

ARCHANA VENKATARAMAN

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<http://engineering.jhu.edu/nsa/>

EDUCATION

Massachusetts Institute of Technology, Cambridge, MA

- Ph.D.**, Electrical Engineering 2007 – 2012
Thesis Title: Generative Models of Brain Connectivity for Population Studies
- M. Eng.**, Electrical Engineering 2006 – 2007
Thesis Title: Signal Approximation using the Bilinear Transform
- S.B.**, Electrical Engineering 2003 – 2006
Concentration: Communications, Controls and Signal Processing

ACADEMIC AND RESEARCH POSITIONS

- John C. Malone Assistant Professor, Johns Hopkins, Baltimore MD** 2016 – Present
Department of Electrical and Computer Engineering (Primary Appointment)
Department of Computer Science (Secondary Appointment)
Department of Applied Math and Statistics (Secondary Appointment)
Malone Center for Engineering in Healthcare (Core Faculty)
Mathematical Institute for Data Science (Core Faculty)
Center for Imaging Science (Core Faculty)
- Postdoctoral Associate, Yale School of Medicine, New Haven CT** 2014 – 2016
Department of Diagnostic Radiology
Yale Image Processing and Analysis Group
Faculty Supervisor: James S. Duncan
- Postdoctoral Fellow, MIT, Cambridge MA** 2012 – 2013
Department of Electrical Engineering and Computer Science
MIT Medical Vision Group
Faculty Supervisor: Polina Golland
- Graduate Research Assistant (PhD), MIT, Cambridge MA** 2007 – 2012
Department of Electrical Engineering and Computer Science
MIT Medical Vision Group
Faculty Supervisor: Polina Golland
- Graduate Research Assistant (MS), MIT, Cambridge MA** 2006 – 2007
Department of Electrical Engineering and Computer Science
Digital Signal Processing Group
Faculty Supervisor: Alan V. Oppenheim

INDUSTRY EXPERIENCE

- Technical Consultant, Vixiar Medical, Annapolis MD** 2018 – 2019
- Intern, MIT Lincoln Laboratory, Lexington MA** June – Aug 2006
Advanced Sensor Techniques Group (103)
Supervisor: Dr. Andrew McKellips

AWARDS AND HONORS

| | |
|--|-------------|
| Best Paper Award, SPIE Medical Imaging (Image Processing Conference) | 2021 |
| Best Paper Award, Machine Learning for Clinical Neuroimaging Workshop | 2020 |
| Elected to Full Membership in the Sigma Xi Honor Society | 2020 |
| Invited Participant, National Academy of Engineering FOE Symposium | 2020 |
| Invited Scholar, World Leader's Forum | 2020 |
| Best Paper Award, Connectomics for NeuroImaging Workshop | 2019 |
| MIT Technology Review: 35 Innovators Under 35 | 2019 |
| NSF CAREER Award | 2019 |
| John C. Malone Assistant Professorship | 2017 |
| Council of Early Career Investigators in Imaging (CECI ²) Travel Award | 2016 |
| CHDI Grant, Network Models of Brain Connectivity for Huntington's Disease | 2013 – 2014 |
| MIT Lincoln Lab Campus Collaboration Award | 2012 – 2014 |
| NIH Advanced Multimodal Neuroimaging Training Program | 2011 – 2012 |
| MICCAI Student Travel Award (\$500) | 2010 |
| National Defense Science and Engineering Graduate Fellowship (NDSEG) | 2007 – 2010 |
| Siebel Scholarship (\$20,000) | 2007 – 2008 |
| MIT Provost Presidential Fellowship | 2006 – 2007 |
| Morris Joseph Levin Award, Best Thesis Presentation (M.Eng.) | 2007 |
| Association of MIT Alumnae, Senior Academic Achievement Award (\$500) | 2006 |
| Xerox Technical Minority Scholarship (\$10,000) | 2006 |
| Maletta Foundation Scholarship, Rochester Engineering Society (\$2500) | 2005 |
| Semiconductor Research Corporation Undergraduate Research Award (\$18,000) | 2004 – 2005 |

TRAINEE AWARDS AND HONORS

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|---|------|
| Danielle Currey (Undergraduate), Michael J. Muuss Research Award | 2021 |
| Danielle Currey (Undergraduate), Outstanding Senior Award (Computer Science) | 2021 |
| Sayan Ghosal (PhD Student), Best Paper Award, SPIE Medical Imaging (Image Processing) | 2021 |
| Niharika Shimona D'Souza (PhD Student), Mathematical Institute for Data Science Fellowship | 2021 |
| Ravi Shankar (PhD Student), Mathematical Institute for Data Science Fellowship | 2021 |
| Naresh Nandakumar (PhD Student), Best Paper Award, ML for Clin. Neuroimaging Workshop | 2020 |
| Niharika Shimona D'Souza (PhD Student), Best Paper Award, ML for Clin. Neuroimaging Workshop | 2020 |
| Niharika Shimona D'Souza (PhD Student), Selected for the Rising Stars Program @ UChicago | 2020 |
| Niharika Shimona D'Souza (PhD Student), Selected for the Rising Stars Program @ UC Berkeley | 2020 |
| Sayan Ghosal (PhD Student), MICCAI Travel Award | 2020 |
| Niharika Shimona D'Souza (PhD Student), MICCAI Travel Award | 2020 |
| Ravi Shankar (PhD Student), Interspeech Travel Award | 2020 |
| Ravi Shankar (PhD Student), Mathematical Institute for Data Science Fellowship | 2020 |
| Naresh Nandakumar (PhD Student), Best Paper Award, Connectomics in Neuroimaging Workshop | 2019 |
| Jeff Craley (PhD Student), Finalist WSE/DOM Young Scientist Award | 2019 |
| Niharika Shimona D'Souza (PhD Student), IPMI Travel Award | 2019 |
| Niharika Shimona D'Souza (PhD Student), MICCAI Travel Award | 2018 |
| Jacob Sager (Undergraduate), William B. Huggins Undergraduate Research Fellowship | 2018 |

PROFESSIONAL SERVICE ACTIVITIES

Editorial Responsibilities

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|-------------------------------------|----------------|
| Editorial Board, Journal of Imaging | 2021 – Present |
| Handling Editor, OHBM Aperture | 2020 – Present |

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| Editorial Board Member, Medical Image Analysis | 2019 – Present |
| Associate Editor, International Symposium on Biomedical Imaging (ISBI) | 2021 |
| Review Editor, <i>Brain Imaging Methods</i> , Frontiers of Neuroscience | 2020 |
| Editor, Connectomics in Neuroimaging, <i>Springer MICCAI Workshops Series, ShenZhen, China</i> | 2019 |
| Editor, Computational Diffusion MRI and Brain Connectivity <i>Springer Mathematics & Visualization Series</i> | 2014 |

Grant Reviewing Activities

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|------|--|
| 2021 | Aligning Science Across Parkinson’s (Michael J. Fox Foundation) |
| 2020 | NSF Panelist: CAREER Panel (CISE Directorate) NSF Panelist: Collaborative Research in Computational Neuroscience (CISE Directorate) |
| 2019 | NSF Panelist: CAREER Panel (CISE Directorate) NSF Ad-Hoc Reviewer: III Small Informatics Panel (CISE Directorate) NSF Panelist: Collaborative Research in Computational Neuroscience (CISE Directorate) NSF Panelist: III Medium Informatics Panel (CISE Directorate) |
| 2018 | NIH Reviewer: Neuroscience and Ophthalmic Imaging Technologies (NOIT) Study Section |

Conference and Workshop Organization

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|------|---|
| 2023 | (Upcoming) Program Committee, Information Processing in Medical Imaging (IPMI) |
| 2022 | (Upcoming) Program Chair, Medical Imaging with Deep Learning (MIDL) |
| 2021 | Co-Director of the 55 th Annual Conference on Information Sciences and Systems (CISS) Sponsored by the IEEE Information Theory Society Program Committee, IEEE International Symposium on Biomedical Imaging Area Chair for Medical Image Computing and Computer Assisted Intervention (MICCAI) Best Paper Award Committee for Medical Imaging with Deep Learning (MIDL) |
| 2020 | Organizer, Asilomar Invited Session: <i>From Neural Networks to Neural Systems: Using AI to Decode the Brain in Health and Disease</i> Area Chair for Medical Image Computing and Computer Assisted Intervention (MICCAI) Session Chair for Medical Image Computing and Computer Assisted Intervention (MICCAI) Faculty Mentor for Medical Image Computing and Computer Assisted Intervention (MICCAI) |
| 2019 | Organizer, CNI: MICCAI Workshop on Connectomics in Neuroimaging Organizer, CISS Invited Session: Mathematical Models to Decode the Brain Area Chair for Medical Image Computing and Computer Assisted Intervention (MICCAI) Area Chair for Medical Imaging with Deep Learning (MIDL) Session Chair, Conference on Information Processing in Medical Imaging (IPMI) |
| 2018 | Organizing Committee, Rising Stars in Biomedical Workshop Technical Program Committee, MICCAI Workshop on Connectomics in Neuroimaging Session Chair, IEEE International Symposium on Biomedical Imaging |
| 2017 | Technical Program Committee, IEEE Conference on Information Sciences and Systems Session Chair, Conference on Information Processing in Medical Imaging |
| 2013 | Organizer, MMBC: MICCAI Workshop on Mathematical Models for Brain Connectivity |

