NIHARIKA SHIMONA D'SOUZA

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EDUCATION

The Johns Hopkins University, Baltimore, MD *September 2016 - November 2021*
Ph.D
Department of Electrical and Computer Engineering
Thesis: Blending Generative Models with Deep Learning for Multidimensional Phenotypic Prediction from Brain Connectivity Data
Advisor: Prof. Archana Venkataraman
Dissertation Committee: Prof. Archana Venkataraman, Prof. René Vidal, Prof. Amitabh Basu, Dr. Kilian Pohl, Dr. Stewart Mostofsky

The Johns Hopkins University, Baltimore, MD *January 2019 - May 2021*
MSE
Department of Applied Mathematics and Statistics
Concentration: Optimization and Statistics (GPA: 3.95/4.00)
Programme Advisor: Prof. Gregory Eyink

Indian Institute of Technology, Kharagpur, WB, India *August 2012 - May 2016*
B. Tech (with Hons.)
Major: Electrical Engineering (CGPA - 9.17/10.00; rank - 5/120)
Minor: Electronics and Electrical Communication Engineering
Concentration: Digital Signal and Image Processing & Communications
Thesis Advisor: Prof. Debdoot Sheet

RESEARCH INTERESTS

Technical Focus: Representation Learning: Theory and Methods, Convex/Non-Convex Optimization and Sparse Modeling, Graph Signal Processing, Optimization on Matrix Manifolds, Compressed Sensing and Sparse Modeling
Application Areas: Computational Neuroscience, Connectomics, Biomedical Signal Processing, Deep Learning for Medical Image Analysis, Multimodal Fusion

PROFESSIONAL EXPERIENCE AND INTERNSHIPS

IBM Research, Almaden, San Jose, CA *Jan, 2022 - Present*
Research Staff Member

IBM Research, Almaden, San Jose, CA *May, 2021 - July, 2021*
Summer Research Intern
Supervisor: Dr. Tanveer Syeda-Mahmood (IBM Fellow)
Project: Generalised Multimodal Representation Learning, Alignment, and Fusion of Observations at Scale

Johns Hopkins University *September 2016 - November 2021*
Graduate Research Assistant (Ph.D)
Supervisor: Prof. Archana Venkataraman
Projects: Joint Network Optimization Models for Functional Connectomics; Coupled Manifold Optimization Models for Functional Connectomics and Behavior; Deep-Generative Hybrids for Multimodal and Dynamic Connectivity and Behavior; Graph Signal Processing for Spatio-Temporal Modeling of Connectivity Data; Multimodal Connectivity Modeling on PSD Matrix Manifolds

Indian Institute of Technology, Bombay *May, 2016 - August, 2016*
Undergraduate Research Intern
Supervisor: Prof. Subhasis Chaudhuri (Director, IIT Bombay)
Project: Non-Local Means based Stacked Autoencoders for Visual Denoising

Indian Institute of Technology, Kharagpur *July, 2015 - April, 2016*
Undergraduate Research Assistant (B.Tech)
Supervisor: Prof. Debdoot Sheet
Project: Self-Taught Domain Adaptive Autoencoders for Deblurring Fluoroscence Microscopy Images

Texas Instruments, Bengaluru *April, 2015 - July, 2015*
Summer Research Intern
Supervisor: Madhan Radhakrishnan - Analog Team - HPA/HAPTICS
Project: Characterization of Core Losses in Inductors of Boost Converters via Mathematical Modeling, Simulation and Experimental Verification.

Indian Institute of Technology, Bombay *November, 2014 - December, 2014*
Undergraduate Research Intern
Supervisor: Prof. Baylon G. Fernandes (Head of the Department, EE, IIT Bombay)
Project: Controller Design for Brushless DC Motors (Mathematical Modeling and Simulation)

Indian Institute of Technology, Gandhinagar *April, 2014 - July, 2014*
Summer Research Intern
Supervisor: Prof. Ragavan K.
Project: Simulation and Design of Induction Motors, Sweep Frequency Response Analysis for Industrial Transformers

FELLOWSHIPS, AWARDS, AND HONOURS

Selected as a Illinois CS Future Faculty Fellow and iDS^2 Fellow
Department of Computer Science, UIUC (Declined) *June 2021*
Illinois Institute for Data Science and Dynamical Systems, UIUC (Declined) *June 2021*

Selected for Tapia Scholarship
CMD-IT/ACM Richard Tapia Celebration of Diversity in Computing Conference *June 2021*

MINDS Data Science Fellowship
Mathematical Institute for Data Science, Johns Hopkins University *February 2021*

Selected for Rising Stars in Data Science, 2021
Center for Data and Computing (CDAC), University of Chicago *January 2021*

Selected for Rising Stars in EECS, 2020
Department of Electrical Engineering and Computer Sciences, UC Berkeley *October 2020*

