**AMY KUCEYESKI, PHD**
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Department of Radiology and Brain and Mind Research Institute
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## Faculty Appointments

2015-present **Assistant Professor of Mathematics in Radiology and Neuroscience**
Department of Radiology and the Brain and Mind Research Institute
Weill Cornell Medical College, New York, NY

2014-present **Visiting Researcher**
Non-Invasive Brain Stimulation and Human Motor Control Laboratory
Burke Rehabilitation Center, White Plains, NY

2013-2015 **Instructor of Mathematics in Radiology and Neuroscience**
Department of Radiology and the Brain and Mind Research Institute
Weill Cornell Medical College, New York, NY

## Education

**Case Western Reserve University**
PhD, Applied Mathematics, May 2009
Thesis Advisor: Dr. Daniela Calvetti
*Thesis Title: Efficient computational and statistical models of hepatic metabolism*

**Mount Union College**
BS, Mathematics, May 2004
Graduated Summa Cum Laude

## RESEARCH

## Research Training

2009-2013 **Postdoctoral Fellow**, Department of Radiology, Weill Cornell Medical College, New York, NY
- Designed a novel approach studying brain connectivity in healthy and diseased patients using graph-theoretic measures and high-dimensional data processing methods.
- Developed methods to infer cortical involvement from white matter injury; applied this methodology to Alzheimer's disease, Fronto-temporal dementia and alcohol dependence.
- Results from this work were presented in several peer-reviewed journals and various world-wide conferences.

2006-2009 **Research Assistant**, Mathematics Department, Case Western Reserve University, Cleveland, OH
- Developed a family of computational models of liver metabolism using statistical tools; this will be a useful aid in the study of liver function and in the design of preventive and curative measures for metabolic disorders
- Designed procedures for steady state analyses, parameter estimation, and dynamic sensitivity analyses for hepatic metabolism models that were validated by experimental data

Summer 2006 **Research Intern**, National Institutes of Health, Bethesda, MD
- Initiated a project developing a new methodology for identifying phenotypic subgroups within the Bipolar Disorder population with the National Institute of Mental Health and the National Institute of Neurological Disorders and Stroke
- Implemented data mining techniques, including association rule analysis and frequent itemsets, on large sets of medical history data in both Matlab and Excel, which lead to some conclusions about frequency and concurrence of symptoms in patients with the disease that may help diagnosis and prevention