Conference and Journal Reviewing Activities

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|---------------------------|----------------|
| Frontiers in Neuroscience | 2019 – Present |
| NeuroImage: Clinical | 2017 – Present |

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| NeuroImage | 2015 – Present |
| IEEE Transactions on Medical Imaging | 2013 – Present |
| Medical Image Analysis | 2013 – Present |
| IEEE Transactions on Neural Systems and Rehabilitation | 2018 – 2019 |
| Journal of Selected Topics in Signal Processing | 2017 – 2018 |
| Public Library of Science (PLoS) One | 2016 – 2017 |
| Information Processing in Medical Imaging | 2021 |
| NeurIPS: Neural Information Processing Systems | 2019 – 2020 |
| <i>Rated by the program committee among the Top 5% of Reviewers in 2019</i> | |
| MICCAI: Medical Image Computing and Computer Assisted Intervention | 2012 – 2018 |
| CISS: IEEE Conference on Information Sciences and Systems | 2017 |
| CVPR: IEEE Conference on Computer Vision and Pattern Recognition | 2010 |

BOOK CHAPTERS AND VOLUMES

- [B1] M.D. Schirmer, **A. Venkataraman**, I. Rekik, M. Kim, A. Wern Chung (Eds.). *Connectomics in NeuroImaging: MICCAI Workshops, ShenZhen, China*, October 2019.
- [B2] **A. Venkataraman**. *Autism Spectrum Disorders: Unbiased Functional Connectomics Provide New Insights into a Multifaceted Neurodevelopmental Disorder*. Connectomics: Methods, Mathematical Models and Applications, Eds. B. Munsel, G. Wu, P. Laurienti, Elsevier Academic Press, 2018.
- [B3] T. Schultz, G. Nedjati-Gilani, **A. Venkataraman**, L. O'Donnell, E. Panagiotaki (Eds.). *Computational Diffusion MRI and Brain Connectivity: MICCAI Workshops, Nagoya, Japan*, January 2014.

SUBMITTED PAPERS UNDER REVIEW

- [S1] D. Currey, J. Craley, D. Hsu, R. Ahmed, **A. Venkataraman**. *EPViz: A Flexible and Lightweight Visualizer to Facilitate Predictive Modeling for Multi-channel EEG*. Under Review for PLoS One, 2021.
- [S2] R. Shankar and **A. Venkataraman**. *Sample, Attend and Morph: A Deep-Bayesian Framework for Adaptive Speech Duration Modification*. Under Review for IEEE Signal Processing Letters, 2021.
- [S3] S. Ghosal, Q. Chen, G. Pergola, A.L. Goldman, W. Ulrich, D.R. Weinberger, **A. Venkataraman**. *A Biologically Interpretable Graph Convolutional Network to Link Genetic Risk Propagations and Imaging Biomarkers of Disease*. Under Review for NeurIPS, 2021.
- [S4] B. Tang, Y. Zhao, **A. Venkataraman**, K. Tsapkini, M. Lindquist, J. Pekar, B. Caffo. *Changes in Functional Connectivity after Transcranial Direct-Current Stimulation: A Connectivity Density Point of View*. Under Revision for NeuroImage, 2021.
- [S5] N.S. D'Souza, M.B. Nebel, D. Crocetti, N. Wymbs, J. Robinson, S. Mostofsky, **A. Venkataraman**. *Deep sr-DDL: Deep Structurally Regularized Dynamic Dictionary Learning to Integrate Multimodal and Dynamic Functional Conn. for Multidimensional Clinical Characterizations*. Under 2nd Review for NeuroImage, 2021.

JOURNAL ARTICLES

- [J1] Y. Kobayashi^{*}, A. Bukowski^{*}, S. Das^{*}, N. Wagle, S. Bakshi, M. Saha, J. Kaltschmidt[†], **A. Venkataraman**[†], S. Kulkarni[†]. *A Statistical Map of the Adult Murine Ileal Enteric Nervous System using an AI-Driven COUNTEN Algorithm*. eNeuro, In Press, 2021.
^{*} Joint first authorship [†] Joint senior authorship
- [J2] N. Nandakumar, K. Manzoor, S. Agarwal, J. Pillai, S. Gujar, H. Sair, **A. Venkataraman**. *Automated Eloquent Cortex Localization in Brain Tumor Patients Using Multi-task Graph Neural Networks*. Medical Image Analysis (MedIA), In Press, 2021.

Underlined names correspond to my trainees.

- [J3] S. Ghosal, Q. Chen, G. Pergola, A.L. Goldman, W. Ulrich, K.F. Berman, A. Rampino, G. Blasi, L. Fazio, A. Bertolino, D.R. Weinberger, V.S. Mattay, **A. Venkataraman**. *A Generative Discriminative Framework that Integrates Imaging, Genetic, and Diagnosis into Coupled Low Dimensional Space*. NeuroImage, In Press, 2021.
- [J4] M.D. Schirmer, **A. Venkataraman**, I. Rekik, M. Kim, S. Mostofsky, M.B. Nebel, K. Rosch, K. Seymour, D. Crocetti, H. Irzan, M. Hutel, S. Ourselin, N. Marlow, A. Melbourne, E. Levchenko, S. Zhou, M. Kunda, H. Lu, N.C. Dvornek, J. Zhuang, G. Pinto, S. Samal, J.L. Bernal-Rusiel, R. Pienaar, A. Wern Chung. *Neuropsychiatric Disease Classification Using Functional Connectomics – Results of the Connectomics in NeuroImaging Transfer Learning Challenge*, Medical Image Analysis (MedIA), 70:101972, 2021.
- [J5] J. Craley, C. Jouny, E. Johnson, **A. Venkataraman**. *Automated Inter-Patient Seizure Detection Using Multichannel Convolutional and Recurrent Neural Networks*. Journal of Biomedical Signal Processing and Control, 64:102360, 2021 (Online Access 2020).
- [J6] X. Liu, K. Akiyoshi, M. Nakano, K. Brady, B. Bush, R. Nandkarni, **A. Venkataraman**, R.C. Koehler, J.K. Lee, C.W. Hogue, M. Czosnyka, P. Smielewski, C.H. Brown. *Determining Thresholds for Three Indices of Autoregulation to Identify the Lower Limit of Autoregulation During Cardiac Surgery*. Journal of Critical Care Medicine, 49(4):650-660, 2021 (Online Access 2020).
- [J7] N.S. D’Souza, N. Wymbs, M.B. Nebel, S. Mostofsky, **A. Venkataraman**. *A Joint Network Optimization Framework to Predict Clinical Severity from Resting State fMRI Data*. NeuroImage, 206:116314, 2020.
- [J8] J. Craley, E. Johnson, **A. Venkataraman**. *A Spatio-Temporal Model of Seizure Propagation in Focal Epilepsy*. IEEE Transactions on Medical Imaging, 39(5):1404-1418, 2020 (Online Access 2019).
- [J9] D. Rangaprakash, M.N. Dretsch, **A. Venkataraman**, J.S. Katz, T.S. Denney Jr., G. Deshpande. *Identifying Disease Foci from Static and Dynamic Effective Connectivity Networks: Illustration in Soldiers with Trauma*. Human Brain Mapping, 39(1):264-287, 2018.
- [J10] S. Zhao, D. Rangaprakash, **A. Venkataraman**, P. Liang, G. Deshpande. *Investigating Focal Connectivity Deficits in Alzheimer’s Disease using Directional Brain Networks Derived from Resting-State fMRI*. Frontiers on Aging Neuroscience, 9:1-12, 2017.
- [J11] S. van Noordt, J. Wu, **A. Venkataraman**, M.J. Larson, M. South, M.J. Crowley. *Inter-trial Coherence of Medial Frontal Theta Oscillations Linked to Differential Feedback Processing in High-Functioning Autism*. Research in Autism Spectrum Disorders, 37:1-10, 2017.
- [J12] **A. Venkataraman**, D. Yang, N. Dvornek, L.H. Staib, J.S. Duncan, K.A. Pelphrey, P. Ventola. *Pivotal Response Treatment Prompts a Functional Rewiring of the Brain Among Individuals with Autism Spectrum Disorder*. NeuroReport, 27(14):1081-1085, 2016.
- [J13] D. Yang, K.A. Pelphrey, D.G. Sukhodolsky, M.J. Crowley, E. Dayan, N. Dvornek, **A. Venkataraman**, J.S. Duncan, L.H. Staib, P. Ventola. *Brain Responses to Biological Motion Predict Treatment Outcome in Young Children with Autism*. Translational Psychiatry, 6(11):e948 2016.
- [J14] **A. Venkataraman**, D. Yang, K.A. Pelphrey, J.S. Duncan. *Bayesian Community Detection in the Space of Group-Level Functional Differences*. IEEE Transactions Medical Imaging, 35(8):1866-1882, 2016.
- [J15] **A. Venkataraman**, J.S. Duncan, D. Yang, K.A. Pelphrey. *An Unbiased Bayesian Approach to Functional Connectomics Implicates Social-Communication Networks in Autism*. NeuroImage Clin, 8:356-366, 2015.
- [J16] **A. Venkataraman**, M. Kubicki, P. Golland. *From Brain Connectivity Models to Region Labels: Identifying Foci of a Neurological Disorder*. IEEE Transactions on Medical Imaging, 32(11):2078-2098, 2013.
- [J17] **A. Venkataraman**, T.J. Whitford, C-F. Westin, P. Golland, M. Kubicki. *Whole Brain Resting State Functional Connectivity Abnormalities in Schizophrenia*. Schizophrenia Research, 139(1-3):7-12, 2012.
- [J18] **A. Venkataraman**, Y. Rathi, M. Kubicki, C-F. Westin, P. Golland. *Joint Modeling of Anatomical and Functional Connectivity for Population Studies*. IEEE Trans on Medical Imaging, 31(2):164-182, 2012.
- [J19] K.R.A. Van Dijk, T. Hedden, **A. Venkataraman**, K.C. Evans, S.W. Lazar, R.L. Buckner. *Intrinsic Functional Connectivity As a Tool For Human Connectomics: Theory, Properties, and Optimization*. Journal of Neurophysiology, 103(1):297-321, 2010.

