EMORY ROLLINS SCHOOL OF PUBLIC HEALTH | CBIS Center for Biomedical Imaging Statistics

Center for Biomedical Imaging Statistics (CBIS)
Rollins School of Public Health
Emory University
Summary of Activities: 2007-2012

A. **CBIS MEMBER NAME AND CURRENT POSTION** (excludes affiliate members):

DuBois Bowman, CBIS Director, Associate Professor of Biostatistics and Bioinformatics

Ying Guo, Assistant Professor, Department of Biostatistics and Bioinformatics

Brani Vidakovic, Professor, Department of Biomedical Engineering and Biostatistics and Bioinformatics

Jian Kang, Assistant Professor, Department of Biostatistics and Bioinformatics; Assistant Professor, Department of Radiology and Imaging Sciences

Gordana Derado, Mathematical Statistician, Centers for Disease Control and Prevention, (NCEZID/DFWED/Biostatistics Office)

Alexandre Rosa Franco, PhD, Associate Professor of Electrical Engineering, School of Engineering (primary), Associate Professor of Neuroscience, School of Medicine, Coordinator of Neuroinformatics and Image Post-processing of Brain Institute of Rio Grande do Sul (Instituto do Cérebro do Rio Grande do Sul- InsCer) Pontifícia Universidade Católica do Rio Grande do Sul (PUCRS) – Brazil and Adjunct Professor of Psychiatry, Emory School of Medicine, Emory University

Lijun Zhang, Data Analyst, Department of Biostatistics and Bioinformatics

Shuo Chen, PhD Student, Department of Biostatistics and Bioinformatics

Anthony Pileggi, PhD Student, Department of Biostatistics and Bioinformatics

Sanjay Agravat, PhD Student in Biomedical Informatics, Lead Application Developer, Research and Woodruff Health Sciences IT

Caprichia Jeffers, PhD Student, Department of Epidemiology

Wenqiong Xue, Ph.D. Student

Phebe Brenne Kemmer, PhD Student

B. **PUBLICATIONS** (identify first-authored articles/books and those with student as first author):

Chapters in Books and Edited Volumes:

1. **Kang, J.**, Yang, Y. (2012). Joint modeling of mixed count and continuous longitudinal data in Analysis of Mixed Data, eds. A.R. de Leon and K. Carriere Chough: Chapman & Hall/CRC, chapter 4, in press.

2. Caffo, B., **Bowman, F. D.**, Eberly, L., and Bassett, S. S. (2011). A Markov Chain Monte Carlo Based Analysis of a Multilevel Model for Functional MRI Data, Handbook of Markov Chain Monte Carlo: Methods and Applications, edited by Steve Brooks, Andrew Gelman, Galin Jones, and Xiao-Li Meng, Chapman & Hall.

3. **Derado, G**., Lee, K., Nicolis, O., **Bowman, F. D.**, Newell, M., Rugger, F. F., and **Vidakovic, B.** (2008). Wavelet-based 3-D Multifractal Spectrum with Applications in Breast MRI Images. Bioinformatics Research and Applications. Lecture Notes in Bioinformatics, volume 4983, Springer-Verlag: 281-292.

4. **Derado, G**., **Bowman, F. D.**, **Patel, R**., Newell, M., and **Vidakovic, B**. (2007). Wavelet Image Interpolation (WII): A Wavelet-based Approach to the Enhancement of Digital Mammography Images. Mandoiu and A. Zelikovsky (Eds.) Bioinformatics Research and Applications. Lecture Notes in Bioinformatics, volume 4463, Springer-Verlag: 203–214.

5. **Bowman, F. D.**, **Guo, Y**., and **Derado, G.** (2007). Statistical Approaches to Neuroimaging Data. *Neuroimaging Clinics of North America: Imaging of the Mind* 17(4): Nov. 2007, 441-458.

Papers:

2012

6. Anderson A., Chane T., Patel P., **Chen S.**, Xue W., Easley K. (2012). Warfarin therapy in HIV-infected individuals: data from the medical home model, *AIDS Patient Care and STDs* (accepted).

7. Bouloux G., **Chen S.**, Easley K., et al (2012). Treatment of Mandibular Fractures in a level I trauma center, *Journal of Oral and Maxillofacial Surgery* (accepted).

8. **Bowman, F. D.**, Zhang, L., Derado, G., and Chen, S. (2012). Determining Functional Connectivity using fMRI Data with Diffusion-Based Anatomical Weighting. *NeuroImage*, 62: 1769-1779.

9. Cholleti, S., **Agravat, S.**, Morris, T., Saltz, J., Xuezheng, S., Cummings, R., Smith, (2012). D Automated Motif Discovery from Glycan Array Data. OMICS: A Journal of Integrative Biology. (In-press).

10. **Derado, G.**, **Bowman, F. D.**, and **Zhang, L.** (2012). Predicting Brain Activity using a Bayesian Spatial Model. *Statistical Methods in Medical Research* (DOI: 10.1177/0962280212448972).

11. **Kang, J.**, Ye, W., Wang, L., Song, P. (2012). Local mixed-effects fitting for detecting reproductive hormone surge times, Statistics in BioSciences, in press.

12. Kennedy, A. P., Binder, E. B., **Bowman, F. D.**, Harenski, K., Ely, T., VanNess, S., Kilts, C. D. (2012). A common *TPH2* haplotype regulates the neural processing of a cognitive control demand. *American Journal of Medical Genetics Part B: Neuropsychiatric Genetics*. (accepted).

13. Raison C., Rutherford R., Woolwine B., **Chen S.**, Schettler P., Drake D., Haroon E., Miller A. (2012). A Randomized Controlled Trial of the Tumor Necrosis Factor-alpha Antagonist Iniximab in Treatment Resistant Depression: Role of Baseline Inflammation, *Archives of General Psychiatry*, 2012 (conditionally accepted).

14. **Xue, W.** and **Bowman, F. D.** (2012). Modeling Functional Connectivity in the Human Brain with Incorporation of Structural Connectivity. (submitted)

15. **Zhang, L**., **Agravat, S.**, **Derado, G.**, **Chen, S.**, and **Bowman, F. D.** (2012). BSMac: A MATLAB toolbox Implementing a Bayesian Spatial Model for Brain Activation and Connectivity. *Journal of Neuroscience Methods*, 204:133-143.