## Publications

**PEER-REVIEWED JOURNAL PUBLICATIONS**
1. Calvetti D.\*, **Kuceyeski A.\***, and Somersalo E. (2008) Sampling-based analysis of spatially distributed model for liver metabolism at steady state, Multi-Scale Modeling and Simulation 7(1), p 407-431.
2. Calvetti D.\*, **Kuceyeski A.\***, and Somersalo E. (2008) A mathematical model of liver metabolism: from steady state to dynamic, Journal of Physics: Conference Series (124).
3. **Kuceyeski A.**, Maruta, J., Niogi, S., Ghajar, J. and Raj, A. (2011) *The generation and validation of white matter connectivity importance maps.* NeuroImage (58), p 109-121.
4. **Kuceyeski A.**, Zhang, Y. and Raj, A. (2012) *Investigating white matter loss and gray matter changes in Alzheimer's disease and Fronto-temporal dementia using structural brain connectivity information.* NeuroImage 61(4): p 1311-23.
5. Raj, A., **Kuceyeski, A.** and Weiner, M. (2012) *A diffusion network model of disease progression in dementia.* Neuron 73(6): p 1204-15.
6. Ivkovic, M., **Kuceyeski, A.**, and Raj, A. (2012) *Statistics of Weighted Brain Networks Reveal Hierarchical Organization and Gaussian Degree Distribution.* PLoS ONE 7(6): e35029.
7. LoCastro, E., **Kuceyeski, A.** and Raj, A. (2013) *Brainography: An Atlas-Independent Surface and Network Rendering Tool for Neural Connectivity Visualization.* NeuroInformatics, News Item.
8. **Kuceyeski A.**, Maruta, J., Relkin, N., and Raj, A. (2013) *The Network Modification (NeMo) Tool: elucidating the effect of white matter integrity changes on cortical and subcortical structural connectivity.* Brain Connectivity, 3(5).
9. **Kuceyeski A.**, Meyerhoff, D., Durrazo T., and Raj, A. (2013) *Loss in Connectivity (LoCo) in regions of the brain reward system in alcohol dependence.* Human Brain Mapping, 34(12), p 3129-42.
10. **Kuceyeski, A.**, Kamel, H., Navi, B.B., Raj, A., and Iadecola, C. (2014) *Predicting future brain tissue loss from white matter connectivity disruption in ischemic stroke.* Stroke, 45(3), p 717-22.
11. Goel, P., **Kuceyeski, A.**, LoCastro, E. and Raj, A. (2014) *Spatial patterns of genome-wide expression profiles reflect anatomic and fiber connectivity architecture of healthy human brain.* Human brain mapping, 35(8), p 4204-18.
12. Glodzik, L.\*, **Kuceyeski A.\***, Rusinek, H., Tsui, W., Mosconi, L., Li, Y., Osorio, R.S., Williams, S., Randall, C., Spector, N., McHugh, P., Murray, J., Pirraglia, E., Vallabhajosula, S., Raj, A., de Leon, M.J. (2014) *Reduced glucose uptake and Aβ in brain regions with hyperintensities in connected white matter.* NeuroImage, 100, p 684-91.
13. **Kuceyeski, A.**, Vargas, W., Dayan, M., Monohan, E., Blackwell, C., Raj, A., Fujimoto, K., Gauthier, S.A. (2015) *Modeling the relationship between gray matter atrophy, abnormalities in connecting white matter and cognitive performance in early Multiple Sclerosis.* American Journal of Neuroradiology. 36(4), p 702-9. PMID: 25414004.
14. Raj, A., LoCastro, E., **Kuceyeski, A.**, Tosun, D., Relkin, N. and Weiner, M. (2015) *Network diffusion model of progression predicts longitudinal patterns of atrophy and metabolism in Alzheimer's Disease.* Cell Reports, 10 (3), p. 359-369.
15. **Kuceyeski, A.**, Navi, B.B., Kamel, H., Relkin, N., Villanueva, M., Raj, R., Toglia, T., O'Dell, M. and Iadecola, C. (2015) *Exploring the brain's structural connectome: a quantitative stroke lesion-dysfunction mapping study.* Human Brain Mapping, 36(6), p 2147-60. PMC4414746.
16. Juluru, K., Al Khori, N., He, S., **Kuceyeski, A.**, and Eng, J. (2015) *A Mathematical Simulation to Assess Variability in Lung Nodule Size Measurement Associated With Nodule-Slice Position.* Journal of Digital Imaging. 28(3), p 373-9.
17. Dayan, M., Monohan, E., Pandya, S., **Kuceyeski, A.**, Nguyen, T., Raj, A., Gauthier, S. (2016) *Profilometry: A new statistical framework for the characterization of white matter pathways, with application to multiple sclerosis.* Human Brain Mapping, 37(3), p 989-1004.
18. Otal B., Dutta A., Foerster Á., Ripolles O., **Kuceyeski A.,** Miranda P.C., Edwards D.J., Ilić T.V., Nitsche M.A., Ruffini G. (2016) *Opportunities for Guided Multichannel Non-invasive Transcranial Current Stimulation in Poststroke Rehabilitation.* Frontiers in Neurology, p 7-21. PMC4764713.
19. **Kuceyeski, A.**, Navi, B.B., Kamel, H., Relkin, N., Villanueva, M., Raj, R., Toglia, T., Iadecola, C. and O'Dell, M. (2016). *Structural connectome disruption at baseline predicts 6-months post-stroke outcome.* Human Brain Mapping, 37(7), p 2587-2601. PMID: 27016287.
20. **Kuceyeski, A.**, Sudhin, S., Dyke, J.P., Bickel, S., Abdelnour, F., Schiff, N.D., Voss, H.U., Raj, A. (2016) *The*

*application of a mathematical model linking structural and functional connectomes in severe brain injury.* NeuroImage: Clinical (11), p 635-647. PMC4864323.

21. Pandya, S., **Kuceyeski, A.** and Raj, A. (in press) *The brain's structural connectome mediates the relationship between regional neuroimaging biomarkers in Alzheimer's disease.* Journal of Alzheimer's Disease.

