BIOGRAPHICAL SKETCH

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NAME: Morgan, Victoria Lee

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

POSITION TITLE: Associate Professor of Radiology and Radiological Science

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
Wright State University, Dayton, OH	B.S.	08/1990	Biomedical Engineering
Vanderbilt University, Nashville, TN	M.S.	05/1994	Biomedical Engineering
Vanderbilt University, Nashville, TN	Ph.D.	12/1996	Biomedical Engineering

A. Personal Statement

In my current research in temporal lobe epilepsy, I am using structural and functional connectivity mapping in the brain to examine the evolution of brain networks in response to seizure propagation to ultimately understand symptoms and surgical treatment outcomes of this disease. In another project focused on detecting non-invasive markers of sports concussion and mild traumatic brain injury, we are relating functional MRI, MRI diffusion tensor imaging, MRI blood flow mapping and MRI cerebrovascular measures to neuropsychological and biomechanical measures.

B. Positions and Honors

Positions and Employment

Positions and Employment

1990-1992 Test Engineer, Impact Test Facility**,** Inland Fisher Guide Div., General Motors Corporation, Dayton, OH
1997 Consultant, Center for Cardiovascular Magnetic Resonance, Barnes-Jewish Hospital at Washington University Medical Center, St. Louis, MO
1997-1999 Sr. Research Assistant, Department of Radiology and Radiological Sciences, Vanderbilt University, Nashville, TN
1999-2000 Instructor, Department of Radiology and Radiological Sciences, Vanderbilt University, Nashville, TN
2000-2012 Assistant Professor, Department of Radiology and Radiological Sciences, Vanderbilt University, Nashville, TN
2008-2013 Assistant Professor, Department of Biomedical Engineering, Vanderbilt University, Nashville, TN
2012-Present Associate Professor, Department of Radiology and Radiological Sciences, Vanderbilt University, Nashville, TN
2013-Present Associate Professor, Department of Biomedical Engineering, Vanderbilt University, Nashville, TN

Other Experience and Professional Memberships

2000-Present	Member, International Society of Magnetic Resonance in Medicine
2008-Present	Member, American Epilepsy Society
2001	Grant reviewer, American Heart Association
2007	Grant reviewer, Medical Research Council (UK)
2009	Grant reviewer, NIH Challenge grants panel #23
2010	Grant reviewer, Italian Ministry of Health Competition for Targeted Research Funding
2010	Steering Committee on Imaging Science, National Academies Keck Futures Initiative
2011	Grant reviewer, NIH MEDI Study Section
2012	ZGM1 PPBC-Y (AN), NIH grant review panel, ad hoc reviewer
2013	ZGM1 PPBC-Y (AN), NIH grant review panel, ad hoc reviewer
2014	ZRG1 SBIB-Z(03) M, NIH grant review panel, ad hoc reviewer
2014	ZMH1 ERB-C(09) R - BRAIN Initiative: Development and Validation of Novel Tools, NIH grant review panel, ad hoc reviewer
2014-2015	NOIT study section, NIH grant review panel, ad hoc reviewer
2014	American Epilepsy Society, Scientific Program Committee
2014-2016	International Society of Magnetic Resonance in Medicine, Brain Function Study Group, Officer
2015-present	NOIT study section, NIH grant review panel member

Honors

2003 Young Investigator's Bursary Award, International Epilepsy Congress, Lisbon, Portugal

C. Contribution to Science

1. My earliest work in neurological functional MRI (fMRI) was focused on understanding the effect of motion on fMRI measures. This is arguably the biggest challenge in fMRI in both research and clinical applications. I served as a co-investigator on these studies to develop computer-generated phantoms to accurately incorporate physiological, magnetic field and acquisition related artifacts in human-like fMRI data to provide a platform to evaluate and compare different motion correction algorithms. This work was funded by an NIH R01 that I served as co-investigator (D. Pickens –PI).
   a. Pickens DR, Li Y, Morgan VL, Dawant BM. Development of computer-generated phantoms for FMRI software evaluation. *MRI*, 2005;23:653-663.
   b. Xu N, Fitzpatrick JM, Li, Y, Dawant BM, Pickens DR, Morgan VL. Computer-generated fMRI phantoms with motion-distortion interaction. *Magn Reson Imaging* 2007;25(10):1376-1384. PMCID:PMC4424598
   c. Morgan VL, Dawant BM, Li Y, Pickens DR. Comparison of fMRI statistical software packages and strategies for analysis of images containing random and stimulus-correlated motion*. Computerized Medical Imaging and Graphics* 2007, 31(6):436-446. PMCID:PMC2570159
   d. Li Y, Xu N, Fitzpatrick JM, Morgan VL, Pickens DR, Dawant BM. Accounting for signal loss due to dephasing in the correction of distortions in gradient-echo EPI via nonrigid registration. *IEEE Transactions in Medical Imaging* 2007;26(12):1698-1707.

