SATRAJIT SUJIT GHOSH

Curriculum Vitae

McGovern Institute for Brain Research
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Degrees

PhD, Cognitive and Neural Systems, Boston University, 2005, Prof. Frank Guenther
B.S. (Honors), Computer Science, National University of Singapore, 1997, Prof. Lonce L. Wyse

Employment

Principal Research Scientist, McGovern Institute for Brain Research, MIT, 2015 – Current
Assistant Professor, Department of Otology and Laryngology, Harvard Medical School, 2014 – Current
Research Scientist, McGovern Institute for Brain Research, MIT, 2011 – 2014
Research Scientist, Research Laboratory of Electronics, MIT, 2007 – 2011
Postdoctoral Associate, Research Laboratory of Electronics, MIT, 2004 – 2007, Dr. Joseph S. Perkell
Software Engineer, Kent Ridge Digital Labs, Singapore, 1997-1998

External Positions held

Massachusetts Eye and Ear, Harvard Medical School, 2014 – Current, Research Associate
Speech and Hearing Biosciences and Technology, (now in) Division of Medical Sciences, Harvard Medical School, 2008 – Current, Member of the Faculty
Editorial board, Frontiers in Brain Imaging Methods, 2012 – Current, Associate Editor
Standards for Datasharing Taskforce, International Neuroinformatics Coordinating Facilities, 2010 – Current
Executive board, TankThink Labs, LLC, 2011 – Current
Department of Cognitive and Neural Systems, Boston University, 2005-2010, Research Fellow

Honors

Educational stipend, International Society for Magnetic Resonance in Medicine, 2008
Graduate Teaching Fellow Award, Boston University, 2000
Presidential University Graduate Fellowship, Boston University, 1998

UROP Students supervised

Alkhairy, Samiya, Fall, 2009, Spring 2010
Zhang, Mark, Spring 2012
Ung, William, Spring 2012

Ph.D. Students Supervised

Sitek, Kevin, in progress
Ciccarelli, Gregory, in progress

Teaching experience

6.541, Speech Communication, Spring 2009, 2011, 2012, 2013, 2014

6.551, Acoustics of Speech and Hearing, Fall 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014

Service

Internal service:

Admissions committee, Speech and Hearing Biosciences and Technology Program (HST), 2010 – Current

Curriculum committee, Speech and Hearing Biosciences and Technology Program (HST), 2009 – Current

External service:

Associate Editor, Frontiers in Brain Imaging Methods, 2012 – Current

Frontiers in Human Neuroscience, 2015 - Current

Review editor, Frontiers in Neuroinformatics, 2011 - Current

Ad hoc grant reviewer

National Science Foundation, 2008, 2010, 2013

National Medical Research Council, Singapore, 2007, 2009, 2011-2012

Department of Defense, 2011

Ad hoc editorial reviewer

Biological Psychiatry, Brain, Brain and Language, Current Biology, European Journal of Neuroscience, Frontiers in Computational Neuroscience, Frontiers in Systems Neuroscience, Frontiers in Neuroinformatics, Human Brain Mapping, Journal of the Acoustical Society of America, Journal of Neuroscience, Journal of Speech, Language and Hearing Research, Magnetic Resonance in Medicine, NeuroImage

Editorial board, Special Research Topic, Python in Neuroscience, Frontiers in Neuroscience

Nipype teaching workshops, Edinburgh 2011, Magdeburg 2012

Speaker, Educational workshop, Organization for Human Brain Mapping, Seattle, 2013

Organizer, HBM Hackathon, Organization for Human Brain Mapping, Seattle, 2013

Local organizing committee, 4th Biennial Conference on Resting State Connectivity, Boston, 2014

Technological and Other Scientific Innovations

Nipype: Brain imaging analysis framework 2008-	Gorgolewski K, Burns CD, Madison C, Clark D, Halchenko YO, Waskom ML, Ghosh SS. (2011). Nipype: a flexible, lightweight and extensible neuroimaging data processing framework in Python. Front. Neuroimform. 5:13. Nipype provides an environment that encourages interactive exploration of algorithms from different packages (e.g., SPM, FSL, FreeSurfer, Camino, MRtrix, AFNI, Slicer), eases the design of workflows within and between packages, and reduces the learning curve necessary to use different packages. I continue develop and oversee the development of the software, funded initially through an R03, as an opensource collaborative project.
MURFI: a realtime MR biofeedback software 2007-	Hinds, O., Ghosh, S., Thompson, T.W., Yoo, J.J., Whitfield-Gabrieli, S., Triantafyllou, C., Gabrieli, J.D. (2011) Computing moment-to-moment BOLD activation for real-time neurofeedback. Neuroimage. 54(1):361-8. PMID: 20682350. This software framework allows biofeedback of activation based on the BOLD signal. I provided that testing and validation framework for the software and contributed to its design and implementation. We are now using this software for three ongoing projects and I have secured additional funding to continue its

