BINGYAO DU
+1 (646) 628 1056 | e: bd2747@columbia.edu

EDUCATION

Columbia University in the City of New York   Manhattan, NY
M.S. in Computer Science   Aug.2024 – Dec.2025 (expected)
- **GPA:** 3.96/4.00

Zhejiang University   Hangzhou, CN
B.Eng. in Computer Science and Technology   Sep. 2019 – Jun. 2023
- **GPA:** 3.86/4.00

PUBLICATION

- **B. Du**, J. Kim, Y. Lyu*. Gaussian Mixture–Based Inverse Perception Contracts for Uncertainty-Aware Robot Navigation. 2026 American Control Conference (ACC). (Under Review)

RESEARCH EXPERIENCE

Texas A&M University, Department of Computer Science & Engineering   Remote
Remote Research Intern with Prof. Yiwei Lyu   Jun.2025 – Sep.2025
Project: Gaussian Mixture based Inverse Perception Contract(GM-IPC) for Uncertainty-Aware Robot Navigation
- Developed a novel pipeline that enables robots to quantify and reason about fine-grained visual **perception uncertainty**, and adapt planning strategies accordingly
- Formalized the representation of GM-IPC as a union of ellipsoidal confidence regions, allowing expressing uncertainty in multi-modal and irregular forms beyond the limitations of single-ellipsoid IPC.
- Proposed a new learning framework for training GM-IPC from empirical perception data and ground truth estimates, together with **theoretical guarantees** on probabilistic coverage
- Integrated GM-IPC with **MPC-CBF** planner to form an **online perception–planning** pipeline
- Demonstrated GM-IPC through uncertainty-set validity and navigation experiments, achieving >95% coverage for >97% of steps across all scenarios and outperforming baselines in both navigation efficiency and no-collision rate

Columbia Engineering   Manhattan, NY
Student Researcher   Feb.2025 – May.2025
Project: Tactile-based Online Active Shape Exploration and Reconstruction
- Designed and trained a **reinforcement learning** agent to actively explore unseen object surfaces using only **tactile sensing**
- Built the full interaction and exploration pipeline in **Isaac Sim/Isaac Lab**, including motion control and scene management
- Modeled a custom dot-matrix TacTip tactile sensor in **URDF** with Isaac Sim's contact-sensing API
- Developed information-gain-based reward functions that encourage active touching of geometry-rich regions such as edges and corners for **PPO** algorithm
- Trained and evaluated the policy with custom metrics (e.g., Chamfer distance to ground truth, surface occupancy), demonstrating effective exploration of high-information areas

Columbia Engineering   Manhattan, NY
Student Researcher at Prof. Matei Ciorcarlie's Lab   Jan.2025 – May.2025
Project: HAMDEM: Tactile-Based Shape Exploration and Recognition with Dexterous Robotic Hand
- Working toward a reinforcement-learning framework that enables the **ROAM Hand** to explore and recognize unseen objects using fingertip tactile sensing
- Designed the action space and simulated tactile exploration environment; conducted preliminary testing with random exploration policies
- Implemented an initial data-driven categorization pipeline and a unified RL + recognition codebase supporting touch–collect–classify workflows

Zhejiang University, Department of Computer Science and Technology　　　　Hangzhou, CN
Dissertation Project, Advisor: Prof. Guofeng Zhang　　　　　　　　　　　Jan.2023 – Jun. 2023
Project: High-precision Reconstruction of Dynamic Scene using Neural Radiance Field(NeRF)
- Researched on high-precision **3D reconstruction of both static and dynamic scenes** based on **NeRF**
- Achieved a 30× training speedup over the NeuS baseline for static scenes while maintaining comparable reconstruction accuracy by integrating **multi-resolution hash encoding** and **NeuS volume rendering**
- Designed a linear voxel-level **future-frame prediction** strategy to mitigate cumulative reconstruction errors over long frame sequences
- For dynamic scenes, outperformed our baseline D-NeRF by a 20x training **acceleration** while maintaining consistent reconstruction **accuracy** with our static scene method

PROFESSIONAL EXPERIENCE

Machine Learning Research Intern at AIML.com　　　　　　　　　　Jun.2025 – Aug.2025
- Built **instance-segmentation** pipelines for cluttered retail checkout images. Implemented a weakly supervised baseline (**saliency** + **GrabCut** + **ViT classification**) and fine-tuned an annotation-free object detection and segmentation framework CutLER (CVPR'23) to improve counting and detection accuracy under varying clutter levels
- Developed a facial **makeup-transfer** system using parsing maps, **Poisson blending**, and fine-tuned a **GAN**-based locally controllable makeup transfer model EleGANt (CVPR'23). Evaluated identity preservation and realism using **Dlib** face similarity, region-level color metrics, and FID
- Authored detailed technical reports and presented project outcomes to the research teams, highlighting quantitative performance gains and deployment feasibility

RELATED PROJECTS

Region-Attentioned Text-guided 3D Deformation　　　　　　　　　　　　Fall, 2024
- Developed a GAN-inspired, **attention**-based method for **text-guided 3D point cloud deformation**, extending the ChangeIt3D framework to enable precise region-focused editing.
- Trained a **PointNet** part segmentor on 8 object categories and extracted region labels from text editing instructions by integrating **Llama-3**, enabling part-level attention maps for localized deformation.
- Integrated the attention module into deformation network and retrained the model on filtered region-focused editing dataset
- Achieved a 68% improvement in shape-wise similarity while maintaining comparable linguistic-visual alignment to the baseline.

Mask Wearing Detection System based on Deep Learning　　　　　　　　　Fall, 2022
- Built a deep-learning pipeline for mask-wearing detection in unconstrained face images
- Implemented the **MTCNN** algorithm for human face detection and **MobileNet** for mask detection
- Fine-tuned model hyperparameters and training configurations to optimize accuracy
- Evaluated the algorithm on provided dataset, achieving an accuracy rate of 98% on test set

SELECTED AWARDS AND HORNERS

- Second Prize in National College Student Mathematics Competition (top 12%)　　2022
- Academic Excellence Award in Zhejiang University　　　　　　　　　　　　　2020
- Zhejiang University Scholarship, Third Prize (top 20%)　　　　　　　　　　　2020

TECHNICAL SKILLS

- **Programming Languages**: Python, C++, C, Java, MATLAB, Bash
- **Machine Learning & Vision**: PyTorch, TensorFlow, Keras, NumPy, SciPy, scikit-learn, OpenCV, Open3D, Blender, MeshLab
- **Robotics & Simulation**: Isaac Sim, Isaac Lab, URDF, ROS/ROS2, Bambu Studio
- **Tools & Development:** Git, Docker, Linux, Jupyter, Visual Studio Code