Sourjya Mukherjee

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EDUCATION

- **National Institute of Technology, Silchar** — Assam, India
  Bachelor of Technology - Electronics and Communications Engineering; CGPA: 8.75 — 2023 - present

- **Arunodoi Academy, Amguri** — Assam, India
  HSC ; Percentage: 90 — 2019

- **Don Bosco School, Amguri** — Assam, India
  HSLC ; Percentage : 87.5 — 2017

MAJOR PROJECTS

- **Liver and Liver Tumor Segmentation from CT Volumes using W-Net**
  Winter Internship Project — Dec 2022 - Jan 2023
  Supervisor: Dr.R.Murugan, ECE, NIT Silchar — link to paper and code

  - A novel 2D CNN architecture, W-Net was proposed in this project. The proposed architecture consists of two encoders and one decoder. The first encoder used is based on a ResNet 50 backbone pre-trained on the imagenet dataset. The rest of the network is trained from scratch. The features extracted by the two encoders are merged and fed to a single decoder which generates the final segmentation masks. The main objective of this approach is to boost model capacity and incorporate regularisation without negatively impacting the training set performance.
  - A unique preprocessing scheme was developed to enhance the contrast between liver and non-liver tissue and liver and tumor tissue respectively.
  - The LiTS-17 dataset was used to train and test the proposed architecture and a detailed ablation study was conducted to assess the contribution of each individual component of the model on the segmentation performance.
  - Proposed model achieved the highest ever recorded dice scores for the segmentation of liver and liver tumors on the LiTS-17 dataset.

- **Detection and Segmentation of Brain Tumors from MRI Volumes using SER-Net**
  Summer Internship Project — May 2022 - July 2022
  Supervisor: Dr.R.Murugan, ECE, NIT Silchar — link to paper and code

  - In this project SER Net, a novel 2D CNN architecture based on the U-Net framework was proposed for the multiclass segmentation of brain tumors from multimodal MRI volumes. The basic convolutional blocks of the U-Net were replaced with residual blocks followed by squeeze-and-excitation modules, and an ASPP module was integrated at the bottleneck of the encoder to realize the SER-Net architecture.
  - The BraTS 2020 and TCGA LGG datasets were used to independently train and test the proposed architecture, and a detailed ablation study was conducted to assess the contribution of each individual component of the model on the segmentation performance.
  - At a computational cost significantly lower than typical 3D models, the SER-Net was able to achieve cutting-edge dice scores on both datasets proving its effectiveness for the segmentation of both HGGs and LGGs.

OTHER PROJECTS

- **Estimation of Chlorophyll Concentration in Leaves**
  Unsuprervised — June 2021
  link to presentation

  - In this project, a simple spectroscope (operating in the visible spectrum) was constructed using a webcam, a DVD's diffraction grating attached to its lens, and a wooden box with a metal slit to house the entire assembly.
  - Using a known source of white light, the absorption spectrum of several leaves was investigated using the Theremino Spectrum Analyzer software. Special attention was paid to the wavelengths for which chlorophyll a and b show maximum absorbance.
  - A modified form of Beer-Lambert's law was used to compare the chlorophyll concentrations in various leaves.

- **Youtube Adview Prediction**
  Unsuprervised — Nov 2021
  link to code

  - Various ML models were tested on the Kaggle Youtube AdView Dataset based on mse, made, and rms errors to find which model gives the best prediction. The decision tree regressor was found to be the best model.
  - Skills learned: Data cleaning, Feature selection, Feature normalization, and Linear regression

- **Image Segmentation Projects**
  - **Skin Lesion Segmentation using UNet++**   *May 2022 - June 2022*
    Unsupervised   *link to code*
    In this project, the segmentation performance of a custom-made UNet architecture was evaluated on the
    ISIC 2016 dataset. No preprocessing schemes were used.
    Through this project, the effect of different loss functions, batch sizes, and learning rates on the segmentation
    performance of the model was studied.
  - **Hard Exudate Segmentation from Fundus Images**   *May 2022 - June 2022*
    Unsupervised   *link to code*
    In this project fundus images from the IDRiD dataset were processed using the Contrast Limited Adaptive
    Histogram Equalization scheme followed by Weighted Gaussian Blur to increase the contrast between Hard
    Exudates and the background.
    Different variants of the UNet model were trained on the dataset and the segmentation results were
    compared. The objective of this project was to study the effect of different architectural elements
    incorporated in the UNet framework.

- **Verilog Projects**
  Supervised, Coursera   *Nov 2022 - Feb 2023*
  link to code
  - Barrel Shifter
  - Array Multiplier
  - Pipelined Multiplier
  - Mealy and Moore State Machine Implementation of Sequence Detector

  These assignments were completed as part of the coursework for the University of Colorado's Coursera course,
  "FPGA Design for Embedded Systems Specialization".

Skills

• **Languages**:	Python, C++, Matlab, Verilog, Arduino, LaTeX
• **Frameworks**:	Pandas, Numpy, Scikit, MONAI, TensorFlow, Keras, OpenCV, FastAI
• **Courses**:	Machine learning (Stanford University, Coursera), FPGA Specialization (University of Colorado, Coursera), Arduino for Beginners(Udemy)

Competitions

- **ROC 2020:** Won 2nd prize in Roboanalyzer-Based Online Competition conducted by IIT Delhi
- **Tecnoesis 2021:** Won 2nd prize in Tecnoesis Pitch Please
- **NITS MUN 2021:** Special Mention in NITS MUN 2021, Delegate USA
- **Tecnoesis 2022:** Won 1st prize in Data Strata, ML competition of NIT Silchar's annual tech fest
- **Neurathon 2023:** Secured 'Most Novel Project' title in North-East India's biggest Machine Learning Hackathon.

Volunteering

- Prayas Foundation teaching volunteer *(Online)*   *Nov 2021 - Oct 2022*
- NSS   *Nov 2020 - Nov 2022*