

# Dr.Saurabh J. Shigwan

ASSISTANT PROFESSOR, COMPUTER SCIENCE AND ENGINEERING, SHIV NADAR IOE DELHI-NCR

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## 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*

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## COMPUTER SKILLS

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

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## 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 Rathie(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 Aranth 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 <b>Research Funding of \$16000 from Mass General Brigham</b> to do research at Harvard Medical lab on <b>Brain Tractography using Diffusion-MRI</b> .

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PUBLICATIONS	<p>Kovvuri Sai Gopal Reddy, Bodduluri Saran, A. Mudit Adityaja, <b>Saurabh J. Shigwan</b>, Nitin Kumar, and Snehasis Mukharjee, "UnSeGArmaNet: Unsupervised Image Segmentation using Graph Neural Networks with Convolutional ARMA Filters", 35th British Machine Vision Conference (BMVC), 2024</p> <p>Abhishek Tiwari, <b>Saurabh J. Shigwan</b> and Rajeev Kumar Singh, "Validation of Deep Learning techniques for quality augmentation in diffusion MRI for clinical studies" Wiley ISMRM and ISMRT 2023</p> <p>Abhishek Tiwari, Ananya Singhal, <b>Saurabh J. Shigwan</b>, 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)</p> <p>Abhishek Tiwari, Ananya Singhal, <b>Saurabh J. Shigwan</b>, Rajeev Kumar Singh, "Deep Learning Framework using Sparse Diffusion MRI for Diagnosis of Frontotemporal Dementia", IEEE/CVF International Conference on Computer Vision ICCV 2023</p> <p>Abhishek Tiwari, <b>Saurabh J. Shigwan</b> 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</p> <p><b>Saurabh J. Shigwan</b>, Akshya Gaikwad, 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 <i>International Symposium on Biomedical Imaging (ISBI-2020)</i>, Iowa City, USA</p> <p><b>Saurabh J. Shigwan</b>, Suyash P. Awate, "Hierarchical generative modeling and Monte-Carlo EM in Riemannian shape space for hypothesis testing" appeared in <i>Medical Image Computing and Computer Assisted Intervention (MICCAI-2016)</i>, Athens, Greece</p> <p>Akshya Gaikwad, <b>Saurabh J. Shigwan</b>, Suyash P. Awate, "A statistical model for smooth shapes in Kendall shape space" appeared in <i>Medical Image Computing and Computer Assisted Intervention (MICCAI-2015)</i>, Munich, Germany</p>
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EDUCATION	<p><b>PhD, Computer Science (CGPA: 8.85/10)</b> <span style="float: right;"><i>Jul' 14 - August' 20</i></span>  CSE, Indian Institute of Technology Bombay, Maharashtra, India  Thesis title: <b>Hierarchical Pointset-Based Statistical Shape Modeling and Applications</b></p> <p><b>MTech, Computer Science (I Class)</b> <span style="float: right;"><i>Jul' 12 - Jul' 14</i></span>  MIU, Indian Statistical Institute Kolkata, West Bengal, India  Thesis title: <b>Shot Boundary Detection in Video</b></p> <p><b>BE, Computer Engineering (I Class)</b> <span style="float: right;"><i>Jul' 07 - Jul' 11</i></span>  University of Mumbai, Maharashtra, India</p>
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