**Keshav Bimbraw**

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******EDUCATION**

**Worcester Polytechnic Institute** Worcester, MA

Ph. D. Candidate in Robotics Engineering (Medical FUSION Lab) Aug ‘20 – May ’25

Concentration – Medical Robotics, Deep Learning, Ultrasound Image Processing, & Human-Machine Interfacing *4.00/4.00 GPA*

**Georgia Institute of Technology** Atlanta, GA

M. S. with Robotics Focus (Music Technology, Computer Software & Media Applications) Aug ‘17 – May ‘19

Concentration – Human Augmentation, Medical Robotics & Robotic Musicianship *3.56/4.00 GPA*

**Thapar University** Patiala, India

B. E. in Mechatronics Engineering (Research Intern - IIT Delhi, Jan – Jul ‘16) July ‘13 – June ‘17

Concentration – Robotics & Mechatronics *4.00/4.00 GPA (8.34 CGPA)*

**EXPERIENCE**

**OnPoint Surgical**  Concord, MA

**Software Engineer, Machine Learning**  Oct ‘24 – now

* Leading the AI efforts at OnPoint Surgical working as a machine learning software engineer in the surgical robotics space focusing on classification, segmentation and registration problems for different medical imaging modalities such as MRI, CT and X-Ray.
* Applied transfer learning and model quantization to deploy a MobileNetV2-based deep learning model for real-time AP/LA X-ray classification on edge devices with >98% accuracy and 4× size reduction. [Paper](https://openreview.net/pdf?id=vZEgKxcUQJ).

**Mitsubishi Electric Research Laboratories**  Cambridge, MA

**Research Intern (Connectivity and Information Processing Group, Mentor: Toshiaki Koike-Akino)** June ‘24 – Aug ‘24

* Worked on exciting research directions focusing on using Generative AI and Vision Language Models (VLMs) such as GPT-4o as intelligent agents for signal processing and predictive analysis. [Paper](https://arxiv.org/abs/2407.10870) accepted to [NeurIPS 2024](https://neurips.cc/) [AIM-FM](https://aim-fm-24.github.io/NeurIPS/) workshop.
* Analyzed ultrasound image classification performance of large vision language models and improved it using retrieval augmented generation (RAG) and few-shot in context learning (ICL). Developed a demonstration for LVLM driven robot control.