Best Paper Award (co-author)
Workshop on Machine Learning for Clinical Neuroimaging,
Intl. Conference on Medical Image Computing and Computer Assisted Intervention *October 2020*

ECE Graduate Student Fellowship
Department of Electrical and Computer Engineering, Johns Hopkins University *August 2016*

Carnegie Institute of Technology Dean's Fellowship
Carnegie Mellon University (Declined) *August 2016*

Undergraduate Research Support
Department of Electrical Engineering, IIT Bombay *November 2014*

Summer Research Support
Summer Research Internship Programme (SRIP)- IIT Gandhinagar *May 2014*

Travel Grants:
Google Conference Scholarship, NeurIPS 2021 *December 2021*
ICLR Travel Funding, ICLR 2021 *April 2021*
NeurIPS Travel Funding, WiML at NeurIPS 2020 *November 2020*
GRO Travel Grant, Graduate Research Organization, Johns Hopkins Univ. *November 2020*
NIH Travel Award, MICCAI 2020 *October 2020*
ICML Diversity and Inclusion Fellowship, WiML at ICML 2020 *July 2020*
Scholarship for Junior Scientists and Underrepresented Populations, IPMI 2019 *June 2019*
NIH Travel Award, MICCAI 2018 *September 2018*

PROFESSIONAL SERVICE ACTIVITIES

External Reviewer (Peer Reviewed Conferences)
NeurIPS 2022: Neural Information Processing Systems
ICML 2022: International Conference on Machine Learning
ML4H 2021: Machine Learning for Health, 2021
ICLR 2022: International Conference on Learning Representations
IPMI 2021: International Conference on Information Processing in Medical Imaging
MICCAI 2019-2022: International Conference on Medical Imaging & Computer Assisted Intervention
MIDL 2019-2021: Medical Imaging with Deep Learning
ISBI 2021-2022: IEEE International Symposium on Biomedical Imaging

External Reviewer (Journals)
Journal of Neuroscience Methods (2018 -Present)
NeuroImage (2020 -Present)
Frontiers in Neuroscience (2021-Present)
IEEE Transactions in Medical Imaging (2021-Present)
IEEE Transactions on Biomedical Engineering (2022-)
Medical Physics (2021-Present)

Review Editor
Analysis Methods, Frontiers in Neuroimaging (2021-Present)

University Service
ECE Department Head Search Committee - Graduate Cohort (2020-2021)

TECHNICAL SKILLSET

Software: Python, R, Matlab, LaTeX, GitHub
Operating Systems: Linux, Windows, MacOX
Frameworks: scikit-learn, networkx, geomstats, PyTorch, DGL, Theano, FSL, FreeSurfer

TEACHING EXPERIENCE

Graduate Teaching Assistant -EN.520.651 Foundations of Probabilistic ML *Fall 2020*
Participant - Teaching Institute, JHU *Summer 2020*
Graduate Teaching Assistant - EN.520.385 Signals, Systems and Inference *Spring 2018*
Undergraduate Teaching Assistant - Electrical Systems (IIT Gandhinagar) *Summer 2014*

MENTORING

Yesika Alexandra Agudelo Londoño - Undergraduate Research Intern, Spring and Summer 2020
Kavindhya Wickramasinghe - Summer 2020 REU Intern
Yu-Chung Peng - Rising Senior (JHU CS), Fall 2021

BOOK CHAPTERS AND VOLUMES

B1 **N.S. D'Souza** , A. Venkataraman "Network Comparison in Connectomics." Connectome Analysis – Characterization, Methods, and Applications, Elsevier Academic Press. In submission, 2021

JOURNAL ARTICLES

J1 **N.S. D'Souza**, M.B. Nebel, D. Crocetti, N. Wymbs, J.Robinson, S. Mostofsky and A. Venkataraman. "Deep sr-DDL: Deep Structurally Regularized Dynamic Dictionary Learning to Integrate Multimodal and Dynamic Functional Connectomics data for Multidimensional Clinical Characterizations", In Proceedings, NeuroImage, 2021

J2 **N.S. D'Souza**, N. Wymbs, M.B. Nebel, S. Mostofsky and A. Venkataraman. "A Joint Network Optimization Framework to Predict Clinical Severity from Resting State fMRI Data" In Proceedings, NeuroImage, 2020

PEER REVIEWED CONFERENCE PUBLICATIONS

(*MICCAI and IPMI are top-tier machine learning and medical imaging venues*)

C1 **N.S. D'Souza**, M.B. Nebel, D. Crocetti, J. Robinson, S. Mostofsky and A. Venkataraman. "A Matrix Autoencoder Framework to Align the Functional and Structural Connectivity Manifolds as Guided by Behavioral Phenotypes" In proc, MICCAI: Medical Imaging Computing and Computer Assisted Intervention, 2021 **(Acceptance Rate $\sim$ 30 %)**

