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 *Expected completion by Fall 2022*

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 **Illinois, USA**
Research Intern July 2020 – April 2021
- Replaced the FC computation using gaussian clustering on the convolutional outputs to enhance the FC layer explainability
- Developed a novel algorithm based on shifting and shrinking class clusters as trainable parameters in the convolutional space

University of New South Wales **Canberra, Australia**
Research Intern April 2020 – July 2020
- Employed ResNet in a siamese network for predicting the 3D registration parameters on synthetically generated femur images
- Incorporated a half dark channel filter algorithm to trim the soft tissue pixels from the clinical knee CT images

RESEARCH PROJECTS

Weak Supervision for Medical Abnormality Classification **IIT Bombay**
- 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**
- Formulated 3D MRI images as a time series and tried several time series methods to tackle medical vision problems
- Devised a method to induce artifacts in MRI images by distorting the Fourier domain pixels to simulate patient movement

Conditional Diabetic Retinopathy Image Synthesis **IIT Bombay**
- Incorporated a Pix2Pix Network, conditioned over the DR grade to generate grade-controlled abnormality images
- 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**
- Devised a pipeline for generating location-controlled abnormality in 2D brain MRI images using Controllable GANs
- Designed a rectifier model based on a Context Encoder with a Pix2Pix backbone to generate corresponding healthy images

Matched Filtering Based Convolutional Blocks **Univerity of Illinois at Urbana-Champaign**
- Computed classwise representative filters from the activations of different regions of input images as perceived by conv layers
- Visualised the features extracted by these filters based on their convolutional output at various spatial locations

KEY TECHNICAL PROJECTS

Deep Retinex Decomposition for Low-Light Enhancement **Fall 2021**
- Implemented a neural network pipeline for 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**
- Designed and trained a cGAN to induce two-way facial age transformation on images using 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, Scipy, NumPy, Pandas, Matplotlib, Keras, TensorFlow