WANWEN CHEN

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RESEARCH INTERESTS

I am interested in ultrasound imaging and analysis, deep learning, and image guidance for robotic surgery.

EDUCATION

University of British Columbia **Vancouver, BC**
Ph.D. student in Electrical and Computer Engineering *Sep 2021 - present*
Advisor: Dr. Tim Salcudean

Carnegie Mellon University **Pittsburgh, PA**
M.S. in Robotics (GPA: 4.12/4.33) *Aug 2019 - Aug 2021*
Advisor: Dr. John Galeotti
Thesis: Ultrasound-based Needle Tracking and Lateral Manipulation Planning for Common Needle Steering

Peking University **Beijing, China**
B.S. in Theoretical and Applied Mechanics (GPA: 3.78/4.0) *Sep 2015 - Jul 2019*
Thesis: Sensor Fusion for Attitude Measurement Based on Quaternions and Kalman Filter

University of California, Los Angeles **Los Angeles, CA**
Cross-disciplinary Scholars (CSST) Summer Program (GPA:4.0/4.0) *Jul 2018 - Sep 2018*

RESEARCH EXPERIENCE

Robotics and Control Lab, University of British Columbia **Vancouver, BC**
Research Assistant, Advisor: Dr. Tim Salcudean *Sep 2021 - present*

- Researching deep learning for tumor segmentation and ultrasound-MRI registration for image guidance during robotic surgery.

Biomedical Image Guidance Lab, Carnegie Mellon University **Pittsburgh, PA**
Research Assistant, Advisor: Dr. John Galeotti *Oct 2019 - Aug 2021*

- Researched ultrasound-based needle tracking for autonomous robotic needle insertion.
- Developed an optical flow-based tissue motion segmentation algorithm to track hardly visible needle.
- Designed an on-line needle tracking algorithm fusing ultrasound-based needle detection algorithms and robot kinematics to track the needle under various visibility.
- Built a novel weighted-RANSAC real-time bent needle C++/Python binding tracking algorithm.
- Stuided using classical image pre-processing and optical flow to guide AI learning better in lung disease diagnosis and segmentation in lung ultrasound.

The Robotics Research Group, Peking University **Beijing, China**
Advisor: Dr. Qining Wang *Sep 2017 - May 2019*

- Researched inertial sensors-based human motion measurement and human locomotion recognition algorithms for prosthesis and wearable robots.
- Designed a joint angle measurement algorithm for swimming strokes measurement based on inertial sensors in Matlab and C.
- Analyzed the patterns of knee joint angle in four swimming strokes and built machine learning models to classify swimming strokes with inertial sensor signals.
- Developed deep learning models to classify locomotion mode using signals from a strain gauge in prosthesis.
- Wrote on-board neural network training and classification algorithms in C/C++ for real-time locomotion mode recognition in robotic transtibial prostheses.

Biomechatronics Lab, University of California, Los Angeles **Los Angeles, CA**
Advisor: Dr. Veronica J. Santos *Jul 2018 - Sep 2018*

- Researched human hand motion primitives during search and retrieval of a buried object in sand.
- Calibrated an inertial measurement units network with 18 sensors and created an animation framework for displaying hand movement in Python.
- Used machine learning models to discover human hand motion patterns and to classify motion intentions.

PUBLICATIONS

"" represents that the authors contributed to the manuscript equally.*

W2 Gare, G. R. *, **Chen, W.***, Hung, A. L. Y., Chen, E., Tran, H. V., Fox, T., Lowery, P., Zamora, K., deBoisblanc, B. P., Rodriguez, R. L. and Galeotti, J. The Role of Pleura and Adipose in Lung Ultrasound AI. (Accepted by *MICCAI 2021 workshop on Lessons Learned from the development and application of medical imaging-based AI technologies for combating COVID-19*).

W1 Hung, A. L. Y., Sun, Z., **Chen, W.**, and Galeotti, J. (2021). Hierarchical Probabilistic Ultrasound Image Inpainting via Variational Inference. In *Deep Generative Models, and Data Augmentation, Labelling, and Imperfections, DGM4MICCAI 2021, DALI 2021* (pp. 83-92). Springer, Cham.

C3 **Chen, W.**, Mehta, K. N., Bhanushali, B. D., and Galeotti, J. (2021, April). Ultrasound-Based Tracking Of Partially In-Plane, Curved Needles. In *2021 IEEE 18th International Symposium on Biomedical Imaging (ISBI)* (pp. 939-943). IEEE.