2011

16. **Chen, S.** and **Bowman, F. D.** (2011). A Novel Support Vector Classifier for Longitudinal High-dimensional Data and Its Application to Neuroimaging Data. *Statistical Analysis and Data Mining*, 4(6): 604-611. [Winning paper for JSM 2011 Student Paper Competition, ASA Section on Statistical Learning and Data Mining]

17. **Guo Y.** (2011). A general probabilistic for group independent component analysis and its estimation methods. *Biometrics*. 67(4): 1532-1542.

18. Johnson, Z., Eady, R., Ahmad, S., **Agravat, S.**, Morris, T., Else, J., Lang, S.,Wiseman, R., O'Connor, D., Penedo, M., Larsen, C,, Kean, L. (2011). Immunogenetic Management Software: a new tool for visualization and analysis of complex immnogenetic datasets. *Immunogenetics*.

19. **Kang, J.**, Johnson, T. D., Nichols, T. E., Wager, T. D. (2011). Meta analysis of functional neuroimaging data via Bayesian spatial point processes, *Journal of the American Statistical Association*, 106(493), 124-134.

20. Li M., **Chen S.**, Zhang X., Chen H., and Shyr Y. (2011). Wave-spec: a preprocessing package for mass spectrometry data. *Bioinformatics* 27(5): 739-740.

21. Schuster D. M., Savir-Baruch B., Nieh P. T., Master V. A., Halkar R. K., Rossi P. J., Lewis M. M., Nye J. A., Yu W., **Bowman F. D.**, Goodman M. M. (2011). Detection of recurrent prostate carcinoma with *anti*-1-amino-3 [^{18}F]fluorocyclobutane-1-carboxylic acid (*anti*-3-[^{18}F]FACBC) PET-CT and ^{111}Indium-capromab-pendetide (ProstaScint) SPECT-CT. *Radiology,* 259(3): 852-861.

2010

22. **Derado, G.**, **Bowman, F. D.**, Ely, T. D., and Kilts, C. D. (2010). Evaluating Functional Autocorrelation within Spatially Distributed Neural Processing Networks. Statistics and Its Interface, vol. 3, no. 1, pp. 45-48.

23. **Derado, G.**, **Bowman, F. D.** and C. D. Kilts (2010). Modeling the spatial and temporal dependence in fMRI data. Biometrics, 66(3):949-57. [Based on ENAR 2009 John Van Ryzin Award for best research paper]

24. **Guo Y.** (2010). A weighted cluster kernel PCA prediction model for multi-subject brain imaging data. *Statistics And Its Interface*. 3:103-111.

25. Woodham D. C., Kenyon N., Bell S. C., Alford R. A., **Chen S.**, Billheimer D., Shyr Y., Rollins-Smith L. A. (2010). Adaptations of skin peptide defenses and possible response to the amphibian chytrid fungus in popu- lations of Australian green-eyed treefrogs, Litoria genimaculata, Diversity and Distributions V16 (4): 703712.

2009

26. **Chen S.**, Li M., Hong D., Billheimer D., Li H., and Shyr Y. (2009). A Novel Comprehensive Wave-form MS data Processing Method, Bioinformatics, 25(6):808-814.

27. **Franco, A. R.**, Pritchard, A., Calhoun, V. D., and Mayer, A. R. (2009). Interrater and intermethod reliability of default mode network selection. *Human Brain Mapping*, v. 30, p. 2293-2303.

2008

28. **Bowman, F. D.**, Caffo, B. A, Bassett, S., and Kilts, C. (2008). Bayesian Hierarchical Framework for Spatial Modeling of fMRI Data. *NeuroImage* 39: 146–156.

29. **Franco, A. R.**, Ling, J., Caprihan, A., Calhoun, V. D., Jung, R. E., Heileman, G. L., and Mayer, A. R. (2008). Multimodal and Multi-tissue Measures of Connectivity Revealed by Joint Independent Component Analysis. *IEEE Journal of Selected Topics in Signal Processing*, v. 2, p. 986-997.

30. **Guo, Y.** (2008). Group Independent Component Analysis of Multi-subject fMRI data: Connections and Distinctions between Two Methods*. IEEE Proceedings of the 2008 International Conference on BioMedical Engineering and Informatics* v2: 748-752.

31. **Guo, Y.** and **Bowman, F. D.** (2008). Modeling Dose-Dependent Neural Processing Responses Using Mixed Effects Spline Models. *NeuroImage*, 40: 698–711.

32. **Guo, Y.**, **Bowman, F. D**., and Kilts, C. D. (2008). Predicting the Brain Response to Treatment using a Bayesian Hierarchical Model with Application to a Study of Schizophrenia. *Human Brain Mapping*, 29(9): 1092-1109.

33. Guo, Y. and Pagnoni G (2008). A unified framework for group independent component analysis for multi-subject fMRI data. *NeuroImage* 42: 1078-1093**. Listed in ScienceDirect's Top 25 hottest articles of *NeuroImage* between July-Sep. 2008.**

34. Pagnoni G., Cekic M. and **Guo Y**.(2008). Thinking about not-thinking: neural correlates of conceptual processing during Zen meditation. *PLoS ONE*, 3(9): e3083.

35. Schuster, D. M., Halkar, R. K., Esteves, F. P., Garcia, E. V., Cooke, C. D., Syed, M. A., **Bowman, F. D.**, and Votaw, J. R. (2008). Investigation of Emission Transmission Misalignment Artifacts on Rubidium-82 Cardiac PET with Adenosine Pharmacologic Stress. *Molecular Imaging and Biology*, 10:201-208.

2007

36. **Bowman, F. D.** (2007). Spatio-Temporal Models for Region of Interest Analyses of Functional Neuroimaging Data, *Journal of the American Statistical Association* 102(478): 442-453.

37. Lyles, R., Manatunga, A., Moore, R., and **Bowman F. D.** (2007). Improving point predictions of random effects for subjects at high-risk, *Statistics in Medicine* 26: 1285–1300.

38. Robertson, D., Snarey, J., Ousley, O., Harenski, K., **Bowman, F. D.**, Gilkey, R., Kilts, C. (2007) The neural basis of moral sensitivity to issues of justice and care: an fMRI study. *Neuropsychologia* 45(4): 755-766.

