Pijuan Yu, Ph.D. Candidate

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Research Interests

Research interests lie in haptics, robotics, and human-computer interaction. Current research focuses on developing remote haptic communication frameworks to render high-resolution tactile sensations between nurse and doctor in virtual and mixed reality (VR/MR).

Education

Aug 2022 – current **Ph.D. in Mechanical Engineering**, *Texas A&M University, College Station, USA*
GPA: 4.00/4.00
Advisor: Rebecca Friesen
Committee: Rebecca Friesen (chair), M. Cynthia Hipwell, Kiju Lee, & Thomas Ferris

Aug 2020 – Dec 2021 **M.S. in Mechanical Engineering**, *Northwestern University, Evanston, USA*
GPA: 3.91/4.00
Advisor: Kevin Lynch, Matthew Elwin
Minor in Engineering Management

Aug 2018 – May 2020 **B.S. in Mechanical Engineering**, *Florida Institute of Technology, Melbourne, USA*
GPA: 3.51/4.00
Honor: Cum Laude

Sep 2016 – Jun 2018 **B.S. in Energy and Power**, *Wuhan Institute of Technology, Wuhan, China*

Work Experience

Aug 2022 – Current **Graduate Research Assistant,** *Texas A&M University, College Station, TX*
- Developed a robotic visuo-haptic platform for remote medical palpation; achieved 75% tumor diagnostic accuracy in 18 participants, proving passive haptic feedback alone sufficed for size perception (Published).
- Integrated a commerical wearable VR haptic glove with Unity to provide force feedback; 40-subject study showed 25% tactile acuity gain via mimicking motions (Submitted).
- Designed a low-cost, high-resolution soft haptic display toolkit (4 x 4 fingertip size tactile array) to democratize access to high-fidelity tactile interfaces (Published).
- Developed and currently validating a haptic telepalpation system that streams high-resolution sensory data from a wearable glove to a soft tactile array via ROS 2; ongoing human studies (N=12) are assessing system efficacy in lump detection and size discrimination tasks.

Apr 2022 – Aug 2022 **Research Technician,** *The Feinberg School of Medicine (Northwestern University), Chicago, IL*
- Designed MRI-compatible pneumatic tactile actuator (PIC32/custom PCB board) delivering 1.57 N – 11.60 N constant-force; fMRI validation with 6 subjects.

Jan 2022 – Mar 2022 **ROS Specialist Internship,** *Quanticity, Chicago, IL*
- Led a 4-member team to deploy an autonomous ground vehicle in Gazebo robot simulation with visual SLAM and ROS 2 Galactic navigation.

Jun 2021 – Dec 2021 **Research Assistant,** *Center for robotics and biosystems (Northwestern University), Evanston, IL*
- Integrated Intel T265 tracking cameras and realsense depth camera D435i across three omni-directional robots, implementing AprilTag detection in ROS/OpenCV.
- Developed a C++/OpenCV pipeline to calibrate dual fisheye lenses and generated 3D point clouds for disparity maps in ROS Noetic to enable real-time obstacle avoidance for mobile robots.
- Implemented formation control and leader-follower algorithms for swarm control.

Publications

Journal Articles (Peer-Reviewed)

1. **P. Yu**, L. C. Batteas, T. K. Ferris, M. C. Hipwell, F. Quek, and R. F. Friesen, "Investigating passive presentation paradigms to approximate active haptic palpation," *IEEE Transactions on Haptics (ToH)*, vol. 18, no. 1, pp. 208–219, 2025. DOI: 10.1109/TOH.2024.3523259.
2. M. Harnett, A. K. Lacy, **P. Yu**, and R. F. Friesen, "Haptic interaction methods for freehand contour generation on a refreshable pin display," *Journal of Computing and Information Science in Engineering (JCISE)*, vol. 25, no. 3, p. 031 003, Jan. 2025, ISSN: 1530-9827. DOI: 10.1115/1.4067417.

Conference Proceedings (Full Length, Peer-Reviewed)

1. **P. Yu**, A. Urquhart, A. Kawazoe, T. K. Ferris, M. C. Hipwell, and R. F. Friesen, "Soft haptic display toolkit: A low-cost, open-source approach to high resolution tactile feedback," in *22nd International Conference on Ubiquitous Robots (UR)*, IEEE, 2025, pp. 59–66. DOI: 10.1109/UR65550.2025.11078133.
2. M. Harnett, **P. Yu**, and R. F. Friesen, "Texture design for diverse virtual touch sensations: Perceptual breadth of parameter-driven turing patterns," in *International Design Engineering Technical Conferences and Computers and Information in Engineering Conference (IDETC-CIE)*, American Society of Mechanical Engineers (ASME), 2025.
3. A. Kawazoe, **P. Yu**, T. K. Ferris, R. F. Friesen, and M. C. Hipwell, "The impact of palpation motion on capturing lumps in tissue with a force sensor," in *2025 IEEE World Haptics Conference (WHC)*, 2025, pp. 236–242. DOI: 10.1109/WHC64065.2025.11123191.

