BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
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NAME: Bahrami, Mohsen

eRA COMMONS USER NAME (credential, e.g., agency login): mbahrami

POSITION TITLE: Instructor, Wake Forest School of Medicine, Department of Radiology

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
Razi University	BS	09/2010	Electrical Engineering
University of Tehran	MS	09/2013	Biomedical Engineering
Virginia Tech – Wake Forest University	PhD	12/2019	Biomedical Engineering
Wake Forest University	Postdoctoral Training	06/2021	Biomedical Engineering – Brain Imaging

NOTE: The Biographical Sketch may not exceed five pages. Follow the formats and instructions below.

A. Personal Statement

I have considerable experience in machine learning, statistics, signal processing, computer programming, and medical imaging. My main research focus has been on developing statistical and machine learning tools for analyzing complex and big data of brain networks. For example, I have developed a software package, called WFU_MMNET, which allows analyzing and comparing regional and global networks as well as dynamic networks of the brain. This software package, which has been developed using several programming languages, including: Matlab, SAS, R, and Python, has been downloaded over 750 times to date (since its release in 2019), with the paper presenting this software being among the top download papers in a prestigious journal. Although, the focus of my research is on Neuroimaging data and particularly fMRI data, my developed tools can be equally used for almost any complex network constructed by other data in other fields.

My research has also involved analyzing the effects of pesticide, aging, and alcohol on functional brain networks and developing promising machine learning techniques for predicting successful weight loss from complex brain circuitry.

B. Positions and Honors

Positions

2021– Present	Faculty Instructor, Department of Radiology, Wake Forest University
2020 – 2021	Research Associate, Department of Radiology, Wake Forest University
2015 – 2019	Graduate Student (PhD), Virginia Tech – Wake Forest University
2011 – 2013	Graduate Student (MS), University of Tehran, Tehran, Iran
2015 – Present	Biomedical Engineering Society (BMES) Organization
2016 – 2017	American Statistical Association

Honors

2019	Top download paper, 2018 – 2019, in Human Brain Mapping
2016	Clinical Neuroscience project award for the best grant proposal
2013	1st rank, achieving the highest GPA among Biomedical Engineering graduate students
2006	Ranked among top 0.5% of more than 434000 participants of BS national entrance exam

C. Contributions to Science

1. I have dedicated my research efforts to developing statistical and machine learning tools to improve our understanding of the brain as a complex system in health and disease. The rapidly evolving neuroimaging technologies combined with increasing computational capabilities of computers has resulted in an unprecedented opportunity to explore cognitive processes in the brain, and to identify abnormalities caused by neurological disorders, such as Alzheimer's disease, long before they advance into the final stages, where the suffering and economic burden is inevitable. The exponential increase of neuroimaging publications over the past two decades as well as launching of several large-scale research projects, such as: Human Connectome Project (HCP), Adolescent Brain Cognitive Development (ABCD), and Alzheimer's Disease Neuroimaging disease Initiative (ADNI) better demonstrates the great promise and growth of this field. Nevertheless, critical methodological challenges yet remain to be addressed before a revolutionary understanding of the brain and its abnormalities are achieved. I have dedicated my career to developing tools that address several important critical challenges. My efforts has led to developing a publicly available software packages, called WFU_MMNET which has been downloaded over 750 times since its release in 2019. This software makes a promising statistical multivariate framework accessible to a wide range of investigators in this field. More specifically, despite predominantly used univariate methods, it allows modeling the connectivity and topology at the same time and thus better identifies compensatory mechanisms in neurological disorders with a complex impact on the brain, it models the dependence structure at multiple resolutions, it allows to control for confounding effects, and most importantly it allows modeling subnetworks of the brain within their global context. A variety of neuroimaging data, such as fMRI, DTI, EEG, and MEG can be analyzed with this software package.

a. **Bahrami M,** Laurienti PJ, Simpson SL (2019). "Analysis of Brain Subnetworks within the Context of their Whole-Brain Networks." *Hum Brain Mapp*. 40(17):5123-5141.doi:10.1002/hbm.24762.

b. **Bahrami M,** Laurienti PJ, Simpson SL (2019). "A MATLAB Toolbox for Multivariate Analyses of Brain Networks." *Hum Brain Mapp*. 40(1):175-186. doi: 10.1002/hbm.24363.

c. Simpson SL, **Bahrami M,** Laurienti PJ (2019). "A Mixed Modeling Framework for Analyzing Multitask Whole Brain Network Data." *Network Neuroscience*. 3(2):307-324. doi: 10.1162/netn_a_00065.