39. Schuster D. M., Votaw J., Nieh P. T., Yu W., Nye J. A., Master V., **Bowman F. D.**, Issa M. M., Goodman M. M. (2007). Initial experience with the radiotracer anti 1-amino-3-[^{18}F]fluorocyclobutane-1-carboxylic acid with PET/CT in prostate carcinoma. *The Journal of Nuclear Medicine* 48: 56-63.

C. **GRANTS** (research and training grants since 2007):

1. **PI: Bowman, F. D.**, "Analytic Methods for Functional Neuroimaging Data," National Institutes of Health (NIH) R01, National Institute of Mental Health (NIMH), **R01-MH079251,** 2007-2012, $1,063,580 (%50). Additional support for Guo (Co-I), Zhang, L. (Applications Developer), Agravat, S**.** (Applications Developer), Chen, S. (Graduate Research Assistant), and Derado, G. (Graduate Research Assistant).
2. **PI: Bowman, F. D.**, "Statistical Methods for Neuroimaging Data," NIH K25, NIMH, **K25-MH65473**, 2002-2007, $535,982 (75%).
3. **Co-investigator: Bowman, F. D.** (PI: Kilts, C.), "Cocaine Dependence and Cognitive Control of Behavior," NIH R01, National Institute on Drug Abuse, 2003-2007. (10%)
4. **Co-investigator: Bowman, F. D.** (PI: Schuster, D.), "18F-FACBC PET-CT for the Detection and Staging of Recurrent Prostate Carcinoma," NIH R01, National Cancer Institute (NCI), 2007-2012. (5%)
5. **PI: Kang, J.**, Emory University Research Committee (URC) and the Atlanta Clinical and Translational Science Institute (ACTSI) "Analysis of Ultra High-Dimensional Data in Imaging Genetics Studies" 2011 –2012, $30,000.
6. **PI: Ying Guo**, "Statistical methods for group independent component analysis for multi-subject functional magnetic resonance imaging data", Emory University Research Committee (URC)/ATCSI award, 2009-2010. Direct costs: $ 29,800.
7. **PI: Bowman, F. D.** NIH U18. "Analytic Methods for Determining Multimodal Biomarkers for Parkinson's Disease", NIH, National Institute for Neurological Disorders and Stroke (NINDS), 2012-2015. Additional support for Guo, Y. (Co-I), Kang, J. (Co-I), Zhang, L. (Applications Developer), Xue, W. (Graduate research assistant).
8. **Co-investigator: Bowman, F. D.** (PI: Saltz, J.), NIH, "Quantitative Response Assessment by Comprehensive Data Integration in RT Treatment," NIH U01, NCI, 2012-2017, 10%. (pending). Additional support for Zhang, L. (Applications Developer).
9. **PI: Guo, Y.,** "Methods for studying development and treatment response of mental disorders", NIH R21 (pending). Additional support for Bowman, F. D. (Co-I), Zhang, L. (Applications Developer).
10. **Co-investigator: Bowman, F. D.** (PI: Schuster, D.), "The Utility of Combined MRI-PET in the Evaluation of Small Pancreatic Masses," NIH R01, National Cancer Institute (NCI), 2012-2016. (10%: pending)
11. **Co-investigator: Bowman, F. D.** (PI: Tanja Jovanovic). "Neuroimaging correlates of impaired fear inhibition in PTSD," NIH R21, 5%, 2012-2015.
12. **Co-investigator: Bowman, F. D.** (PI: Safiya Dalmida). "Neuro-Biocultural Substrates of Sexual Risk Behavior of Mid-Adolescent Girls," National Science Foundation.

13. **Bioinformatician: Agravat, S.,** NCI, Haian Fu (PI), Joel Saltz (Co-PI), Fadlo Khuri (Co-PI), "High Throughput Protein-Protein Interaction Interrogation in Cancer", 2012-2017, (10%).
14. **Bioinformatician: Agravat, S**., NIH, NIGMS, David Smith (PI), U54 GM062116-10, 2010-2011, (40%).
15. **Bioinformatician: Agravat, S**., NIH/NCRR, David Smith (PI), "Shotgun Glycomics: Linking Glycan Structure and Function", 2009-2011, (50%).
16. **Software Developer: Agravat, S**., NIH/NCRR, David Stephens (PI), "UL1RR025008", 2009-2011, (50%)
17. **Software Developer: Agravat, S**., NIH, Christian Larsen (PI), "U19AI51731-07", (50%)
18. **Alexandre Rosa Franco, Postdoc Fellow**, Emory University, Helen Mayberg, Dubois Bowman, Xiaoping Hu, PI, "Title of project: Resource Allocation of the Human Brain: A Competitive Equilibrium Approach", 2009-2011, $54,000 (50%).
19. **Co-investigator: Bowman, F. D.** (PI: Lance Waller). "Atlanta Summer Institute for Training In Biostatistics (Renewal)," NIH T15, 2%.
20. **Neuroimaging Track Director and Training Faculty: Bowman, F. D.** (PI: Lance Waller). "Biostatistics in Genetics, Immunology, and Neuroimaging," NIH T32, 2005-2013, (5%).
21. **Co-investigator: Bowman**, F. D. (PI: Amy Herring, University of North Carolina) NIH R13, "Workshop for Junior Biostatisticians in Health Research," NCI, 2009-2011, $100,000.
22. **Training faculty: Bowman, F. D.** (PI: Wilkinson/Marsteller). "Initiative for Maximizing Student Diversity (IMSD) Program," NIH.

D. **PRESENTATIONS** (identify invited talks):

Keynote and Grand Rounds Presentations

Bowman, F. D. (2008). "Exploring the Human Brain through Statistical Methods for Neuroimaging Data," invited speaker in the Center for Rehabilitation Medicine Grand Rounds, Emory Healthcare, Atlanta, GA.

Bowman, F. D. (2008). "Modeling Brain Imaging Data to Find Neural Representations of Behavior and Disease", Keynote address at the 10th Annual Symposium on Statistics in Psychiatry, New York University, University of Pennsylvania, Columbia University, and Yale University, New York, NY.

Bowman, F. D. (2008), "Statistics: A Pathway to a Promising Future." StatFest: A Conference for Undergraduates, sponsored by the American Statistical Association, October 2008, Beaumont, TX.

