapping and navigation.

Robotic Linkage Mechanism Synthesis - Research Assistant — August 2021 - Present
Big-Scale Data, 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 (3–5M samples per topology) for design exploration.
- Designed and trained a conditional β-VAE with a Transformer-based attention mechanism to generate feasible mechanisms from target paths, achieving a 70.8% success rate under Chamfer distance threshold.
- Derived unified analytical framework using dual quaternions and Lie group formulation for spatial mechanism modeling. Integrating joint types, geometric, velocity, and acceleration constraints for multiple families of spatial four-bar mechanisms.

Dexterous Hands Design and Optimization — November 2025 - Present
Multi-DOF Mechanism Design, Optimization, Kinematics and Dynamics Analysis

- Re-designed a commercial 6-DOF dexterous hand under cost constraints, restricting modifications to finger length, linkage

dimensions, and spatial finger layout (12 structural parameters optimized).

- Developed a full forward kinematic and dynamic model to evaluate fingertip pose error and contact stability under varying object thickness (1–60 mm).
- Defined quantitative grasp metrics including fingertip normal alignment angle, contact force direction deviation, and workspace coverage.
- Implemented CMA-ES structural optimization, the optimized hand can achieve stable parallel and angled pinch for objects with different thicknesses.

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

Mechanism Design, Prototype Deployment

- Designed upper- and lower-limb rehabilitation mechanisms using four-bar and Watt-I six-bar linkages to replicate patient-specific motion trajectories.
- Fabricated and assembled functional prototypes; deployed in a partner nursing home for patient therapy evaluation.
- Processed motion capture data from human subjects using Kinect and Vicon systems; applied B-spline smoothing and K-Means clustering to extract representative rehabilitation motions.
- Optimized linkage parameters using NSGA-II + ARSBX multi-objective algorithm to minimize trajectory tracking error while reducing structural complexity. Achieved $\leq 5\%$ normalized path deviation across multiple lower-limb gait trajectories after optimization.

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)

Selected 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. 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.
5. 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.

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