- [C1] N.S. D'Souza, M.B. Nebel, D. Crocetti, N. Wymbs, J. Robinson, S. Mostofsky, **A. Venkataraman**. *A Matrix Auto-encoder Framework to Align the Functional and Structural Connectivity Manifolds as Guided by Behavioral Phenotypes*. To Appear in MICCAI: Medical Image Computing and Computer Assisted Intervention, 2021. **[Acceptance Rate \approx 30%]**
- [C2] N.S. D'Souza, M.B. Nebel, D. Crocetti, N. Wymbs, J. Robinson, S. Mostofsky, **A. Venkataraman**. *M-GCN: A Multimodal Graph Convolutional Network to Integrate Functional and Structural Connectomics Data to Predict Multidimensional Phenotypic Characterizations*. To Appear in MIDL, 2021. **Selected for a Long Oral Presentation (<15% of Accepted Papers)**
- [C3] N. Nandakumar, K. Manzoor, S. Agarwal, J. Pillai, S. Gujar, H. Sair, **A. Venkataraman**. *A Multi-Scale Spatial and Temporal Attention Network on Dynamic Connectivity to Localize The Eloquent Cortex in Brain Tumor Patients*. In Proc. IPMI: Information Processing in Medical Imaging, LNCS 12729:241-252, 2021. **[Acceptance Rate \approx 30%]**
- [C4] Y. Peng, N.S. D'Souza, B. Bush, C. Brown, **A. Venkataraman**. *Predicting Acute Kidney Injury via Interpretable Ensemble Learning and Attention Weighted Convolutional-Recurrent Neural Networks*. In Proc. Conference on Information Sciences and Systems (CISS), pp. 1-6, 2021.
- [C5] D. Currey, D. Hsu, R. Ahmed, **A. Venkataraman**, J. Craley. *Cross-Site Epileptic Seizure Detection Using Convolutional Neural Networks*. In Proc. Conf on Information Sciences and Systems (CISS), pp. 1-6, 2021.
- [C6] S. Ghosal, Q. Chen, G. Pergola, A.L. Goldman, W. Ulrich, K.F. Berman, A. Rampino, G. Blasi, L. Fazio, A. Bertolino, D.R. Weinberger, V.S. Mattay, **A. Venkataraman**. *G-MIND: An End-to-End Multimodal Imaging-Genetics Framework for Biomarker Identification and Disease Classification*. In Proc. SPIE, vol.11596, 2021. **Selected for an Oral Presentation - Best Paper Award**
- [C7] N. Nandakumar, N.S. D'Souza, K. Manzoor, J. Pillai, S. Gujar, S. Agarwal, H. Sair, **A. Venkataraman**. *A Multi-Task Deep Learning Framework to Localize the Eloquent Cortex in Brain Tumor Patients using Both Static and Dynamic Functional Connectivity*. In Proc. MLCN: MICCAI Workshop on Machine Learning for Clinical Neuroimaging, LNCS 12449:34-44, 2020. **Selected for an Oral Presentation - Best Paper Award**
- [C8] N.S. D'Souza, M.B. Nebel, D. Crocetti, N. Wymbs, J. Robinson, S. Mostofsky, **A. Venkataraman**. *A Deep-Generative Hybrid Model to Integrate Multimodal and Dynamic Connectivity for Predicting Spectrum-Level Deficits in Autism*. In Proc. MICCAI: Medical Image Computing and Computer Assisted Intervention, LNCS 12267:437-447, 2020. **[Acceptance Rate \approx 30%]**
- [C9] R. Shankar, H.-W. Hsieh, N. Charon, **A. Venkataraman**. *Multispeaker Emotion Conversion via a Chained Encoder-Decoder-Predictor Network and Latent Variable Regularization*. In Proc. Interspeech: Conference of the International Speech Communication Association, 3391-3395, 2020.
- [C10] R. Shankar, J. Sager, **A. Venkataraman**. *Non-parallel Emotion Conversion using a Pair Discrimination Deep-Generative Hybrid Model*. In Proc. Interspeech: Conference of the International Speech Communication Association, 3396-3400, 2020.
- [C11] N. Nandakumar, K. Manzoor, J. Pillai, S. Gujar, H. Sair, **A. Venkataraman**. *A Novel Graph Neural Network to Localize Eloquent Cortex in Brain Tumor Patients from Resting-State fMRI Connectivity*. In Proc. CNI: MICCAI Workshop on Connectomics in Neuroimaging, LNCS 11848:10-20, 2019. **Selected for an Oral Presentation (< 25% of Accepted Papers) - Best Paper Award**
- [C12] R. Shankar, J. Sager, **A. Venkataraman**. *A Multi-Speaker Emotion Morphing Model Using Highway Networks and Maximum Likelihood Objective*. In Proc. Interspeech: Conference of the International Speech Communication Association, 2848-2852, 2019. **Selected for an Oral Presentation**
- [C13] J. Sager, J. Reinhold, R. Shankar, **A. Venkataraman**. *VESUS: A Crowd-Annotated Database to Study Emotion Production and Perception in Spoken English*. In Proc. Interspeech: Conference of the International Speech Communication Association, 316-320, 2019. **Selected for an Oral Presentation**

