Souvik Datta

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Education

Vellore Institute of Technology — **Chennai, India**
Bachelor of Technology in **Electrical and Electronics Engineering**, *CGPA: (8.43/10)* — *July 2019 – May 2023*

Work Experience

Deep Learning Research Assistant | *Supervisor*: Dr. Subbulekshmi D — *May 2022 – Present*
Vellore Institute of Technology — Chennai, India

- Working on Deep Learning models for Brain Tumour & Skin Cancer Segmentation using **Vision Transformers**.
- Developed a **U-Net** based **Neural Network Architecture** for a brain tumor-based Image Segmentation model.
- Presented an abstract on **GNN**-based "Semi-Supervised Learning for Autonomous Navigation" at **ICDAC, 2022**.

Computer Vision Intern — *Jan 2022 – Jul 2022*
Omnipresent Robot Technologies — New Delhi, India

- Programmed custom **YOLOv5** object detection model over 6 classes for drone analytics with a **93%** accuracy.
- Deployed a **Mask R-CNN** Model for hyperbola detection with an accuracy of over **94%** on a MALA GPR.
- Developed Python scripts with **Geocoding APIs** and **Folium**, increasing effective data visualization by **14%.**
- Optimized **Deep Learning** Models by **37%** for scene-change detection in **remote sensing** applications.
- Implemented **k-means Learning Algorithm** and improved change detection on multi-spectral images by 54%.

Project Assistant | *Supervisor*: Dr. Sriramalakshmi P — *Apr 2022 – Jun 2022*
Vellore Institute of Technology — Chennai, India

- Extensively used **MATLAB/Simulink** on Tidal Energy Conversion Modules for Power Generation applications.
- Examined the performance and operation of **PMSG, Zeta Converters, H-Bridge Circuits** and **LC Filters**.
- Achieved an Output Voltage of **118V** against an Input of **120V**, yielding an **Overall Efficiency** of **98.33%.**
- Tested **Fast Fourier Transform** Analysis and attained a very low **Total Harmonic Distortion** of **0.26%.**

Research Intern | *Supervisor*: Dr. Chinmaya K.A. — *Mar 2021 – Aug 2021*
Indian Institute of Technology, BHU — Varanasi, India

- Reviewed literature survey on existing **Three-Port DC-DC Converters** for EV chargers with their drawbacks.
- Designed a Closed-Loop Converter with **PI Controller** having **16%** more transient stability against disturbances.
- Simulated and tested a foundation Closed-Loop Control model with a **Solar PV array** using **MATLAB/Simulink**.

Projects

Jet Engine Health Prediction | *Pandas, scikit-learn* | [CODE] | Machine Learning

- Predicted **Remaining Useful Life (RUL)** for turbofan jet engines using a **Random Forest** Classifier Model.
- Performed **Exploratory Data Analysis** on NASA's Dataset and analyzed feature correlation using **Seaborn**.
- Applied hyperparameter optimization using **Randomized Search CV** and increased **F1-Score** to an overall **91.2%.**

State Estimation using Kalman Filter| *Numpy, Matplotlib*| [CODE] | Kalman Filter

- Developed Kalman Filter-based state estimation model for precise approximation & visualization of a robot's state.
- Attained an extremely low **Mean Square Error** of **2.8%** & **1.1%** for the robot's position & velocity on evaluation.

Semantic Segmentation on Satellite Images | *TensorFlow, OpenCV, Keras* | [CODE] | Deep Learning

- Devised a **U-Net**-based Image Segmentation Model for land cover analysis on 5 classes from LandCover Dataset.
- Developed a network based on the **ResNet34** Architecture & achieved a mean Intersection over Union (IoU) of **72%**.

RF-Learning Robot | *PyTorch, Pybullet, Gym-OpenAI* | [CODE] | Reinforcement Learning

- Programmed a quadruped robot to exhibit walking gait using **PyTorch**-based **Reinforcement Learning** model.
- Optimized learning rate & other hyperparameters to marginally improve the **Mean Reward** of the model by **14%**.

Soil Type Recognition | *OpenCV, TensorFlow, Keras* | [CODE] | Computer Vision

- Designed a classification model with **5 classes** and **98% testing accuracy** using a Convolutional Neural Network.
- Applied Data Augmentation & reduced **validation losses** by **23%** on implementing **MobileNetV2 Architecture**.

3D Point Cloud from Depth Map | *Open3D, Keras, OpenCV* | [CODE] | Computer Vision

- Produced 3D point cloud data maps from 2D monocular RGB image-based depth maps using **Open3D functions**.
- Exploited a **PointNet**-based Object Detection model to classify 3D point cloud data with **81% training accuracy**.

IoT Book Bot | *Arduino, OpenCV, Raspberry Pi* | [CODE] | Robotics

- Engineered a mobile robot using **Raspberry Pi, Arduino** and **esp8266** for IoT Navigation and Object Detection.
- Implemented a 2D object detection model on **MS COCO** classes and a **QR-Code** and **Barcode** decryption script.