**Worcester Polytechnic Institute (WPI)** Worcester, MA

**PhD Candidate (Medical FUSION Lab, Adviser: Haichong K. Zhang)** March ‘20 – Feb ‘25

* Developed a novel ultrasound-based method to simultaneously estimate manipulation skill type and grasp forces from forearm muscle activity, enabling real-time, high-resolution assessment of dexterity for HMI applications. [Paper](https://arxiv.org/abs/2502.00275).
* Funded by Amazon Robotics GBTI for the 2023-2024 academic year to use ultrasound to estimate finger forces to improve a haptic feedback system. Demonstrated ultrasound based continuous force estimation with an error of 5% (IEEE IUS ’23). [Paper](https://ieeexplore.ieee.org/abstract/document/10306652). [Video](https://youtu.be/eVyNQ7SFq8k).
* Developed a pipeline for simultaneously estimating finger forces and hand gestures from a single ultrasound image using a two-stage Convolution Neural Network (CNN) based pipeline (NEMS ’24).
* Worked on using incremental learning, 3D CNN based video classification and fine tuning approaches to improve ultrasound based gesture recognition towards inter-session generalizability (2 papers accepted to IEEE IUS ’24).
* Developed a mirror-based ultrasound system for gesture classification, utilizing CNNs and Vision Transformers (ViT), and achieving a gesture classification accuracy of 93% (SPIE Medical Imaging ’24). [Paper](https://www.spiedigitallibrary.org/conference-proceedings-of-spie/12932/129320Z/Mirror-based-ultrasound-system-for-hand-gesture-classification-through-convolutional/10.1117/12.3005247.full).
* Developed a data-driven hand gesture recognition pipeline for VR interfacing (Meta Quest Pro) using ultrasound data and CNNs, achieving online accuracy of 92% for 4 gestures, and a low pipeline latency of 59.48 ms. [Paper](https://ieeexplore.ieee.org/document/10331075). [Video](https://youtu.be/8Cx___jnLJM).
* Developed a deep learning based pipeline to predict finger angles & hand configurations from forearm ultrasound images. Achieved an error of 7.35⁰ for finger joint angle prediction (IEEE ICRA ’22). [Paper](https://ieeexplore.ieee.org/abstract/document/9812287?casa_token=sQC_RsEr3x8AAAAA:WIQu8lAm3-a3pNmmauXmSBz1zKSLBlVYphsFiUzJbRI4hKSKds3lO0ta96yjy3JODULj1w). [Video](https://www.youtube.com/watch?v=YdhpU829e-M). Extended version published in [IEEE T-MRB](https://ieeexplore.ieee.org/abstract/document/10020174).
* Conceptualized a novel augmented reality based lung ultrasound scanning guidance system (MICCAI ASMUS ‘20). [Paper](https://link.springer.com/chapter/10.1007/978-3-030-60334-2_11). [Video](https://vimeo.com/463333665).
* Established the real-time ultrasound data acquisition software framework for a tele-operative low-cost lung ultrasound robot. [Paper](https://pubmed.ncbi.nlm.nih.gov/34532570/). [Code](https://github.com/bimbraw/Ultrasound-Screen-Capture).
* Designing a forearm ultrasound based American Sign Language classification system using machine learning. [Poster](https://drive.google.com/file/d/1D9iBSxFHLbtp-pfDGkQKp3Kjw397H_Uv/view?usp=sharing) presented at ICRA ‘22.
* Mentoring and assisting graduate (MS and PhD students) and undergraduate teams with their major qualifying projects and independent research studies.

**Mitsubishi Electric Research Laboratories**  Cambridge, MA

**Research Intern (Connectivity and Information Processing Group, Mentor: Toshiaki Koike-Akino)** May ‘23 – Aug ‘23

* Designed pipelines for multi-modal biosignal data acquisition and human-machine interaction in AR/VR/XR applications.
* Incorporated adversarial regularization to bolster hand gesture classification performance in the context of domain adaptation.
* Leveraged random channel ablation to optimize the performance across multiple biosignal modalities for hand gesture classification.
* Demonstrated that we can make multi-modal biosignal based gesture classification robust to missing channel data using random channel ablation ([IEEE EMBC ’24](https://arxiv.org/abs/2407.10874)).

**Nokia Bell Labs** New Providence, NJ

**Augmented Human Sensing Intern/Co-Op (Data & Devices Group, Mentor: Mingde Zheng)** June ‘22 – Dec ‘22

* Designed low-latency biosignal based pipelines (sEMG, IMU) to estimate bodily motion for Human-Machine Interaction. [Video](https://youtu.be/GSJTYDu5IxQ).
* Submitted and presented a paper ([IEEE SII 2023](https://ieeexplore.ieee.org/abstract/document/10039467)) and multiple invention reports. Offered a Co-Op extension, which was accepted.
* Developed demonstrations for biosignal-based remote multi-sensor real-time shared-autonomy industrial robotic applications.
* Investigated multi-channel sEMG based hand movement classification for robotic control using deep learning (MLP, CNN).
* Utilized transfer learning approach for improving performance of sEMG based hand configuration classification from 91% to 96%.

**Agile Resources Inc.** Peachtree City, GA

**Audio DSP Engineer (Panasonic Automotive Systems of America)**  Oct ‘19 – March ‘20

* Developed Qualcomm’s Hexagon SDK for audio applications in Eclipse on Android framework development.
* Utilized Qualcomm tools to evaluate audio modules such as Bass Mid Treble, Parametric Equalizer, Fade & Balance, etc.