C2 **N.S. D'Souza**, M.B. Nebel, D. Crocetti, J. Robinson, S. Mostofsky and A. Venkataraman. "M-GCN: A Multimodal Graph Convolutional Network to Integrate Functional and Structural Connectomics Data to Predict Multidimensional Phenotypic Characterizations " In proc. MIDL: 4^{th} Intl. Conference on Medical Imaging with Deep Learning, 2021 **(Selected for Long Oral- Top 18/250 submissions, Invited for Special Issue Submission)**

C3 Y. Peng, **N.S. D'Souza**, B. Bush, C. Brown, and A. Venkataraman. "Predicting Acute Kidney Injury via Interpretable Ensemble Learning and Attention Weighted Convoutional-Recurrent Neural Networks" In Proc. IEEE CISS: Conference on Information Sciences and Systems, 2021

C4 **N.S. D'Souza**, M.B. Nebel, D. Crocetti, N. Wymbs, J. Robinson, S. Mostofsky and A. Venkataraman. "A Deep-Generative Hybrid Model to Integrate Multimodal and Dynamic Connectivity for Predicting Spectrum-Level Deficits in Autism". In proc. MICCAI: Medical Imaging Computing and Computer Assisted Intervention, 2020 **(Oral Presentation, Acceptance Rate $\sim$ 30 %)**

C5 N. Nandakumar, **N.S. D'Souza**, K. Manzoor, J. Pillai, S. Gujar, H. Sair and A. Venkataraman, "A Multi-Task Deep Learning Framework to Localize the Eloquent Cortex in Brain Tumor Patients Using Dynamic Functional Connectivity " In proc. MLCN, 3^{rd} MICCAI Workshop on Machine Learning in Clinical Neuroimaging, 2020 **(Selected for Oral Presentation) Best Paper Award**

C6 **N.S. D'Souza**, N. Wymbs, M.B. Nebel, S. Mostofsky and A. Venkataraman. "Integrating Neural Networks and Dictionary Learning for Multidimensional Clinical Characterizations from Functional Connectomics Data". In Proc. MICCAI: Medical Imaging Computing and Computer Assisted Intervention, 2019 **(Acceptance Rate $\sim$ 30 %)**

C7 **N.S. D'Souza**, N. Wymbs, M.B. Nebel, S. Mostofsky and A. Venkataraman. "A Coupled Manifold Optimization Framework to Jointly Model the Functional Connectomics and Behavioral Data Spaces." In Proc. IPMI: Information Processing in Medical Imaging, 2019 **(Acceptance Rate $\sim$ 30 %)**

C8 **N.S. D'Souza**, N. Wymbs, M.B. Nebel, S. Mostofsky and A. Venkataraman. " A Generative-Discriminative Basis Learning Framework to Predict Clinical Severity from Resting State Functional MRI Data." In Proc. MICCAI: International Conference on Medical Image Computing and Computer Assisted Intervention, 2018 **(Selected for Early Acceptance: $\sim$ Top 15 %)**

C9 N. Nandakumar, **N. S. D'Souza**, J. Craley, K. Manzoor, J. J. Pillai, S. K. Gujar, H. I. Sair, and A. Venkataraman "Defining Patient Specific Functional Parcellations in Lesional Cohorts via Markov Random Fields" In Proc: MICCAI Workshop on Connectomics in NeuroImaging, '18. **(Selected for Oral Presentation: $\sim$ Top 20 %)**

CONFERENCE ABSTRACTS

A1 **N.S. D'Souza**, M.B. Nebel, N. Wymbs, S. Mostofsky, A. Venkataraman. "A Joint Network Optimization Framework to Predict Clinical Severity from Resting-State Functional MRI Data". In Proc. Conference on Medical Imaging and Case Reports, 2019 **(Invited Talk)**

A2 **N.S. D'Souza**, M.B. Nebel, N. Wymbs, S. Mostofsky, A. Venkataraman "A Joint Network Optimization to Predict Clinical Severity from Resting-State Functional Connectomics" In Proc. Flux Congress, 2019 **(Selected for Poster Presentation)**

A3 **N.S. D'Souza**, M.B. Nebel, N. Wymbs, S. Mostofsky, A. Venkataraman "A Generative-Discriminative Basis Learning Framework to Predict Autism Spectrum Disorder Severity". In Proc. ISBI: International Symposium on Biomedical Imaging, 2018. **(Selected for Poster Presentation)**

A4 N. Nandakumar, **N.S. D'Souza**, H. Sair, A. Venkataraman. "A Modified K-Means Algorithm for Resting State FMRI Analysis of Brain Tumor Patients, As Validated by Language Localization". In Proc. ISBI: International Symposium on Biomedical Imaging, 2018 **(Selected for Poster Presentation)**