	development.
Realtime voice modification setup 2005-2007	Cai, S, Boucek, M, Ghosh, S.S., Guenther, F.H., Perkell, J.S. (2008) A System for Online Dynamic Perturbation of Formant Trajectories and Results from Perturbations of the Mandarin Triphthong /iau/. International Seminar in Speech Production, Strassbourg, France. This system was initially implemented on a Texas instruments DSP board and later transferred to a solution that involved commodity ASIO capable sound cards and a standard software stack based on RtAudio.
Noise suppression for MRI patient microphone input 2004-2005	Two provisional patents were applied for but not pursued after expiry. 2007 Online noise suppression software for Magnetic Resonance Imaging 2007 Bidirectional noise suppressing communication setup for Magnetic Resonance Imaging The goal of this software was to provide a mechanism to suppress MR noise. This is still being used in research projects at MIT.
Carotid artery diameter estimation from ultrasound images 1999-2000	Current usage status is unknown. I built the graphical interface for the software to provide a semi-automated method for artery diameter estimation that reduced human intervention significantly and validated it against manual measurements.
FlexEffex: Interactive sound effects and music 1997-1998	I contributed to the development of the FlexEffex architecture and rewrote the internal sound effects plugin api and hardware libraries. The software was subsequently sold to a company, MindMaker Inc.

Publications

1. Guenther, F.H., Nieto-Castanon, A., Tourville, J.A. and **Ghosh, S.S.** (2001) The effects of categorization training on auditory perception and cortical representations. Proceedings of the Speech Recognition as Pattern Classification (SPRAAC) Workshop, Nijmegen, The Netherlands.
2. Guenther, F.H. and **Ghosh, S.S.** (2003) A model of cortical and cerebellar function in speech. Proceedings of the XVth International Congress of Phonetic Sciences (pp. 169-173). Barcelona, Spain: 15th ICPhS Organizing Committee.
3. Guenther, F.H., **Ghosh, S.S.** and Nieto-Castanon, A. (2003) A neural model of speech production. Proceedings of the 6th International Seminar on Speech Production. Sydney, Australia
4. Nieto-Castanon, A., **Ghosh, S.S.**, Tourville, J.A., Guenther, F.H. (2003) Region of interest based analysis of functional imaging data. Neuroimage. 19(4):1303-16. PMID: 12948689.
5. Guenther, F.H., Nieto-Castanon, A., Ghosh, S.S., Tourville, J.A. (2004) Representation of sound categories in auditory cortical maps. J Speech Lang Hear Res. 47(1):46-57. PMID: 15072527.
6. Max, L., Guenther, F.H., Gracco, V.L., **Ghosh, S.S.** and Wallace, M.E. (2004) Unstable or insufficiently activated internal models and feedback-biased motor control as sources of dysfluency: A theoretical model of stuttering. Contemporary Issues in Communication Science and Disorders. 31.
7. Klein, A., Mensh, B., **Ghosh, S.**, Tourville, J., Hirsch, J. (2005) Mindboggle: automated brain labeling with multiple atlases. BMC Med Imaging. 5:7. PMCID: PMC1283974.
8. Guenther, F.H., **Ghosh, S.S.**, Tourville, J.A. (2006) Neural modeling and imaging of the cortical interactions underlying syllable production. Brain Lang. 96(3):280-301. PMCID: PMC1473986.