**Bose Corporation** Stow, MA

**Active Noise Control Engineering Intern (Automotive Systems Division)**  May ‘19 – Oct ‘19

* Designed sound synthesis framework for electric vehicles and implemented processor-optimized signal processing algorithms.
* Devised a physical car sound simulation system using Logitech pedals to evaluate models and reduce testing time.

**Georgia Institute of Technology (Georgia Tech)** Atlanta, GA

**Research Assistant (Robotic Musicianship Lab)**  Aug ‘17 – May ‘19

* Lead the ML based ultrasound gesture classification [project](https://gtcmt.gatech.edu/skywalker) from Aug ‘18 – May ‘19. Robot and code featured in [The Age of A.I](https://youtu.be/UwsrzCVZAb8?t=1079).
* Utilized ultrasound data from the forearm to classify hand grasping configurations for controlling a soft robotic gripper. [Paper Link](https://ieeexplore.ieee.org/document/9176483).
* Investigated a combination of Ultrasound & EMG data using supervised learning algorithms to enhance assistive robot control.
* Translated Piano playing to robots using a single DOF system and designed a robotic hand with one DOF per finger. [Link](https://drive.google.com/file/d/1bLGMaNiJcKgj9wzIZIy0YlRz8Kj3OJXE/view?usp=sharing).
* Created an ultrasound in the loop tendon-based wearable exoskeleton for upper extremity rehabilitation of stroke survivors. [Link](https://drive.google.com/file/d/10ZK2K1fI90I0AVr5jjTlthfDECNXcPIK/view?usp=sharing).
* Taught Computer-Aided Design (CAD), Fusion 360, 3D printing, and Mechatronics for Project Studio Course. [Link](https://vimeo.com/444132536), [Link](https://drive.google.com/file/d/1PYHPMrOLP6-12o97rCuxAX5ZVvhJofBY/view?usp=sharing).

**IIT Delhi** New Delhi, India

**Research Intern (Autonomous Robotics Lab)** Jan ‘16 – Aug ‘16

* Conceptualized and programmed the system framework for two KUKA KR-5 robotic arms to collaboratively play a guitar. [Link](https://vimeo.com/174093155).
* Improved performance of a 6 DOF motion platform at Simulator Development Division, Secunderabad, India. [Link](https://ieeexplore.ieee.org/abstract/document/7931899).
* Developed a teach pendant and a control module to control virtual robots in RoboAnalyzer software. [Link](https://ieeexplore.ieee.org/abstract/document/7931881).
* Modified the mechanical and electrical design of Tulsi Bead making device under the rural development initiative of IIT Delhi.

**Research Interests**

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**Human-Machine Interaction:** Human-machine interfaces & robotics applications; AI-enabled robotics & medical image processing; Gesture & pose classification, estimation, & detection;

**Machine Learning:** Deep learning;Multi-modal data processing; Transfer Learning; Generative AI; Deep learning model optimization; Model compression; Data compression; Online learning; End-to-end deep learning pipelines;

**Robotics:** Wearable robotics & wearable sensor systems; Design & development of robots for human-robot interaction; Computer vision; Industrial robotics & automation; Robot teleoperation;

**Medical Robotics:** New technologies & methodologies in medical robotics; Ultrasound image processing; IoT (Internet of Things); Medical Device development; Surgical robotics; AI-Enabled radiology;

**SKILLS**

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**Software Skills** Python, TensorFlow, PyTorch, ROS, Linux, NumPy, MATLAB, OpenCV, C++