C2 Hung, A. L. Y., **Chen, W.**, and Galeotti, J. (2021, April). Ultrasound Confidence Maps Of Intensity And Structure Based On Directed Acyclic Graphs And Artifact Models. In *2021 IEEE 18th International Symposium on Biomedical Imaging (ISBI)* (pp. 697-701). IEEE.

J2 Wang, Q., Zhou, Z., Zhang, Z., Lou, Y., Zhou, Y., Zhang, S., **Chen, W.**, Mao, C., Wang, Z., Lou, W. and Mai, J. (2020). An Underwater Lower-Extremity Soft Exoskeleton for Breaststroke Assistance. IEEE *Transactions on Medical Robotics and Bionics*, 2(3), 447-462.

J1 Feng, Y., **Chen, W.**, and Wang, Q. (2019). A strain gauge based locomotion mode recognition method using convolutional neural network. *Advanced Robotics*, 33(5), 254-263.

C1 Mai, J., **Chen, W.**, Zhang, S., Xu, D., and Wang, Q. (2018, October). Performance analysis of hardware acceleration for locomotion mode recognition in robotic prosthetic control. In *2018 IEEE International Conference on Cyborg and Bionic Systems (CBS)* (pp. 607-611). IEEE.

PRESENTATIONS

Ultrasound-based Tracking of Partially In-plane, Bending Needle
International Symposium on Biomedical Imaging 2021, Nice, France (Virtual) *April 2021*
Presented in the poster session.

Human Hand Motion Primitives During Haptic Search and Retrieval of Buried Objects in Sandbox
UCLA CSST Research Program, Los Angeles, CA *Sep 2018*
Presented in Mechanical and Aerospace Engineering Peer Seminar and awarded for Outstanding Research and Presentation.
Presented in a poster presentation for final presentation of CSST research program.

ADDITIONAL TRAINING

Medical Augmented Reality Summer School **Zürich, Switzerland (Virtual)**
University of Balgrist *Aug 2021 - Sep 2021*
Two weeks of lectures on medical AR/VR with a competition of projects in AR-assisted surgery.

TEACHING EXPERIENCE

College of Engineering, Peking University **Beijing, China**
Tutor for Mathematics in Engineering *Feb 2019 - Jun 2019*
- Provided classes and support to sophomores for concepts clarification and exam reviews.

College of Engineering, Peking University **Beijing, China**
Tutor for Introduction to Computation *Sep 2018 - Jan 2019*

- Provided classes and supports to freshmen for concepts clarification, programming skills training and exam reviews.
- Advised freshmen on their academic development.

AWARDS

- President's Academic Excellence Initiative PhD Award — University of British Columbia, Sep 2021
- International Tuition Award — University of British Columbia, Sep 2021
- **2021 Four Year Doctoral Fellowship** — University of British Columbia, Sep 2021
- **Excellent Graduate (top 17%)** — Peking University, Jun 2019
- Outstanding Project in Undergraduate Student Research in College of Engineering — Peking University, Jun 2019
- Outstanding Research and Presentation at the Mechanical and Aerospace Engineering Peer Seminar — CSST Program, UCLA, Sep 2018
- Meritorious Winner in Interdisciplinary Contest In Modeling — COMAP, Apr 2018
- Gong Qiaoyu Scholarship — Peking University, 2017, 2018
- Yang Fuqing and Wang Yangyuan Academician Scholarship — Peking University, 2016

SKILLS AND INTERESTS

Programming	Python, Matlab, C/C++
Tools and Frameworks	OpenCV, PyTorch, ROS, Tensorflow, LaTeX, Git, Docker
Languages	Mandarin, English, Cantonese

EXTRA-CIRRUCULAR ACTIVITIES

Women in Engineering, University of British Columbia — **Vancouver, BC**
High School Mentorship — *Sep 2021 - present*

- Provide inclusive and equitable access to information about engineering and support students as they navigate the university application process.
- Offer professional, academic, and interpersonal guidance to students as they transition into post-secondary.
- Meet with my mentee and develop learning objectives and review them periodically.

The Robotics Institute, Carnegie Mellon University — **Pittsburgh, PA**
Master Students Mentor — *Sep 2020 - Dec 2020*

- Provided advice on academic development for three first-year master students.

Cantonese Development Society, Peking University — **Beijing, China**
Vice President & Publicity Department — *Sep 2017- May 2018*

- Managed the finance of the association.
- Organized Cantonese learning courses including student management and courses materials distribution.
- Designed publicity materials such as posters, tickets and souvenirs for multiple events.