SAMBARTA RAY

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# SUMMARY

# Researcher and software developer with broad experience in scientific research in university research labs, R and D in small-scale startups and large-scale industrial product development in various multi-disciplinary projects. Passionate about building technologies for good, open-ended problems, fast prototyping, and learning new technologies.

# EDUCATION

**Master of Science (Thesis)**, **Electrical Engineering**

Arizona State University, Tempe, AZ***Aug 2018 – Aug 2020***

# Bachelor of Technology, Electronics, and Communication Eng.

Heritage Institute of Technology, Kolkata, India***Aug 2012 – Jun 2016***

# PROFESSIONAL EXPERIENCE

**Machine Learning Engineer and Data Scientist** | Manus Robotics, Lexington, MA ***Dec 2020 – present***

* Core team member in developing a novel multimodal muscle activity sensing technology to greatly enhance assistive devices and empower independent and healthy living of individuals suffering from stroke or amputations.
* Developed the prototype used for finishing the National Science Foundation’s (NSF) Small Business Innovation Grant (SBIR-Phase-I) project with a broader potential of benefitting 30 million disabled survivors of stroke, spinal cord injury and traumatic brain injury around the globe.
* Responsible as a key contributor for receiving NSF’s SBIR-Phase-II award worth $1M to further the research and development of this game-changing technology.
* Joint inventors of the patent pending algorithm filed with USPTO, titled – “Gesture detection based on direction policies.”
* Recognition of work from multiple conferences and startup accelerators:
  + 2021 US Cohort for MassChallenge’s 50th accelerator program
  + 2021 MIT Digital Technology & Strategy Conference
  + 2022 MIT Research and Development Conference
  + 2023 MIT Startup Ecosystem Conference

**Graduate Researcher and Software Engineer** | Arizona State University, Tempe, AZ ***Jan 2019 - Nov 2020***

* Senior researcher in ASU’s START Lab under the supervision of Dr Claire Honeycutt. Responsible for conducting research on Fall prevention mechanisms using Smart Orthotics for people with lower-limb disability due to stroke or other neuro-muscular conditions.
* Led a team of 15 people in analyzing, debugging, filtering EMG data from clinical experiments for grant review and journal publication. Presented work at the BRAIN Center annual IAB meeting.
* Developed an Android application for remote data collection to facilitate research continuity during the COVID19 lockdown. Generated a $20K grant even during the economic downturn due to the immediate impact of the remote app.

**Software Development Engineer** | Tata Consultancy Services, Chennai, India ***Sep 2016 - Jun 2018***

* Software developer in a large scale B2B project for a leading US Bank and responsible for developing and maintaining critical banking software packages.
* Reduced 65% of defect list and delivered change requests 3 months ahead of schedule saving $700K and winning Star TeamAward from client-side. **Link**: <https://rb.gy/ie7huf>
* Conducted corporate training of 20 associates in best coding practices, project management, business communication, agile delivery and got awarded the Star of Learners Group. **Link**: <https://rb.gy/wl50kh>

**Embedded Systems Intern** | New Jersey Institute of Technology, Newark, NJ ***Jun 2015 - Aug 2015***

* Designed an autonomous obstacle course navigating robot using spiking neural networks, based on neuro-synaptic processing of an insect. Presented the work at the VLSID 2016 international conference of embedded systems.

# PUBLICATIONS (21 citations as of May 2023)

* *Design of active ankle-foot orthotics for gait assistance and fall prevention*

**IRATJ 2020** - Link: <https://medcraveonline.com/IRATJ/IRATJ-06-00209.pdf>

* *An intelligent and automated vision-based system for advanced security and surveillance in ATM*

**INDICON 2015** - Link: <https://ieeexplore.ieee.org/document/7443827>

* *Motion control of insect-bot using Spiking Neural Networks*

**NJIT Summer Symposium** - Link: <https://centers.njit.edu/uri/sites/uri/files/Book%20of%20Abstracts%202015.pdf#page=93>

* *A Study on the Analysis of Treadmill Perturbation Data for the Design of Active Ankle-Foot Orthosis to Prevent Falls and Gait Rehabilitation*