Bowman, F. D. (2007), "Staying the Course: Pursuing Research Careers in Mental Health." The 2007 NIMH Career Opportunities in Research (COR) Annual Colloquium, November 2007, Albuquerque, New Mexico.

Invited Research Paper Presentations

2012

1. Bowman, F. D. (2012). "A Multimodal Technique for Determining Connectivity within the Human Brain," Invited speaker at the Multimodal Neuroimaging Training Program, Carnegie Mellon University and the University of Pittsburgh, Pittsburgh, PA.

2. Bowman, F. D. (2012). "Analysis of Large-scale Neuroimaging Data: Methods for Determining Functional Connectivity and Task-Related Changes in Neural Processing," Invited speaker in the Division of Biostatistics, Washington University School of Medicine, St. Louis, MO..

3. Bowman, F. D. and Chen, S. (2012). "A Novel Support Vector Classifier for Longitudinal High-dimensional Data," invited talk at ENAR Spring Meeting, Washington, D. C.

4. Bowman, F. D. (2012). "A Bayesian Spatial Model for the Analysis of Large-scale Neuroimaging Data," Invited speaker at the 5th Annual Bayesian Biostatistics Conference, The University of Texas MD Anderson Cancer Center, Houston, TX.

5. Derado, G., Bowman, F. D. (2011). "Predicting Brain Activity using a Bayesian Spatial Model", GEOMED 2011, Victoria, British Columbia.

6. Derado, G., Bowman, F. D. (2011). "Predicting Brain Activity using a Bayesian Spatial Model", 13th Biennial CDC Symposium on Statistical Methods, Atlanta, GA.

7. Guo Y. (2012). "A general group ICA model for multi-subject fMRI data and its estimation methods". Department of Mathematics and Statistics, Georgia State University.

8. Guo Y. (2012). "A hierarchical group ICA model for estimating temporal and spatial patterns of brain networks". In Invited Session "Computational Tools and Quantitative

Methods for High Dimensional Data Analysis", Society for Industrial and Applied Mathematics (SIAM) 36th Annual Conference, Huntsville, Alabama.

9. Guo Y. and Tang L. (2012). "A new probabilistic group ICA method for modeling between-subject variability in brain functional networks". In Topic Contributed Session "Novel developments in statistical blind source separation and independent component analysis." International Biometrics Society (ENAR) Meeting, Washington DC.

10. Kang, J. and Song, P. Bai, Y. (2012) Accounting for spatial temporal correlation in fMRI data analysis using a composite likelihood approach, Composite Likelihood Workshop, Canada, Banff.

11. Kang, J. (2012) Bayesian spatial point processes for functional neuroimaging meta-analysis, Department of Statistics, University of Georgia Organization for Human Brain Mapping 2012 – Talk: Default Mode Network Functional Structure Predicts Treatment Response of Deep Brain Stimulation.

12. Xue, W. (2012). "Modeling Functional Connectivity in the Human Brain with Incorporation of Structural Connectivity", JSM, San Diego, CA.

13. Xue, W. (2012). "A Bayesian Approach to Determining Functional Connectivity in the Human Brain with Incorporation of Structural Connectivity", ENAR, Washington, D.C.

14. Zhang, L., Kang, J., Bowman, F. D. (2012). *A Bayesian random shape model for fMRI and MRI data,* Eastern North American Region (ENAR).

2011

15. Bowman, F. D. (2011). "Characterizing Behavior-Related Neural Processing Changes and Functional Connectivity in the Human Brain," Invited speaker at the John and Mary Franklin Foundation Paul D. Coverdell Neuroimaging Program, University of Georgia, Athens, GA.

16. Bowman, F. D. (2011). "A Bayesian Spatial Model for the Analysis of Large-scale Neuroimaging Data," Invited speaker at The Brad Efron Honorary Symposium on Large-Scale Inference, Social and Scientific Systems, Inc., Silver Spring, MD.

17. Bowman, F. D. (2011). "Statistical Analysis of Neuroimaging Data: A look at current methods and challenges," Invited speaker at the National Science Foundation Workshop on Statistical Analysis of Neuroimaging Data for Social and Behavioral Science Research, Arlington, VA.

18. Bowman, F. D. (2011). "Predicting Brain Activity using a Bayesian Spatial Model," Invited speaker in the Bernoulli Society sponsored session "Statistics in Neuroscience", International Statistical Institute, Dublin, Ireland.

19. Bowman, F. D. (2011). "A Bayesian Spatial Model for Predicting Brain Activity," Invited speaker JSM, Miami, FL.

20. Bowman, F. D. (2011). "Predicting Brain Activity using a Bayesian Spatial Model," Invited speaker at the Statistical Methods for Very Large Data Sets Conference, Baltimore, MD.

21. Bowman, F. D. (2011). "A Spatial Modeling Framework for Functional Neuroimaging Data," Invited speaker at the University of Florida Workshop on High Dimensional Inference, Gainesville, FL.

2010

22. Bowman, F. D. (2010). "Statistical Modeling of Brain Imaging Data: An Overview, Challenges, and Future Directions," Invited speaker at the Statistical and Applied Mathematical Sciences (SAMSI) 2010-11 Analysis of Object Data Opening Workshop and Tutorials, Research Triangle Park, NC.

23. Bowman, F. D., Derado, G., and Chen, S. (2010). "Determining Differences in Functional Connectivity using a Combined fMRI/DTI Analysis," Topic Contributed Paper Session at the Joint Statistical Meetings, Vancouver, British Columbia, Canada.

24. Bowman, F. D., Derado, G., and Chen, S. (2010). "Determining Resting-State Neural Processing Networks: A Combined fMRI-DTI Approach," invited talk at ENAR Spring Meeting, New Orleans, LA.

25. Guo Y. (2010). "A general probabilistic model for group independent component analysis of functional neuorimaging data." Dept. of Biostatistics, Medical College of Georgia, Augusta, GA.

26. Guo Y. (2010). "A probabilistic group independent component analysis model and a fast approximate estimation approach." In Topic Contributed Session "Statistical Analysis of Brain Signals", Joint Statistical Meetings, Vancouver, Canada.