9. Guenther, F.H., **Ghosh, S.S.**, Nieto-Castanon, A. and Tourville, J.A. (2006) A neural model of speech production. In: J. Harrington & M. Tabain (eds.), Speech Production: Models, Phonetic Processes, and Techniques. London: Psychology Press.
10. Tiede, M., Shattuck-Hufnagel, S., Johnson, B., **Ghosh, S.**, Matthies, M., Zandipour, M. and Perkell, J. (2007) Gestural phasing in /kt/ sequences contrasting within and cross word contexts. Proceedings of the XVIth International Congress of Phonetic Sciences. Saarbrücken, Germany.
11. **Ghosh, S.S.**, Tourville, J.A., Guenther, F.H. (2008) A neuroimaging study of premotor lateralization and cerebellar involvement in the production of phonemes and syllables. J Speech Lang Hear Res. 51(5):1183-202. PMCID: PMC2652040.
12. Cai, S, Boucek, M, **Ghosh, S.S.**, Guenther, F.H., Perkell, J.S. (2008) A System for Online Dynamic Perturbation of Formant Trajectories and Results from Perturbations of the Mandarin Triphthong /iau/. International Seminar in Speech Production, Strassbourg, France.
13. Balci, S.K., Sabuncu, M.R., Yoo, J., **Ghosh, S.S.**, Whitfield-Gabrieli, S., Gabrieli, J.D., Golland, P. (2008) Prediction of Successful Memory Encoding from fMRI Data. Med Image Comput Comput Assist Interv. 2008(11):97-104. PMCID: PMC2855196.
14. Perkell, J.S., Lane, H., **Ghosh, S.S.**, Matthies, M.L., Tiede, M., Guenther, F., Ménard, L. (2008) Mechanisms of Vowel Production: Auditory Goals and Speaker Acuity. International Seminar in Speech Production, Strassbourg, France.
15. Klein, A., **Ghosh, S.S.**, Avants, B., Yeo, B.T., Fischl, B., Ardekani, B., Gee, J.C., Mann, J.J., Parsey, R.V. (2010) Evaluation of volume-based and surface-based brain image registration methods. Neuroimage. 51(1):214-20. PMCID: PMC2862732.
16. Cai, S., **Ghosh, S.S.**, Guenther, F.H., Perkell, J.S. (2010) Adaptive auditory feedback control of the production of formant trajectories in the Mandarin triphthong /iau/ and its pattern of generalization. J Acoust Soc Am. 128(4):2033-48. PMCID: PMC2981117.
17. **Ghosh, S.S.**, Kakunoori, S., Augustinack, J., Nieto-Castanon, A., Kovelman, I., Gaab, N., Christodoulou, J.A., Triantafyllou, C., Gabrieli, J.D., Fischl, B. (2010) Evaluating the validity of volume-based and surface-based brain image registration for developmental cognitive neuroscience studies in children 4 to 11 years of age. Neuroimage. 53(1):85-93. PMCID: PMC2914629.
18. **Ghosh, S.S.**, Matthies, M.L., Maas, E., Hanson, A., Tiede, M., Ménard, L., Guenther, F.H., Lane, H., Perkell, J.S. (2010) An investigation of the relation between sibilant production and somatosensory and auditory acuity. J Acoust Soc Am. 128(5):3079-87. PMCID: PMC3003728.
19. Golfinopoulos, E., Tourville, J.A., Bohland, J.W., **Ghosh, S.S.**, Nieto-Castanon, A., Guenther, F.H. (2011) fMRI investigation of unexpected somatosensory feedback perturbation during speech. Neuroimage. 55(3):1324-38. PMCID: PMC3065208
20. Silver, A.L., Nimkin, K., Ashland, J.E., **Ghosh, S.S.**, Van der Kouwe, A.J., Brigger, M.T., Hartnick, C.J. (2011) Cine magnetic resonance imaging with simultaneous audio to evaluate pediatric velopharyngeal insufficiency. Arch Otolaryngol Head Neck Surg. 137(3):258-63.
21. Brunner, J., **Ghosh, S.**, Hoole, P., Matthies, M., Tiede, M., Perkell, J. (2011) The influence of auditory acuity on acoustic variability and the use of motor equivalence during adaptation to a perturbation. J Speech Lang Hear Res. 54(3):727-39. PMID: 20966388.
22. Cai, S., **Ghosh, S.**, Guenther, F., Perkell, J. (2011). Focal manipulations of formant trajectories reveal a role of auditory feedback in the online control of both within-syllable and between-syllable speech timing. J Neurosci 31: 45. 16483-16490. PMID: 22072698.
23. Hinds, O., **Ghosh, S.**, Thompson, T.W., Yoo, J.J., Whitfield-Gabrieli, S., Triantafyllou, C., Gabrieli, J.D. (2011) Computing moment-to-moment BOLD activation for real-time neurofeedback. Neuroimage. 54(1):361-8. PMID: 20682350.

