Sagnik Majumder

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Education

May 2021 **University of Texas at Austin (UT)-Austin**, Texas, United States
Master of Science in Computer Science

July 2018 **Birla Institute of Technology and Science (BITS)-Pilani**, Pilani, Rajasthan, India
Bachelor of Engineering (Hons.) in Electronics and Instrumentation
Thesis: "Neural Architecture Meta-learning via Reinforcement" | Advisor: Prof. V. Ramesh
GPA: 9.55/10, Distinction and ranked 2^{nd} in department

May 2014 **South Point High School (SPHS)**
All India Senior School Certificate Examination (AISSCE), CBSE; **Aggregate - 94.6%,**

Internships and Research

Jul 2018 - May 2019 **Research assistant at Goethe University, Germany**
Advisors - Prof. Visvanathan Ramesh, Mr. Martin Mundt

- Built a continual learning framework by integrating variational autoencoder based deep generative replay and statistical outlier rejection with OpenSet algorithm
- Curated a novel dataset for multi-target concrete bridge defect identification, meta-learned task specific neural architectures and compared their performance withe baseline deep learning models and transfer learning
- Investigated a common architectural design practice of monotonically increasing feature amounts with depth in CNNs, through parameterization of feature distribution across layers and obtained results that contradict this practice

Jan-Jun, 2018 **Bachelor thesis intern at Goethe University, Germany**
Advisors - Prof. Visvanathan Ramesh, Mr. Martin Mundt

- Worked on Q-learning (MetaQNN) and REINFORCE (ENAS) based neural architecture search algorithms for image classification
- Proposed a greedy alternative to the Q-learning update rule in MetaQNN for improving convergence with shorter search schedules
- Worked on reward design and loss reformulation for extending architecture search to deep generative models

May 2017 - *May* 2019 **Research intern through DAAD WISE scholarship program**
Advisor - Prof. Christoph Malsburg, senior fellow at Frankfurt Institute for Advanced Studies

- Created a distortion invariant handwritten digit recognition system
- Used Gabor filters for feature (intensity, orientation and frequency) extraction
- Used elastic matching between graphs with dynamic links, for recognition
- Worked on motion parameter estimation and prediction with Reichardt velocity detection mechanism and self-organizing neural fields

Internships and Research Continued...

May-Jul, 2016 | **Research intern at Indian Institute of Remote Sensing, Dehradun, India**
Advisors - Ms. Shefali Agarwal, Mr. Raghavendra S.

- Implemented software based synchronization of terrestrial laser scanner (TLS) and global positioning system in mobile mapping system using network communication protocols
- Processed scan data from TLS and extracted it to human readable format

Major Academic Projects

Jan-Dec, 2017 | **Project member at Multimedia Laboratory, BITS Pilani, India**
Advisors - Prof. Surekha Bhanot, Prof. Kamlesh Tiwari

- Worked on face recognition with baseline CNNs and transfer learning; used OpenFace toolkit for affine transformation based face alignment as a data preprocessing step
- Implemented a system for image grounded text generation using primer text produced from sign language images; used fine-tuned CNN models for sign language image classification and LSTM for text generation

Jan-May, 2017 | **Project member at Nano Bio Sensors Group, CSIR-CEERI Pilani, India**
Advisor - Mr. Soumendu Sinha

- Designed an ISFET based pH-meter; collected 'pH-sensitivity vs temperature' data and applied feature normalization
- Temperature-compensated the pH-meter through ML by using diverse regression models like neural networks, support vector regression, random forest and polynomial regression