2. I have been analyzing Neuroimaging data to identify network changes in the brain due to conditions such as Alzheimer's disease and due to adverse effects from pesticide exposure, alcohol consumption, and aging. During my MS study, In provided additional quantitative evidence on functional networks created by anatomical atlas to change the network topology when compared to networks created by functional parcellations, regardless of what population group is being studied. I demonstrated altered functional brain network change topology in Alzheimer's patients, which could be used for distinguishing patients with Alzheimer's disease from healthy subjects. I have also demonstrated the adverse effects of pesticide exposure on brain networks of Latino immigrant workers which places them at additional risk for developing neurological disorders in later life. I have also shown the undersired effects of alcohol and aging on brain networks which can shed light on complex changes associated with these two. I have also used advanced machine learning techniques for projecting dynamic networks of the brain onto lower dimensional manifolds which can help with visualization and analysis of complex dynamic patterns in the brain during different cognitive states and due to brain disorders. I have also used advanced machine learning techniques for prediction of successful weight loss among older adults with obesity.

a. Burdette JH, Laurienti PJ, Miron LL, **Bahrami M,** Simpson SL, Nicklas BJ, Fanning J, Rejeski JW (2020). "Functional Brain Networks: Unique Patterns with Hedonic Appetite and Confidence to Resist Eating Older Adults with Obesity." *Obesity*, 28 (12): p.2379-2388.

b. **Bahrami M,** Lyday RG, Casanova R, Burdette JH, Simpson SL, Laurienti PJ (2019). "Using Low Dimensional Manifolds to Map Relationships Between Dynamic Brain Networks." *Frontiers in Human Neuroscience*, 13: p.430.

c. **Bahrami M,** Laurienti PJ, Quandt SA, Talton J, Pope CN, Summers P, Burdette JH, Chen HY, Liu J, Howard TD, Arcury TA, Simpson SL (2017)."The Impacts of Pesticide and Nicotine Exposures on Functional Brain Networks in Latino Immigrant Workers." *Neurotoxicology*.62:138-150.

d. **Bahrami M,** Hossein-Zadeh GA (2015). "Assortativity Changes in Alzheimer's Disease: A Resting State fMRI Study." *IEEE 23rd Iranian Conference on Electrical Engineering (ICEE).* Tehran, Iran. Publisher: IEEE. Pages:141-144. doi: 10.1109/IranianCEE.2015.7146198.

e. **Bahrami M,** Hossein-Zadeh GA (2014). "Functional Parcellation Affect Network Measures in Graph Analysis of Resting-State fMRI." *21rd Iranian Conference on*

Biomedical Engineering (ICBME). Tehran, Iran. Publisher: IEEE. Pages:263-268. doi: 10.1109/ICBME.2014.7043933.

C. Research Support

Ongoing

U04449 07/01/2021 – 07/1/2021
Project PI (Bahrami)
Predicting variability in maintaining sedentary behavior intervention among older adults using neuroimaging
data and machine learning techniques
Role: Project PI

RO1 EB024559 06/15/2018 – 02/28/2022
Project PI (Simpson)
Analytical Tools for Complex Brain Networks: Fusing Novel Statistical Methods and Network Science to
Understand Brain Function
Role: Investigator

P50 0AA026117-01 12/10/2017 – 11/30/2022
Project PI (Weiner)
Wake Forest Translational Alcohol Research Center (WF-TARC) – Translational studies on Early-Life Stress
And Vulnerability To Alcohol Addiction
Role: Investigator

Completed

RO1 ES008739 03/01/2013 – 02/28/2016
Project PI (Arcury)
CBPR on Pesticide Exposure & Neurological Outcomes for Latinos: PACE4
Role: Investigator

K25 EB012236-03 07/01/2012 – 06/30/2017
Project PI (Simpson)
Statistical Methods for Whole-Brain Connectivity Networks
Role: Investigator