# Michael Cho

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## Research Interests

Research interests lie at the intersection of biomedical engineering and machine learning, focusing on federated and deep learning with an emphasis on fairness, ethics, privacy, and security—especially for healthcare applications—supported by expertise in public policy, high-performance computing, cloud and embedded low-power system design, and human-computer interaction.

## Education

2022 – Present | Ph.D. in Electrical and Computer Engineering, Atlanta, GA | **Georgia Institute of Technology** GPA: 4.0/4.0

2022 – 2025 | MSc. in Electrical and Computer Engineering, Atlanta, GA | **Georgia Institute of Technology** GPA: 4.0/4.0

2020 – 2022 | Bachelor of Science in Computer Science, Seattle, WA | **University of Washington** GPA: 3.9/4.0

## Research Experience

Jan 2023 - Present | **Ph.D. Researcher** | ***Inan Research Lab*** | **Georgia Institute of Technology** | *Advisor: Dr. Omer T. Inan*

- Developed and applied machine learning and deep learning algorithms for cardiovascular and physiological signal processing, collaborating with interdisciplinary teams.
- Curated and managed a dataset of over 15,000 manually annotated seismocardiogram (SCG) heartbeats for fiducial point and signal quality assessment.
- Designed and implemented quantitative metrics for cardiac event detection, supporting research in heart health and stress analysis.
- Automated annotation workflows to improve data quality for ML benchmarking and reproducibility.
- Integrated hardware systems, clinical study data, and advanced analytics to advance research on cardiac and musculoskeletal health and stress responsivity.

Dec 2020 - Jun 2022 | **Undergraduate Researcher** | ***Ubicomp Lab*** | **University of Washington** | *Advisor: Dr. Afra Mashhadi*

- Explored and implemented federated learning (FL) frameworks (TensorFlow Federated, PyTorch, Flower) for collaborative machine learning across distributed edge devices.
- Ported existing ML workflows to FL, ensuring integration and compatibility.
- Programmed and configured edge clients and embedded devices for efficient FL participation and privacy-focused workflows.
- Built secure cloud infrastructure for encrypted user data uploads, enabling secure FL training.
- Led integration of FL frameworks, embedded devices, and cloud servers to advance privacy-preserving, collaborative ML.

Jun 2021 - Jun 2022 **Undergraduate Researcher** — ***Engineering and Mathematics*** — **University of Washington** — *Advisor: Dr. Sunwoong Kim*

- Conducted research on password strength estimation in cyber-physical systems utilizing cloud infrastructure.
- Developed HELPSE (Homomorphic Encryption-based Lightweight Password Strength Estimation) to enable privacy-preserving, server-side password assessment.
- Implemented numerical algorithms in the homomorphic encryption domain to support robust password scoring.
- Refined LPSE to overcome depth constraints and improve computational efficiency.
- Built a virtual keyboard-based client-server system to capture and encrypt passwords for secure analysis on embedded hardware.

## Work Experience

Feb 2023 - Sep 2023 **Educator Workforce Data Specialist**
***Professional Educator Standards Board*** — ***Olympia, WA (Remote)***
Gathered, analyzed, and interpreted qualitative and quantitative data on educational practices and standards for paraeducators. Collaborated with a team, designed research methodologies, and presented findings through reports. Advanced educational initiatives and fostered continuous improvement.

May 2020 - Aug 2020 **Laboratory Process Analyst**
***King County Water Treatment*** — ***Seattle, WA***
Performed comprehensive analysis of wastewater samples, conducted tests to assess water quality parameters, monitored treatment processes, ensured regulatory compliance, and provided recommendations for process optimization and improvement to enhance overall plant efficiency.

Apr 2017 - Nov 2019 **Wastewater Treatment Plant Operator**
***Cedar Creek Corrections Center*** — ***Littlerock, WA***
Performed a variety of operation, maintenance, and testing activities related to wastewater treatment according to city, state and/or federal wastewater treatment requirements.