**Deep Learning Model Experience** 1D, 2D and 3D CNN, Vision Transformer, GPT-x, Enc-Dec, ResNet, MLP

**3D Design/3D printing** SolidWorks, Autodesk Inventor, Autodesk Fusion 360, Unity, TinkerCAD, Cura

**Electrical/Electronic skills** Arduino, Raspberry Pi, Motors, Actuators, Hardware & software interfacing

**Programming Frameworks** Shell Scripting, Git, Visual Studio Code, PyCharm, Version Control, AWS Cloud

**ACADEMIC PROJECTS**

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**Ultrasound based Gesture Recognition on Edge (WPI, On Device Deep Learning)** Fall ‘23

* Developed an edge solution for ultrasound based gesture classification by deploying a pre-trained CNN on a Raspberry Pi.
* Utilized Float16 quantization to reduce latency by 10 ms while achieving the same train and test accuracy.

**Analyzing the performance of a cart pole system for different parameters for RL (WPI, Artificial Intelligence)**  Spring ‘23

* Implemented a Reinforcement Learning framework in PyTorch using OpenAI Gym where the goal is to keep a pole upright,
* Analyzed the performance of the system for Deep Q-Networks (DQN) and Q-Learning scenarios for various system parameters.

**Comparing low & high-dimensional forearm ultrasound-based hand state classification (WPI, Machine Learning)**  Spring ‘22

* Investigated the feasibility of using image compression techniques for extracting the latent structure of ultrasound images. [Link](https://drive.google.com/file/d/17gE6GYWe8PWJ5g-VtjKLZz2YO8X6IP-3/view?usp=sharing).
* Designed a real-time ML pipeline for training and testing models for hand motion classification based on forearm ultrasound.

**Navigation of a Raspberry-Pi-based Robot using camera and Lidar data (Georgia Tech, Intro. To Robotics Research)** Fall ‘18

* Used camera data to [find the center of a ball](https://drive.google.com/file/d/1MWnO-YQMQrfbNgStuxxBOtb2QV0ZW2Ag/view?usp=sharing) and tracked it using Dynamixel actuators attached to a mobile robot.
* Used Lidar data to avoid obstacles and maintaining a specific distance from them while [moving towards a goal](https://drive.google.com/file/d/1i_43mzUJ2jsxBCk5GGfe513W0Ntd9T-z/view?usp=sharing) (waypoint classification using SVM).

**Design of an ultrasound-guided vein cannulation robot (Georgia Tech, Medical Robotics)** Spring ‘18

* Oversaw a 5-person multi-discipline team to develop a medical robot that can hold an ultrasound probe to detect jugular vein. [Link](https://drive.google.com/file/d/1QYiNKyen9jId7NcDo363wpNWQYtSj841/view?usp=sharing).
* Designed and programmed a PRRRP configuration robot for its end effector to reach specific positions in the robot workspace.

**LEADERSHIP**

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**Leadership Experience** at WPI Fall ’20 – now

* Mentored high school and undergraduate students towards ongoing research projects through Massachusetts Life Sciences Center (MLSC) High School Apprenticeship Program, Major Qualifying Projects (MQP), & Research Experience for Undergrads (REU).
* Senator and representative of the Robotics Department for the Graduate Student Government for academic year ’21- ‘22.
* Member of the Rho Beta Epsilon Robotics Engineering society. Co-hosted a C++ workshop for beginners.
* Graduate Student Officer at The Alliance: the social, educational, & professional support network of LGBT+ students.

**Vertically Integrated Projects (VIP) Instructor** at Robotic Musicianship Lab at Georgia Tech Fall ‘17 – Spring ‘19

* Lead teams of undergraduates in robotics and mechatronics research. Assisted with continual mentorship and guidance.