- [C14] [R. Shankar](#), H.-W. Hsieh, N. Charon, **A. Venkataraman**. *Automated Emotion Morphing in Speech Based on Diffeomorphic Curve Registration and Highway Networks*. In Proc. Interspeech: Conference of the International Speech Communication Association, 4499-4503, 2019.
- [C15] [R. Shankar](#) and **A. Venkataraman**. *Weakly Supervised Syllable Segmentation by Vowel-Consonant Peak Classification*. In Proc. Interspeech: Conf of the Intl Speech Communication Association, 644-648, 2019.
- [C16] [J. Craley](#), C. Jouny, E. Johnson, **A. Venkataraman**. *Automated Noninvasive Seizure Detection and Localization Using Switching Markov Models and Convolutional Neural Networks*. In Proc. MICCAI: International Conference on Medical Image Computing and Computer Assisted Intervention, LNCS 11767:253-262, 2019. **[Acceptance Rate \approx 30%]** – **Selected for Early Acceptance (Top 18% of Submissions)**
- [C17] [S. Ghosal](#), Q. Chen, A.L. Goldman, W. Ulrich, K.F. Berman, D.R. Weinberger, V.S. Mattay, **A. Venkataraman**. *Bridging Imaging, Genetics, and Diagnosis in a Coupled Low-Dimensional Framework*. In Proc. MICCAI: International Conference on Medical Image Computing and Computer Assisted Intervention, LNCS 11767:647-655, 2019. **[Acceptance Rate \approx 30%]** – **Early Acceptance (Top 18% of Submissions)**
- [C18] [N.S. D'Souza](#), N. Wymbs, M.B. Nebel, S. Mostofsky, **A. Venkataraman**. *Integrating Neural Networks and Dictionary Learning for Multidimensional Clinical Characterizations from Functional Connectomics Data*. In Proc. MICCAI: International Conference on Medical Image Computing and Computer Assisted Intervention, LNCS 11766:709-717, 2019. **[Acceptance Rate \approx 30%]**
- [C19] [J. Craley](#), E. Johnson, **A. Venkataraman**. *Integrating Convolutional Neural Networks and Probabilistic Graphical Modeling for Epileptic Seizure Detection in Multichannel EEG*. In Proc. IPMI: Information Processing in Medical Imaging, LNCS 11492:291-303, 2019. **[Acceptance Rate \approx 30%]** – **Oral Presentation**
- [C20] [N.S. D'Souza](#), N. Wymbs, M.B. Nebel, S. Mostofsky, **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, LNCS 11492:605-616, 2019. **[Acceptance Rate \approx 30%]**
- [C21] [S. Ghosal](#), Q. Chen, A.L. Goldman, W. Ulrich, D.R. Weinberger, V.S. Mattay, **A. Venkataraman**. *A Generative-Predictive Framework to Capture Altered Brain Activity in fMRI and its Association with Genetic Risk: Application to Schizophrenia*. SPIE Medical Imaging, vol. 10949, 2019.
- [C22] [N. Nandakumar](#), [N.S. D'Souza](#), [J. Craley](#), K. Manzoor, J. Pillai, S. Gujar, H. Sair, **A. Venkataraman**. *Defining Patient Specific Functional Parcellations in Lesional Cohorts via Markov Random Fields*. In Proc. CNI: MICCAI Workshop on Connectomics in Neuroimaging, LNCS 11083:88-98, 2018. **Selected for an Oral Presentation (< 25% of Accepted Papers)**
- [C23] [N.S. D'Souza](#), N. Wymbs, M.B. Nebel, S. Mostofsky, **A. Venkataraman**. *A Generative-Discriminative Basis Learning Framework to Predict Clinical Severity from Resting State Functional MRI Data*. In Proc. MICCAI: Intl Conference on Medical Image Computing and Computer Assisted Intervention, LNCS 11072:163-171, 2018. **[Acceptance Rate \approx 30%]** – **Selected for Early Acceptance (Top 15% of Submissions)**
- [C24] [J. Craley](#), E. Johnson, **A. Venkataraman**. *A Novel Method for Epileptic Seizure Detection Using Coupled Hidden Markov Models*. In Proc. MICCAI: International Conference on Medical Image Computing and Computer Assisted Intervention, LNCS 11072:482-489, 2018. **[Acceptance Rate \approx 30%]** **Selected for Early Acceptance (Top 15% of Submissions)**
- [C25] **A. Venkataraman**, N. Wymbs, M.B. Nebel, S. Mostofsky. *A Unified Bayesian Approach to Extract Network-Based Functional Differences from a Heterogeneous Patient Cohort*. In Proc CNI: MICCAI Workshop on Connectomics in NeuroImaging, LNCS 10511, pp. 60-69 2017. **Selected for an Oral Presentation (< 20% of Accepted Papers)**
- [C26] N.C. Dvornek, D. Yang, **A. Venkataraman**, P. Ventola, L.H. Staib, K.A. Pelphrey, J.S. Duncan. *Prediction of Autism Treatment Response from Baseline fMRI using Random Forests and Tree Bagging*. In Proc. MICCAI Workshop on Multimodal Learning for Clinical Decision Supp, pp. 1-8, 2016. – **Oral Presentation**
- [C27] **A. Venkataraman**, D. Yang, K.A. Pelphrey, J.S. Duncan. *Community Detection in the Space of Functional Abnormalities Reveals both Heightened and Reduced Brain Synchrony in Autism*. In Proc. BAMBI: MICCAI Workshop on Bayesian and Graphical Models for Biomedical Imaging, pp. 1-12, 2015. – **Oral Presentation**

- [C28] [A. Sweet[†]](#), [A. Venkataraman[†]](#), S.M. Stufflebeam, H. Liu, N. Tanaka, P. Golland. *Detecting Epileptic Regions Based on Global Brain Connectivity Patterns*. In Proc. MICCAI: International Conference on Medical Image Computing and Computer Assisted Intervention, LNCS 8149:98-105, 2013. [Acceptance Rate \approx 30%]
Selected for an Oral Presentation (< 10% of Accepted Papers)
[†] Joint first authorship (equal contributions)
- [C29] [A. Venkataraman](#), M. Kubicki, P. Golland. *From Brain Connectivity Models to Identifying Foci of a Neurological Disorder*. In Proc. MICCAI: International Conference on Medical Image Computing and Computer Assisted Intervention, LNCS 7510:697-704, 2012. [Acceptance Rate \approx 30%]
Selected for an Oral Presentation (< 10% of Accepted Papers)
- [C30] [A. Venkataraman](#), Y. Rathi, M. Kubicki, C-F. Westin, P. Golland. *Joint Generative Model for fMRI/DWI and its Application to Population Studies*. In Proc. MICCAI: International Conference on Medical Image Computing and Computer Assisted Intervention, LNCS 6361:191-199, 2010. [Acceptance Rate \approx 30%]
Selected for Oral Presentation (< 10% of Accepted Papers)
- [C31] [A. Venkataraman](#), M. Kubicki, C-F. Westin, P. Golland. *Robust Feature Selection in Resting-State fMRI Connectivity Based on Population Studies*. In Proc. MMBIA: IEEE Computer Society Workshop on Mathematical Methods in Biomedical Image Analysis: 63-70, 2010.
- [C32] [A. Venkataraman](#), K.R.A Van Dijk, R.L. Buckner, P. Golland. *Exploring Functional Connectivity in fMRI via Clustering*. In Proc. ICASSP: IEEE Conference on Acoustics, Speech and Signal Proc, 441-444, 2009.
- [C33] P. Golland, D. Lashkari, [A. Venkataraman](#). *Spatial Patterns and Functional Profiles for Discovering Structure in fMRI Data*. In Proc. Asilomar Conf on Signals, Systems and Computers, 1402-1409, 2008.
- [C34] [A. Venkataraman](#), A.V. Oppenheim, *Signal Approximation using the Bilinear Transform*, In Proc. ICASSP: IEEE Conference on Acoustics, Speech and Signal Processing, 3729-3732, 2008.

WORKING PAPERS AND PREPRINTS

- [W1] [J. Craley](#), C. Jouny, E. Johnson, R. Ahmed, D. Hsu, [A. Venkataraman](#). *Biologically Inspired Seizure Activity Tracking with Recurrent Convolutional Networks*. In Prep. for PLoS One, 2021.
- [W2] [R. Shankar](#), H.-W. Hsieh, N. Charon, [A. Venkataraman](#). *Nonparallel Emotion Conversion Using a Variational Cycle GAN*. In Prep. for IEEE Transactions on Audio, Speech, and Language Processing, 2021.

CONFERENCE ABSTRACTS

- [A1] [D. Currey](#), [J. Craley](#), D. Hsu, R. Ahmed, [A. Venkataraman](#). *EPViz: A Flexible and Lightweight Visualizer to Facilitate Predictive Modeling for Multi-channel EEG*. American Epilepsy Society Annual Meeting, 2021.
- [A2] [J. Craley](#), C. Jouny, E. Johnson, Raheel Ahmed, David Hsu, [A. Venkataraman](#). *GraphTrack: Automated Seizure Detection and Tracking in Scalp EEG Recordings*. American Epilepsy Society Annual Meeting, 2021.
- [A3] [S. Ghosal](#), Qiang Chen, Giulio Pergola, Daniel Weinberger, [A. Venkataraman](#). *An End-to-End Multimodal Imaging-Genetics Framework for Biomarker Identification and Disease Classification*. Asilomar Invited Session: From Neural Networks to Neural Systems: Using AI to Decode the Brain in Health and Disease, 2020.
- [A4] [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*. Second International Conference on Medical Imaging and Case Reports, 2019. **Invited Abstract and Presentation**
- [A5] [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 Connectomics*. Flux Congress, 2019.
- [A6] [A. Venkataraman](#), [N.S. D'Souza](#), M.B. Nebel, N. Wymbs, S. Mostofsky. *Predicting Behavior from Resting-State fMRI Connectivity*. In Proc. SAND9: Statistical Analysis of Neuronal Data, 2019.
Selected for a Young Investigator Spotlight Presentation

- [A7] [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.
- [A8] [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.
- [A9] [J. Craley](#), E. Johnson, **A. Venkataraman**. *Robust Seizure Detection Using Coupled Hidden Markov Models*. In Proc. ISBI: International Symposium on Biomedical Imaging, 2018.
- [A10] **A. Venkataraman**, J.S. Duncan, D. Yang, K.A. Pelphrey. *Abnormal Functional Communities in Autism*. IMFAR: Intl Meeting For Autism Research, 2016. **Oral Presentation (< 5% of Abstracts)**
- [A11] D. Rangaprakash, G. Deshpande, **A. Venkataraman**, J.S. Katz, T.S. Denney, M.N. Dretsch. *Identifying Foci of Brain Disorders from Effective Connectivity Networks*, ISMRM, 2016. **Honorable Mention**
- [A12] **A. Venkataraman**, J.S. Duncan, D. Yang, K.A. Pelphrey. *An Unbiased Bayesian Approach to Functional Connectomics Implicates Social-Communication Networks in Autism*. In Proc. ISBI: International Symposium on Biomedical Imaging, 2015. **Invited Abstract and Presentation**
- [A13] S. Zhao, **A. Venkataraman**, P. Liang, G. Deshpande. *Investigating the Role of Brain Stem in Alzheimer's Disease using Directional Brain Networks derived from Resting State fMRI*, Annual Mtg of ISMRM, 2015.
- [A14] **A. Venkataraman**, M. Kubicki, P. Golland. *From Brain Connectivity Models to Identifying Foci of a Neurological Disorder*. 3rd Biennial Conference on Resting State Brain Connectivity, Sept 2012.
- [A15] **A. Venkataraman**, K.R.A Van Dijk, R.L. Buckner, P. Golland. *Exploring Functional Connectivity in fMRI via Clustering*, Annual Meeting of the Organization of Human Brain Mapping, June 2009.

