Siddharth Satyam

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Education

University of California San Diego **Sept 2022 - April 2024**
MS in Machine Learning and Data Science *San Diego, California*

IIT Kanpur **CPI - 9.4/10**
Bachelor of Technology in Mechanical Engineering *Kanpur*

Baldwin Academy **93.8%**
CBSE Class 12th *Patna*

Delhi Public School Patna **10.0/10.0 CGPA**
CBSE Class 10th *Patna*

Publications

- **Energy-Efficient Implementation of Generative Adversarial Networks on Passive RRAM Crossbar Arrays**
  Siddharth Satyam, Honey Nikam, Shubham Sahay
  Submitted to: IEEE Transactions on Neural Networks and Learning Systems **[arXiv]**
- **Long Short-Term Memory Implementation Exploiting Passive RRAM Crossbar Array**
  Honey Nikam, Siddharth Satyam, Shubham Sahay
  IEEE Transactions on Electron Devices
  doi: 10.1109/TED.2021.3133197 **[arXiv]**

Work Experience

Larsen and Toubro Infotech [presentation] **June '21 – July '21**
Software and ML Engineer Intern *Powai, Mumbai*

- Worked on building a regression model to predict carbon footprint in supply chain management companies.
- Performed Document Information Extraction using machine learning techniques to use the data for prediction analysis.
- Worked on DBMS to integrate data from in-memory relational databases to web applications using OData services.
- Created a workflow to perform Robotic Process Automation in Document Information Extraction service.

Research Projects

Spectrum Based Fault Localization using Graph Neural Networks | *Prof. Subhajit Roy, IIT Kanpur* **Ongoing**

- Implemented the spectrum based fault localization problem as a graph network of test cases and components.
- Created a graph neural network implementing message aggregation from test nodes to component nodes and vice versa.
- Generated component bug suspicion probabilities using component node embeddings through feed forward networks.
- Performed evaluation of results with respect to state of the art metrics for fault localization such as Ochiai and Tarantula. **[report]**

Neural Network training leveraging Weight Binarization | *Prof. Shubham Sahay, IIT Kanpur* **Ongoing**

- Created a digit classification neural network using the MNIST dataset and updated weights through gradient descent.
- Mapped the network weights to binary resistance values in a passive RRAM crossbar array.
- Performed an evaluation on the trade-off between accuracy and decreased memory and energy consumption.

Vanilla GAN — Neuromorphic computing | *Prof. Shubham Sahay, IIT Kanpur* **Nov '20 - April '21**

- Implemented Generative Adversarial Networks to synthesize realistic looking images of the MNIST dataset.
- Performed a simulation of a fixed amplitude training requiring in-situ computations on passive RRAM crossbars.
- Performed evaluation of energy dissipation and accuracy considering the effects of RRAM device-to-device variations.
- Performed a detailed study on the effects of noise inputs to the generator from random sampling by pseudo random noise generators and noise from true random noise generators on the accuracy of the output images.

LSTM — Neuromorphic computing | *Prof. Shubham Sahay, IIT Kanpur* **[code]** **Nov '20 - April '21**

- Performed a time series analysis using LSTM networks for the prediction of airline passenger dataset.
- Simulated a fixed amplitude in-situ training and evaluated effects of update symmetry and RRAM device variations.
- Performed a comparative study to predict the enhanced accuracy and energy efficiencies of LSTM implementation in passive over active 1T-1R crossbar arrays.

Competitions

IEEE International Future Energy Challenge | *Prof. Sandeep Anand, IIT Bombay* [**report**] **Dec '19 - Mar '20**

- Created a simplified 3D CAD model of the Printed Circuit Board to develop an approximate thermal simulation model.
- Determined the temperature gradient using Finite Element Methods across the volume of the Printed Circuit Board.
- Selected as lead member of the thermals sub-team and awarded the third prize in the world with a cash prize of 1K USD.