Peer-reviewed Publications and Submissions

- Martin Mundt, **Sagnik Majumder**, Iuliia Pliushch, Visvanathan Ramesh. *"Unified Probabilistic Deep Continual Learning through Generative Replay and Open Set Recognition"*. To be submitted to a **tier-1 conference**.
[Preprint], [Codebase]
- Martin Mundt, **Sagnik Majumder**, Sreenivas Narasimha Murali, Panagiotis Panetsos, Visvanathan Ramesh. *"Meta-learning Convolutional Neural Architectures for Multi-target Concrete Defect Classification with the COncrete DEfect BRidge IMage Dataset"*. **CVPR 2019**.
[Main body], [Supplementary], [Codebase]
- Martin Mundt, **Sagnik Majumder**, Tobias Weis, Visvanathan Ramesh. *"Rethinking Layer-wise Feature Amounts in Convolutional Neural Network Architectures"*. **NeurIPS 2018** Workshop: Critiquing and Correcting Trends in Machine Learning.
[Workshop web-page with link to publication], [Publication], [Codebase]
- Martin Mundt, Iuliia Pliushch, **Sagnik Majumder**, Visvanathan Ramesh. *"Open Set Recognition Through Deep Neural Network Uncertainty: Does Out-of-Distribution Detection Require Generative Classifiers?"*. **ICCV 2019** Workshop: Statistical Deep Learning for Computer Vision.
[Publication]

- **Sagnik Majumder**, C. von der Malsburg, Aashish Richhariya, Surekha Bhanot, "*Handwritten Digit Recognition by Elastic Matching*" Journal of Computers vol. 13, no. 9, pp. 1067-1074, 2018. [Publication], [Codebase]
- Rishabh Bhardwaj, **Sagnik Majumder**, Pawan K. Ajmera, Soumendu Sinha, Rishi Sharma, R. Mukhiya, Pratik Narang. "*Temperature compensation of ISFET based pH sensor using artificial neural networks*" . In: Micro and Nanoelectronics (RSM), 2017 IEEE Regional Symposium on. IEEE. 2017, pp. 155–158. [Publication]
- Rishabh Bhardwaj, Soumendu Sinha, Nishad Sahu, **Sagnik Majumder**, Pratik Narang, Ravindra Mukhiya. *"Modeling and Simulation of Temperature Drift for ISFET based pH Sensor and its Compensation through Machine Learning Techniques "*. International Journal of Circuit Theory and Applications 2019. [Publication]

Teaching Experience

Semester 1, 2017-18: Teaching assistant for "Neural Networks and Fuzzy Logic" at BITS Pilani

Coursework

Graduate:	Deep Learning Seminar; Natural Language Processing; Reinforcement Learning: Theory & Practice
Undergraduate:	Neural Networks & Fuzzy Logic; Machine Learning; Advanced Calculus; Linear Algebra and Complex Variables; Probability and Statistics; Computer Programming; Operating Systems; Object Oriented Programming; Advanced Computer Architecture
MOOC:	Data Structures (certificate); Algorithms (certificate); Discrete Mathematics (certificate); Stanford's CS231n: Convolutional Neural Networks for Visual Recognition; Stanford's CS224n:Natural Language Processing with Deep Learning; UC Berkeley's CS294: Deep Reinforcement Learning

Software Skills

Programming Language:	Python; C; C++; Java; Matlab
Autodifferentiation Framework:	PyTorch; Tensorflow; Caffe
Python Package:	Numpy; Scipy; SK-learn; Matplotlib; Seaborn; Plotly
Operating System:	Linux (Debian, Ubuntu); MS Windows
Distributed Version Control:	Git
Document Preparation:	LaTeX; MS Word

Academic Honors and Achievements

August 2018	TOEFL iBT: 116 (Reading: 30, Listening: 29 Speaking: 27, Writing: 30)
July 2018	GRE: 334 (Quantitative: 170, Verbal: 164, AWA: 5.0)
Jan 2016 - Jun 2018	Received merit scholarship for academic excellence from BITS Pilani for 5 consecutive semesters
August 2017	Offered full-time role as machine learning engineer (software development) by the technology division of Goldman Sachs India
March 2017	Secured 2^{nd} place in paper presentation at APOGEE, BITS Pilani technical festival
December 2016	Received DAAD WISE scholarship 2017 for research internship in Germany
June 2014	Ranked in top 0.50% in IIT-JEE and 64 in WBJEE
February 2014	Offered KVPY fellowship by the Department of Science and Technology, Govt. of India

Co-curricular Activities

2016-17: Project coordinator of Instrumentation Forum, BITS Pilani
2014-17: Member of BITS Firefox Community, Google Developers' Group and Instrumentation Forum at BITS PIlani

Extra-curricular Activities

2016-17: Cultural secretary of Moruchhaya, the Bengali cultural association at BITS Pilani
2014-18: Member of Moruchhaya