**Arizona State University** Thesis portal - Link:<https://keep.lib.asu.edu/_flysystem/fedora/c7/233916/Ray_asu_0010N_20278.pdf>

**TECHNICAL SKILLS**

**Programming Languages:** Python, MATLAB, Java, SQL, JavaScript, Angular, C/C++.

**Machine Learning:** Deep Learning, Feature Engineering, Transfer Learning, Classification, Regression.

**Frameworks/Applications:** Keras, TensorFlow, Scikit-learn, Pandas, Jupyter, Anaconda, Wit.ai.

**Robotics and Design Tools:** Arduino, SIMULINK, ROS, Gazebo, PCL, TurtleBot, Universal Robot Arm.

**Software Development Tools:** Android Studio, Heroku, AWS, GCP, Git, SageMaker, Cloud ML, Flask.

# TECHNICAL PROJECTS

**Design of Ankle Foot Orthosis for gait rehabilitation and fall prevention (Thesis)** ***Aug 2019 – Aug 2020***

* Engineered an ankle robotic orthosis using pneumatic actuators, ESP8266 Microcontroller, BNO055 IMU sensors, I2C multiplexers, and phase-based custom control algorithm.
* Developed a custom DAQ System using **MATLAB** and designed a wearable IMU-based embedded system to detect trip events using **scikit** learn, **logistics regression**, and **time series** analysis.
* Improved the **Ground Reaction Force of up to 116%** that can potentially help prevent falls in stroke survivors.
* Paper published in IRATJ 2020. **Link:** <https://rb.gy/zq1tml>

**Bridge Collision Detection System using perception-based robotics *Jan 2019 – May 2019***

* Developed autonomous driving features for trucks to avoid overhead bridge collision using a depth-sensing camera with **90% accuracy** in detecting bridge heights.
* Utilized Point Cloud Library (**PCL**) in **ROS** framework with **RANSAC** algorithm.
* Developed optimized methods for estimation of camera parameters through physical testing using **TurtleBot** and **Gazebo** simulation.
* **Link:** <https://rb.gy/femqen>

**Text-to-Image Synthesis using Generative Adversarial Networks *Aug 2019 – Dec 2019***

* Employed a Deep Learning-based **GAN** for synthesizing images from descriptive text sentences using **CNN**, **ReLU**, residual networks, Adam optimizer, and sigmoid activation.
* Achieved **70% reduction** in discriminator loss using both **TensorFlow** and **PyTorch** platforms.
* **Link:** <https://rb.gy/1ynoux>

**Chatbot using Facebook’s Wit.ai app *Aug 2020 – Sep 2020***

* Developed a chatbot using Facebook’s messenger, developer’s platform, and **wit.ai** app
* NLP based chatbot for detecting human emotion and suggesting activities based on detected emotions
* Developed the app using **Python**, **Flask,** and **PyMessenger** and hosted it on the cloud using **Heroku**
* Facebook AI hackathon 2020
* **Link:** <https://rb.gy/tosixt>

**Security and Surveillance using Computer Vision *Jan 2015 – Dec 2015***

* Developed a Computer Vision system for detecting facial occlusion and anomalous situations for security inside ATM kiosks with an **accuracy of 75%** in variable lighting conditions using **Matlab**.
* Available on IEEE Xplore digital library with multiple citations
* **Link:** <https://rb.gy/ewuer1>

# CERTIFICATIONS

* TensorFlow Developer Professional Certification – **Deeplearning.AI (Link:** <https://rb.gy/iygqpx>**)**
* Fundamentals of Deep Learning for Computer Vision – **Nvidia (Link:** <https://rb.gy/qhyshk>**)**
* Google Cloud Platform End to end Machine Learning with TensorFlow – **GoogleCloud (Link:** <https://rb.gy/0dpnfi>**)**
* AWS AI/ML Bootcamp: End to end pipeline using BERT, TensorFlow, and SageMaker – **Amazon**
* Control of Mobile Robots – **Georgia Tech (Link:** <https://rb.gy/qrkpwf>**)**