**Keshav Bimbraw**

**Google CSRMP 2021B** | <https://bimbraw.github.io/> | 678-436-9426 | [bimbrawkeshav@gmail.com](mailto: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](https://bimbraw.github.io/files/SII_2023_Paper_Accepted_Version.pdf)) 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 7.35⁰ 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).
* 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/).
* 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](https://gtcmt.gatech.edu/skywalker) from Aug ‘18 – May ‘19. My robot and code were featured in the first episode of The Age of A.I. [Link](https://youtu.be/UwsrzCVZAb8?t=1079).
* 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.

**SKILLS**

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**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**

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**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

* 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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| |  | | --- | | • 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**

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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*. [Submitted Paper](https://bimbraw.github.io/files/SII_2023_Paper_Accepted_Version.pdf).
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](https://ieeexplore.ieee.org/abstract/document/9812287?casa_token=sQC_RsEr3x8AAAAA:WIQu8lAm3-a3pNmmauXmSBz1zKSLBlVYphsFiUzJbRI4hKSKds3lO0ta96yjy3JODULj1w). [Video](https://youtu.be/YdhpU829e-M). *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](https://pubmed.ncbi.nlm.nih.gov/34532570/). [Video](https://www.youtube.com/watch?v=_Zr0HbDOzEc).
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](https://link.springer.com/chapter/10.1007/978-3-030-60334-2_11). [Video](https://vimeo.com/463333665).
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](https://ieeexplore.ieee.org/document/9176483). [Video](https://vimeo.com/444131445).
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](https://ieeexplore.ieee.org/abstract/document/7931881).
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](https://ieeexplore.ieee.org/document/7931899).
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](https://aip.scitation.org/doi/10.1063/1.4929265).
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](https://ieeexplore.ieee.org/document/7350466).