Keshav Bimbraw

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EDUCATION

Worcester Polytechnic Institute, Worcester, MA
Candidate for Ph. D. in Robotics Engineering (Medical FUSION Lab) — Aug '20 – now
Concentration – Medical Robotics, Ultrasound Image Processing and Machine Learning — 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 and Robotic Musicianship — 3.56/4.00 GPA

Thapar University, Patiala, India
Bachelor of Engineering in Mechatronics Engineering (Research Intern - IIT Delhi from Jan – Jul '16) — July '13 – June '17
Concentration – Robotics and Mechatronics — GPA - 4.00/4.00 GPA (8.34 CGPA)

EXPERIENCE

Worcester Polytechnic Institute — Worcester, MA
Graduate Research Assistant (Medical FUSION Lab) — March 2020 – now
- Working on developing a deep learning based algorithm for predicting finger angle based on forearm ultrasound images.
- Developed a novel Augmented Reality based Lung Ultrasound Scanning Guidance system. Link.

Agile Resources Inc. — Peachtree City, GA
Audio DSP Engineer at Panasonic Automotive Systems of America — Oct 2019 – March 2020
- 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 in Automotive Systems Division — May 2019 – Oct 2019
- 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
Graduate Research Assistant in Robotics — Aug 2017 – May 2019
- 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.
- Took an initiative to improve expressivity of Shimon (Marimba playing robot) by replacing its actuators and 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.

Autonomous Robotics Laboratory, IIT Delhi — New Delhi, India
Research Intern — Fall and Summer 2016
- 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.
- Developed a Teach pendant to control virtual robots in RoboAnalyzer. Link.
- Modified the mechanical and electrical design of Tulsi Bead making device under rural development initiative of IIT Delhi.

ACADEMIC PROJECTS

Navigation of a Raspberry-Pi based Robot using various sensors — Fall 2018
- Used data from Raspberry Pi camera to find center of a ball and track it by actuating Dynamixel motors attached to the robot.
- Used Lidar data to avoid obstacles and maintaining a specific distance from them while moving towards a goal.
- Achieved goal position by classification & real time prediction of various waypoints using support vector machine.

Design of an ultrasound guided vein cannulation robot Spring 2018

- Worked with a 5-person multi-discipline team to develop a medical robot that can hold an ultrasound probe to detect jugular vein.
- PRRRP configuration Robot manufactured and programmed so that end effector can reach specific positions in the robot workspace.

Development of a Hybrid Stewart platform using Arduino Spring 2017

- Developed a hybrid two stage Stewart platform system as an improvement over the conventional Stewart platform.
- Arduino Mega microcontroller used to control 12 servo motors simultaneously. Control Interface developed in Visual Studio (C#).

SKILLS

- **Software Skills:** MATLAB, Simulink, Python, ROS, Arduino, C, C#, Linux, Microsoft Office, Microsoft PowerPoint, Microsoft Excel, Microsoft Word, LaTeX, Robotics programming, OpenCV, SolidWorks, Inventor, PTC Creo, Fusion 360, exposure to Java, C++ and HTML.
- **Electronic/manufacturing skills:** Arduino, Raspberry Pi, FSR, Sensors, Circuit Design, DC motors, Motors, linear actuators, Hardware & software interfacing, 3D printing, rapid prototyping, Electro-mechanical systems, Machine Learning integration with Robotics.
- **Communication/Writing:** Technical papers, Research presentations, Public speaking, technical reports, interaction with people from different backgrounds & disciplines, written & verbal communication skills, creating & leading teams, creating & teaching curriculum.
- **Research:** Writing experimental proposals, conducting experiments, analyzing data, presenting results, composing scientific reports.

LEADERSHIP

Vertically Integrated Projects Instructor at Robotic Musicianship Lab Fall 2017 – Spring 2019

- Vertically Integrated Project Instructor leading teams of undergraduates to involve them in research on robotics and Mechatronics.
- Mentoring students to help them work on real life robotics projects as well as development of their presentation skills.

Diversity and Inclusion Fellow at Georgia Institute of Technology Spring 2019

- 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 AND AWARDS

- Awarded PhD positions at WPI & Georgia Tech. Accepted the WPI offer. (Tuition support & $31824 yearly award) March 2020
- Selected to be Diversity and Inclusion Fellow by Georgia Tech Institute Diversity ($1000 award) February 2019
- Selected as NSF-NRT ARMS (Accessibility, Rehabilitation, & Movement Science) Trainee ($1500 award) August 2018
- Scholarship to pursue masters at Georgia Tech (Tuition support & $14100 yearly award) August 2017
- Awarded merit scholarships and grants totaling INR 336,000 at Thapar University. June 2017

PUBLICATIONS

[1] Tsumura, R., Hardin, J. W., **Bimbraw, K.**, Odusanya, O. S., Zheng, Y., Hill, J. C., Hoffmann, B., Soboyejo, W., Zhang, H. (2020). Tele-operative Robotic Lung Ultrasound Scanning Platform for Triage of COVID-19 Patients. In: *arXiv preprint arXiv:2010.12335*. Paper Link. Video.

[2] **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.

[3] **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.

[4] 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.

[5] **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 International Conference on Robotics and Automation for Humanitarian Applications (RAHA)* (pp. 1-5). IEEE. Paper Link.

[6] 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.

[7] **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.