2. As one of the first researchers to attempt to apply MRI functional connectivity mapping to the study of epileptogenic networks (abstract in 2003, award cited above), I found that the identification of the nodes of these networks would be a significant challenge. Some research institutions focused on the use of simultaneous EEG and MRI methods to localize interictal spikes presumed to be these nodes, but this technique and hardware was not widely available and remains not clinically feasible. Therefore, I developed an fMRI data driven approach to identify the timing of interictal epileptic events called two-dimensional temporal clustering analysis (2dTCA). After some pilot study (a,b), I have validated the method on healthy controls (c) and epilepsy patients (d). This work has launched a field of data driven analyses of interictal

epileptic fMRI data for both clinical and research purposes. I served as the primary investigator on all of these studies listed below. This work was funded by a NIH R01 grant (PI-VLM).

a. Morgan VL, Gore JC, Abou-Khalil B. Cluster analysis detection of functional MRI activity in temporal lobe epilepsy. *Epilepsy Research* 2007;76(1):22-33. PMCID:PMC2003336
b. Morgan VL, Li Y, Abou-Khalil B, Gore JC. Development of 2dTCA for detection of irregular, transient BOLD activity. *Human Brain Mapping*, 2008;29(1):57-69. PMCID: PMC2719759
c. Morgan, VL, Gore, JC. Detection of irregular, transient fMRI activity in normal controls using 2dTCA: comparison to event-related analysis using known timing. *Human Brian Mapping* 2009;30:3393-3405. PMCID: PMC2748174
d. Morgan, VL, Gore, JC, Abou-Khalil, B. Functional epileptic network in left mesial temporal lobe epilepsy detected using resting fMRI. *Epilepsy Research* 2010;88:168-178. PMCID: PMC2823966

3. After identifying potential nodes in temporal lobe epilepsy networks using methods including 2dTCA, my group has focused on using MRI functional connectivity mapping to determine the evolution of these seizure networks over years of seizure duration. We hypothesize that this information can ultimately be used to understand how repeated seizures are linked to cognitive and behavioral deficits (b), and can be used to predict post-surgical outcome in these patients. Towards this goal, we have measured an increase causal effect of the contralateral hippocampus over the ipsilateral one in the later years of the disease (a). Additionally, we have found increasing functional isolation of the ipsilateral temporal lobe structures with simultaneous increasing synchronization with extra-temporal lobe seizure generalization related structures as duration increases (c, d), a process that may facilitate the spread of seizures over time. I served as the primary investigator on all of these studies listed below. This work was initially funded through an Epilepsy Foundation Research Grant (PI-VLM) and subsequently through a NIH R01 grant (PI-VLM).
   a. Morgan VL, Roger BP, Sonmezturk HH, Gore JC, Abou-Khalil B. Cross hippocampal influence in mesial temporal lobe epilepsy measured with high temporal resolution functional Magnetic Resonance Imaging. *Epilepsia* 2011;52(9):1741-1749. PMCID:PMC4428312
   b. Holmes MJ, Folley BS, Sonmezturk HH, Gore JC, Kang H, Abou-Khalil B, Morgan VL. Resting state functional connectivity of the hippocampus associated with neurocognitive function in left temporal lobe epilepsy. *Human Brain Mapping,* 2014;35(3):735-44. PMCID:PMC3915042
   c. Morgan VL, Abou-Khalil B, Rogers BP. Evolution of functional connectivity networks and their dynamic interaction in temporal lobe epilepsy. *Brain Connectivity* 2015;5(1):35-44. PMCID:PMC4313394 [Available 2/1/16]
   d. Morgan VL, Conrad BN, Abou-Khalil B, Rogers BP, Kang H. Increasing structural atrophy and functional isolation of the temporal lobe with duration of disease in temporal lobe epilepsy. *Epilepsy Research*, 2015;110:171-178. PMCID:PMC4306813 [Available 2/1/16]

