Yipai Du

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Education

- **The Hong Kong University of Science and Technology** — Hong Kong, China
  Doctor of Philosophy - Electronic and Computer Engineering — *2019.9 - 2024.5*
  Affiliated to the Robotics Institute of HKUST
  PhD Thesis: *Vision-based Tactile Sensing: Principle, Process and Practice*
  Supervisor: *Prof. Michael Yu Wang and Prof. Bertram Emil Shi*

- **ETH Zurich** — Zurich, Switzerland
  Exchange Student - Robotics, Systems and Control — *2018.8 - 2019.9*
  One year exchange with courses, semester thesis and master thesis
  Semester Thesis: *Elevation Mapping in Autonomous Forestry, supervised by Prof. Marco Hutter*
  Master Thesis: *Learning Dynamical Features for Vision-based Tactile Sensors, supervised by Prof. Raffaello D'Andrea*

- **KTH Royal Institute of Technology** — Stockholm, Sweden
  Master of Science - Systems, Control and Robotics — *2017.8 - 2019.9*

- **University of Michigan-Shanghai Jiao Tong University Joint Institute** — Shanghai, China
  Bachelor of Science - Electrical and Computer Engineering — *2014.9 - 2018.8*
  Graduation with Honor, Shanghai City

Experience

- **Visiting Scholar** — West Lafayette, USA
  Purdue University — *2022 - 2023*
  - **Supervisor**: Prof. Yu She
  - **Participated the development of Pytact**: A framework to calibrate the tactile sensor and extract the tactile information that supports GelSight and Digit sensor.
  - **Developed the Allegro-Digit package**: A ROS package that integrates the Allegro robotic hand and the Digit tactile sensor for tactile processing and control.
  - **Explored to improve the efficiency of learning tactile in-hand manipulation**: Apply model-based tactile processing to reduce the perception dimensionality. Exploit the finger kinematics to pre-filter the feasible action space. Utilize an uncertainty-aware dynamics model to learn the complex contact dynamics between the hand and the object.

- **Graduate Teaching Assistant** — Hong Kong, China
  The Hong Kong University of Science and Technology — *2021 - 2022*
  - **Courses**: Advanced Deep Learning Architectures, Signal and Systems

- **Software Engineer Intern** — Beijing, China
  Horizon Robotics — *2016 - 2017*
  - **Duties**: Developed high definition map software to generate map used for autonomous driving. Assisted with hardware installation, calibration and vehicle on-road testing.

- **Undergraduate Teaching Assistant** — Shanghai, China
  University of Michigan - Shanghai Jiao Tong University Joint Institute — *2015 - 2017*
  - **Courses**: Signal and Systems, Business Communication, Honors Mathematics, Honors Calculus

Research Focus

- **Deformable tactile manipulation**: Robotic manipulation on clothes with multimodal vision-based tactile feedback. The focus is on high-resolution contact detection and hybrid force-position trajectory planning (ROBIO 2024).
- **Tactile in-hand manipulation**: Learning to adjust the pose of a small stick in the Allegro robotic hand with the Digit tactile sensor on real hardware, with a focus on data and model efficiency (IROS 2024).
- **Vision-based tactile information processing**: Reconstruction of 3D contact and estimation of contact force, object geometry and pose from it (RA-L 2022, RA-L 2021). Sparse visual and tactile signal extraction and processing (ICRA 2022).
- **Design and application of vision-based tactile sensors with different forms**: Tactile gripper for robotic manipulation (RA-L 2022). Visual-tactile dual modality sensor to obtain both visual signal from the world and tactile signal when in contact (ICRA 2022). Tactile foot for robotic leg balancing (ICRA 2021). Tactile arm for human-robot interaction (CASE 2020).

Publications

- **Yipai Du**, Shoaib Aslam, Michael Yu Wang, Bertram E. Shi, "Hanging a T-Shirt: A Step towards Deformable Peg-in-Hole Manipulation with Multimodal Tactile Feedback," in *IEEE International Conference on Robotics and Biomimetics (ROBIO)*, 2024
- **Yipai Du**, Pokuang Zhou, Michael Yu Wang, Wenzhao Lian and Yu She, "Stick Roller: Precise In-hand Stick Manipulation with a Sample-Efficient Tactile Model," in *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2024
- **Yipai Du**, Guanlan Zhang and Michael Yu Wang, "3D Contact Point Cloud Reconstruction From Vision-Based Tactile Flow," in *IEEE Robotics and Automation Letters (RA-L)*, 2022
- Guanlan Zhang, **Yipai Du**, Hongyu Yu and Michael Yu Wang, "DelTact: A Vision-based Tactile Sensor using a Dense Color Pattern," in *IEEE Robotics and Automation Letters (RA-L)*, 2022
- Qi Wang*, **Yipai Du*** and Michael Yu Wang, "SpecTac: A Visual-Tactile Dual-Modality Sensor Using UV Illumination," in *International Conference on Robotics and Automation (ICRA)*, 2022
- Guanlan Zhang, **Yipai Du**, Yazhan Zhang and Michael Yu Wang, "A Tactile Sensing Foot for Single Robot Leg Stabilization," in *IEEE International Conference on Robotics and Automation (ICRA)*, 2021
- **Yipai Du**, Guanlan Zhang, Yazhan Zhang and Michael Yu Wang, "High-resolution 3-dimensional Contact Deformation Tracking for FingerVision Sensor with Dense Random Color Pattern," in *IEEE Robotics and Automation Letters (RA-L)*, 2021
- Yazhan Zhang, Guanlan Zhang, **Yipai Du** and Michael Yu Wang, "VTacArm. A Vision-based Tactile Sensing Augmented Robotic Arm with Application to Human-robot Interaction," in *IEEE International Conference on Automation Science and Engineering (CASE)*, 2020
- Jiajun Shi*, Wenjie Yin*, **Yipai Du*** and John Folkesson, "Automated Underwater Pipeline Damage Detection using Neural Nets," in *ICRA Workshop on Underwater Robotics Perception*, 2019

Honors and Awards

- Research Travel Grant, HKUST - 2023 and 2024
- Second Place, HKUST Three Minute Thesis Competition - 2023
- Overseas Research Award, HKUST - 2022
- Best Teaching Assistant, HKUST - 2022
- Erasmus Scholarship, ETH Zurich - 2018
- KTH Opportunity Scholarship, KTH - 2018
- Graduation with Honor, Shanghai City - 2018
- Excellent Teaching Assistant Mentor, UM-SJTU Joint Institute - 2018
- Yuliming Scholarship, UM-SJTU Joint Institute - 2017 and 2018
- KTH Scholarship, KTH - 2017
- Excellent Intern, Horizon Robotics - 2017
- Excellent Teaching Assistant, UM-SJTU Joint Institute - 2017
- SJTU Excellent Academic Scholarship, SJTU - 2015, 2016 and 2017
- Meritorious Winner in Mathematical Contest in Modeling, COMAP - 2016

Skills Summary

- **Languages**: Python, C++, Matlab
- **Frameworks**: OpenCV, Pytorch, ROS, Scikit, CVXPY, TensorFlow, Keras
- **Hardware Experience**: GelSight/Digit/DelTact/ETH/SpecTac Tactile Sensors, Kinova/UR/Franka Emika Panda Robotic Arms, Allegro Robotic Hand, Zed/Kinect Azure RGBD Cameras

Academic Services

- Reviewer for IEEE Robotics and Automation Letters (RA-L)
- Reviewer for IEEE Sensors Journal
- Reviewer for IEEE International Conference on Robotics and Automation (ICRA)
- Reviewer for IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)