Yufei Zhang

Tel: (+1) 646-713-5164 | E-mail: yz4917@columbia.edu | http://www.linkedin.com/in/zyffbk
Add.: 425 Summit Ave, Jersey City, New Jersey, 07306, United States

EDUCATION BACKGROUND

Columbia University in the city of New York 08/2024-Present
Master of Science in Engineering (GPA: 3.75/4.00)
Coursework: Advanced Spoken Language Processing, Robot Learning, Robotics Studio, Applied Robotics: Algorithms&software, Data Science For Mechanical Systems, Intro to Control Theory, Mechatronics & Emebedded Micro

University of California, San Diego 09/2023-01/2024
Exchange Programme
Coursework: Natural Language Processing, Mathematics for Robotics, Eng Hands-on Group Project

Beijing University of Technology(Project 211) 08/2020-07/2024
Bachelor of Engineering in Robot Engineering (Major GPA: 3.85/4.00; Overall GPA: 3.69/4.00)
Overall Average Score: 89.09%

PROFESSIONAL EXPERIENCES

Institute of Automation, Chinese Academy of Sciences, Beijing, China 06/2023-09/2023
Embedded Engineer Intern

- Participated in a reinforcement-learning–based dexterous manipulation project using a multi-finger, pure-motor-driven robotic hand.
- Implemented the real-time execution layer by porting the control framework to FreeRTOS, enabling deterministic low-latency control loops required for RL deployment.
- Rewrote joint-level motor drivers, encoder feedback modules, and initialization routines to support stable execution of RL-generated action commands.
- Assisted in integrating the RL policy pipeline (PPO/SAC-based) with the hardware controller through a ROS/TCP interface, supporting real-time action streaming and state feedback.
- Contributed to real-robot tests of manipulation policies, verifying trajectory tracking performance and system stability during RL fine-tuning.

Microsoft (China) Co,. Ltd. 01/2022-02/2022
MSRA Researcher

- Selected into the Microsoft Innovative Personnel Cultivation Program and participated in a project on multilingual dialogue generation.
- Processed large-scale conversational datasets and performed linguistic feature analysis, text normalization, and visualization using Python.
- Fine-tuned Transformer-based encoder–decoder models including mBART and mT5 for generating context-aware responses across multiple languages.
- Conducted experiments on sequence-to-sequence training with attention mechanisms, evaluating semantic coherence, relevance, and cross-language generalization.
- Integrated generated text with Azure Neural TTS (FastSpeech2 + HiFiGAN backend) to produce natural speech output for conversational AI scenarios.
- Participated in the design of the digital avatar pipeline, integrating speech synthesis with facial animation modules to drive mouth shapes and head motion in multilingual scenarios.

ACADEMIC PROJECTS & EXPERIENCE

Columbia University: 5-DOF Hippotherapy Rehabilitation System 09/2025–Present
Research Assistant (Advisor: Prof. Sunil K. Agrawal)

- Developed the dynamic model of a 5-degree-of-freedom hippotherapy rehabilitation platform, capturing pelvic rotations and translational motions essential for therapeutic replication of horse-riding gait.
- Formulated the full equations of motion using Lagrangian and Jacobian-based representations, modeling both rhythmic horse gait inputs and human–platform interaction forces.
- Builting a simulation environment to evaluate 5-DOF pelvic trajectories, stability envelopes, and rider balance responses under controlled perturbations.

Columbia University: LipSyncBot, Multi-Servo Viseme Control System for Expressive 02/2025–Present
Research Assistant (Advisor: Prof. Hod Lipson)

- Developed a multi-degree-of-freedom robotic lip mechanism using AL20C servos and a custom silicone mouth structure for expressive speech generation.
- Designed phoneme-to-viseme mapping for 44 English phonemes and created a servo-angle calibration GUI for real-time key-frame recording of 12 lip shapes.
- Implemented a Python-based lip-sync pipeline combining TTS-generated phoneme timing with servo trajectory interpolation for natural and synchronized articulation.
- Experimented with silicone casting, mold design, and material testing to improve compliance and appearance for human-robot interaction.

Columbia University: Wearable 3-RRR Spherical Parallel Mechanism Ankle Rehabilitation Robot 02/2025–Present

Graduate Researcher (Advisor: Prof. Sunil K. Agrawal)

- Participated in the design and refinement of a 3-RRR spherical parallel mechanism for human ankle rehabilitation, enabling pitch–roll–yaw rotation for clinical therapy.
- Contributed to dynamic modeling, Jacobian-based force mapping, workspace analysis, and passive spring-based compliance modulation.

Columbia University: Robotics Studio Course 02/2025-06/2025

Teaching Assistant (Advisor: Prof. Hod Lipson)

- Guided student teams in designing quadruped and other bio-inspired robots, providing technical support in CAD modeling, mechanical design, robot simulation, and reinforcement learning for legged systems
- Assisted students in setting up PyBullet simulation environments, implementing PPO-based reinforcement learning, tuning reward functions, and performing sim-to-real transfer for locomotion control.
- Developed instructional examples based on my own quadruped locomotion framework (peak simulated running speed 25.33 m/s) to demonstrate best practices in RL training, gait stability analysis, and robust controller design.
- Provided weekly debugging sessions, design advice for legged robot projects, and grading of project deliverables and technical reports for a class of more than 80+ students.