DISSERTATIONS

- [D1] **A. Venkataraman**. *Generative Models of Brain Connectivity for Population Studies*. Doctor of Philosophy Thesis. Massachusetts Institute of Technology, Cambridge MA, 2012.
- [D2] **A. Venkataraman**. *Signal Approximation Using the Bilinear Transform*. Masters of Engineering Thesis. Massachusetts Institute of Technology, Cambridge MA, 2007.

OPEN-SOURCE DATA AND SOFTWARE

The Varied Emotion in Syntactically Uniform Speech (VESUS) Dataset

VESUS is a lexically controlled dataset of parallel emotional speech utterances. VESUS contains 252 distinct phrases, each read by 10 actors in 5 emotional states (neutral, angry, happy, sad, fearful). Using Amazon Mechanical Turk, we obtain 10 crowd-sourced ratings for each utterance to determine the perceived emotional content. In total, VESUS contains over 6 hours of pure speech and over 10,000 emotional annotations.

The EEG Prediction Visualizer (EPViz)

EPViz is a lightweight and standalone software package to aid researchers in developing, validating, and reporting their predictive modeling outputs. Developed in Python, EPViz allows researchers to load a PyTorch deep learning model, apply it to the EEG, and overlay the output channel-wise or subject-level temporal predictions on top of the original EEG time series. These results can be saved as high-resolution images for use in manuscripts and presentations. EPViz also provides valuable tools for clinician-scientists, including spectrum visualization, computation of basic data statistics, and annotation editing.

The EDF Anonymizer

This tool is designed to facilitate the sharing of clinical EEG data. It provides a graphical interface for the user to alter header fields in a standard EDF file; it also provides default settings for scrubbing patient IDs and time stamps. the EDF Anonymizer has been approved for data sharing by the University of Wisconsin IRB.

All research products are available for download at <https://engineering.jhu.edu/nsa/>.

ONGOING RESEARCH SUPPORT

NIH R21CA263804 PI: [Venkataraman](#) 09/01/21 – 8/31/23
Automated Presurgical Language Mapping via Deep Learning for Multimodal Brain Connectivity
This project will develop a graph neural network to map the language areas of the brain using resting-state fMRI and diffusion MRI. We will link our predictions to change in postoperative cognitive functioning.
Agency: National Cancer Institute
Total Funding Amount: \$405,949 over 2 years

JHU Discovery Award Joint PI: Faigle/[Venkataraman](#) 05/01/21 – 04/30/22
Harnessing Machine Learning to Optimize Stroke Critical Care Resource Use
*This project will develop an automated platform to continuously predict the risk of critical care needs for post-MT stroke patients. This is a highly competitive internal award with only a **15% funding rate**.*
Total Funding Amount: \$100,000 for 1 year

JHU Discovery Award Joint PI: Marvel/[Venkataraman](#)/Rosenthal 05/01/21 – 04/30/22
Using Motor Imagery and Machine Learning-Based Real-Time fMRI Neurofeedback to Improve Motor Function in Cerebellar Ataxia
*This project will use a real-time fMRI neurofeedback to train cerebellar ataxia patients to “exercise” their motor network. This is a highly competitive internal award with only a **15% funding rate**.*
Total Funding Amount: \$100,000 over 2 years

GI Core Pilot Grant Program PI: [Venkataraman](#) 04/01/21 – 03/31/22
AI for Neuro-GI: Developing an AI-Driven Software to Construct and Analyze the First Large-Scale Network Map of the Enteric Nervous System
This project will develop AI methods to estimate the ENS connectome from immunostained microscopy and extract predictive topological measures of the network to compare across healthy and diseased cohorts.
Total Funding Amount: \$15,000 for 1 year

MCEH Seed Grant PI: [Venkataraman](#) 01/01/20 – 12/31/21
A Deep Learning Approach to Continuously Forecast Postop Kidney Failure During Cardiac Surgery
*This project develops an automated platform to predict the risk for AKI based on patient history and real-time intra-operative and physiological data. This is a competitive internal award with only a **20% funding rate**.*
Total Funding Amount: \$50,000 for 1 year

NSF CAREER 1845430 PI: [Venkataraman](#) 02/15/19 – 01/31/24
Small Data in a Big World: Balancing Interpretability and Generalizability for Data Integration in Clinical Neuroscience
This project develops a coupled network optimization framework that simultaneously extracts interpretable features from functional neuroimaging data and makes patient-specific predictions.
Agency: National Science Foundation, CISE Directorate
Total Funding Amount: \$500,006 over 5 years

NSF CRCNS 1822575 PI: [Venkataraman](#) 10/01/18 – 09/30/22
Discovering Network Structure in the Space of Group-Level Functional Differences
This project develops a robust mathematical framework to detect altered neural subsystems that track with a particular neurological disorder. We focus on three clinical testbeds: autism, ADHD and schizophrenia.
Agency: National Science Foundation, CISE Directorate
Total Funding Amount: \$874,048 over 3 years

COMPLETED RESEARCH SUPPORT

JHU Discovery Award Joint PI: [Venkataraman](#)/Johnson/Sair/Jouny 07/01/19 – 06/30/21
Noninvasive Seizure Localization in Epilepsy Patients via Multimodal Magnetic Resonance Imaging
*This project collects multimodal MRI from epilepsy patients and uses this data to develop new machine learning algorithms to localize the seizure onset. This is a highly competitive internal award with only a **15% funding rate**.*

Total Funding Amount: \$100,000 over 2 years

JHMI Synergy Award Joint PI: Johnson/Venkataraman 07/01/17 – 06/31/18
Epileptic Seizure Localization via Bayesian Structure Learning
This project develops a Bayesian structure learning framework to track the origin and progression of a focal epileptic seizure in the brain. This is a highly competitive internal award with only a 15% funding rate.
Total Funding Amount: \$100,000 over 2 years

Neuroradiology MRI Scanning Award Joint PI: Sair/Venkataraman/Johnson 07/01/17 – 06/31/18
Building a Database of Neurotypical Controls for Multiple Clinical Studies
This project will collect rsfMRI data from a normative population using the research Siemens 3T scanner at JHMI. This dataset will serve as a resource for the Johns Hopkins community.
Total Funding Amount: \$7,000 for 1 year

PENDING RESEARCH SUPPORT

NIH R01 PI: Caffo 09/01/21 – 08/31/26
Statistical Methods for Structural and Functional Integration in Multi-Modal Neuroimaging Data
This project will develop a suite of analytical tools to integrate structural and functional information about the brain to better understand and predict neurological dysfunction.
Agency: National Institute of Biomedical Imaging and Bioengineering
Project Role: Co-Investigator
Total Funding Amount: \$2,043,750 over 5 years
Portion to co-I Venkataraman: \$741,000 over 5 years
Scored in the 9th Percentile - Awaiting NIH Advisory Council

NSF IIS Core PI: Venkataraman 09/01/21 – 08/30/24
RI: Small: An Automated Framework for Emotional Speech Generation via Deformable Curve Registration and Deep-Generative Hybrid Models
This project will develop an Automated Emotion Morphing (AEM) framework that combines elements of deformable curve registration and time series alignment with deep learning to generate emotional speech.
Agency: National Science Foundation, CISE Directorate
Total Funding Amount: \$494,000 over 3 years

NIH R01 PI: Venkataramano 04/01/22 – 03/31/27
A Modular Framework for Data-Driven Neurogenetics to Predict Complex and Multidimensional Autistic Phenotypes
This project will develop novel computational algorithms that fuse multimodal neuroimaging and genetics data to bridge the multiple viewpoints of autism spectrum disorder (ASD). Our algorithms will be used to explore key questions related to the clinical heterogeneity of ASD and will be released as an open-source tool for the research community.
Agency: National Institute of Neurological Disorders and Stroke
Total Funding Amount: \$2,896,109 over 5 years

PUBLIC MENTIONS

Johns Hopkins Hub (March 2021): *Unlocking Schizophrenia's Secrets*

Article Summary: Engineering doctoral student Sayan Ghosal in the NSA Lab combines genetic and imaging data to develop better model of the mental illness. (*Correspondent: Wick Eisenberg*)

This Week in Machine Learning (TWiML) Podcast (October 2019): *Using AI to Diagnose and Treat Neurological Disorders with Archana Venkataraman*

Interview Summary: This conversation explores Archana Venkataraman's work in applying machine learning to these problems, including biomarker discovery, disorder severity prediction, along with some of the various techniques and frameworks used. (*Host: Sam Charrington*)

Center for Data Innovation (September 2019): *5 Q's for Archana Venkataraman*

Article Summary: The Center for Data Innovation spoke with Archana Venkataraman, assistant professor

of electrical and computer engineering at Johns Hopkins University. Venkataraman discussed how machine learning can help increase our understanding of complex neurological disorders. (*Correspondent: Joshua New*)

Fair Observer (August 2019): *South Asians Are Shaping the Future of Science and Technology*