**HONORS & AWARDS**

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| --- | --- |
| • Won PhD Backlin Scholarship to cover tuition and health insurance through WPI. | Sept. ‘24 |
| • Won IEEE EMBC NextGen Scholar Award. | May ‘24 |
| • Funded through Amazon Robotics GBTI Award for the 2023-2024 academic year (Tuition support & yearly award) | August ‘23 |
| • Selected for the 2021B cohort of Google Research’s CSRMP. The first person at WPI to have ever been selected. | Sept. ‘21 |
| • Awarded PhD positions at WPI & Georgia Tech. Accepted the WPI offer. (Tuition support & $31824 yearly award). | March ‘20 |
| • Selected to be Diversity and Inclusion Fellow by Georgia Tech Institute Diversity ($1000 award). | February ‘19 |
| • Selected as NSF-NRT ARMS (Accessibility, Rehabilitation, & Movement Science) Trainee ($1500 award). | August ‘18 |
| • Scholarship to pursue master’s at Georgia Tech (Tuition support & $14100 yearly award). | August ‘17 |
| • Awarded merit scholarships and grants totaling INR 336,000 at Thapar University. | June ‘17 |

**JOURNAL PUBLICATIONS**

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**Published**

1. **Bimbraw, K.**, Nycz, C. J., Schueler, M., Zhang, Z., & Zhang, H. K. (2023). Simultaneous estimation of hand configurations and finger joint angles using forearm ultrasound. *IEEE Transactions on Medical Robotics and Bionics, 5(1)*, 120-132. [Paper](https://ieeexplore.ieee.org/abstract/document/10020174).
2. Tsumura, R., Hardin, J.W., **Bimbraw, K.**, Grossestreuer, A.V., Odusanya, O.S., Zheng, Y., Hill, J.C., Hoffmann, B., Soboyejo, W. and Zhang, H.K., 2021. Tele-Operative Low-Cost Robotic Lung Ultrasound Scanning Platform for Triage of COVID-19 Patients. *IEEE Robotics and Automation Letters, 6*(3), pp.4664-4671. [Paper](https://pubmed.ncbi.nlm.nih.gov/34532570/). [Video](https://www.youtube.com/watch?v=_Zr0HbDOzEc).

**Awaiting Review**

1. **Bimbraw, K.**, Wang, Y., Liu, J., & Koike-Akino, T. (2024, October). GPT Sonograpy: Hand Gesture Decoding from Forearm Ultrasound Images via VLM. *IEEE Sensors Journal*. [Paper](https://arxiv.org/abs/2407.10870).
2. **Bimbraw, K.**, Tang, Y., & Zhang, H. K. (2024, September). Acoustic Reflector based Forearm Ultrasound for Hand Gesture Classification. *IEEE Sensors Journal.*

[3] **Bimbraw, K.**, Nekkanti, S., Tiller, D., Deshmukh, M., Calli, B., Howe, R. D., & Zhang, H. K. (2024, December). Simultaneous Estimation of Manipulation Skill and Hand Grasp Force from Forearm Ultrasound Images. *Cyborg and Bionic Systems, a Science Journal*.

[4] Lin, F., **Bimbraw, K.**, Hou, S., Gao, S., Zhang, Z., and Zhang, H. K. (2024, December). Ultrasound-Based Hand Gesture Recognition with Cross-User Reproducibility through Deep Metric Learning with Triplet Network. *IEEE Robotics and Automation Letters.*

[5] Ramuu, T., Nekkanti, S., **Bimbraw, K.**, Vostrikov, S., Lin, F., Murphy, A., Cossettini, A., and Zhang, H. K. (2025, June). Wearable Continuous Hand Force Estimation Using A-Mode Ultrasound: Demonstration with the WULPUS Platform. *IEEE Sensors Journal.*