2009

27. Bowman, F. D. (2009). "Determining Resting-State Neural Processing Networks: A Combined fMRI-DTI Approach," invited talk in a session entitled "Emerging Applications in High-Dimensional Data Analysis" at the 60th Anniversary of the Department of Biostatistics, University of North Carolina, Chapel Hill, NC.

28. Bowman, F. D. (2009). "Determining Resting-State Neural Processing Networks: A Combined fMRI-DTI Approach," speaker in the Statistica Sinica Invited Paper Session "Analysis of complex and high-dimensional data" at the Joint Statistical Meetings, Washington, D. C.

29. Bowman, F. D. (2009), "Characterizing Neural Processing and Mechanisms of treatment using Neuroimaging Statistics," invited talk in the NIMH Mentored Training Program to Increase Diversity in HIV, Substance Use and Mental Health (R25MH080669-01A1), Morehouse School of Medicine, Atlanta, GA.

30. Bowman, F. D. (2009), "Bayesian vs. Frequentist Statistical Methods in Neuroimaging Applications," invited speaker in symposium entitled "To Be Bayesian or Frequentist or Not: A Debate on Functional Imaging Analyses," 15th annual meeting of the Organization for Human Brain Mapping (OHBM), San Francisco, CA. Published *NeuroImage*, v. 47, pp. S7.

31. Bowman, F. D. (2009). "Identifying Behavior-Related Neural Processing Alterations and Functional Connections in the Human Brain: A Spatial Modeling Approach for fMRI Data," invited speaker at Brown University, Center for Statistical Sciences, Providence, RI.

32. Bowman, F. D. (2009). "A Unified Approach for Identifying Behavior-Related Neural Processing Alterations and Functional Connections in the Human Brain: A Spatial Modeling Approach for fMRI Data," invited speaker at Columbia University, Department of Statistics Seminar Series, New York, NY.

33. Guo Y. (2009). "Statistical methods for probabilistic group independent component analysis for fMRI data," In invited session "Computational and Numerical Methods in Imaging", IMACS world conference on Computational and Applied Mathematics & Applications in Science and Engineering, University of Georgia, Athens, GA.

2008

34. Bowman, F. D. (2008). "Bayesian spatial hierarchical modeling," invited speaker at the Institute for Pure and Applied Mathematics (IPAM) Program entitled "Mathematics in

Brain Imaging," University of California at Los Angeles (UCLA), Los Angeles, CA.

35. Bowman, F. D. (2008). "Discovering Patterns of Connectivity within the Human Brain," invited talk at the Joint Statistical Meetings, Denver, CO.

36. Bowman, F. D. (2008). "A Look into the Human Brain: Neural Processing Representations of Behavior and Disease," James Grizzle Distinguished Alumni Award Lecture, University of North Carolina at Chapel Hill, Department of Biostatistics, Chapel Hill, NC.

37. Bowman, F. D. (2008). "Bayesian Analysis for fMRI Data," invited speaker at the 14th annual meeting of the Organization for Human Brain Mapping (OHBM), Advanced fMRI Course, Melbourne, Australia.

38. Bowman, F. D. (2008). "A Unified Approach for Identifying Behavior-Related Neural Processing Alterations and Functional Connections in the Human Brain: A Spatial Modeling Approach for fMRI Data," Special invited lecture at Statistical Analysis of Neuronal Data Workshop (SAND4), Carnegie Mellon University, Pittsburgh, PA.

39. Bowman, F. D. (2008). Statistical Modeling Approaches to Characterize Experimentally-Induced Alterations in Human Brain Function, invited talk at the University of Georgia, Department of Statistics, Athens, GA.

40. Guo Y. (2008)."A Unified Framework for Group Independent Component Analysis for Multi-subject fMRI data." In Invited Session "New Statistical Methods for Biomedical Imaging Data". International Biometrics Society (ENAR) Meeting, Arlington, VA.

41. Guo Y. (2008). "Group Independent Component Analysis of Multi-subject fMRI data: Connections and Distinctions between Two Methods." In invited session "Statistical analysis of Medical Images" *IEEE* International Conference on BioMedical Engineering and Informatics, Hainan, China.

2007

42. Bowman, F. D. (2007). "Bayesian Hierarchical Modeling of Functional Neuroimaging Data," invited talk at the International Chinese Statistical Association, Applied Statistics Symposium, Raleigh, NC.

43. Bowman, F. D. (2007). "Detecting Differential Patterns of Activation in the Human Brain," invited talk at the 11th Biennial CDC & ATSDR Symposium on Statistical Methods: Analyzing and Mapping Health Inequities to Impact Policies for Eliminating Disparities, Atlanta, GA.

44. Bowman, F. D. (2007). "Statistical Modeling Approaches to Characterize Experimentally-Induced Alterations in Human Brain Function," invited talk at Massachusetts Institute of Technology, Massachusetts General Hospital, Athinoula A. Martinos Center for Biomedical Imaging, Harvard-Massachusetts Institute of Technology Division of Health Sciences & Technology and the Massachusetts General Hospital, Boston, MA.

45. Bowman, F. D. (2007). "Bayesian Hierarchical Modeling of Functional Neuroimaging Data," invited talk at ENAR Spring Meeting, Atlanta, GA.

46. Bowman, F. D. (2007). "Spatial Modeling Approaches to Characterize Experimentally-Induced Alterations in Human Brain Function ", invited talk at Vanderbilt University School of Medicine, Department of Biostatistics, Nashville, TN.

47. Bowman, F. D. (2007). "Statistical Modeling Approaches to Characterize Experimentally-Induced Alterations in Human Brain Function", invited talk at the University of Michigan, Department of Biostatistics, Ann Arbor, MI.

48. Guo Y. (2007). "A Maximum Likelihood Approach for Multi-subject Independent Component Analysis". Department of Biostatistics, Johns Hopkins University.

49. Guo Y. (2007)."Statistical Tests of Group Differences in Independent Component Analysis of Multisubject fMRI Data." Invited talk in Topic Contributed Session (Nonparametric and Semiparametric Methods in Brain Imaging Studies). Joint Statistical Meetings, Salt Lake City, Utah.

50. Guo Y. (2007). "Statistical methods for group Independent Component Analysis for Multisubject fMRI data." Division of Biostatistics, Washington University Medical School.

51. Guo Y. (2007). "Statistical methods for group Independent Component Analysis for Multisubject fMRI data." Dept. of Statistics, University of Georgia.