Article Summary: Archana Venkataraman is using artificial intelligence (AI) to better map the human brain and to develop entirely new ways to diagnose and treat neurological disorders. (*Correspondent: Vikram Zutshi*)

MIT Technology Review (June/July 2019): *35 Innovators Under 35*

Article Summary: Archana Venkataraman develops mathematical models designed to unlock the “black box” of the brain’s function and provide the building blocks for treatments. (*Correspondent: Jonathan Rosen*)

JHU Engineering Magazine (Summer 2019): *Safety First: Building a Resilient Future*

Article Summary: Researchers at Johns Hopkins develop algorithms to use brain imaging and electrical monitoring technology to localize epileptic foci in the brain. (*Correspondent: Andrew Meyers*)

JHU Engineering Magazine (Summer 2018): *Your Brain on Engineering*

Article Summary: Researchers at Johns Hopkins use machine learning techniques to localize the source of epileptic seizures based on noninvasive EEG recordings. (*Correspondent: Christen Brownlee*)

MIT News (2012): *Mapping Neurological Disease*

Article Summary: A new algorithm developed at MIT can analyze information from medical images to identify diseased areas of the brain and connections with other regions. (*Correspondent: Helen Knight*)

TECHNICAL PRESENTATIONS

Invited Talks and Seminars

- 2021 **Title: Deep Imaging-Genetics to Parse Neuropsychiatric Disorders**
- AI Center Summer Seminar Series, UIUC (*Host: Prof. Ravishankar K. Iyer*)
- 2021 **Title: Deep Learning for Multimodal and Dynamic Functional Neuroimaging**
- School of Computing Colloquium, University of Leeds (*Hosts: Profs. Karim Djemame and Alex Frangi*)
 - EE Graduate Seminar (*Host: Prof. Jayanti Venkataraman*)
- 2021 **Title: Bayesian Approaches in Machine Learning**
- ISMRM Course in Machine Learning: Everything You Wanted to Know but Were Afraid to Ask (*Organizers: Prof. Carl-Fredrik Westin and Prof. Demian Wassermann*)
- 2021 **Title: Integrating Convolutional Neural Networks and Probabilistic Graphical Models for Epileptic Seizure Detection and Localization**
- SIAM CSE Symposium, Data-Driven Methods for Biology and Medicine (*Host: Prof. Xin Yee*)
- 2020 **Title: You Can Teach an Old Dog New Tricks – Deep Learning in Data-Starved Regimes**
- Stanford Vision and Learning Lab, Stanford University, USA (*Host: Prof. Ehsan Adeli*)
 - Applied Math Colloquium, University of Pennsylvania, USA (*Hosts: Prof. Paris Perdikaris and Prof. James Gee*)
- 2020 **Title: Deep Learning for Multimodal and Dynamic Functional Neuroimaging**
- Feindel Virtual Brain and Mind Lecture, Montreal Neurological Institute, McGill University, Canada (*Hosts: Prof. Louis Collins and Prof. Tal Arbel*)
- 2020 **Title: Integrating Convolutional Neural Networks and Probabilistic Graphical Models for Epileptic Seizure Detection and Localization**
- AI for Mental Disorders Workshop of WCCI 2020 (*Host: Prof. Mah Parsa*)
- 2019 **Title: Generative-Deep Hybrid Models to Decipher Brain Functionality**

- Guest Lecture, Athinoula A. Martinos Center for Biomedical Imaging, Mass General Hospital and Harvard Medical School, USA (*Hosts: Prof. Bruce Fischl, Prof. Lilla Zollei*)
 - Guest Lecture, Medical Vision Group, Department of Electrical Engineering and Computer Science, Massachusetts Institute of Technology, USA (*Host: Prof. Polina Golland*)
 - Special Departmental Seminar, Department of Electrical and Computer Engineering, University of Maryland College Park, USA (*Host: Prof. Behtash Babadi*)
 - Departmental Seminar Series, Department of Biostatistics, University of Wisconsin Madison, USA (*Host: Prof. Vikas Singh*)
- 2019 **Title: Generative Models to Decode the Brain**
- Machine Learning in Medicine Seminar Series, Department of Electrical and Computer Engineering, Cornell University, USA (*Hosts: Prof. Mert Sabuncu, Prof. Amy Kuceyeski*)
 - Medical Imaging Seminar Series, Department of Computer Science, University of North Carolina Chapel Hill, USA (*Host: Prof. Martin Styner*)
 - Neuroscience and Behavior Distinguished Seminar Series, Department of Neuroscience, University of Massachusetts Amherst, USA (*Host: Prof. Xian Du*)
- 2018 **Title: Mathematical Models for Functional Neuroimaging**
- Bodian Distinguished Lecture Series, Mind Brain Institute, Johns Hopkins University, USA (*Invitation by Prof. Ernst Niebur*)
- 2018 **Title: Generative Models to Decode Brain Pathology**
- Departmental Seminar Series, Department of Applied Mathematics and Statistics, Johns Hopkins University, USA (*Invitation by Prof. Tamas Budavari*)
- 2018 **Title: Automated Detection and Localization of Epileptic Seizures**
- Guest Lecture, Department of Anesthesiology and Critical Care Medicine, Johns Hopkins Medical Institute, USA (*Invitation by Prof. Robert Stevens*)
- 2017 **Title: An Adaptable Framework to Extract Abnormal Brain Networks**
- Distinguished Lecture Series, Institute for Computational Medicine, Johns Hopkins University, USA (*Invitation by Prof. Michael Miller*)
 - Keynote Lecture, IEEE Joint Chapters Meeting, Rochester NY, USA (*Invitation by Prof. Cristian Linte*)
 - Guest Lecture, Department of Biomedical Engineering, University of Rochester, USA (*Invitation by Prof. Cristian Linte*)
 - Departmental Seminar Series, Department of Electrical Engineering, Rochester Institute of Technology, USA (*Host: Prof. Jayanti Venkataraman*)
 - Departmental Seminar Series, Department of Electrical and Computer Engineering, University of Virginia Charlottesville, USA (*Host: Prof. Daniel Weller*)
- 2016 **Title: An Adaptable Framework to Extract Abnormal Brain Networks**
- Departmental Seminar Series, Magnetic Resonance Research Center, Department of Radiology and Biomedical Imaging, Yale University, USA (*Invitation by Prof. Todd Constable*)
 - Special Departmental Seminar, Department of Electrical and Computer Engineering, University of Texas San Antonio, USA (*Host: Prof. Yufei Huang*)
 - Special Departmental Seminar, Department of Biomedical Engineering, Vanderbilt University, USA (*Host: Prof. Todd Giogio*)
 - Special Departmental Seminar, Department of Electrical Engineering, University of Rochester, USA (*Host: Prof. Wendi Heinzelman*)
 - Special Departmental Seminar, Department of Electrical Engineering and Systems Science, Washington University, USA (*Host: Prof. Arye Nehorai*)

- 2015 **Title: An Unbiased Bayesian Approach to Functional Connectomics Implicates Social-Communication Networks in Autism**
- Invited Session on Brain Connectivity, International Symposium on Biomedical Imaging, Brooklyn NY, USA (*Session Organizer: Prof. Vince Calhoun*)
- Title: An Adaptable Framework to Extract Abnormal Brain Networks**
- Special Departmental Seminar, Department of Electrical and Computer Engineering, Johns Hopkins University, USA (*Host: Prof. Jerry Prince*)
- 2014 **Title: Characterizing Abnormal Brain Networks**
- Invited Session on Neuroimaging, Image Processing Conference at SPIE Medical Imaging, San Diego CA, USA (*Session Organizer: Prof. Martin Styner*)
- 2013 **Title: Characterizing Abnormal Brain Networks**
- Special Departmental Seminar, Institute of Medical Engineering and Science, Massachusetts Institute of Technology, USA (*Host: Prof. Arup Chakraborty*)
 - Special Departmental Seminar, Department of Electrical and Computer Engineering, Johns Hopkins University, USA (*Host: Prof. Jerry Prince*)
 - Special Departmental Seminar, Department of Electrical and Computer Engineering, University of Texas Austin, USA (*Host: Prof. Constantine Caramanis*)
 - Guest Lecture, Image Processing and Analysis Group, Department of Diagnostic Radiology, Yale University, USA (*Host: Prof. James Duncan*)
- 2012 **Title: From Brain Connectivity Models to Identifying Foci of a Neurological Disorder**
- Guest Lecture, Laboratory for Mathematical Imaging, Brigham and Womens Hospital, USA (*Invited by Prof. Carl-Fredrick Westin*)
 - Rising Stars Workshop, Massachusetts Institute of Technology, USA (*Invited by Prof. Polina Golland*)
- 2012 **Title: Generative Models of Brain Connectivity for Population Studies**
- Guest Lecture, MIT Lincoln Laboratory, Lexington MA, USA (*Invited by Group 104*)
 - Guest Lecture, MGH Martinos Center for Biomedical Imaging, USA (*Invited by Prof. Bruce Rosen*)
- 2011 **Title: Joint Modeling of Anatomical and Functional Connectivity for Population Studies**
- Guest Lecture, Parietal Team, Neurospin, Gif-sur-Yvette, France (*Hosts: Bertrand Thirion, Gael Varaquoux*)

