MONI SHANKAR DEY

EDUCATION

Institute	Degree	Specialization	CGPA	Year
IIT Bombay	M.Tech. Geo-Informatics	Image Analysis	9.58	2020
Presidency University	M.Sc. Physics	Radio Astronomy	7.21	2017

ACADEMIC THESIS

M.Tech.: Attention Morph-UNet for Road & Building Extraction from Satellite Images *[2020]*

M.Sc.: Simulating Foregrounds for Redshifted HI 21 cm Signal Study of Epoch of Reionization (EoR) *[2017]*

RESEARCH PUBLICATIONS

Dual-Path Morph-UNet for Road and Building Segmentation From Satellite Images *[2021]*

Journal: Geoscience and Remote Sensing Letters (IEEE)

Authors: **Moni Shankar Dey**, Ushashi Chaudhuri, Biplab Banerjee & Avik Bhattacharya

- Designed novel **DPM-UNet** for aerial object segmentation based solely on their **morphological** features.
- Incorporated residual & dense path in UNet architecture resulting in **reduced redundancy** & small model size.
- Achieved state of the art (SOTA) on road & building segmentation while having **90%** less parameters (**0.45 mil.**)

Image Restoration by Learning Morphological Opening-Closing Network *[2020]*

Journal: Mathematical Morphology -Theory and Applications (De Gruyter)

Authors: Ranjan Mondal, **Moni Shankar Dey** & Bhabatosh Chanda

- Designed **Alternate Sequential Filter** based morphological network for de-raining and de-hazing images.
- **Reconstructed** de-hazed image by estimating airlight and transmittance map using **joint DSSIM** loss.
- Achieved **SOTA** on O-HAZE, D-HAZY, and Rain dataset for **de-hazing** & **de-raining** tasks respectively.

Open-Set Classification of CRISM Hyperspectral Data *[Under Review]*

Authors: Sandeepan Dhoundiyal, **Moni Shankar Dey**, Shashikant Singh, P. V. Arun, G. Thangjam & Alok Porwal

- Proposed **EVMF**, combining Random Forests & Extreme Value Analysis to identify minerals in **CRISM** data.
- Achieved state of art accuracy of **87%**, kappa score of **0.85** & detected **89% outliers**, on Open Set test data.
- Quantified model's **interpretability** using **SHAP**, and compared it with spectra's physically significant features.

WORK EXPERIENCE

SigTuple Technologies *Bangalore*

Data Scientist - II *[Oct'23 - Present]*

- **Leading** a 3 member team, as a **SPOC**, for a collaborative inter-company **Point of Care (POC)** device project.
- **Simulated** scenarios for device resource usage, & **benchmarked IP and DL** algorithms to check device capacity.
- Streamlined existing detection pipeline & increased inference speed by **12x** on **NVIDIA-Jetson Nano**.
- **Architectured** & implemented a **test-driven pipeline** for model inference, considering the device's constraints.
- Developed **NATS** messaging for **async** inter-module communication, & **dockerized** code for on-edge deployment

Data Scientist - I *[Apr'22 - Sep'23]*

- **Owner** of **Malaria module** - designed pipelines for data annotation, model training & inference on PBS images.
- Synced with product & medical team to define **KPI** & **develop strategy** to detect **malaria** at **40x** magnification
- Implemented basic **active learning** pipeline, leading to **67% reduction** in **annotation** time by doctors.
- Scraped and **mined in-house database** to identify potential malaria samples & add **hard negatives**.
- Applied **self supervised learning** & **clustering** to improve diversity and **reduce imbalances** in training data.
- Designed **YOLOX** based 3-stage model & finetuned over 2 iteration, achieving **23% improvement on F1** score
- Productionized the inference pipeline, and deployed it on GCP post dockerization.
- Improved IP based 40x RBC classification model with **ECA-ResNet** based model for **stain variation** robustness
- Investigated product complaints, and **refactored** existing codebase to be reliable & **resilient to edge cases**.
- Documented and conducted **device-wide tests** post system releases, as part of the **regulatory** framework.

Rakuten Mobile (Innoeye)   *Tokyo (Remote)*
Software Engineer   *[Nov'20 - Apr'22]*
- Part of 30+ member team responsible for developing **Rakuten Link**, Rakuten Mobile's flagship app
- Entrusted with developing **Proof of Concepts (PoC)** & features for Voicemail, Greetings and Call sections
- Implemented unit **test case** for code robustness, including edge cases, usability & general reliability
- Collaborated closely with cross-cultural product & UI teams across the time zones under agile methodologies

Indian Statistical Institute   *Kolkata*
Machine Learning Research Intern   *[May'19 - Aug'19]*
- Investigated image processing operations and ways to incorporate them in deep learning based framework
- Developed **morphological** neural network (MNN) for **style transfer** & pencil sketch on MIT Adobe Dataset
- Designed **Deep-MNN** to estimate crowd strength & achieved **18.3%** accuracy improvement over MC-CNN.

SustLabs   *Mumbai*
Data Science Intern   *[Dec'18 - Jan'19]*
- Extensive survey of machine learning methods for detecting real time **appliance activity** using **NILM**
- Responsible for building training and test **dataset** of **30+** home and industrial appliances in market.
- Developed analytical model to detect **appliance signature** from smart meter aggregate load data using **R**

SELECTED PROJECTS

Hourly Micro-Climatic Parameter Forecasting using Deep Learning
- Performed EDA & removed trend and non stationarity from micro climatic **time series IoT data**
- Extracted **multiple seasonalities** using Fourier transform & utilized it as exogenous variables in ARIMA model
- Developed model consisting of 1D CNN & achieved **23% lower MAPE** compared to ARIMA for hourly forecast

Myocardial Infarction detection using Deep Learning
- Designed a novel 11 layer deep network consisting of **1D CNN** for analyzing raw **ECG** signals
- Pre-processed and de-noised the raw signal by applying **SG filter** and **CP Detection** algorithm
- Executed the network in PyTorch over **PTB Diagnostic ECG** dataset and achieved accuracy of **97.89%**

TECHNICAL SKILLS

Tools: Git, CircleCI, Docker, NATS, GCP, MongoDB, NoSQL, Firebase, LabelStudio, MLFlow
Languages: Python, R, Cython, Swift, C, Kotlin, Java
ML Frameworks: TensorFlow, PyTorch, Keras, CoreML, Huggingface, FastAPI, ONNX
Remote Sensing: ENVI, ArcGIS, QGIS, Google Earth Engine

SCHOLASTIC ACHIEVEMENTS

- **Academic Reviewer** - Earth Science Informatics (Springer) *[Impact Factor - 2.705]*   *[2023 - Present]*
- Selected for **PhD** in **Physics** at **Tata Institute of Fundamental Research** (TIFR)   *[2018]*
- Awarded **Junior Research Fellowship** in **Physics** for securing **AIR 142** in **CSIR-UGC NET**   *[2017]*