Niraj Mahajan

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EDUCATION

University of California San Diego La Jolla, CA
Master of Science in Computer Science Sept 2022 – June 2024
- Courses: Deep Generative Models, Computer Vision, Design and Analysis of Algorithms

Indian Institute of Technology Bombay | **GPA: 9.33** Mumbai, India
Bachelor of Technology with Honors, Major: Computer Science and Engineering Jul 2018 – May 2022
- Activities: Teaching Assistant (Computer Vision: Theory and Lab, Digital Image Processing), CSEA General Secretary
- Courses: Medical Vision, Computer Vision, Reinforcement Learning, Image Processing, Fairness in ML, AI, ML with Graphs

EXPERIENCE

University of Illinois Urbana-Champaign | Research Intern **July 20 – April 21**
- Enhanced the FC layer explainability by replacing the FC computation by performing gaussian clustering on the conv outputs
- Developed a novel algorithm based on shifting and shrinking class clusters as trainable parameters in the convolutional space

University of New South Wales, Canberra | Research Intern **April 20 – July 20**
- Predicting the 3D registration parameters for synthetically generated femur images using a ResNet in a Siamese network
- Performed soft tissue removal on clinical knee CT scan images with the help of a half dark channel filter algorithm

RESEARCH PROJECTS

Dynamic Cardiac MRI reconstruction from undersampled k-space data | UCSD **Ongoing**
- Significantly speed up the Cardiac MRI acquisition with an end-to-end CNN pipeline to populate undersampled Fourier data
- Enhance the reconstruction with Fourier data from the previous cardiac cycles by exploiting the similarities in the ECG pattern

LSTM based Video Frame Interpolation | UCSD **Ongoing**
- Ensure directional conformism in the video by ensuring that all generated frames lie on the same line in the latent space
- Introduce a frame rate control for the generated video by regulating the latent space spacing between successive frames

Weak Supervision for Medical Abnormality Classification | IIT Bombay **Fall 2021**
- Achieved state-of-the-art segmentation on the BUSI dataset by using Pyramid Scene Parsing and Efficient Spatial Pyramid Blocks
- Developed an end-to-end classifier-segmenter pipeline to classify BUSI images using weak supervision for training the segmenter

Recurrent Neural Networks for Analysing 3D Medical Data | IIT Bombay **Spring 2022**
- Formulated 3D MRI images as a time series and tried several time series methods to tackle medical vision problems
- Induced synthetic artefacts in MRI images by distorting the Fourier domain pixels to simulate patient movement

Conditional Diabetic Retinopathy Image Synthesis | IIT Bombay **Spring 2021**
- Generated grade-controlled abnormality images using a Pix2Pix Network, conditioned over the Diabetic Retinopathy grade
- Optimised the process with a two-stage pipeline by generating the blood vessel structure followed by populating the fundus pixels

Location Controlled Brain Tumour Image Synthesis | IIT Bombay **Spring 2021**
- Devised a pipeline for generating location-controlled abnormality in 2D brain MRI images using Controllable GANs
- Enhanced the training by generating healthy images from the tumour images using in-painting with a Context Encoder backbone

KEY TECHNICAL PROJECTS

Deep Retinex Decomposition for Low-Light Enhancement **Fall 2021**
- Performed low light enhancement by isolating and enhancing the reflectance and the illumination components of images

Domain Adaptable Feature Learning for Localisation **Fall 2021**
- Visualised the features learned by the convolutional layers using Class Activation Mappings and Saliency Maps
- Performed Weakly Supervised object localisation for digit detection with a classifier trained to discriminate CIFAR from SVHN

Fischer Faces for Facial Recognition **Fall 2020**
- Highlighted the performance of Fischer's LDA for face recognition in varying lighting & intra-class variance conditions

Popular Link Prediction Algorithms for Social Networks **Fall 2020**
- Surveyed heuristic-based algorithms like Adamic Adar, Katz Measure, Preferential Attachment on link prediction applications

Face Ageing using GANs **Spring 2020**
- Induced two-way facial age transformation on images using a conditional GAN trained with an AlexNet-based age classifier

TECHNICAL SKILLS

Languages	*(Fluent)* Python, Git, Matlab, *(Familiar)* C++, SQL, Bash, Java, C, HTML/CSS, JavaScript, Make
Libraries	PyTorch, OpenCV, scikit-learn, Scipy, NumPy, Pandas, Matplotlib, Keras, TensorFlow