Vehicle Dynamics Design | *IITK Motorsports* [**report**] **Dec '18 - Jul '19**

- Worked for the Vehicle Dynamics sub-team and participated in the Virtual BAJA SAEINDIA 2019 competition.
- Decided the suspension points on chassis, considering camber angles and anti-dive percentage using MATLAB and CAD.
- Generated a program for the change in camber angle and toe angle with wheel travel in a double wishbone suspension.
- Designed a Rack and Pinion steering system and performed the structural analysis using Finite Element Methods.

Course Projects

Deep Learning techniques on GIS Data to predict Social factors | *Prof. Esha Chatterjee* [**report**] **SOC 479**

- Studied relevant literature implementing deep learning techniques utilizing Geographical Information Systems.
- Worked on the idea of using neighborhood vector polygons to create prediction systems for domestic violence rates.
- Discussed the relevance of using prediction systems for areas with under-reported domestic crime rates.

Numerical solution of ODE systems using Runge-Kutta methods | *Prof. K Muralidhar* **ME 685**

- Performed higher order explicit schemes to solve systems of differential equations through discretization techniques.
- Studied the discretization errors and compared the time complexity, consistency and stability of different order schemes.
- Performed Regula Falsi technique to carry out boundary value problems involved in fourth order Runge-Kutta methods
- Numerically simulated velocity distribution of turbulent flow between parallel plates using Navier Stokes equations.

Technical Skills

Languages: Python, JavaScript, C, C++, XML, SQL, MATLAB, FORTRAN
Developer Tools: VS Code, Cloud Foundry, SAP Business Application Studio, Ansys, SolidWorks, GitHub
Libraries: Keras, Tensorflow, Pytorch, Deep Graph Library

Relevant Coursework

Programming: Deep Learning **ME698**, Data Structures and Algorithms **ESO207**, C Programming **ESC101** Cryptology **CS641**, Numerical Methods **ME685**
Mathematics: Linear Algebra and ODE **MTH102**, Partial Differential Equations **MSO203**, Tensor Algebra **ME321** Complex Analysis **MSO202**, Real Analysis **MTH101**
Electronics: Introduction to Electronics **ESC201**, Power Electronics **ESO203**, Control Systems **ME354**
Cognitive Science: Congnitive Neuroscience **CGS609**, Psychology of Language **PSY499**, Applied Psychology **PSY152**

Achievements

- Received Letter of Acceptance from University of Technology of Troyes for the semester exchange program.
- Received a Pre-Placement Offer from Larsen and Toubro Infotech in the SAP Business unit.
- Awarded the third position for the course project of Introduction to Manufacturing Processes TA201 in 2019-20.
- Secured AIR 1384 in JEE Advanced 2018 and AIR 747 in JEE Mains 2018 among 1.05 million students who appeared.
- Awarded the prestigious National Talent Search Examination NTSE scholarship awarded by NCERT in 2016.
- Received the KVPY fellowship, conducted by IISc Bangalore, securing AIR 1010 in KVPY SX stream in 2017.
- Received merit certificate in Indian National Mathematical Olympiad 2016 by Homi Bhabha Centre for Science.
- Secured 4^{th} position at Regional Mathematical Olympiad RMO 2015 and 11^{th} position at RMO 2014.

Extracurricular Activities

Tabla: Received Senior Diploma and placed in first division by Prayag Sangeet Samiti, Allahabad in 2011-12.
Company Coordinator, Students' Placement Office IIT Kanpur: Coordinated with the companies and students to ensure smooth conduction of two weeks long Placement Drive 2019.
Secretary, Ritambhara 2019: Assisted in the management of the fashion event organised in the cultural fest Antaragni.
Student Guide, Counselling Service IIT Kanpur: Mentored 6 freshmen to ensure smooth transition to campus life.
Secretary, Fine Arts Club IIT Kanpur: Supervised and participated in performances and exhibition events.
Talks: Neural Correlates of Emotional Responses to Music, Endsemester talk for the course CGS609A [**Link**]