Contributed Research Paper and Poster Presentations

2012

52. Amzat R, Taleghani P, Savir-Baruch B, Nieh PT, Master VA, Rossi P, Halkar RK, Goodman MM, Bowman FD, Schuster DM (2012). "Extraprostatic recurrent prostate carcinoma detection with synthetic amino acid PET/CT surpasses imaging with ^{111}Indium-capromab-pendetide plus diagnostic CT," Society for Nuclear Medicine Annual Meeting, Miami, Florida.

53. Chen, S. and Bowman, F. D. (2012). "A Bayesian Hierarchical Framework for Modeling Brain Connectivity of Neuroimaging Data," Topic Contributed talk at the Joint Statistical Meetings, San Diego, CA.

54. Chen, S., Bowman, F. D., and Zhang, L. (2012). "A Bayesian Hierarchical Framework for Modeling Brain Connectivity of Neuroimaging Data," ENAR Spring Meeting, Washington, D. C.

55. Xue, W. and Bowman, F. D. (2012). "Modeling Functional Connectivity In The Human Brain With Incorporation Of Structural Connectivity," Joint Statistical Meetings, San Diego, CA.

56. Xue, W. and Bowman, F. D. (2012). "A Bayesian Approach to Determining Functional Connectivity in the Human Brain with Incorporation of Structural Connectivity," ENAR Spring Meeting, Washington, D. C.

57. Zhang, L., Bowman, F. D., and Wang, M. (2012). "An Extended GEE Model With Latent Variables For Brain fMRI Connectivity," poster presentation at Joint Statistical Meetings, San Diego, CA.

58. Zhang, L., Kang, J., and Bowman, F. D. (2012) "A Bayesian Random Shape Model for fMRI and MRI Data," poster at the ENAR Spring Meeting, Washington, D. C.

2011

59. Agravat, S. (2011). "GlycoPattern: A Platform for Motif Analysis and Glycan Array Exploration," presentation at Glycobiology Cell Communication Satellite Meeting, Seattle, WA.

60. Bowman, D. and Derado, G. (2011). "Predicting Brain Activity Using a Bayesian Spatial Hierarchical Model," 17th annual meeting of the Organization for Human Brain Mapping (OHBM), Quebec City, Canada.

61. Chen, S. and Bowman, D. (2011). "A Novel Support Vector Classier for Longitudinal Functional Neuroimaging Data," 17th annual meeting of the Organization for Human Brain Mapping (OHBM), Quebec City, Canada.

62. Tolbert, T., Guo, Y. (2011). "Analysis of subject-specific brain functional networks in an fMRI study". Summer Undergraduate Research Experience at Emory (SURE) Program.

63. Wang, M., Zhang, L. (2011). "Comparison and Summary of Criteria for Working Correlation Structure and Covariate Selection in Generalized Estimating Equation," ENAR.

64. Zhang, L., Agravat, S., Derado, G., Chen, S., Bowman, F. D. (2011). "BSMac: A MATLAB toolbox Implementing a Bayesian Spatial Model for Brain Activation and Connectivity." Proceedings of the Organization for Human Brain Mapping (OHBM), 17th Annual Meeting, Quebec City, Canada, 2011.

65. Zhang, L., Bowman, F. D. (2011). "A group study on brain connectivity and activation with graph theory in Schizophrenia," Joint Statistical Meetings (JSM) 2011.

2010

66. Agravat, S. (2010). "Tools for Mining Motifs and Building Glycan Cartoon Structures," Workshop on Glycan Array/Bioinformatics, Atlanta, GA.

67. Bowman, F.D. (2010). "A Bayesian Spatial Model for Identifying Localized Brain Activity Changes and Functional Connectivity,"International Biometrics Conference, Florianopolis, Santa Catarina, Brazil.

68. Chen, S., Bowman, F. D., Zhang, L. (2010). "A Bayesian Hierarchical Framework for Modeling of Resting-State fMRI Data," Joint Statistical Meetings (JSM).

69. Chen, S. and Bowman, D. (2010). "A Bayesian Hierarchical Framework for Modeling of Resting-state fMRI Data," ENAR Spring Meeting, New Orleans, LA.

70. Derado, G., Bowman, D., Guo, Y., and Kilts, C. (2010). "Predicting Post-baseline Brain Activity using a Bayesian Spatial Hierarchical Model," ENAR Spring Meeting, New Orleans, LA.

71. Schuster DM, Savir-Baruch B, Nieh PT, Master V, Halkar RK, Rossi P, Lewis M, Bowman FD, Yu W, Goodman MM (2010). Report of a clinical trial of anti-1-amino-3-[18F]fluorocyclobutane-1-carboxylic acid (anti-[18F]FACBC) PET-CT in recurrent prostate cancer. 2010 Society for Nuclear Medicine Annual Meeting, Salt Lake City, Utah.

72. Zhang, L., S. Agravat, G. Derado, F. D. Bowman (2010). "MATLAB Toolbox for the Analysis of fMRI Data: A Bayesian Spatial Model for Activation and Connectivity," Joint Statistical Meetings (JSM) 2010.

2009

73. Bowman, D., Derado, G., and Chen, S. (2009). "Evaluating Functional Connectivity using fMRI Data with Diffusion-Based Anatomical Weighting," 15th annual meeting of the Organization for Human Brain Mapping (OHBM), San Francisco, CA. Published *NeuroImage*, v. 47, pp. S147.

74. Chen, S., Derado, G., Guo, Y., Mayberg, H., and Bowman, D. (2009). "Classification Methods for Identifying the Neural Characteristics of Antidepressant Treatment," Invited oral presentation at the Organization for Human Brain Mapping, 15th Annual Meeting, San Francisco, CA. Published *NeuroImage*, v. 47, p. S71.

75. Chen, S., Bowman, D., and Derado, G. (2009). "Connectivity Analysis Based on fMRI and DTI Brain Imaging Data," ENAR Spring Meeting, San Antonio, TX.

76. Derado, G. and Bowman, D. (2009). "Modeling the Spatial and Temporal Dependence in fMRI Data," ENAR Spring Meeting, San Antonio, TX.

