BISWAJIT SAHA

+91 6291674952 ⋄ sahabiswajit.ju@gmail.com

Website ⋄ GitHub ⋄ Orcid ⋄ LinkedIn

EDUCATION

BE in Electrical Engineering, Jadavpur University   *expected August 2024*
GPA: 9.09/10 (*current*)

RESEARCH EXPERIENCE

Carnegie Mellon University, United States of America   *January 2022 - May 2022*
Research Intern, XuLab — Advisor: Dr. Min Xu

- Worked on fine-tuning of transformers for image classification, transfer learning methods were particularly employed on different but related datasets. This work is an open source contribution to AITom under XuLab.

Kyungpook National University, South Korea   *July 2022 – December 2022*
Research Intern, ECIS Lab — Advisor: Dr. Rammohan Mallipeddi

- Working on Uncertainty Quantification(UQ) for Aleatoric and Epistemic Uncertainty estimation on a given dataset through Bayesian inference, following which we detect the outliers and related errors.

Indian Institute of Technology Roorkee, India   *May 2023 - July 2023*
Research Intern, Computer Vision Lab — Advisor: Dr. Sparsh Mittal

- Working on diffusion model based image sample synthesis of minority classes pertaining to long-tail datasets and improve the F1 score of classifier model on these classes.

Indian Statistical Institute, Kolkata, India   *April 2022 - March 2023*
Research Intern, Image Processing and Computer Vision Lab — Advisor: Dr. Swagatam Das

- Worked on developing an adaptive mix-up of selected data-points and sample new data points belonging to a class in vicinity with the minority spectrum of an imbalanced dataset.

Jadavpur University, India   *January 2022 - Present*
Research Assistant, CMATER Lab — Advisor: Dr. Ram Sarkar

- Developed a Segmentation Network Architecture for skin lesion segmentation.
- Developed an end-to-end framework for classification aided with a meta-heuristic hybrid optimization algorithm for feature selection and elimination of redundant features to boost base model performance .
- Worked on a segmentation architecture for lung nodule detection on LUNA16 database.

OPEN-SOURCE PROJECTS

- Segmentation as a tool in medical imaging to detect melanoma
  - U-Net architecture implementation to segregate region of interest.
  - Github rep: Link
- Deep Convolutional Neural Network Improvisation using Genetic Algorithm
  - Curated optimized feature space with less redundant features.
  - Github rep: Link
- Numeral Character recognition using indigenous Convolutional Neural Architecture
  - End-to-end framework for lightweight CNN composition.
  - Github rep: Link
- Classification of types of Lung Carcinoma using CNNs
  - Using transfer learning technique on different pre-trained models for binary classification.
  - Github rep: Link
- SARS-CoV-2 detection from lung CT images using traditional contour based feature extraction techniques.
  - Extractors used: Haralick, Gabor and GLCM.
  - Classifiers used: SVM, MLP & KNN.
  - Github rep: Link

RESEARCH PUBLICATIONS

Journals

3. Faizanuddin Ansari, Agnish Bhattacharya, **Biswajit Saha**, Swagatam Das, "Mo2E: Mixture of Two Experts for Class-Imbalanced Learning from Medical Images", submitted to *MICCAI-2023*
   - A data augmentation technique to sample new data points through Mix-Up and building an adaptive data-sampler around it,
   - samples fed to the mix-up network are adaptive to instantaneous metrics available for each class after every iteration making sure the learning curve of the model does not go through bias training.

2. **Biswajit Saha**, Agnish Bhattacharya, Ram Sarkar, "PITSNet: A Poly-attention Intel Transfer Segmentation Network for Skin Lesion Segmentation", submitted to *Pattern Recognition*, Elsevier.
   - A segmentation network which incorporates ConvNeXT layers as the encoder, and bottleneck decoder configuration with compression ratio of 0.25,
   - squeeze excitation module attention-based transfer of intelligence from shallow(initial) regions to deeper(latent) regions of the segmentation network.

1. Agnish Bhattacharya, **Biswajit Saha**, Soham Chattopadhyay, Ram Sarkar, "Deep Feature Selection Using Adaptive-Beta Hill Climbing Aided Whale Optimization Algorithm for Lung and Colon Cancer Detection ", accepted at *Biomedical Signal Processing and Control*, Elsevier.
   - Proposed a meta-heuristic hybrid optimization algorithm to filter the features required to classify the lung and colon cancer histopathological images (LC25000 dataset) into 2, 3 and 5 classes using deep features extracted from the respective data, initial features extracted by different CNNs in each case.

ONGOING PROJECTS

1. Contact-less heart rate monitoring system with RGB videos with characteristic 5fps and total length of 20 secs.
   - feature extraction from the red channel of these frames over a consistent period of time to generate time-varying data-points that further requires some gated-mechanism to refine the redundant features
2. Application of Bayesian Reasoning in tasks of UQ, different methods employed to evaluate Aleatoric and Epistemic uncertainty on the given dataset, and model trained on it respectively.
   - further improvement on the Bayesian model used to infer the degree of uncertainty in them and use of ensemble models for estimation of mean uncertainty in practice
3. Diffusion model based image sample synthesis of minority classes pertaining to long-tail datasets
   - Composing denoising architecture, hybrid loss function for backpropagation and noise scheduler to generate intermediates

COURSEWORK

i) Digital Signal Processing	ii) Sequential Systems and Microprocessors	iii) Instrumentation
iv) Mathematics	v) Signals and Systems	vi) Control Systems

ACHIEVEMENTS

WBJEE(2020): **99.70(%ile)**

JEE Mains(2020): **98.70(%ile)**

SKILLS

Languages	Python, MATLAB, Java
Frameworks	PyTorch, TensorFlow, Keras, Pandas, NumPy, OpenCV, Imgaug
Tools	Putty