24. Gorgolewski, K., Burns, C.D., Madison, C., Clark, D., Halchenko, Y.O., Waskom, M.L., **Ghosh, S.S.** (2011). Nipype: a flexible, lightweight and extensible neuroimaging data processing framework in Python. *Front. Neuroinform.* **5**:13.
25. Perrachione, T.K., Del Tufo, S.N., **Ghosh, S.S.**, Gabrieli, J.D.E. (2011) "Phonetic variability in speech perception and the phonological deficit in dyslexia." 17th Meeting of the International Congress of Phonetic Sciences, (Hong Kong, August 2011).
26. Poline, J., Breeze, J.L., **Ghosh, S.S.**, Gorgolewski, K., Halchenko, Y.O., Hanke, M., Haslegrove, C., Helmer, K.G., Marcus, D.S., Poldrack, R.A., Schwartz, Y., Ashburner, J. and Kennedy, D.N. (2012). Data sharing in neuroimaging research. *Front. Neuroinform.* **6:**9.
27. **Ghosh, S.S.**, Klein, A., Avants, B. and Millman, K.J. (2012). Learning from open source software projects to improve scientific review. *Front. Comput. Neurosci.* **6:**18
28. Cai, S., Beal, D.S., **Ghosh, S.S**., Tiede, M.K., Guenther, F.H., Perkell, J.S. (2012) Weak responses to auditory feedback perturbation during articulation in persons who stutter: Evidence for abnormal auditory-motor transformation. PLoS One.
29. ***** Doehrmann, O., *** Ghosh, S.S**., Polli, F.P., Reynolds, G., Horn, F., Keshavan, A., Whitfield-Gabrieli, S., Hofmann, S.G., Pollack, M., Gabrieli, J.D. (2013) Predicting treatment response in social anxiety disorder from functional magnetic resonance imaging. JAMA Psychiatry. (* Joint first authors)
30. Hinds, O., Thompson, T., **Ghosh, S.S.**, Yoo, J., Whitfield-Gabrieli, S., Triantafyllou, C., Gabrieli, J. (2013) Roles of Default-Mode Network and Supplementary Motor Area in Human Vigilance Performance: Evidence from Real-Time fMRI. Journal of Neurophysiology.
31. Tustison NJ, Johnson HJ, Rohlfing T, Klein A, **Ghosh SS**, Ibanez L and Avants B (2013). Instrumentation bias in the use and evaluation of scientific software: Recommendations for reproducible practices in the computational sciences. Front. Neurosci. 7:162.
32. **Ghosh, S.S.**, Keshavan, A., Langs, G (2013). Predicting Treatment Response from Resting State fMRI Data: Comparison of Parcellation Approaches. 3rd International Workshop on Pattern Recognition in NeuroImaging (Philadelphia, June 2013).
33. Perrachione, T.K. and **Ghosh, S.S.** (2013). Optimized design and analysis of sparse-sampling fMRI experiments. Front. Neurosci. 7:55. doi: 10.3389/fnins.2013.00055
34. Cai, S., Beal, D.S., **Ghosh, S.S.**, Guenther, F.H., Perkell, J.S. (2014) Impaired timing adjustments in response to time-varying auditory perturbation during connected speech production in persons who stutter. Brain and Language.
35. Cai, S., Tourville, J.A., Beal, D.S., Perkell, J.S., Guenther, F.H. and **Ghosh, S.S.** (2014). Diffusion Imaging of Cerebral White Matter in Persons Who Stutter: Evidence for Network-Level Anomalies. Front. Hum. Neurosci. 8:54
36. Christodoulou JA, Del Tufo SN, Lymberis J, Saxler PK, **Ghosh SS**, Triantafyllou C, Whitfield-Gabrieli S, Gabrieli JD. (2014). Brain bases of reading fluency in typical reading and impaired fluency in dyslexia. PLoS One. 9(7):e100552. doi: 10.1371/journal.pone.0100552. eCollection 2014.
37. Stoeckel, L.E., Garrison, K.A., **Ghosh, S.S.**, Wighton, P., Hanlon, C.A., Gilman, J.M., Greer, S., Turk-Browne, N.B., deBettencourt, M.T., Scheinost, D., Craddock, C., Thompson, T., Calderon, V., Bauer, C.C., George, M., Breiter, H.C., Whitfield-Gabrieli, S., Gabrieli, J.D., LaConte, S.M., Hirshberg, L., Brewer, J.A., Hampson, M., Van Der Kouwe, A., Mackey, S., Evins, A.E. (2014). Optimizing real time fMRI neurofeedback for therapeutic discovery and development, NeuroImage: Clinical
38. Gabrieli, J.D.E., **Ghosh, S.S.**, Whitfield-Gabrieli, S. (2015). Prediction as a Humanitarian and Pragmatic Contribution from Human Cognitive Neuroscience. Neuron.

