NARESH NANDAKUMAR

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***Citizenship: United States**

PROFESSIONAL SUMMARY

Machine and Deep Learning Image Analysis Researcher with 4.5+ years of experience in applied artificial intelligence, including graph network analysis, and computational neuroimaging.

Recipient of two first author best paper awards for developing intricate and specialized deep learning network architectures designed for improving clinical health care for brain tumor patients.

EDUCATION

PhD The Johns Hopkins University *June 2017 - present*
Dept: Electrical and Computer Engineering
Advisor: Archana Venkataraman
GPA: 3.84/4.0

MSE The Johns Hopkins University *December 2020*
Dept: Electrical and Computer Engineering
Advisor: Archana Venkataraman
GPA: 3.84/4.0

B.Eng Vanderbilt University *May 2017*
Major: Electrical Engineering
Minor: Mathematics and Economics
Eng. GPA: 3.8/4.0

JOURNAL AND CONFERENCE PUBLICATIONS

N. Nandakumar, D. Hsu, R. Ahmed, A. Venkataraman. *"Automated Seizure Onset Zone Localization Using Graph Convolutional Neural Networks on Resting-state Functional Connectivity"* Under revision. IEEE Transactions on Biomedical Engineering 2022.

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 Journal, 74:102203 Elsevier 2021.

N. Nandakumar, K. Manzoor, Shruti 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"* Information Processing in Medical Imaging (IPMI) 2021. LNCS pp. 241-252. Springer, Cham, 2021.
[Acceptance rate ≈ 30%]

N. Nandakumar, N. D'Souza, K. Manzoor, J. Pillai, S. Gujar, H. Sair, A. Venkataraman. *"A Multi-Task Deep Learning Framework to Localize the Eloquent Cortex in Brain Tumor Patients Using Dynamic Functional Connectivity"* MICCAI 2020 Workshop on Machine Learning in Clinical Neuroimaging. LNCS pp. 34-44. Springer, Cham, 2020.
Selected for Oral Presentation; Best Paper Award

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"* MICCAI Workshop on Connectomics in NeuroImaging. LNCS pp. 10-20. Springer, Cham, 2019.
Selected for an Oral Presentation (< 25% of Accepted Papers); Best Paper Award

N. **Nandakumar**, N. 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*." MICCAI Workshop on Connectomics in Neuroimaging. LNCS pp. 88-98. Springer, Cham, 2018.
Selected for an Oral Presentation (< 25% of Accepted Papers)

N. **Nandakumar**, N. 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.*" ISBI: International Symposium on Biomedical Imaging, 2018.

S. Chaganti, K. M. Nelson, R. Harrigan, K. P. Nabar, **N. Nandakumar**, T. Goecks, S. A. Smith, B. A. Landman, L. A. Mawn. *"Estimated Incidence of Ophthalmic Conditions Associated with Optic Nerve Disease in Middle Tennessee."* Available on ArXiv: https://arxiv.org/abs/1712.01481 2017.

INTERNAL PRESENTATIONS

A Novel Graph Neural Network to Localize Eloquent Cortex in Brain Tumor Patients from Resting-State fMRI Connectivity. **Poster** at WSE/DOM Research Retreat, Johns Hopkins University 2020.

A Novel Graph Neural Network to Localize Eloquent Cortex in Brain Tumor Patients from Resting-State fMRI Connectivity. **Poster** at Malone Center Healthcare in Engineering Annual Symposium, Johns Hopkins University 2019.

A Modified K-Means Algorithm for Resting State FMRI Analysis of Brain Tumor Patients, As Validated by Language Localization **Poster** at WSE/DOM Research Retreat, Johns Hopkins University 2019.

A Modified K-Means Algorithm for Resting State FMRI Analysis of Brain Tumor Patients, As Validated by Language Localization. **Poster** at Malone Center Healthcare in Engineering Annual Symposium, Johns Hopkins University 2018.

RESEARCH EXPERIENCE

Ph.D. Candidate Neural Systems Analysis Lab *June 2017 – present*

- Deriving and implementing machine learning/deep learning algorithms to neuroimaging (fMRI, DTI, MRI) data of those with neurological disorders such as epilepsy, spinal cord injury, or having a brain tumor.
- Technical focus: Deep learning, CNNs, graph convolutional networks, Bayesian inference, graphical models, manifold learning, and spectral embedding analysis.
- Clinical focus: Develop automated methods to assist presurgical planning for brain tumor resection procedures and seizure onset zone resection procedures using rs-fMRI.

Undergraduate Research, MASI Lab Vanderbilt University *Sept. 2015 – May 2017*

- Developed a 3D MRI visualization app (deployed on android) of the brain using multi modal segmentation, coupled as senior capstone project.
- Co-authored preprint "Incidence of Optic Nerve Disease in Middle Tennessee."

TEACHING/MENTORING EXPERIENCE

Teaching Assistant, Foundations of Probabilistic Machine Learning *Aug 2021 – Dec 2021*

- Responsibilities include holding midterm reviews, recitation sessions, grading HW, creating exam problems.

Teaching Assistant, Signals, Systems and Machine Learning *Jan 2019 – May 2019*

- Responsibilities include holding midterm reviews, recitation sessions, grading HW, taking exams and notes each class period.

Research Experience for Undergraduate (REU) Mentor, NSA lab *Jun 2021 – Aug 2021*

- Mentored Karina Soto Perez (HCC). Project: Automated Brain Tumor Segmentation from Structural MRI. Implemented U-Net.

WORK EXPERIENCE

RF Engineer Intern, T-Mobile *May 2016 – Aug 2016*

- Trained in fundamentals of mobile wireless networks and RF design for mobile networks (GSM, UMTS LTE). Responded to about 400 customer tickets for network performance.
- Supported new site build, sector split design, and distributed antenna systems.

Academic Tutor *May 2015 – April 2018*

- Have tutored over 15 students in SAT/ACT math/English, high school math, physics, chemistry and collegiate level math courses.

PROFESSIONAL SERVICE

Journal Reviewer *Sep 2020 – present*

- Medical Image Analysis (MedIA) – deep learning methods for fMRI analysis
- IEEE Transactions on Medical Imaging (TMI) – rs-fMRI graph methods (2021)

Academic Conference Paper Reviewer *Apr 2020 – present*

- Medical Image Computing and Computer Assisted Intervention (MICCAI)
- International Symposium on Biomedical Imaging (ISBI)

ACADEMIC SKILLS

Programming languages: Python, MATLAB, R.

Relevant coursework: Deep learning, random signals analysis (foundations of probabilistic machine learning), statistical theory, statistical pattern recognition, medical image analysis, compressed sensing and sparse recovery, machine learning for signals processing, nonlinear optimization, statistical inference for graphs.

HONORS AND AWARDS

WSE Teaching Excellence Award Finalist	*March 2022*
Best paper award: MLCN workshop MICCAI 2020	*October 2020*
Best paper award: CNI workshop MICCAI 2019	*October 2019*
Johns Hopkins University ECE dept. one-year PhD fellowship	*Sept 2017 – Sept 2018*
Vanderbilt University Best senior capstone project EE dept.	*April 2017*
Vanderbilt University Deans' List	*June 2014 – May 2017*

SERVICE

STEM Outreach Volunteer for Barclay School, Baltimore, MD	*Feb 2019 - present*
Social and Professional Development Chair, ECE dept. JHU	*Sept 2018 – Sept 2021*
Math and English Teacher, Muthamizh Munnettra Mandram	*March 2015 – Jan 2019*