Conference, Workshop & Symposium Oral Presentations

- 2021 **M-GCN: A Multimodal Graph Convolutional Network to Integrate Functional and Structural Connectomics Data to Predict Multidimensional Phenotypic Characterizations**
Medical Imaging with Deep Learning Conference, Lübeck, Germany (Virtual)
Speaker: Niharika Shimona D'Souza, PhD Student
- 2021 **G-MIND: An End-to-End Multimodal Imaging-Genetics Framework for Biomarker Identification and Disease Classification**
SPIE Medical Imaging, Image Processing Conference, San Diego, CA (Virtual)
Speaker: Sayan Ghosal, PhD Student
- 2020 **A Multi-Task Deep Learning Framework to Localize the Eloquent Cortex in Brain Tumor Patients using Both Static and Dynamic Functional Connectivity**
CNI: MICCAI Workshop on ML for Clinical Neuroimaging, Lima, Peru (Virtual)
Speaker: Naresh Nandakumar, PhD Student
- 2019 **Engineering Solutions to Brain Dysfunction**
EmTech, Massachusetts Institute of Technology
- 2019 **A Generative-Deep Hybrid Model for Epileptic Seizure Localization**

Mathematical Institute for Data Science Symposium, JHU

- 2019 **A Joint Network Optimization Framework to Predict Clinical Severity from Resting-State Functional MRI Data**
Second International Conference on Medical Imaging and Case Reports
Speaker: Niharika Shimona D'Souza, PhD Student
- 2019 **A Novel Graph Neural Network to Localize Eloquent Cortex in Brain Tumor Patients from Resting-State fMRI Connectivity**
CNI: MICCAI Workshop on Connectomics in Neuroimaging, ShenZhen, China
Speaker: Naresh Nandakumar, PhD Student
- 2019 **AI in Medicine: Opportunities and Hurdles**
JHU/APL Future of Humans and Machines Symposium
- 2019 **Integrating Convolutional Neural Networks and Probabilistic Graphical Modeling for Epileptic Seizure Detection in Multichannel EEG**
IPMI: International Conference on Information Processing in Medical Imaging, Hong Kong
Speaker: Jeff Craley, PhD Student
- 2019 **Predicting Behavior from Resting-State fMRI Connectivity**
SAND9: Statistical Analysis of Neuronal Data, Pittsburgh, PA
- 2018 **Defining Patient Specific Functional Parcellations in Lesional Cohorts via MRFs**
CNI: MICCAI Workshop on Connectomics in Neuroimaging, Granada, Spain
Speaker: Naresh Nandakumar, PhD Student
- 2017 **Extracting Network-Based Functional Differences from a Heterogeneous Patient Cohort**
CNI: MICCAI Workshop on Connectomics in Neuroimaging
- 2016 **Abnormal Functional Communities in Autism**
IMFAR: International Meeting for Autism Research
- 2015 **Community Detection in the Space of Functional Abnormalities Reveals Abnormal Brain Synchrony in Autism**
BAMBI: MICCAI Workshop on Bayesian and Graphical Models for Biomedical Imaging
- 2013 **Detecting Epileptic Regions Based on Global Brain Connectivity Patterns**
MICCAI: International Conference on Medical Image Computing and Computer Assisted Intervention
- 2012 **From Brain Connectivity Models to Identifying Foci of a Neurological Disorder**
MICCAI: International Conference on Medical Image Computing and Computer Assisted Intervention
- 2010 **Joint Generative Model for fMRI/DWI and its Application to Population Studies**
MICCAI: International Conference on Medical Image Computing and Computer Assisted Intervention

Other Poster Presentations

- 2020 **Bridging Imaging, Genetics, and Diagnosis in a Coupled Low-Dimensional Framework**
WSE/DOM Research Retreat, Johns Hopkins University
Presenter: Sayan Ghosal, PhD Student
- 2020 **A Novel Graph Neural Network to Localize Eloquent Cortex in Brain Tumor Patients from Resting-State fMRI Connectivity**
WSE/DOM Research Retreat, Johns Hopkins University
Presenter: Naresh Nandakumar, PhD Student
- 2020 **Automated Emotion Morphing in Speech Based on Diffeomorphic Curve Registration and Highway Networks**
WSE/DOM Research Retreat, Johns Hopkins University
Presenter: Ravi Shankar, PhD Student

- 2020 **Integrating Neural Networks and Dictionary Learning for Multidimensional Clinical Characterizations from Functional Connectomics Data**
WSE/DOM Research Retreat, Johns Hopkins University
Presenter: Niharika Shimona D'Souza, PhD Student
- 2020 **Automated Noninvasive Seizure Detection and Localization Using Switching Markov Models and Convolutional Neural Networks**
WSE/DOM Research Retreat, Johns Hopkins University
Presenter: Jeff Craley, PhD Student
- 2019 **A Generative-Predictive Framework to Capture Altered Brain Activity in fMRI and its Association with Genetic Risk: Application to Schizophrenia**
WSE/DOM Research Retreat, Johns Hopkins University
Presenter: Sayan Ghosal, PhD Student
- 2019 **Defining Patient Specific Functional Parcellations in Lesional Cohorts via MRFs**
WSE/DOM Research Retreat, Johns Hopkins University
Presenter: Naresh Nandakumar, PhD Student
- 2019 **A Generative-Discriminative Basis Learning Framework to Predict Clinical Severity from Resting State Functional MRI Data**
WSE/DOM Research Retreat, Johns Hopkins University
Presenter: Niharika Shimona D'Souza, PhD Student
- 2019 **A Novel Method for Epileptic Seizure Detection Using Coupled Hidden Markov Models**
WSE/DOM Research Retreat, Johns Hopkins University
Presenter: Jeff Craley, PhD Student
- 2015 **Bayesian Community Detection in the Space of Group-Level Functional Differences**
Yale Bioimaging Sciences Retreat Symposium
- 2012 **From Brain Connectivity Models to Identifying Foci of a Neurological Disorder**
Third Biennial Conference on Resting State Brain Connectivity
- 2009 **Exploring Functional Connectivity in fMRI via Clustering**
Annual Meeting of the Organization of Human Brain Mapping
- 2005 **An Integrated Low-Power Switched-Capacitor DC-DC Power Converter**
Interconnect Focus Center Design Review, Atlanta, GA

TEACHING INITIATIVES

Courses Taught at Johns Hopkins University

- EN.520.746** *Seminar in Medical Image Analysis*
This graduate seminar explores key topics in the field, such as functional MRI analysis, object tracking, uncertainty quantification, deformable registration, and image segmentation.
Semesters Taught: Spring 2021
- EN.520.651** *Random Signals Analysis*
A core graduate course that covers the fundamentals of probabilistic machine learning. Selected Topics: probability spaces, random variables, derived distributions, decision theory, parameter estimation, graphical models, EM algorithm, approximate inference techniques, Markov models, random sequences, Dirichlet processes, autoencoders
Semesters Taught: Fall 2016, Fall 2017, Fall 2018, Fall 2019, Fall 2020
- EN.520.385** *Signals, Systems and Learning*
An elective undergraduate course that covers detection and estimation in signal processing.

Selected Topics: Discrete time Fourier transforms, Z-transforms, probability spaces, random variables, derived distributions, random processes, power spectral density, signal estimation, hypothesis testing, signal detection, state-space models, clustering algorithms
Semesters Taught: Spring 2018, Spring 2019, Spring 2020

Teaching Prior to Professorship (MIT)

- 6.437** *Information and Inference*
Teaching assistant for a core graduate course in machine learning.
Responsibilities: teaching weekly recitation, writing and grading exams, compiling homework assignments and solutions, holding weekly office hours
Semester Taught: Spring 2011
- HKN SP** *Introduction to Signals and Systems*
Developed an introductory signals and systems course to prep underclassmen; compiled and taught four (chalkboard) lectures, each one lasting three hours
Taught: Intersession 2006

MENTORING ACTIVITIES

PhD Students

1. Sayan Ghosal Sept 2017 – May 2023 (Exp)
Department: Electrical and Computer Engineering
Project: Imaging-Genetics for Schizophrenia
2. Ravi Shankar Sept 2017 – May 2023 (Exp)
Department: Electrical and Computer Engineering
Project: Manipulating Emotional Content in Speech
3. Naresh Nandakumar June 2017 – May 2023 (Exp)
Department: Electrical and Computer Engineering
Project: Localizing Eloquent Cortex for Presurgical Planning
4. Jeff Craley June 2017 – Dec 2021 (Exp)
Department: Electrical and Computer Engineering
Project: Detecting and Localizing Epileptic Seizures
5. Niharika Shimona D'Souza Sept 2016 – Oct 2021 (Exp)
Department: Electrical and Computer Engineering
Project: Predicting Clinical Severity from fMRI

Rotation PhD Students

1. Pouria Tohidi April 2016 – Mar 2018
Department: Electrical and Computer Engineering
Project: Epileptic Seizure Detection
2. Jacob Reinhold Aug 2017 – Jan 2018
Department: Electrical and Computer Engineering
Project: Manipulating Emotional Content in Speech