**CONFERENCE PUBLICATIONS**

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1. **Bimbraw, K.**, Steines, D. (2025, May). Tranfer Learning and Quantization for Efficient AP vs. LA X-Ray View Classification on an Edge Device. In *Medical Imaging with Deep Learning- Short Papers*. [Paper](https://openreview.net/pdf?id=vZEgKxcUQJ).
2. **Bimbraw, K.**, Zhang, H. K., & Islam, B. (2024, September). Forearm Ultrasound based Gesture Recognition on Edge. In *2024 IEEE Body Sensor Networks Conference*. [Paper](https://arxiv.org/abs/2409.09915).
3. **Bimbraw, K.**, Talele, A., & Zhang, H. K. (2024, September). Hand Gesture Classification based on Forearm Ultrasound Video Snippets Using 3D Convolutional Neural Networks. In *2024 IEEE International Ultrasonics Symposium (IUS)* (pp. 1-4). IEEE. [Paper](https://arxiv.org/abs/2409.16431).
4. **Bimbraw, K.**, Rothenberg, J., & Zhang, H. K. (2024, September). Improving Intersession Reproducibility for Forearm Ultrasound based Hand Gesture Classification through an Incremental Learning Approach. In *2024 IEEE International Ultrasonics Symposium (IUS)* (pp. 1-4). IEEE. [Paper](https://arxiv.org/abs/2409.16415).
5. **Bimbraw, K.**, Liu, J., Wang, Y., & Koike-Akino, T. (2024, July). Random Channel Ablation for Robust Hand Gesture Classification with Multimodal Biosignals. In *2024 IEEE Engineering in Medicine and Biology Conference (EMBC)* (pp. 1-6). IEEE. [Paper](https://arxiv.org/abs/2407.10874).
6. **Bimbraw, K.**, & Zhang, H. K. (2024, April). Mirror-based Ultrasound System for Exploring Hand Gesture Classification through Convolutional Neural Network and Vision Transformer. In *Medical Imaging 2024: Ultrasonic Imaging and Tomography* (Vol. 12932, pp. 218-222). SPIE. [Paper and Video](https://www.spiedigitallibrary.org/conference-proceedings-of-spie/12932/129320Z/Mirror-based-ultrasound-system-for-hand-gesture-classification-through-convolutional/10.1117/12.3005247.full).
7. **Bimbraw, K.**, Rothenberg, J., & Zhang, H. K. (2023, October). Leveraging Ultrasound Sensing for Virtual Object Manipulation in Immersive Environments. In *2023 IEEE 19th International Conference on Body Sensor Networks (BSN)* (pp. 1-4). IEEE. [Paper](https://ieeexplore.ieee.org/document/10331075). [Video](https://youtu.be/8Cx___jnLJM).
8. **Bimbraw, K.**, & Zhang, H. K. (2023, September). Estimating Force Exerted by the Fingers Based on Forearm Ultrasound. In *2023 IEEE International Ultrasonics Symposium* *(IUS)*. (pp. 1-4). [Paper](https://ieeexplore.ieee.org/abstract/document/10306652). [Video](https://youtu.be/eVyNQ7SFq8k).