77. Schuster, D. M., Savir-Baruch, B., Nieh, P. T., Votaw, J. R., Nye, J. A., Master, V., Halkar, R. K., Bowman, F. D., Goodman, M. M. (2009). Initial report of a clinical trial of anti-1 amino 3 [18F]fluorocyclobutane-1-carboxylic acid (anti-[18F]FACBC) PET-CT in recurrent prostate cancer. 2009 Society for Nuclear Medicine Annual Meeting, Toronto, Canada.

2008

78. Bowman, F. D. and Derado, G. (2008). "Modeling the spatial and temporal dependence in fMRI data: An application to a study of inhibitory control in cocaine addiction," 14th annual meeting of the Organization for Human Brain Mapping (OHBM), Melbourne, Australia. Published *NeuroImage*, v. 41, p. S30.

79. Caffo, B., **Bowman, F. D.**, Bassett, S., and Kilts, C. (2008). "A Bayesian Hierarchical Framework for Spatial Modeling of fMRI Data," Organization for Human Brain Mapping, 14th Annual Meeting, Melbourne, Australia. Published *NeuroImage*, v. 41, p. S17.

80. Derado, G., Lee, K., Nicolis, O., Bowman, F. D., Newell, M., Rugger, F. F., Vidakovic, B. (2008). "Wavelet-based 3-D Multifractal Spectrum with Applications in Breast MRI Images," 4-th International Symposium on Bioinformatics Research and Applications, Atlanta, GA.

2007

81. Clay, L. and Bowman, D. (2007). Examining the Effects of Ethanol on Neural Processing in the Human Brain. The NIMH Career Opportunities in Research (COR) Annual Colloquium, Albuquerque, New Mexico.

82. Derado, G., Nair, H. P., Bowman, F. D., Drexler, K., Kilts, K. (2007). "Functional Activity Differences in Brain Regions Related to Emotional Regulation in Recovered Cocaine Addicts," Organization for Human Brain Mapping, 13th Annual Meeting, Chicago, IL. Published *NeuroImage* v. 36, p. 99.

83. Derado, G., Bowman,D., Patel, R., Newell, M., and Vidakovic, B. (2007). Wavelet Image Interpolation (WII): A Wavelet-based Approach to Enhancement of Digital Mammography Images. International Symposium on Bioinformatics Research and Applications, Atlanta, GA.

84. Derado, G. and Bowman, D. (2007). "Modeling the spatial and temporal dependence in fMRI data: An application to an inhibitory control study of cocaine addicts," ENAR Spring Meeting, Atlanta, GA.

85. Guo, Y., Pagnoni, G., Bowman, F. D. (2007). "Comparison of Methods of Group Independent Component Analysis for Multisubject fMRI Data," Organization for Human Brain Mapping, 13th Annual Meeting, Chicago, IL. Published *NeuroImage* v. 36, p. 124.

86. Nye, J., Tudorascu, D., Bowman, F. D., Santana, C., Faber, T., Votaw, J. (2007). A post-imaging method for correcting heart drift in PET/CT cardiac imaging. *Journal of Nuclear Medicine* 48(S2):50P-c.

E. SOFTWARE (description, plus download/usage statistics):

- BSMac – (Bayesian Spatial Model for Activation and Connectivity). A MATLAB toolbox implementing a Bayesian spatial model for brain activation and connectivity. http://www.sph.emory.edu/bios/CBIS/download_page.php). See below for BSMac dissemination.

- *Developed by CBIS member as part of Center for Comprehensive Informatics (CCI) projects:

    - eBIRT – http://ebirt.emory.edu. A search engine for biomedical resources located within the Atlanta Clinical and Translational Sciences Institute (ACTSI)

- GlycoPattern – http://glycopattern.emory.edu. A platform for mining and exploring glycan arrays designed for the Consortium for Functional Glycomics
- GLYMMR – http://glymmr.emory.edu. A motif mining algorithm for glycan arrays designed for the Consortium for Functional Glycomics.
- Immunogenetic Management Software (IMS): a new tool for visualization and analysis of complex immnogenetic datasets

BSMac Dissemination

CBIS has developed computer software to implement our state-of-the-art statistical methods. Our software, Bayesian spatial model for activation and connectivity (BSMac), is equipped with dynamic 3-dimensional visualizations to display task-related functional connectivity and activation maps with anatomical labels to identify localized areas in the brain that exhibit highly probable task-related changes.

In the brief period since 2011, our BSMac software has been downloaded and used by an international audience. Below is a listing of the departments/organizations where research groups are working with our software:

NATIONAL:

- Dept. of Biostatistics and Bioinformatics, Emory University, Atlanta, GA, USA;
- Dept. of Psychiatry, Emory University, Atlanta, GA, USA;
- Dept. of Radiology, Emory University, Atlanta, GA, USA;
- Dept. of Neurosurgery, Emory University, Atlanta, GA, USA;
- Dept. of Biostatistics, University of Michigan, Ann Arbor, MI, USA;
- Dept. of Psychology, University of Michigan, Ann Arbor, MI, USA;
- Dept. of Psychology, University of Georgia, Athens, USA;
- Dept. of Psychiatry and Behavioral Sciences, University of Arkansas for Medical Sciences, AR, USA;
- Veterans Affairs Northern California Health Care System, Martinez, CA, USA;
- Human Cognitive Neurophysiology Laboratory, VA Medical Center, Martinez, California, USA;
- Clinical Psychology, University of California, San Diego, CA, USA;

- Miami Children's Hospital, Miami, USA;
- Department of Psychiatry, University of Pittsburgh, USA;
- Modeling Systems Analyst of Transportation Mobility & Planning Division, University of Virginia, USA;
- School of Medicine, Washington University, USA

INTERNATIONAL:

