Keshav Bimbraw

Google CSRMP 2021B | bimbraw.github.io | (678)-436-9426 | bimbrawkeshav@gmail.com | linkedin.com/in/bimbraw/ | F1 Student

EDUCATION

Worcester Polytechnic Institute (WPI), Worcester, MA
Ph. D. student in Robotics Engineering (Medical FUSION Lab) — Aug '20 – now
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 — GPA - 4.00/4.00 GPA (8.34 CGPA)

EXPERIENCE

Nokia Bell Labs — New Providence, NJ
Augmented Human Sensing Intern (AI Research Lab) — June '22 – now
- Research Intern in the Data and Devices Group working on exciting projects in the in the Human-Machine Interaction space.

WPI — Worcester, MA
Research Assistant (Medical FUSION Lab) — March '20 – now
- Developed a deep learning and machine learning based pipeline to predict finger joint angles & hand configurations from forearm ultrasound images. Achieved an error of 7.35º for finger joint angle prediction (IEEE ICRA '22). ArXiv preprint. Video.
- Developed a novel Augmented Reality based lung ultrasound scanning guidance system (MICCAI ASMUS '20). Paper. Video.
- Mentoring and assisting undergraduate teams for 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
- Worked on 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
- Worked on sound synthesis for electric vehicles and implementing processor optimized signal processing algorithms.
- Implemented and evaluated a variable bandwidth shifting bandpass filter (in MATLAB) on an electric vehicle with a random noise source. Developed a physical car sound simulation system using Logitech pedals to evaluate models and reduce testing time.

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. Link.
- Assisted a team to improve the expressivity of Shimon (a marimba playing robot) by replacing its actuators & control scheme. Link.
- Translated Piano playing to robots using a single DOF system and designed a robotic hand with one DOF per finger. Link.
- Developed an ultrasound in the loop tendon based wearable exoskeleton for upper extremity rehabilitation of stroke survivors. Link.
- Computer-Aided Design (CAD), Fusion 360, 3D printing and Mechatronics Instructor for Project Studio Course. Link.

IIT Delhi — New Delhi, India
Research Intern (Autonomous Robotics Lab) — Jan '16 – Aug '16
- Programmed two KUKA KR-5 robotic arms to collaboratively play a guitar. Link.
- Developed a Control Module for RoboAnalyzer using C# to simulate control of mass spring damper & single-link robotic arm systems.
- Improved performance of a 6 DOF motion platform at Simulator Development Division, Secunderabad, India. Link.
- Helped with the development of a Teach pendant 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

Navigation of a Raspberry-Pi based Robot using camera and Lidar data Fall '18

• Used camera data to find center of a ball and track it by actuating Dynamixel motors 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 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 Engineering Department for the Graduate Student Government at WPI.
• Member of the Rho Beta Epsilon Robotics Engineering society at WPI. Hosted a C++ workshop for beginners at WPI.
• Graduate Student Officer at The Alliance: the social, educational, & professional support network of LGBTQIAP+ students at WPI.

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

• Lead teams of undergraduates to involve them in robotics and mechatronics research.
• Mentored students to work on real life robotics projects & improving their project presentation skills.

Diversity and Inclusion Fellow at Georgia Tech Spring '19

• Lead efforts in making Georgia Tech a more inclusive campus by organizing student and faculty activities at GTCMT.
• Took an initiative to enroll students & faculty in campus activities related to promoting a diverse & inclusive community.

HONORS & AWARDS

• Selected for 2021B cohort of Google Research's CSRMP program. 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 masters 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.**, Nycz, C. J., Schueler, M., Zhang, Z., & Zhang, H. K. (2021). Prediction of Metacarpophalangeal joint angles and Classification of Hand configurations based on Ultrasound Imaging of the Forearm. In: *arXiv preprint:2109.11093*. Link. Video.

[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 Link. Video.

[3] **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.

[4] **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.

[5] 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.

[6] **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.

[7] 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.

[8] **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.