Keshav Bimbraw

Google CSRMP 2021B | https://bimbraw.github.io/ | 678-436-9426 | bimbrawkeshav@gmail.com | https://www.linkedin.com/in/bimbraw/ | F1-Visa Status

EDUCATION

Worcester Polytechnic Institute, Worcester, MA
Ph. D. student in Robotics Engineering (Medical FUSION Lab)   Aug '20 – May '25 (tentative)
Concentration – Ultrasound Image Processing, Medical Robotics & Human-Computer Interaction   *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

Nokia Bell Labs   New Providence, NJ
Augmented Human Sensing Co-Op (Data and Devices Group, AI Research Lab)   June '22 – now
- Researching low-latency pipelines using biological signals (sEMG, IMU, etc.) to estimate motion for Human-Machine Interaction.
- Submitted a paper (Accepted, 2023 IEEE SII) and an invention report. Offered a Co-Op extension, which was accepted.

Worcester Polytechnic Institute (WPI)   Worcester, MA
Research Assistant (Medical FUSION Lab)   March '20 – now
- Developed a deep learning based pipeline to predict finger joint angles & hand configurations from forearm ultrasound images. Achieved an error of 7.35° for finger joint angle prediction (IEEE ICRA '22). Paper. Video.
- Conceptualized a novel augmented reality based lung ultrasound scanning guidance system (MICCAI ASMUS '20). Paper. Video.
- Established the real-time ultrasound data acquisition software framework for a tele-operative low-cost lung ultrasound robot. Paper.
- Mentoring and assisting undergraduate teams with their major qualifying projects and independent research studies.

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 Skywalker project from Aug '18 – May '19. My robot and code were featured in the first episode of The Age of A.I. Link.
- 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.
- Created an ultrasound in the loop tendon-based wearable exoskeleton for upper extremity rehabilitation of stroke survivors. Link.
- Taught Computer-Aided Design (CAD), Fusion 360, 3D printing, and Mechatronics for Project Studio Course. Link, Link.

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.
- Improved performance of a 6 DOF motion platform at Simulator Development Division, Secunderabad, India. Link.
- Developed a teach pendant and a control module to control virtual robots in RoboAnalyzer software. Link.
- Modified the mechanical and electrical design of Tulsi Bead making device under the rural development initiative of IIT Delhi.

SKILLS

Software Skills	Python, MATLAB, TensorFlow, ROS, Linux, NumPy, matplotlib, OpenCV, C++
3D Design/3D printing	SolidWorks, Autodesk Inventor, Autodesk Fusion 360, Tinkercad, PreForm
Electrical/Electronic skills	Arduino, Raspberry Pi, Motors, Actuators, Hardware & software interfacing

ACADEMIC PROJECTS

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.
- 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 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 (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.
- Designed and programmed a PRRRP configuration robot for its end effector to reach specific positions in the robot workspace.

LEADERSHIP

Leadership Experience at WPI   Fall '20 – now
- 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

- Selected for the 2021B cohort of Google Research's CSRMP. The first person at WPI to have ever been selected.   September '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

PUBLICATIONS

[1] **Bimbraw, K.**, & Zheng, M. (2022, August). Towards The Development of a Low-Latency, Biosignal-Controlled Human-Machine Interaction System. *Accepted to be presented in 2023 IEEE/SICE International Symposium on System Integrations*.

[2] **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 Link. Video. *Journal Paper communicated to IEEE Transactions on Medical Robotics and Bionics.*

[3] 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 Link. Video.

[4] **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 Link. Video.

[5] **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 Link. Video.

[6] 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 Link.

[7] **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 Link.

[8] 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 Link.

[9] **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 Link.