39. Gorgolewski KJ, Varoquaux G, Rivera G, Schwartz Y, Sochat VV, **Ghosh SS**, Maumet C, Nichols TE, Poline JB, Yarkoni T, Margulies DS, Poldrack RA (2015). NeuroVault.org: A repository for sharing unthresholded statistical maps, parcellations, and atlases of the human brain. Neuroimage.
40. Gorgolewski KJ, Varoquaux G, Rivera G, Schwarz Y, **Ghosh SS**, Maumet C, Sochat VV, Nichols TE, Poldrack RA, Poline JB, Yarkoni T, Margulies DS. (2015). NeuroVault.org: a web-based repository for collecting and sharing unthresholded statistical maps of the human brain. Front Neuroinform. 10;9:8.
41. Whitfield-Gabrieli S, **Ghosh SS**, Nieto-Castanon A, Saygin Z, Doehrmann O, Chai XJ, Reynolds GO, Hofmann SG, Pollack MH, Gabrieli JD. (2015) Brain connectomics predict response to treatment in social anxiety disorder. Mol Psychiatry
42. Langs G, Golland P, **Ghosh SS** (2015). Predicting Activation across Individuals with Resting-State Functional Connectivity based Multi-Atlas Label Fusion. Med Image Comput Comput Assist Interv. Munich, Germany, October.

Conference abstracts (available upon request)

Invited Presentations

Predicting Treatment Outcome in Anxiety and Depression
McLean Hospital, Belmont, USA, 2015
Organization for Human Brain Mapping, Hawaii, USA, 2015

Linking Knowledge and Reproducible Research Via Standardized Provenance Models
Tools for Integrating and Planning Research in Neuroscience, UCLA, Los Angeles, USA, 2014

A Neuroinformatics Bridge to Personalized Healthcare
Boston University, Hearing research seminar, Boston, USA, 2014
Vanderbilt University, Nashville, USA, 2014

Enabling knowledge generation and reproducible research by embedding provenance models in metadata stores
Neuroinformatics Congress, Stochkholm, Sweden, 2013

Python Tools for Reproducible Research in Brain Imaging
PyData conference, Boston, USA, 2013

Nipype: Opensource platform for unified and replicable interaction with existing neuroimaging tools
Brigham and Womens Hospital, Boston, USA, 2009
Massachusetts General Hospital, Boston, USA, 2010, 2012, 2013
Radiology, U of Washington, Seattle, USA, 2011,
PICSL, U of Pennsylvania, Philadelphia, USA, 2011
Scientific Python Conference in India, Hyderabad, India, 2010
INCF Datasharing Workshop, Quebec, Canada, 2011
Python in Neuroscience Workshop, Paris, France, 2011

Leveraging scientific computation to bridge neuroimaging and clinical applications
Radiology, U of Pennsylvania, Philadelphia, USA, 2011
Haskins Laboratories, New Haven, Connecticut, USA 2012

Datasharing and reproducible research: Barriers and solutions
Janelia Farm Bioimage Informatics II Conference, Washington DC, USA, 2011
University de Montreal, Montreal, Canada, 2013

Using high-resolution fMRI to identify individual-specific speech motor regions
Surgical Brain-Mapping laboratory, Brigham and Womens Hospital, Boston, USA, 2010

Region of interest analysis of functional Magnetic Resonance Imaging data
New York State Psychiatric Institute, Columbia University, New York, USA, 2007
Singapore General Hospital, Singapore, Singapore, 2007

Exploring speech motor control through computational modeling and neuroimaging
Center for Life Sciences, National University of Singapore, Singapore, 2007

Research contracts and grants

Past

2008-2010 Dissemination of cross-platform software for artifact detection and region of interest analysis of fMRI data
NIH/NIBIB/R03 EB008673
Co-PI

2012 - 2014 Learned regulation of the limbic network via combined EEG and fMRI (PI: John Gabrieli)
NIH/NIMH/R21 MH092564
Investigator

Current

2011-2015 Using Real-Time Functional Brain Imaging and Computer Training To Enhance Recovery from Traumatic Brain Injury (TBI) (PI: John Gabrieli)
DOD/Clinical trial award PT100120
Investigator

2012 – 2015 A randomized controlled trial of intranasal oxytocin as an adjunct to behavioral therapy for autism spectrum disorder (PI: John Gabrieli)
DOD/Clinical Trial Award AR110329
Sub-contract PI

2012 – 2015 MURFI: An Optimized Platform for Realtime fMRI Neurofeedback
MIT McGovern Institute Neurotechnology Program
Co-PI

2012 – 2016 Blast Induced Traumatic Brain Injury
DOD/Institute for Soldier NanoTechnologies
Investigator

2014 – 2015 Brain basis for voice-based tracking of neurological disorders
MIT McGovern Institute Neurotechnology Program
MIT Lincoln Lab Funds
Co-PI