Masters Students

1. Evan Yu Nov 2019 – May 2021
Department: Biomedical Engineering
Thesis Topic: Predicting Acute Kidney Injury from Intraoperative Measurements
Co-advised with Charles Brown in the Department of Anesthesiology
First Postgraduate Position: PhD Student at University of Texas, Dallas

2. Yi-Te Hsu March 2020 – Dec 2020
 Department: Computer Science
 Graduate Project: Sequence-to-Sequence Models for Emotion Conversion in Speech
3. Rohan Nandkarni Jan 2018 – June 2019
 Department: Biomedical Engineering
 Thesis: Examination of the Association Between Arterial Blood Pressure Below the Lower Limit of Autoregulation and Acute Kidney Injury After Cardiac Surgery
Co-advised with Charles Brown in the Department of Anesthesiology
First Postgraduate Position: Researcher in the Imaging for Surgery, Therapy and Radiology Lab

Undergraduate Students

1. Arjun Somayazulu Oct 2019 – Present
 Department: Computer Science and Biomedical Engineering
 Project: Emotion Recognition from Human Speech
2. Yu-Chung Peng Sept 2019 – Present
 Department: Computer Science and Neuroscience
 Project: Machine Learning Algorithms to Predict Postoperative AKI
3. Narayani Wagle Jan 2019 – Present
 Department: Computer Science and Biomedical Engineering
 Project: Analyzing the Structure and Function of the Enteric Nervous System
4. Yuta Kobayashi Jan 2019 – Present
 Department: Biomedical Engineering
 Project: Analyzing the Structure and Function of the Enteric Nervous System
5. Karina Soto Perez June 2021 – Aug 2021
 Department: NSF Research Experiences for Undergraduates Program
 Project: Predicting ASD and ADHD
First Post-Departure Position: Undergraduate Student at HCC
6. Allie Burgess June 2021 – Aug 2021
 Department: NSF Research Experiences for Undergraduates Program
 Project: Predicting ASD and ADHD
First Post-Departure Position: Undergraduate Student at the University of Alabama
7. Danielle Currey Nov 2019 – May 2021
 Department: Computer Science
 Project: Epileptic Seizure Detection
First Post-Departure Position: Research Assistant, Beth Israel Deaconess Medical Center
8. Kavi Wick June 2020 – Aug 2020
 Department: NSF Research Experiences for Undergraduates Program
 Project: Predicting Spinal Cord Injury
First Post-Departure Position: Undergraduate Student at Rutgers University
9. Yesika Alexandra Agudelo Londono Jan 2020 – July 2020
 Home Institution: Universidad De Antioquia, Colombia
 Project: Predicting Neurological Disorders from rs-fMRI Data
Visiting Student sponsored by the Colciencias
First Post-Departure Position: Research Assistant in Colombia
10. Jacob Sager June 2017 – June 2019
 Department: Electrical and Computer Engineering
 Project: Emotion Recognition from Human Speech
First Postgraduate Position: Software Engineer at FiscalNote

11. Duha Awad

June 2018 – Aug 2018

Department: NSF Research Experiences for Undergraduates Program

Project: Epileptic Seizure Detection

First Post-Departure Position: Undergraduate Student at University of Maryland, College Park

UNIVERSITY SERVICE

Department of Electrical and Computer Engineering

| | |
|--|----------------|
| ECE Curriculum Committee | 2018 – Present |
| Distinguished Lecturer Committee | 2016 – Present |
| Graduate Student Admissions | 2017 – Present |
| Co-Director, Conference on Information Sciences and Systems (CISS) | 2020 – 2021 |
| ECE Department Head Search Committee | 2020 – 2021 |
| ECE Chair Election Committee | 2019 |
| Faculty Search Committee | 2017 – 2018 |
| ECE Chair Election Committee | 2017 |
| Graduate Student Visit Day Organizer | 2017 |
| Keynote Speaker, GRACE Mentoring Dinner | 2016 |

Whiting School of Engineering

| | |
|--|----------------|
| AI-X Initiative Steering Committee | 2019 – Present |
| Malone Center Strategic Planning Committee | 2016 – Present |
| MINDS Symposium Planning Committee | 2019 |
| WSE/DOM Research Retreat Committee | 2018 – 2020 |
| MINDS Faculty Search Committee | 2018 – 2019 |
| WSE Curriculum Committee | 2016 – 2018 |
| Malone Center Student Symposium Organizer | 2017 |
| ChemBE Dept Head Search Committee | 2017 – 2018 |
| Malone Center Faculty Search Committee | 2016 – 2017 |

Doctoral Thesis Committee Membership

1. Yufan He Expected Aug 2021
Department: Electrical and Computer Engineering
Thesis Advisor: Jerry Prince, ECE
2. Ben Strober Expected Aug 2021
Department: Computer Science
Thesis Advisor: Alexis Battle, BME
3. Jordi Abante May 2021
Department: Electrical and Computer Engineering
Thesis Advisor: John Goutsias, ECE
4. Golnoosh Kamali Oct 2020
Department: Biomedical Engineering
Thesis Title: Transfer Function Models of Cortico-Cortical Evoked Potentials for the Localization of Seizures in Medically Refractory Epilepsy Patients
Thesis Advisor: Sridevi Sarma, BME
5. Yi (Gary) Li August 2020
Department: Electrical and Computer Engineering
Thesis Title: Optimization of Administered Activity for Pediatric Renal SPECT Imaging
Thesis Advisor: Eric Frey, Medicine

6. Evan Schwab Nov 2017
 Department: Electrical and Computer Engineering
 Thesis Title: Joint Spatial-Angular Sparse Coding, Compressed Sensing, and Dictionary Learning for dMRI
 Thesis Advisors: Rene Vidal, BME and Nicholas Charon, AMS

Masters Thesis Committee Membership

1. Rohan Nandkarni June 2019
 Department: Biomedical Engineering
 Thesis Title: Examination of the Association Between Arterial Blood Pressure Below the Lower Limit of Autoregulation and Acute Kidney Injury After Cardiac Surgery
 Thesis Advisor: Charles Brown, Anesthesiology and Archana Venkataraman, ECE
2. Carolina Pacheco Aug 2018
 Department: Biomedical Engineering
 Thesis Title: Recurrent Neural Nets for Classification of Human Embryonic Stem Cell-Derived Cardiomyocytes
 Thesis Advisor: Rene Vidal, BME

Graduate Board Exams Administered

1. Jacob Reinhold Aug 2021 (Exp)
 Department: Electrical and Computer Engineering
2. Haomin Chen Aug 2021 (Exp)
 Department: Computer Science
3. Ranjani Srinivasan June 2021 (Exp)
 Department: Electrical and Computer Engineering
4. Ravi Shankar May 2021
 Department: Electrical and Computer Engineering
5. Naresh Nandakumar Oct 2020
 Department: Electrical and Computer Engineering
6. Sayan Ghosal Oct 2020
 Department: Electrical and Computer Engineering
7. Blake Dewey Sept 2019
 Department: Electrical and Computer Engineering
8. Miguel Vivar Lazo June 2019
 Department: Biomedical Engineering
9. Yufan He June 2019
 Department: Electrical and Computer Engineering
10. Niharika Shimona D'Souza April 2019
 Department: Electrical and Computer Engineering
11. Jeff Craley April 2019
 Department: Electrical and Computer Engineering
12. Jordi Abante Llenas April 2019
 Department: Electrical and Computer Engineering
13. Muhan Shao Feb 2019
 Department: Electrical and Computer Engineering
14. Scott Sterrett Feb 2019
 Department: Biomedical Engineering
15. Wenying Wang April 2018
 Department: Biomedical Engineering

ECE Qualifying Exams Administered

- Mardava Gubbi (Aug 2019)
- Hancheng Min (Jan 2019)
- Naresh Nandakumar (Aug 2018)
- Ravi Shankar (Aug 2018)
- Sayan Ghosal (Aug 2018)
- Ranjani Srinivasan (Aug 2018)
- Jacob Reinhold (Aug 2018)

- Yan Jiang (Jan 2018)
- Niharika Shimona D'Souza (Aug 2017)
- Yufan He (Aug 2017)
- Muhan Shao (Aug 2017)
- Mengnan Zhao (Aug 2017)
- Nanxin Chen (Jan 2017)
- Jaejin Cho (Jan 2017)

PROFESSIONAL SOCIETY MEMBERSHIPS

| | |
|---|----------------|
| Sigma Xi Honor Society | 2020 – Present |
| International Speech and Communication Association (ISCA) | 2019 – Present |
| American Epilepsy Society (AES) | 2019 – Present |
| MICCAI Society Member | 2008 – Present |
| Siebel Scholar | 2007 – Present |
| IEEE Member | 2006 – Present |
| Tau Beta Pi, Engineering Honor Society | 2006 – Present |
| Eta Kappa Nu, EE Honor Society | 2006 – Present |
| National Society of Collegiate Scholars | 2006 – Present |

REFERENCES

Available upon request.