9. **Bimbraw, K.**, & Zheng, M. (2023, January). Towards The Development of a Low-Latency, Biosignal-Controlled Human-Machine Interaction System. In *2023 IEEE/SICE International Symposium on System Integration (SII)* (pp. 1-7). [Paper](https://bimbraw.github.io/files/SII_2023_Paper_Accepted_Version.pdf). [Video](https://youtu.be/GSJTYDu5IxQ).
10. **Bimbraw, K.**, Nycz, C. J., Schueler, M. J., Zhang, Z., & Zhang, H. K. (2022, May). Prediction of Metacarpophalangeal joint angles and Classification of Hand configurations based on Ultrasound Imaging of the Forearm. In: *2022 International Conference on Robotics and Automation (ICRA)* (pp. 91-97). IEEE. [Paper](https://ieeexplore.ieee.org/abstract/document/9812287?casa_token=sQC_RsEr3x8AAAAA:WIQu8lAm3-a3pNmmauXmSBz1zKSLBlVYphsFiUzJbRI4hKSKds3lO0ta96yjy3JODULj1w). [Video](https://youtu.be/YdhpU829e-M).
11. **Bimbraw, K.**, Ma, X., Zhang, Z., Zhang, H. (2020). Augmented Reality-Based Lung Ultrasound Scanning Guidance. In: *Medical Ultrasound, and Preterm, Perinatal and Paediatric Image Analysis. ASMUS 2020, PIPPI 2020*. Lecture Notes in Computer Science, vol 12437. Springer, Cham. doi.org/10.1007/978-3-030-60334-2\_11. [Paper](https://link.springer.com/chapter/10.1007/978-3-030-60334-2_11). [Video](https://vimeo.com/463333665).
12. **Bimbraw, K.**, Fox, E., Weinberg, G. and Hammond, F. L. (2020). Towards Sonomyography-Based Real-Time Control of Powered Prosthesis Grasp Synergies. In: *2020 42nd Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC)*, Montreal, QC, Canada, 2020, pp. 4753-4757, doi: 10.1109/EMBC44109.2020.9176483. [Paper](https://ieeexplore.ieee.org/document/9176483). [Video](https://vimeo.com/444131445).
13. Mehta, I., **Bimbraw, K.**, Chittawadigi, R. G., & Saha, S. K. (2016). A teach pendant to control virtual robots in Roboanalyzer. In: *2016 Int. Conference on Robotics and Automation for Humanitarian Applications (RAHA)* (pp. 1-6). IEEE. [Paper](https://ieeexplore.ieee.org/abstract/document/7931881).
14. **Bimbraw, K.**, Mehta, I., Venkatesan, V., Joshi, U., Sabherwal, G. S., & Saha, S. K. (2016). Performance improvements of a 6-DOF motion platform. In: *2016 Int. Conference on Robotics & Automation for Humanitarian App. (RAHA)* (pp. 1-5). IEEE. [Paper](https://ieeexplore.ieee.org/document/7931899).
15. Kaur, M., Singh, G., **Bimbraw, K.**, & Uniyal, P. (2015). Study of phase transformation and microstructure of alcohol washed titania nanoparticles for thermal stability. In: *AIP Conference Proceedings* (Vol. 1675, No. 1, p. 030049). AIP Publishing. [Paper](https://aip.scitation.org/doi/10.1063/1.4929265).
16. **Bimbraw, K.** (2015). Autonomous cars: Past, present, and future. In: *2015 12th International Conference on Informatics in* *Control, Automation and Robotics (ICINCO)* (Vol. 1, pp. 191-198). IEEE. [Paper](https://ieeexplore.ieee.org/document/7350466).