- University of Toronto, Canada;
- PUCRS, Brazil;
- Dept. of Data analysis, Ghent University, Belgium;
- Inserm, France;
- Dept. of Psychology, Humboldt-University zu Berlin, Berlin, Germany;
- Dept. of Psychology, University of Milano–Bicocca, Milano, Italy;
- Dept. of Psychology, University of Torino, Italy;
- Dept. of Psychology, University of Turin Via Verdi, Torino, Italy
- Institute of Psychiatry, King's College London, UK;
- Department of Psychiatry, University Hospital Brno and Masaryk University, Brno, Czech Republic;
- Department of Automatic Control and Systems Engineering, University of Sheffield, United Kingdom;
- Dept. of Psychiatry, School of Medicine, Eulji University, Daejeon, Korea;
- Dept. of Nuclear Medicine, College of Medicine, Seoul National University, Seoul, Korea;
- Dept. of Anatomy, School of medicine, Shandong University, China;
- Dept. of Radiology, Yangzhou Hongquan Hospital of Yangzhou University Medical Academy, Yangzhou, China;
- Dept. of Psychiatry, Graduate School of Medical Science, Kyoto Prefectural University of Medicine, Kyoto, Japan;
- The System of Universities and Colleges in Vietnam, Hanoi, Vietnam;

- University of Transport and Communications, Hanoi, Vietnam;
- Biomedical Engineering Department, Tarbiat Modares University, Tehran, Iran;
- Fuzhou University, Fuzhou, China;
- University of New South Wales, Sydney, Australia;
- Bond University, Gold Coast, Australia;

F. TEACHING (related to CBIS mission, including conference workshops/short courses):

- Short Course (June 2012) in Brazil: Organizer and Lecturer. [Franco, A.]
- Functional Neuroimaging: A Hands-On Approach [Franco, A.]
- BIOS 760R(560R), Adv. Topics in Neuroimaging Statistics, Emory University, Spring 2010. [Bowman, F. D., Guo, Y.]
- Invited speaker at 15th annual OHBM Meeting, "Bayesian vs. Frequentist Statistical Methods in Neuroimaging Applications," symposium entitled *To Be Bayesian or Frequentist or Not: A Debate on Functional Imaging Analyses*, San Francisco, CA, June 2009. Published *NeuroImage*, v. 47, pp. S7. [Bowman, F. D.]
- Invited Short Course, "Statistical Modeling and Analysis of Brain Imaging Data" in the International Biometrics Society, Eastern North American Region (ENAR) Meeting, San Antonio, TX, March, 2009. [Bowman, F. D., Guo, Y.]
- Invited Speaker at the Institute for Pure and Applied Mathematics (IPAM) Program entitled "Mathematics in Brain Imaging," University of California at Los Angeles (UCLA), July 2008. [Bowman, F. D.]
- Invited Speaker at the 14th annual OHBM Meeting, "Bayesian Analysis for fMRI Data," Advanced fMRI Course, Melbourne, Australia, June 2008. [Bowman, F. D.]

G. LEADERSHIP ACTIVITIES/HONORS (related to CBIS mission, including review panels, editorial boards, etc.):

DuBois Bowman

- Founding member of the Statistics in Imaging Section of the American Statistical Association (ASA), 2012.

- Treasurer of the Statistics in Imaging Section of the ASA, 2012.
- Associate Editor for *Journal of the American Statistical Association, Applications and Case Studies*, 2007-2012
- Associate Editor for *Biometrics*, 2007-2009
- National Institutes of Health (NIH), **Invited special emphasis panel grant reviewer**, National Institute for Child Health and Human Development (NICHD), ZHD1 DRG-H 52, Learning Disabilities Innovation Hubs, 2012.
- **External Advisory Committee member**, Multimodal Neuroimaging Training Program, Carnegie Mellon University and the University of Pittsburgh, 2012.
- Emory University Alzheimer's Disease Research Center, **Grant reviewer**, 2012.
- National Academies (National Academy of Sciences, National Academy of Engineering, Institute of Medicine, and the National Research Council) Keck Futures Initiative Conference on Imaging Science, **Selected workshop participant**, Irvine, CA, 2010.
- NIH, **Invited special emphasis grant review panelist** for health services, clinical, and population health research, 2009.
- Atlanta University Center (AUC) National Institute of Mental Health (NIMH) Career Opportunities in Research (COR) **Advisory Board**, 2009-2012.
- NIH, Biostatistical Methods and Research Design (BMRD) Study Section, **Invited Grant Reviewer**, 2008.
- NIH, NIMH, **Invited grant review panelist for K99 Pathway to Independence Grants**, telephone meeting, 2007.
- NIH, NIMH, **Invited grant review panelist for K99 Pathway to Independence Grants**, Bethesda, MD, 2007.

Ying Guo

- National Science Foundation (NSF), Methodology, Measurement, and Statistics (MMS) Program, Invited grant reviewer, 2009.
- National Science Foundation (NSF), Cognitive Neuroscience Program, Invited grant reviewer, 2011.

- Canadian Breast Cancer Foundation (CBCF), Invited grant reviewer in CBCF National Grants Scientific Review Panel, Imaging-based Earlier Detection of Breast Cancer Program, 2012.

Lijun Zhang

- Session Chair of JSM2012: *Meta-Analysis, Latent Class Analysis, Interrater Agreement, and Control Charts in Epidemiology;*
- Judge for ENAR RAB Poster Award Competition, 2012.
- Review Panel: *Journal of NeuroImage; Journal of Neurocomputing; IEEE Transactions on Medical Imaging (TMI); Organization for Human Brain Mapping (OHBM) ; International Journal of Biomedical Imaging (IJBI); Journal of Pattern Recognition Research;*

Shuo Chen

- 2009 Organization of Human Brain Mapping Trainee Abstract Award, 15th OHBM meeting.
- 2010 Emory University Internal Nomination for HHMI International Graduate Student Fellowship (selected as one of seven Ph.D. students across all majors within Emory University).
- 2011 Statistical Learning and Data Mining Student Paper Competition winner, American Statistical Association, JSM 2011.
- 2011- NIH Biostatistics in Genetics, Immunology, and Neuroimaging (BGIN) Training Program Fellowship.
- 2011 Livingston Fellowship (to award one outstanding Ph.D. student in Department of Biostatistics, Emory University).
- 2012 David Byar Young Investigator Award Competition Travel Award, American Statistical Association, JSM 2012.

H. OTHER SIGNIFICANT ACCOMPLISHMENTS RELATED TO CBIS MISSION.

Lijun Zhang

- Scholarship for “Developing Statistical Methods for NeuroImaging” workshop in UCSD, by NSF.
- Travel Award by the Statistical and Applied Mathematical Sciences Institute (SAMSI) for the Simulation of Rare Events Workshop, 2012.

- Travel Award by Statistical Analysis of Neuronal Data (SAND5), 2011.