Nirbhay Sharma

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Education

B.Tech, CSE | Indian Institute of Technology (IIT) Jodhpur | CGPA: **8.97**/10 Aug'19-May'23

Class 12^{th} | Dehradun public school | Percentage: **96.4** Mar'18-Mar'19

Class 10^{th} | SD public school | CGPA: **10/10** Mar'16-Mar'17

Technical Skills

Languages: Python, C/C++, HTML/CSS, Javascript, Haskell, Prolog

Tools and Frameworks: Pytorch, Flask, Django, Regex, Heroku, Git, Github, Firebase, Mongodb, Mysql

Familiar with: Tensorflow, Java, React, Nodejs, ejs, Google Colab, OpenCV

Research Interests

Computer Vision (CV), Natural Language Processing (NLP), Federated Learning (FL), Split Learning, Object Detection

Publications

Nirbhay Sharma, *Gautam Kumar*, *Dr. Angshuman Paul*, "An Extremely Lightweight CNN Model For the Diagnosis of Chest Radiographs in Resource-constrained Environments". "International Journal of Medical Physics" 2023

Industry Experience

Print Generation | Pytorch, Python, GAN, Diffusion

Full Time (ML Engineer) | **Faaya Astu** India Jun'23-Present

- Studied **Text To Image** models for print/pattern generation using Text prompts
- FineTuned **GALIP**, a **GAN** based model for **Text to Pattern generation** on **AWS** instance
- Implemented **inference** scripts for **MiniGPT4** for prompts refinement
- Currently exploring **Diffusion** models for **Text to Pattern generation**

Split Neural Networks | Pytorch, Python, Jetson Nano, PySyft

Intern (ML Engineer) | **ExaWizards** India Jun'22-July'22

- Splitted **Mask-RCNN, FCN_Resnet50, YOLOv5** for **Instance segmentation, segmentation, face detection** tasks
- Utilized **Pysyft** and **Jetson Nano** for transferring features from one device to another
- Implemented **encoder-decoder** architecture for **tensor compression**
- Reduced **inference time** on Jetson nano device while preserving **data privacy**

Research Experience

Noise Engineered Federated Distillation for Heterogeneous Settings | Pytorch, FL, Python

Research Project | Supervisor: **Dr. Deepak Mishra** | IIT Jodhpur Aug'22-May'23

- **Proposed** a **novel** Federated Learning Framework to handle **model heterogeneity** among clients
- Utilized the concept of **Data-free KD** for **knowledge transfer** from Client models to Server model
- Solved the issue of requirement of **Generator or proxy dataset** at server end for KD
- Utilized **Gaussian Noise** samples for Distillation
- Compared and **analyzed** our algorithm with state-of-the-art algorithms for **Model heterogeneity**
- **Outperformed** the **relevant baselines** in terms of **test accuracy** by a considerable margin

Light Weight CNN Model for Chest Radiographs Classification | Pytorch, Python, Torchvision, Numpy

Research Project | Supervisor: **Dr. Angshuman Paul** | IIT Jodhpur Jun'21-Mar'22

- Designed a **Lightweight CNN model** for the abnormal detection of **Chest Radiographs**
- Combined the ideas from **Squeezenet** and **Mobilenet** to prepare a Light weight model

- Our Model Outperforms various light weight CNN architectures like **Squeezenet**, **Shufflenet**, **Mobilenet** on NIH dataset both on binary and multiclass classification
- Our **research paper** got accepted at **International Jornal of Medical Physics**

Cell Detection and Classification | Pytorch, Python, Torchvision, Numpy

Research Project | Supervisor: **Dr. Angshuman Paul** | IIT Jodhpur Aug'22-Present

- Detected and classified cells data sample into **necrotic** and **apoptotic cells**
- Finetuned various SOTA object detectors such as **YOLO**, **SSD**, **RetinaNet**, **DeTR**
- Achieved remarkable results using **DeTR** with a Mean Average Precision (MAP) of **40.0**

Projects

Image Captioning using Detection Transformer (DeTR) | Github | Pytorch, Python

- Implemented **DeTR** (a **transformer** based object detector) from **scratch** using **Pytorch**
- Modified **DeTR** architecture for **image captioning** task
- Trained **DeTR** on **Flickr30k** dataset for **500** epochs and evaluated on **Flickr8k** dataset using **BLEU** score
- Achieved a **BLEU** score of **57.36** on **Flickr8k** dataset

Regularizing Federated Learning (FL) via Adversarial Model Perturbations (AMP) | Github | Pytorch, FL, Python

Course Project | Supervisor: **Dr. Richa Singh** | IIT Jodhpur

- Compared and analyzed the effect of **Adversarial Model Perturbations (AMP)** on **4** SOTA FL algorithms
- Implemented **FedAvg**, **FedProx**, **FedNTD**, **SCAFFOLD** from **scratch**
- Integrated the AMP module with aforementioned FL algorithms at client side
- Observed a boost of **2-3%** accuracy in each of the algorithm

CNN Algorithms Comparison | Github | Pytorch, Numpy, Matplotlib, PIL, Python

Course Project | Supervisor: **Dr. Mayank Vatsa** | IIT Jodhpur

- Compared **7** deep **CNN** architectures on **Retinal Eye disease dataset**
- Implemented **Squeezenet**, **Mobilenet**, **Inceptionnet**, **Shufflenet**, **Googlenet**, **Resnet**, **Efficientnet** from **scratch**
- Performed a **comparison study** among the state-of-the-art deep CNN architectures

Image Colorization | Github | Pytorch, Numpy, Matplotlib, PIL, Python

Course Project | Supservisor: **Dr. Mayank Vatsa** | IIT Jodhpur

- Converted **grayscale image** to **colored image** using **GAN** architectures
- Implemented **pix2pix** GAN from scratch for the colorization task
- Performed colorization on **LAB** and **RGB** image format

Mask-NoMask Detection | Github | Pytorch, Numpy, PIL, Matplotlib, Python

Course Project | Supservisor: **Dr. Richa Singh** | IIT Jodhpur

- Detected **5300** images under masked and no masked category with an accuracy of **99.6%**
- Used transfer learning with **Mobilenet v2** for classification task
- Combined the trained model with **OpenCV** for real time classification

PRA-Visualizer | Github | Url | React, Nodejs, HTML, CSS, Firebase

Course Project | Supservisor: **Dr. Suchetna Chakraborty** | IIT Jodhpur

- Implemented a **Page Replacement Algorithm Visualizer** which simulates various page replacement algorithms given **Frames** and **demand pages**
- Implemented **10** algorithms including **LRU**, **Working set**, **FIFO** etc.
- Designed the **web UI** application with **animations** for better visulations

Coursework

Probability and Statistics, Optimization for Machine Learning, Pattern Recognition and Machine Learning (PRML), Deep Learning, Dependable AI, Time Series Analysis, Cryptography, Blockchain, Computer Graphics