**PRESENTATIONS AND POSTERS**

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1. **Bimbraw, K.**, Wang, Y., Liu, J., & Koike-Akino, T. (2024, July). GPT Sonograpy: Hand Gesture Decoding from Forearm Ultrasound Images via VLM. *AIM-FM: Advancements in Medical Foundation Models: Explainability, Robustness, Security, and Beyond at Neural Information Processing Systems (NeurIPS 2024).*
2. Murphy, A., **Bimbraw, K.**, Vostrikov, S., Enyedy, A., Cossettini, A., & Zhang, H. K. (2024). Towards Wearable Forearm Ultrasound Based Gesture Recognition for Human-Robot Interfacing. *Biomedical Engineering Society Meeting (BMES 2024)*.
3. **Bimbraw, K.**, Tang, Y., & Zhang, H. K. (2024). Acoustic Reflector based Forearm Ultrasound for Hand Gesture Classification. *Northeast Robotics Colloquium (NERC 2024)*.
4. **Bimbraw, K.**, & Zhang, H. K. (2024). Towards Forearm Ultrasound based Hand Gesture Classification and Finger Force Estimation using Deep Learning. *New England Manipulation Symposium (NEMS 2024)*.
5. Garza, J., **Bimbraw, K.**, Tang, Y., & Zhang, H. K. (2023). Integrating Vibrational Haptic Feedback on Sonomyography Hand Configuration Estimation. *2023 BMES Annual Conference*.
6. **Bimbraw, K.**, Rothenberg, J., & Zhang, H. K. (2022). Forearm Ultrasound Images can be Classified to Predict Static American Sign Language Letters. In: *2022 International Conference on Robotics and Automation* *Workshop on Human-centered Autonomy in Medical Robotics (IEEE ICRA)*. [Poster](https://drive.google.com/file/d/1JqJqxqGjdLCXsYo_zIXkMjcmfOGhPRTI/view?usp=sharing). [Abstract](https://drive.google.com/file/d/1D9iBSxFHLbtp-pfDGkQKp3Kjw397H_Uv/view?usp=sharing).
7. **Bimbraw, K.**, Fox, E., Weinberg, G. & Hammond, F. L. (2019). Sonomyography based real-time hand grasp configuration identification via supervised learning to control a soft robotic gripper. In: *2019* *Spring School on Medical Robotics (SSMR) and 2019 International Symposium on Medical Robotics (ISMR)*, Atlanta, GA, USA. [Poster](https://drive.google.com/file/d/13RYaXV_PtDpWr_GRoHFMnd3FJ8npFGIl/view?usp=sharing).
8. **Bimbraw, K.** (2018). Imparting expressivity and dynamics to percussive musical robot Shimon. In: Three Minute Thesis (3MT™) at Georgia Tech. [Link](https://smartech.gatech.edu/handle/1853/60602).
9. Rosa, L., **Bimbraw, K.**, Hammond, F. L. & Weinberg, G. (2018). Comparison and Integration of SMG and EMG. In: *BMES 2018 Annual Meeting*. Atlanta, GA, USA. [Poster](https://drive.google.com/file/d/1PYHPMrOLP6-12o97rCuxAX5ZVvhJofBY/view?usp=sharing).

**PROVISIONAL PATENTS**

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1. **Bimbraw, K.**, & Steines, D. (2025, April). Transfer Learning and Quantization for Efficient AP vs. LA X-Ray View Classification on an Edge Device.

**PROFESSIONAL AFFILIATIONS**

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* Institute of Electrical and Electronics Engineers (IEEE)
* IEEE Robotics & Automation Systems (RAS)
* Biomedical Engineering Society (BMES)
* Association for Computing Machinery (ACM)

**REVIEWING**

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* IEEE Robotics and Automation Letters (IEEE RA-L)
* IEEE International Symposium on Biomedical Imaging (ISBI)
* IEEE Transactions on Medical Robotics and Bionics (T-MRB)
* IEEE International Conference on Robotics and Automation (ICRA)
* Nature Scientific Reports
* Springer Nature Journal of NeuroEngineering and Rehabilitation

**REFERENCES (Contact information available upon request)**

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| --- | --- |
| Haichong K. ZhangAssistant Professor, Robotics Engineering Worcester Polytechnic Institute | Toshiaki Koike-Akino Distinguished Research Scientist  Mitsubishi Electric Research Laboratories |
| Ziming Zhang Assistant Professor, Electrical & Computer Engineering Worcester Polytechnic Institute | Jing Liu  Visiting Research Scientist  Mitsubishi Electric Research Laboratories |
| Frank L. Hammond III Assistant Professor, Mechanical Engineering  Georgia Institute of Technology | Mingde (Jack) Zheng Principal Scientist, Augmented Human Sensing,  Nokia Bell Labs |
| Ayanna Howard Dean of Engineering, Monte Ahuja Endowed Dean's Chair  College of Engineering, The Ohio State University | Michael Eggleston Data & Devices Group Leader,  Nokia Bell Labs |

**MENTEES**

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|  |  |
| --- | --- |
| Matthew HunterMentored At: Georgia Tech (VIP)  Current Affiliation: Stanford University | Catherine Pollard  Mentored At: Worcester Polytechnic Institute (MLSC)  Current Affiliation: John Hopkins University |
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