4. In addition to functional connectivity methods, gray matter structure and white matter structural connectivity are also important in understanding the evolution of the brain in diseases such as epilepsy. For this work I have collaborated with Zhaohua Ding, Ph.D. to design and implement MRI structural methodologies in healthy controls (a) and then in the epileptic networks studied previously (b). In epilepsy we found that there was a linear relationship between functional connectivity and gray matter concentration in key regions of these seizure networks, which may be important in predicting the post-surgical outcome in these patients. In these two studies, I was the primary investigator. In our most recent collaboration (c), I have supported Dr. Ding in his innovative development of spatio-temporal correlation tensors, which are a completely novel investigation of functional connectivity of white matter. My role in this work is to help determine validation procedures and to relate the findings to traditional functional connectivity methodologies.
   a. Morgan VL, Mishra A, Newton AT, Gore JC, Ding Z. Integrating Functional and Diffusion Magnetic Resonance Imaging for Analysis of Structure-Function Relationship in the Human Language Network. *PLoS ONE* 2009;4(8):E6660. doi:10.1371/journal.pone.0006660 PMCID:PMC2721978
   b. Holmes MJ, Yang X, Landman BA, Ding Z, Kang H, Abou-Khalil BA, Sonmezturk HH, Gore JC, Morgan VL. Functional networks in temporal lobe epilepsy: a voxel-wise study of resting-state functional connectivity and gray matter concentration. *Brain Connectivity* 2013; 3(1):22-30. PMCID:PMC3621340
   c. Ding Z, Newton AT, Xu R, Anderson AW, Morgan VL, Gore JC. Spatio-temporal correlation tensors reveal functional structure in human brain. *PLoS ONE* 2013; 8(12):e82107.PMCID:PMC3855380

Complete List of Published Work in MyBibliography:
http://www.ncbi.nlm.nih.gov/sites/myncbi/victoria.morgan.1/bibliography/47282847/public/?sort=date&direction=ascending

D. Research Support

Ongoing Research Support

5R01NS035929-11 Binder (PI); Morgan (PI, Vanderbilt Site) 12/1/12-5/31/16
NIH/NINDS Multi-site Study
Presurgical Applications of fMRI in Epilepsy
The goal of this study is to use functional MRI to predict cognitive outcome after left temporal lobe surgery for seizures.
Role: Principal Investigator (Vanderbilt Site)

1R01 NS075270-01A1 Morgan (PI) 03/01/12-02/28/17
NIH/NINDS
MRI Structural and Functional Connectivity Changes in Temporal Lobe Epilepsy
The ultimate goal of this study is to use MRI to determine how temporal lobe epilepsy affects widespread functional and structural networks across the brain in order to understand how this disease causes seizures and cognitive defects in patients.
Role: Principal Investigator

Completed Research Support in the last 3 years

Morgan (PI) 11/8/12-11/7/13
Vanderbilt Institute for Clinical and Translational Research (funded by Vanderbilt CTSA grant UL1 TR000445)
Multimodal MRI of Sports Related Concussion
The goal of this study is to identify MRI biomarkers of sports related concussion.
Role: Principal Investigator

5R01 NS055822-03 Morgan (PI) 09/30/07-06/30/12
NIH/NINDS
Temporal Clustering Analysis for Detection of Irregular Transient fMRI Activation
The overall goal of this project is to further develop and evaluate a novel, non-invasive imaging and analysis method for the detection and localization of transient, repeated, but irregular changes in brain activity using functional Magnetic Resonance Imaging (fMRI).
Role: Principal Investigator

5R01 EB00461-10 Gore (PI) 02/01/08-01/31/13
NIH/NIBIB
Integrated Imaging of Brain Function at 7 Tesla
This is a research partnership designed to develop and integrate different methods of brain imaging using MRI, NIR, ERP and advanced methods of data analysis.
Role: Co-Investigator

2R01NS049251-06 Miga (PI) 04/01/08-03/31/12
National Institutes of Health/NINDS
Multimodal Registration of the Brain's Cortical Surface

To determine whether computer models, laser range data of the intra-operative environment, and tracked stylus digitization technology can be combined to effectively compensate for deformation during image-guided brain tumor surgery.
Role: Co-Investigator- responsible for pre-surgical fMRI component of the study