   ***These authors contributed equally to the manuscript***

## Presentations

INVITED TALKS

11/16 *The role of the brain's connectome in health and disease*
**Buffalo NeuroImaging Analysis Center,** Buffalo, NY

10/16 *The (dys)-connectome: quantifying brain network influences in disease and recovery*
**Biomedical Imaging Center 3$^{rd}$ Annual Symposium,** Mount Sinai, NY

04/16 *Exploring the conncetome without diffusion tensor imaging: from research to clinical application in stroke*
**European Stroke Conference,** Venice Italy

11/15 *The (dys)-connectome: quantifying brain network influences in disease and recovery*
**The City College of New York,** New York NY

10/15 *The (dys)-connectome: quantifying brain network influences in disease and recovery*
**Mount Sinai Hospital,** New York NY

10/14 *Modeling the Link Between Structural Connectivity Network Disruption and Performance and Activity Limitation in Stroke*
**American Congress for Rehabilitation Medicine**, Toronto, Canada

03/13 *Changes to the Structural Connectivity Network in MS Subjects Is Correlated with Cortical Thickness and a Measure of Disability*
**American Academy of Neurology Conference,** San Diego, CA

06/13 Works in Progress Seminar: *Exploring the brain's connectome: linking patient dysfunction to network disruption*
**The Brain and Mind Research Institute,** Weill Cornell Medical College, New York, NY

10/13 *Structural disconnection in early multiple sclerosis patients is related to atrophy in subcortical areas and a measure of cognition*
**European Committee for Treatment and Research in Multiple Sclerosis Conference,** Copenhagen, Denmark

04/12 *Quantifying loss in brain connection in Neurodegeneration*
**Columbia University**, New York, NY

03/12 *Linking Structural Brain Network Disruption to Dysfunction*
**Brain Trauma Foundation**, New York, NY

09/11 *Quantifying Disruptions in the Structural Brain Network*
**McGill University,** Montreal, Quebec, Canada

09/07 *Mathematical modeling and its application to liver metabolism*
**Mount Union College**, Alliance, OH

06/07 *The liver: spatial distribution at steady state*
**Applied Inverse Problems Conference**, Vancouver, Canada, June 2007

05/07 *Adaptive sampling techniques: application to a large-dimensional liver metabolism model*
**Lappeenranta University of Technology**, Lappeenranta, Finland

12/06 *A spatially distributed metabolic model of the liver in fasted, resting state*
**Finnish Inverse Problems Society Conference**, Tampere, Finland

## Support and Awards

CURRENT RESEARCH GRANTS

National Institutes of Health, NHLBI, R21 HL132277-01                    9/1/16-8/31/18
PIs: Kuceyeski and James Min

Role: Co-Principal Investigator

Title: An integrated computing platform for prediction and visualization of coronary ischemia

Description: To improve visualization and prediction of coronary ischemia from CT imaging and computational fluid dynamics.

National Institutes of Health, NINDS R01 NS092802-01A1                    7/15/16-4/30/21

PI: Ashish Raj

Role: Co-investigator

Title: Predictive model of spread of Parkinson's pathology using network diffusion

Description: The major goals of this project are to use mathematical models to predict the spread of pathology in Parkinson's disease.

National Multiple Sclerosis Society, RR-1602-07671                    10/1/16-9/30/20

PI: Thanh Ngyuen

Role: Co-investigator

Title: Identifying mechanisms of myelin repair in multiple sclerosis

Description: The major goals of this project are to use multi-modal MR imaging to detect demyelination and myelin repair in multiple sclerosis

Departmental Start-up Grant                    7/1/14-1/31/17

PI: Kuceyeski

Role: PI

Title: Research Initiation Funds

Description: The purpose of this grant is to set up the PI's laboratory and to fund preliminary studies needed to be competitive for extramural research support.

**PAST RESEARCH GRANTS AND STIPENDS**

Leon Levy Research Fellowship                    2/1/13-06/31/14

PI: Kuceyeski

Role: PI

Title: Quantifying the link between connectivity disruption and patient dysfunction and disability in stroke

Description: This project focused on creating biomarkers that quantified the impact of stroke infarct location and size on the structural connectivity network in the brain, and built models to predict patient disability based on these biomarkers.