Preprints and Submitted Manuscripts

1. **P. Yu**, G. Couch, T. K. Ferris, M. C. Hipwell, and R. F. Friesen, "Haptic acuity during shared grasp experiences in virtual reality," *TechRxiv Preprint*, 2025, submitted to IEEE Transactions on Haptics (ToH). DOI: 10.36227/techrxiv.175561688.83754873/v1.
2. M. Harnett, **P. Yu**, and R. F. Friesen, "Texture design for diverse virtual touch sensations: Perceptual breadth of parameter-driven turing patterns," submitted to Journal of Computing and Information Science in Engineering (JCISE), 2025.

Manuscripts in Preparation

1. **P. Yu**, A. Kawazoe, A. Urquhart, T. K. Ferris, M. C. Hipwell, and R. F. Friesen, "Towards high fidelity remote palpation system," in preparation for submission to 2026 IEEE Haptics Symposium (HAPTICS), 2025.

Conference Contributions & Work-in-Progress Papers

Apr 30, 2024 — **P. Yu** and R. F. Friesen (2024). Sharing grasping experiences in virtual reality. *The 2024 Texas Regional Robotics Symposium (TEROS), College Station.* (Conference Poster)

Apr 7, 2024 — **P. Yu** and R. F. Friesen (2024). Exploring shared grasping experiences in virtual reality. *2024 IEEE Haptics Symposium (HAPTICS), Long Beach.* (Hands-on demonstration; work-in-progress paper) [Video Link]

Aug 20, 2023 — **P. Yu** and R. F. Friesen (2023). Rubber hand illusion induced by a 3-dimensional platform for passive touch in remote palpation. *2023 ASME IDETC-CIE, Boston.* (Extended abstract; Oral presentation)

Jul 10, 2023 — L. C. Batteas, D. J. Volpi, **P. Yu**, K. Kyei-Amponsah, F. Quek, R. F. Friesen, and M. C. Hipwell (2023). Optimizing passive presentation strategies for improved interpretation of haptic replay experiences. *2023 IEEE World Haptics Conference (WHC), Delft*, Netherlands. (Work-in-progress paper) [Link]

Selected Projects

Mar 2021 – Jun 2021 **Dual UR5 Arms Assembly,** *Northwestern University, Evanston, IL*
- Automated dual UR5 robotic arm assembly workflows using ROS (Robot Operating System) and MoveIt!, developing Lua/Python scripts to simulate collaborative tasks in CoppeliaSim.
- Engineered a dual-arm assembly platform to assemble four subcomponents into a primary unit, improving process efficiency by 20% compared to manual methods.

Sep 2019 – Apr 2020 **Electrical Formula SAE,** *Florida Institute of Technology, Melbourne, FL*
- Designed and integrated a cooling system (radiator, fan shroud, electric fan, water pump) using Simulink simulations, reducing motor overheating risk by 35% during endurance testing.
- Developed a 3D-printed SolidWorks motor shield prototype to protect critical components from environmental debris, extending hardware lifespan by 50% in harsh conditions.

Selected Activities

Jul 2025 **Student Ambassador in 2025 Ubiquitous Robots Conference,** *College Station, TX*
- Ensured operational readiness of audiovisual systems for all technical sessions, performing equipment checks and providing real-time troubleshooting to prevent delays.
- Provided on-stage assistance to international speakers and academic presenters, facilitating seamless presentations and managing presentation materials.

Feb 2024 **Houston Elementary S.T.E.M. Night,** *Bryan, TX*
- Led demonstrations of the WEART TouchDiver Haptic Glove to elementary students and their families, enhancing STEM education.
- Highlighted the glove's touch simulation capabilities, promoting engagement and interactive learning in STEM.

Skills

Coding	Python (Advanced) | C/C++ | C# | R | MATLAB
Robotics	ROS1/ROS2 | OpenCV | SLAM | Navigation | Moveit! | Gazebo | CoppeliaSim | Socket/Serial Communication | Forward/Inverse kinematics
Mechatronics	Raspberry Pi | Arduino | PIC32 Microcontroller | PCB Design | PWM | NI DAQ Systems | DC/Servo/Stepper Motors | Pneumatic Systems
Mechanical	Finite element analysis (FEA) | Solidworks | OnShape | Fusion 360 | ANSYS Workbench | MATLAB Simulink | 3D Printers | Soft flexible material
UI Design	Unity (VR/MR interface) | Universal Windows Platform (UWP) | Python Tkinter
Languages	English (Fluent) | Mandarin Chinese (Proficient)

Honors/Memberships

Awards and Achievements

2022 - current **NSF Funded Graduate Research Fellowship** , Texas A&M University

2023 - 2024 **Graduate Student Travel Award** , J. Mike Walker '66 Department of Mechanical Engineering in Texas A&M University

2020 **Cum Laude**, College of Engineering in Florida Institute of Technology

Membership

2024 - current **Student Member**. American Society of Mechanical Engineers (ASME)

Student Member. Institute of Electrical and Electronics Engineers (IEEE)

2022 **Member**. Texas A&M University's RoboMasters Robotics team