A5 **N.S. D'Souza**, R. Sathish, A. Shahpurwala, R.K. Das, J Chatterjee, A Guha Roy, D. Sheet, "Deblurring of Fluorescence Microscopy Images using Domain Adaptive Self-Taught Autoencoders" In Proc. ISBI: International Symposium on Biomedical Imaging, 2016 **(Selected for Poster Presentation)**

INVITED TALKS AND PRESENTATIONS

T1 **Generalised Multiplex Graph Neural Networks for Multimodal Fusion**
Invited Talk, ML/AI Seminar, IBM Research, Almaden, San Jose — *July 2021*

T2 **Mathematical Models of Brain Connectivity and Behavior**
Invited Virtual Seminar, Computer Vision Talks — *March, 2022*
Invited Talk, Neuroimaging and Brain Dynamics Lab, Vanderbilt University, TN — *October, 2021*
Invited Talk, Intel Labs, Santa Clara, CA & Hilsboro, OR — *August 2021*
Invited Talk, ML/AI Seminar, IBM Research, Almaden, San Jose — *June 2021*
Invited Talk, Amazon Alexa AI, Boston/Cambridge — *April 2021*
Invited Talk, Computer Science Colloquium, U. Illinois Urbana Champaign — *April 2021*
Invited Talk, SabLab (ECE, Cornell Tech)/CoCoLab (Radiology & Statistics, Cornell U.) — *March 2021*
Invited Talk, Neurotheory Network Seminar, Halicioğlu Data Science Ins., UC San Diego — *March 2021*
Invited Talk, Image Guided Neurosurgery Lab, BWH & Harvard Medical School — *March 2021*
Invited Talk, Koyejo Lab, U. Illinois Urbana Champaign — *February 2021*
Invited Talk, Laboratory of NeuroImaging, U. Southern California — *February 2021*
Invited Talk, Poldrack Lab, Stanford University — *January 2021*
Invited Lightning Talk, Rising Stars in Data Science, CDAC, U. Chicago — *January 2021*

Invited Talk, Rose Yu Group, Computer Science, UC San Diego *January 2021*
Invited Talk, Bouchard Group, LBNL and Yu Group, UC Berkeley (Statistics) *December 2020*

P1 **A Deep-Generative Hybrid Model to Integrate Multimodal and Dynamic Connectivity for Predicting Spectrum-Level Deficits in Autism**
Invited Poster Presentation, WiML Workshop, NeurIPS 2020 *December 2020*

T3 **Mapping Brain Connectivity to Behavior: from Network Optimization Frameworks to Deep-Generative Hybrid Models**
Invited Talk, Rising Stars in EECS, UC Berkeley *November 2020*
ECE Graduate Seminar, Johns Hopkins University *October 2020*
Invited Talk, GRUNECO, Universidad de Antioquia, Colombia *August 2020*

P2 **A Coupled Manifold Optimization Framework to Jointly Model the Functional Connectomics and Behavioral Data Spaces** *July 2020*
Invited Poster Presentation, WiML Workshop, ICML 2020

P3 **Integrating Neural Networks and Dictionary Learning for Multidimensional Clinical Characterizations from Functional Connectomics Data**
Invited Poster Presentation, WSE/DOM Research Retreat, Johns Hopkins University *February 2020*

T3 **A Joint Network Optimization Framework to Predict Clinical Severity from Resting-State Functional MRI Data**
Invited Talk, Conference on Medical Imaging and Case Reports 2020, Boston, MA *November 2019*

P4 **A Generative-Discriminative Basis Learning Framework to Predict Clinical Severity from Resting State Functional MRI Data**
Invited Poster Presentation, WSE/DOM Research Retreat, Johns Hopkins University *March 2019*

T4 **A Generative-Discriminative Basis Learning Framework to Predict Autism Spectrum Disorder Severity**
Center for Neurodevelopment Imaging & Research, Kennedy Krieger Institute *March 2018*

PROFESSIONAL SOCIETY MEMBERSHIPS

Vice President - ECE Graduate Students Association, JHU *September 2019- September 2021*
Student Mentee - Selected for MICCAI Mentorship Programme *August 2020 & 2021*
Participant - Selected for MIDL 2021 Doctoral Symposium *June 2021*
Poster Mentor - Women in Machine Learning Workshop (NeurIPS 2020) *December 2020*
Student Member - Graduate Association of Women in CS & ECE, JHU *September 2016- present*
Student Member - Graduate Women of Whiting, JHU *September 2017- present*
Secretary - ECE Graduate Students Association, JHU *September 2017- August 2018*
Member - MICCAI Society *July 2018 - present*
Member - IEEE *January 2016 - present*

REFERENCES

**** Available upon request**