C219L, C-Block
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Dr.Saurabh J. Shigwan

Assistant Professor, Computer Science and Engineering, Shiv Nadar IOE Delhi-NCR

Professional Summary

Shiv Nadar Institute of Eminence Delhi-NCR
Designation: Assistant Professor, CSE department *Jan '21 - Present*

Psychiatry Neuroimaging Laboratory, HMS, Boston
Designation: Pre-doctoral Fellow *Aug '19 - Mar '20*

Computer Skills

Languages: Python, MATLAB, Cython, C/C++
Platforms/Libraries: SciPy-NumPy, Pytorch, PyG, Tensorflow, Keras, DiPy
Research Tools: Slicer, ITK-SNAP, VTK

Ongoing Research Projects

Quantitative measure estimation from Sparse DWI using Transformers
Students: Abhishek Tiwari, Ananya Sighal *Sept '22 - Present*
Collaborator: Dr. Rajeev Kumar(SNU)

- Understanding traditional diffusion tensor imaging
- Finding correlation between Diffusion Weighted imaging signal
- Estimating principle components of diffusion tensor using DNN
- Implementation is in **Python-Keras-TensorFlow** and **Cython**

Unsupervised Image Segmentation using Graph Neural Networks
Students: Kovvuri Reddy, Bodduluri Saran, Mudit Adityaja *Sept '23 - Present*
Collaborators: Dr. Nitin Kumar(SNU), Dr. Snehasis Mukharjee(SNU)

- Designed a SOTA method for unsupervised segmentation using GNN and Modularity loss
- Experimental results on three Computer vision dataset and three Medical image datasets.
- Compared result with one of the foundational model MedSAM.

Tractography using Deep Neural Nets
Student: Ishaan Bharatiya *May '24 - Present*
Collaborators: Prof. Yogesh Rathi(Harvard Medical School), Dr. Rajeev Kumar(SNU)

- Understanding traditional diffusion tractography using **unscented Kalman filter**
- Finding correlation between DMRI input and Fibre Bundle positions
- Estimating Fibre directions from DMRI with state of the art Deep Neural Nets
- Implementation is in **Python-Keras-TensorFlow** and **Cython**

Analysis of Spine bone for fractures
Students: Chekuri Arahanth Varma *Sept '23 - Present*

- Studying traditional parallel beam and fan beam 2D reconstruction
- Studying existing cone beam reconstruction using ASTRA toolbox
- Reconstruction from sparse cone beam sinograms using Geometry aware DNNs
- Implementation is in **Python-Keras-TensorFlow** and **Cython**

Research Interests

Statistical Modeling and Inference, Medical Image Processing, Bayesian Analysis, Machine Learning, Computer Vision, Deep Learning, Convolution network, Graph convolutional network, Shape analysis.

Awards & Achievements

Secured **Research Funding of $16000 from Mass General Brigham** to do research at Harvard Medical lab on **Brain Tractography using Diffusion-MRI**.

Publications

Kovvuri Sai Gopal Reddy, Bodduluri Saran, A. Mudit Adityaja, **Saurabh J. Shigwan**, Nitin Kumar, and Snehasis Mukharjee, "UnSeGArmaNet: Unsupervised Image Segmentation using Graph Neural Networks with Convolutional ARMA Filters", 35th British Machine Vision Conference (BMVC), 2024

Abhishek Tiwari, Rajeev Kumar Singh and **Saurabh J. Shigwan**, "SwinDTI: swin transformer-based generalized fast estimation of diffusion tensor parameters from sparse data" Neural Computing and Applications, Springer, 2023

Abhishek Tiwari, Ananya Singhal, **Saurabh J. Shigwan**, Rajeev Kumar Singh, "Early Diagnosis of Alzheimer through Swin-Transformer-Based Deep Learning Framework using Sparse Diffusion Measures" The 15th Asian Conference on Machine Learning (ACML 2023)

Abhishek Tiwari, Ananya Singhal, **Saurabh J. Shigwan**, Rajeev Kumar Singh, "Deep Learning Framework using Sparse Diffusion MRI for Diagnosis of Frontotemporal Dementia", IEEE/CVF International Conference on Computer Vision ICCV 2023

Abhishek Tiwari, **Saurabh J. Shigwan** and Rajeev Kumar Singh, "Validation of Deep Learning techniques for quality augmentation in diffusion MRI for clinical studies" Elsevier NeuroImage: Clinical Q1 SCI Journal Impact Factor = 4.2

Saurabh J. Shigwan, Akshya Gailkwad, Suyash P. Awate, "Object Segmentation With Deep Neural Nets Coupled with a Shape Prior, When Learning from a Training Set of Limited Quality and Small Size" to appear in *International Symposium on Biomedical Imaging* (ISBI-2020), Iowa City, USA

Saurabh J. Shigwan, Suyash P. Awate, "Hierarchical generative modeling and Monte-Carlo EM in Riemannian shape space for hypothesis testing" appeared in *Medical Image Computing and Computer Assisted Intervention* (MICCAI-2016), Athens, Greece

Akshya Gailkwad, **Saurabh J. Shigwan**, Suyash P. Awate, "A statistical model for smooth shapes in Kendall shape space" appeared in *Medical Image Computing and Computer Assisted Intervention* (MICCAI-2015), Munich, Germany

Education

PhD, Computer Science (CGPA: 8.85/10) *Jul' 14 - August' 20*
CSE, Indian Institute of Technology Bombay, Maharashtra, India
Thesis title: **Hierarchical Pointset-Based Statistical Shape Modeling and Applications**

MTech, Computer Science (I Class) *Jul' 12 - Jul' 14*
MIU, Indian Statistical Institute Kolkata, West Bengal, India
Thesis title: **Shot Boundary Detection in Video**

BE, Computer Engineering (I Class) *Jul' 07 - Jul' 11*
University of Mumbai, Maharashtra, India