Skills

- **Languages**: Python, MATLAB/Simulink, GNU Octave, LaTeX
- **Libraries**: Numpy, Matplotlib, Pandas, OpenCV, scikit-learn, TensorFlow, Keras, PyTorch
- **Technical**: CARLA, Proteus, LT-Spice, Fritzing
- **Environment**: Git/GitHub, Raspbian OS
- **Hardware Boards**: Arduino, Raspberry Pi, esp8266

Publications

[1] **S. Datta**, M. Kundu, R. D. Choudhury, S. P. and S. VT, "**IoT Book Bot**", 2022 *IEEE India Council International Subsections Conference (INDISCON),* 2022, pp. 1-6. | [Certificate] | [arXiv] | [IEEE *Xplore*]

[2] M. Kundu, **S. Datta** and K.G, "**IoT-Based Anaesthesia Control and Monitoring System**", in *Reinvention of Health Applications with IoT: Challenges and Solutions*, 1st ed., A. Pathy and S. S, Ed. Taylor and Francis Group, 2022, Chapter - 8, pp. 127-141, DOI: 10.1201/9781003166511-8. [Link]

[3] **S. Datta** and Sriramalakshmi P., "**Two Stage Boost Inverter for Wave Energy Conversion**", *8th International Conference on Advances in Energy Research (ICAER)*, July, 2022. | [Certificate] | [arXiv] | [PPT]

[4] **S. Datta**, R. Bharatwaj, Subbulekshmi D., D T. and A S., "**Semi-Supervised Learning for Autonomous Navigation**", *International Conference on Data Analytics and Computing (ICDAC)*. Wenzhou, China, May, 2022. | [Certificate] | [Abstract] | [PPT]

[5] **S. Datta**, Subbulekshmi D. and Venkatesan R., "**Brain MRI Segmentation**". [In Preparation]

[6] R.D. Choudhury, M. Kundu, **S. Datta** and Sriramalakshmi P., "**IoT Campus Mart Pro**". [In Preparation]

Awards & Honours

1. Achieved an outstanding overall **All India Rank – 10** (out of 76 teams) in the electric BAJA SAE, 2022. [Certificate]
2. Secured **1st Position out of 30 teams** in Aerospace Quiz League conducted by Team Aviators. [Certificate]
3. Found 3 asteroids under **NASA International Astronomical Search Collaboration**, 2021. [Certificate]
4. Consistently contributed to high-quality **Open Source Projects** through **Hacktoberfest** editions 2021 & 2022.

Extra – Curriculars

Student Member, Youth Red Cross –

1. Organized a fund-raising campaign that provided a full meal to over 150 **underprivileged children**.
2. Contributed to the collection of books for 200 **poor school children** in North Bengal reliant on donations.
3. Administered a massive fund-raising initiative to feed more than 300 **community animals** across pan-India.
4. Arranged 3 **webinars** to address critical issues like - **Mental Health, Drug Abuse** and **Child Labour**.
5. Gathered donations to provide 114 **teenage** girls with sanitary napkins and to educate them on their benefits.

Power Electronics Head, The Road Runners, eBAJA ATV –

1. Co-Developed the design of the data acquisition system and its integration with **RX/TX communication**.
2. Simulated models to determine EV performance using **Proteus** and **MATLAB/Simulink** software.
3. Reviewed and researched relevant literature on **BLDC motors** and **controllers** for eBAJA applications.
4. Extensively used **Proteus** software with HC-SR04 Sensor & Magnetic Reed Switch for wheel RPM calculations.

Relevant Coursework

Robotics & Control (S)| Neural Networks (A)| Differential Equations (A)| Network Theory (A)| Electric Vehicles (B)| Problem Solving & Programming (A)| IoT Domain Analyst (A)| Statistics (B)| Embedded Sys. Design (B)| Calculus (A)|

*Grade: S – 10, A – 9, B – 8 (on a scale of 10)

Certifications & MOOCs

1. **Neural Networks and Deep Learning** — DeepLearning.AI - Coursera | [Certificate] | [GitHub]
   - Learned key NN concepts such as Optimizers, Loss functions, Activation functions, Backpropagation etc.
2. **Robotics: Aerial Robotics** — University of Pennsylvania - Coursera | [Certificate] | [GitHub]
   - Studied essential concepts such as quadcopter kinematics, trajectory tracking, and motion planning strategies.
3. **Machine Learning** — Stanford University - Coursera | [Certificate] | [GitHub]
   - Mastered key ML topics like Linear Algebra, Statistics, Probability, Cost Function etc. using MATLAB scripts.
4. **Self-Driving Cars** — University of Toronto - Coursera | [Certificate] | [GitHub]
   - Grasped prime autonomy concepts like visual perception, localization, state estimation etc. using CARLA.
5. **3D Computer Vision** — National University of Singapore – Dr. Gim Hee Lee
   - Studied concepts like 3D Geometry, Pose Estimation, Multi-View Stereo, Camera Calibration, Homography etc.
6. **Reinforcement Learning** — Stanford University – Dr. Emma Brunskill (Q-Learning, Policy Gradient, Batch RL etc.)