Sep 2010 - Apr 2012 **Assembly Structure Mechanic**
***The Boeing Company*** — ***Everett, WA***
Performed precision assembly of aircraft structures, including fuselage, wings, and control surfaces. Ensured adherence to engineering specifications, performed inspections, and collaborated with team members to meet production targets while maintaining strict quality standards.

## Publications


Cho, Michael and Afra Mashhadi (2022). "Caring Without Sharing: A Federated Learning Crowdsensing Framework for Diversifying Representation of Cities". en. In: *Mobile and Ubiquitous Systems: Computing, Networking and Services*. Ed. by Takahiro Hara and Hirozumi Yamaguchi. Cham: Springer International Publishing, pp. 601–616. ISBN: 978-3-030-94822-1. DOI: 10.1007/978-3-030-94822-1_39.

Cho, Michael et al. (June 2022). "HELPSE: Homomorphic Encryption-based Lightweight Password Strength Estimation in a Virtual Keyboard System". In: *Proceedings of the Great Lakes Symposium on VLSI*

*2022*. GLSVLSI '22. New York, NY, USA: Association for Computing Machinery, pp. 405–410. ISBN: 978-1-4503-9322-5. DOI: 10.1145/3526241.3530338.

Abbaraju, Vikram and Michael Cho et al. (2025). "Characterizing Central-Autonomic Dynamics during an Episodic Memory Task using Multi-Modal Neural and Cardiomechanical Signals". In: *IEEE Transactions on Biomedical Engineering*, pp. 1–12. ISSN: 1558-2531. DOI: 10.1109/TBME.2025.3622916.

Cho, Michael, Vikram Abbaraju, et al. (2025). "Quantifying Opioid Withdrawal through Cardio-mechanical Variability using Multi-modal Wearable Sensors". In: *IEEE-EMBS International Conference on Body Sensor Networks 2025*. URL: https://openreview.net/forum?id=q91O03HCa9.

Cho, Michael, Cem Yaldiz, et al. (In Review). "Seismocardiography Pig Hypovolemia Dataset for Signal Quality Indexing and Validated Cardiac Timings". In: *Nature Scientific Data*.

## Awards and Fellowships

**National Science Foundation Graduate Research Fellowship (NSF GRFP)**

**President's Fellowship,** Georgia Institute of Technology

**Steve W. Chaddick Fellowship,** Georgia Institute of Technology

**Mary Gates Research Scholarship,** University of Washington

**Ronald E. McNair Postbaccalaureate Achievement Program,** University of Washington

**Undergraduate Research Conference Travel Award,** University of Washington

**Dr. Charles H. Mitchell Scholarship,** Seattle Central College

## Honors and Memberships

**Association for Computing Machinery (ACM)**, Officer

**Tau Sigma National Honor Society**, Member

**Mathematics Engineering Science Achievement (MESA)**, Member

**Seattle Central Computer Science and Engineering Club**, Member

## Teaching and Volunteering

Aug 2022 - Dec 2022 **Graduate Teaching Assistant, ECE 3005**
***Georgia Institute of Technology***
Supported the instruction of ECE students in technical and professional communication, including writing, presentations, and teamwork skills. Provided guidance on technical writing style, document structure, and strategic communication for engineering contexts. Assisted in course administration and offered one-on-one mentorship to students.

Jan 2022 - Sep 2022 **Children Volunteer**
***Hands On Atlanta***
Participated in outreach activities connecting volunteers to nonprofits and schools to support education and community development for children.

Apr 2020 - Jun 2022 **Mentor and Volunteer Reentry Support Programs**
***Seattle Central College***
Provided mentorship for currently and formerly incarcerated students, fostering a welcoming learning environment and advocating for social equity. Supported educational access and assisted individuals in employment and housing stabilization efforts.

Jan 2016 - Nov 2019 **Academic Tutor**
***Centralia College***
Provided tutoring support in multiple subjects, helping students strengthen foundational knowledge and succeed academically.

## Languages

**Natural:** English (Advanced), Spanish (Conversational), Japanese(Basic), Korean (Basic), Tagalog (Basic)
**Formal:** Python, MATLAB, C++/C, Bash, Lua, Java