National Institutes of Health, NIBIB NRSA Fellowship EB012404-01                    8/2010-8/2012

PI: Kuceyeski

Role: PI

Title: Construction of a connectivity importance map of white and gray matter in the human brain

Description: Awarded this prestigious two-year postdoctoral fellowship research training grant to study structural connectivity in the human brain

**AWARDS**

05/12    **Magna Cum Laude Award**
         *International Society of Magnetic Resonance in Medicine, Melbourne, Australia*
         Awarded to the top 15% of all abstracts within the same category

04/08    **Honorable Mention**
         *Research Showcase, Case Western Reserve University, Cleveland, OH*

Awarded to approximately 10% of the participants for excellence in research and poster presentation

04/07 **First Prize**
*Research Showcase, Case Western Reserve University, Cleveland, OH*
Approximately 5% of the participants were awarded this prize for outstanding research and communication of their work


## TEACHING AND MENTORING

### Formal Teaching
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| 2005 | Calculus I for Science and Engineering, Case Western Reserve University, Cleveland, OH |
| 2005 | Calculus I for Life and Social Sciences, Case Western Reserve University, Cleveland, OH |
| 2006 | Calculus II for Life and Social Sciences, Case Western Reserve University, Cleveland, OH |
| 2008 | Integrated Calculus, Summer Medical and Dental Education Program, Case Western Reserve University, Cleveland, OH |
| 2009 | Calculus III for Science and Engineering, Case Western Reserve University, Cleveland, OH |

### Invited Lectures
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| 11/11 & 3/14 | Lecture for CS7594: Seminar on Computational Issues in Health and Medicine, Cornell-Ithaca and Cornell NYC-Technion, Cornell University, Ithaca, NY |
| 12/13 | Lecture for CS5660: Signal and Image Processing at Cornell NYC-Technion, Cornell University, Ithaca, NY |
| 7/14 | Rehabilitation Medicine Grand Rounds, Weill Cornell Medical College, New York, NY |
| 12/15 | Neurology Grand Rounds, Weill Cornell Medical College, New York, NY |
| 6/16 | Neurological Surgery Grand Rounds, Weill Cornell Medical College, New York, NY |

### Mentoring
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| Fall 2011 | STEM after-school program mentor, New York Academy of Sciences, New York NY |
| 2015-2016 | Neurosciences graduate program rotation mentor: Naomi Xia, Hillary Raab and Bob Xie, Weill Cornell Medical College, New York, NY |
| Summer 2016 | Biophysics graduate program rotation mentor: Hasan Mohammad, Weill Cornell Medical College, New York, NY |
| Summer 2016 | Summer internship mentor: Evan Yu, Biomedical Engineering graduate student, Cornell University, Ithaca, NY Quintin Rizek, neuroscience graduate student, Brown University, Providence, RI Kimberly Ho, high school student, Stuyvesant High School, New York, NY |
| 2015-present | PhD thesis committee member, Christopher Mezias, Department of Neuroscience, Weill Cornell Medical College, New York, NY |
| 2016-present | PhD thesis committee member, Fontasha Powell, Department of Neuroscience, Weill Cornell Medical College, New York, NY |
| 2016-present | PhD thesis co-advisor, Bob Xie, Department of Neuroscience, Weill Cornell Medical College, New York, NY |


## ADMINISTRATIVE AND PROFESSIONAL ACTIVITIES
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| 2010-present | Organizer, Biomedical Imaging Research Seminar Series, Weill Cornell Medical College, New York, NY |
| 2015-present | Faculty Board, Women In Science, Weill Cornell Medical College, New York NY |

### Ad-hoc Reviewer
Radiology, Stroke, American Journal of Neuroradiology, PLoS One, NeuroImage, NeuroImage: Clinical, Human Brain Mapping, Organization for Human Brain Mapping Conference, Psychiatry Research: Neuroimaging Section

### Memberships
Pi Mu Epsilon (mathematics honor society), Vice President

Psi Kappa Omega (academic honor society)
Alpha Lambda Delta (academic honor society)
American Mathematical Society
Society for Industrial and Applied Mathematics
Association for Women in Mathematics
Mathematical Association of America
International Society to Advance Alzheimer's Research and Treatment
American Heart Association
American Academy of Neurology
New York Academy of Sciences
International Society for Magnetic Resonance in Medicine
Organization for Human Brain Mapping
American Congress of Rehabilitation Medicine