Real-Time Blind Motion Deblurring for Humanoid Robot Vision 09/2023 – 06/2024

Undergraduate Thesis, Beijing University of Technology (Advisor: Prof. Naigong Yu)

- Developed MoUGAN, a GAN-based real-time blind motion deblurring model combining MobileNetV3 and UNet for lightweight multi-scale image restoration.
- Designed improved modules including dataset augmentation, self-attention, bidirectional feature fusion, and cascaded dilated convolutions to enhance detail recovery.
- Implemented full PyTorch training pipeline with degradation modeling, GAN loss, perceptual loss, and adaptive learning-rate scheduling.
- Achieved 36.36 dB PSNR, 0.9211 SSIM, and 18.79s inference time on GoPro/Köhler datasets, outperforming prior methods in both quality and speed.
- Validated robustness across dynamic scenes and non-realistic images, demonstrating strong generalization for robotic vision tasks.

Ball-retrieval Car Design Based on Refined A* Algorithm 03/2023-06/2023

Programming Developer & Embedded System Designer

- Implemented an improved A* safety path planning algorithm with heuristic weight tuning and obstacle inflation, achieving 20–80% reduction in searched nodes while maintaining <5% change in path length, significantly improving navigation efficiency and safety.
- Built an autonomous navigation system integrating SLAM with enhanced A*, enabling stable cruising and dynamic obstacle avoidance in indoor environments.
- Developed a real-time vision module using color and contour features for accurate table-tennis ball detection and localization.
- Integrated ROS-based motion control and designed a PID controller to improve tracking accuracy during ball retrieval.
- Created Python tools for path visualization, map debugging, and performance evaluation, supporting algorithm verification and system optimization.

Robust Fault Diagnosis for Gas Turbine Rotor via Transfer Reinforcement Learning 12/2022-03/2023

Sole Author

- Proposed an improved DQN-based Transfer Reinforcement Learning method (Transfer-DQN) for robust gas turbine rotor fault diagnosis to embrace the difficulty of acquiring sensitive features and the lack of labelled data
- Collected vast gas turbine rotor mechanical fault data, preprocessed one-dimensional raw vibration signal, and split dataset into a training set and test set

- Applied multiple fault sample data as the source domain and a single fault class as the target domain, respectively, and performed the source-to-target domain transfer learning based on generative adversarial, and used multi-scale one-dimensional wide convolutional neural network (M-WDCNN) with the ε-greedy strategy for Q-network fitting and decision making
- Tested on the bearing dataset of Western Reserve University and domestic gas turbine test bench, and achieved accuracies of 98.95% and 96.91%, respectively, proving its robustness and efficiency
- Independently accomplished research, accepted by the 2023 IEEE International Conference on Systems, Man, and Cybernetics, and certified as CCF-C

RoboMaster Robotics Team (PIP Group) 08/2022-09/2023

Electrical Control Lead, Beijing University of Technology (Advisor: Prof. Xiangyin Zhang)

- Led the full-stack development of the Dart System, including firing control, embedded motor firmware, sensor integration, and stabilization logic.
- Designed and iteratively upgraded the Engineer Robot's electrical architecture, covering power distribution, actuator control, signal routing, and fault-tolerant system integration.
- Developed the Infantry chassis control system, implementing high-speed velocity control, cascaded PID tuning, and gimbal–chassis coordination for competitive maneuverability.
- Participated the Sentry robot's SLAM localization and autonomous navigation pipeline, integrating LiDAR/IMU fusion, real-time mapping, and global/local path-planning algorithms.
- Participated the team's UAV (Drone) control and perception pipeline, including flight-controller parameter tuning, visual marker tracking, and autonomous hovering/position-hold capabilities.
- Organized and instructed a Training Program for 50+ new electrical-control applicants, delivering structured lectures, hands-on labs, and technical evaluations; ultimately selected 30 qualified members for long-term development in the team.
- Coordinated mechanical, embedded, and vision subteams, ensuring system-level stability and robustness during high-intensity competition tasks.

PUBLICATIONS

Yufei Zhang. Robust Fault Diagnosis for Gas Turbine Rotor via Transfer Reinforcement Learning. 2023 IEEE International Conference on Systems, Man, and Cybernetics, Honolulu, Hawaii, USA, October, 2023. DOI: 10.1109/SMC53992.2023.10394000

Yufei Zhang, Henan Zhao, Zekai Yang, Tong Mo, Yiya Yao. Attention-based mask R-CNN for Microvascular Segmentation. 2023 7th International Conference on Electrical, Mechanical and Computer Engineering (ICEME 2023) (Manuscript No. YNMBNQGHJI, ISBN: 979-8-3503-8297-7). DOI: 10.1109/ICEMCE60359.2023.10490963

Yufei Zhang, Qianze Liu, Tong Mo, Yiya Yao. Attention U-net for Cell Instance Segmentation. 2023 China Automation Congress. DOI: 10.1109/CAC59555.2023.10450733

ADDITIONAL INFORMATION

Mapping Principal, **The 17th National College Student Smart Car Competition** 11/2021-01/2022

Programming Language: C, C++, Python

Software & Tool: Python, C/C++, MATLAB, Linux/Ubuntu, ROS, ROS2, Gazebo, PyBullet, Mujoco, Isaac Gym, rviz, OpenCV, Reinforcement Learning, A*, PID, PyTorch, TensorFlow, STM32CubeMX, FreeRTOS, Keil, UART/CAN/PWM communication, SolidWorks, Fusion 360, Blendor, Jupyter, VS Code, PyCharm, LaTeX.

Selected Awards:

- Digital-Design-Dimensions Show (second prize provincial award; National 3D Technology Application Capability
- Certification, Application Engineer V4)
- 2021 China Intelligent Robot Fighting and Competitive Competition (first prize provincial award in humanoid
- autonomous fighting; third price provincial award in robot visual confrontation)
- 2022 RoboMaster University Championship (third prize)
- The 17th National College Student Smart Car Competition (third prize)
- National Undergraduate Innovation and Entrepreneurship (project approval)
- Alibaba Cloud Apsara Clouder Certification