

WANWEN CHEN

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RESEARCH INTERESTS

Ultrasound Imaging and Analysis, Deep Learning, Image Guidance for Robotic Surgery

EDUCATION

University of British Columbia

Ph.D. student in Electrical and Computer Engineering

Advisor: Dr. Tim Salcudean

Vancouver, BC

Sep 2021 - present

Carnegie Mellon University

M.S. in Robotics (GPA: 4.12/4.33)

Advisor: Dr. John Galeotti

Thesis: Ultrasound-based Needle Tracking and Lateral Manipulation Planning for Common Needle Steering

Pittsburgh, PA

Aug 2019 - Aug 2021

Peking University

B.S. in Theoretical and Applied Mechanics (GPA: 3.78/4.0)

Thesis: Sensor Fusion for Attitude Measurement Based on Quaternions and Kalman Filter

Beijing, China

Sep 2015 - Jul 2019

University of California, Los Angeles

Cross-disciplinary Scholars (CSST) Summer Program (GPA:4.0/4.0)

Los Angeles, CA

Jul 2018 - Sep 2018

RESEARCH EXPERIENCE

Robotics and Control Lab, University of British Columbia

Research Assistant, Advisor: Dr. Tim Salcudean

Vancouver, BC

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

Research Assistant, Advisor: Dr. John Galeotti

Pittsburgh, PA

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.
- Studied 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

Advisor: Dr. Qining Wang

Beijing, China

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

Advisor: Dr. Veronica J. Santos

Los Angeles, CA

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. In *Clinical Image-Based Procedures, Distributed and Collaborative Learning, Artificial Intelligence for Combating COVID-19 and Secure and Privacy-Preserving Machine Learning* (pp. 141-149). Springer, Cham.
- 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 Needle Tracking and Lateral Manipulation Planning for Common Needle Steering

Master of Robotics Thesis Talk, Pittsburgh, PA (Virtual)

Aug 2021

Presented as my speaking qualifier.

Ultrasound-based Tracking of Partially In-plane, Bending Needle

International Symposium on Biomedical Imaging 2021, Nice, France (Virtual)

Apr 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

University of Balgrist

Zürich, Switzerland (Virtual)

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

Tutor for Mathematics in Engineering

Beijing, China

Feb 2019 - Jun 2019

- Provided classes and support to sophomores for concepts clarification and exam reviews.

College of Engineering, Peking University

Tutor for Introduction to Computation

Beijing, China

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

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| • 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

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

EXTRA-CIRRICULAR ACTIVITIES

Women in Engineering, University of British Columbia

High School Mentorship

Vancouver, BC

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

Master Students Mentor

Pittsburgh, PA

Sep 2020 - Dec 2020

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

Cantonese Development Society, Peking University

Vice President & Publicity Department

Beijing, China

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.