

Rajeev Raizada

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APPOINTMENTS	Dartmouth College <i>Research Assistant Professor, Neukom Institute for Computational Science</i>	Apr.2008 – present
EDUCATION AND TRAINING	Univ. of Washington, Seattle <i>Postdoctoral research. Advisor: Prof. Patricia Kuhl</i>	2003 – March 2008
	MGH-NMR Center, Charlestown <i>Postdoctoral research. Advisor: Prof. Russell Poldrack</i>	2000 – 2003
	Boston University <i>Ph.D. in Cognitive & Neural Systems. Advisor: Prof. Stephen Grossberg</i>	1996 – 2000
	Univ. of Birmingham, England <i>M.Sc. in Cognitive Science</i>	1994 – 1995
	Univ. of Oxford, England <i>B.A. in Mathematics & Philosophy</i>	1991 – 1994
RESEARCH INTERESTS	<ul style="list-style-type: none">• Pattern-based fMRI analysis: applying methods from machine learning to study distributed multivoxel activation patterns in the brain (also sometimes referred to as MVPA).• Beyond just “decoding,” seeking to uncover the structure of neural representations, and their relations to individual differences in behaviour.• To apply cognitive neuroscience to education. Specifically, measuring the structure of neural representations to reveal representational competence underlying behavioural performance.• To explore the role of environmental factors in learning, in particular socioeconomic status• Cognitive processes of interest: representational structure, learning, attention, neural processing of number and arithmetic, reading and dyslexia, speech.	
JOURNAL PUBLICATIONS	Under review <ul style="list-style-type: none">• Raizada, R.D.S., Tsao, F.M., Liu, H.M., Holloway, I.D., Ansari, D. and Kuhl, P.K. (2009) Linking brain-wide multivoxel activation patterns to behaviour: examples from language and math. <i>Under second round of review at NeuroImage</i>.• Raizada, R.D.S. and Kishiyama, M. (2009) Effects of socioeconomic status on brain development, and how Cognitive Neuroscience may contribute to leveling the playing field. <i>Invited review for Frontiers in Human Neuroscience</i>. Published <p>These papers can be downloaded from http://www.dartmouth.edu/~raj/publications.html</p> <ul style="list-style-type: none">• Raizada, R.D.S., Tsao, F.M., Liu, H.M. and Kuhl, P.K. (2009) Quantifying the adequacy of neural representations for a cross-language phonetic discrimination task: prediction of individual differences. <i>Cerebral Cortex</i>, Advance Online Publication. DOI: http://dx.doi.org/10.1093/cercor/bhp076• Raizada, R.D.S., Richards, T.L., Meltzoff, A. and Kuhl, P.K. (2008) Socioeconomic status predicts hemispheric specialisation of the left inferior frontal gyrus in young children. <i>Neuroimage</i>, 40(3), 1392-401.• Raizada, R.D.S. and Poldrack, R.A. (2007) Challenge-driven attention: interacting frontal and brainstem systems. <i>Frontiers in Human Neuroscience</i>, 1, 3.	

- **Raizada, R.D.S.** and Poldrack, R.A. (2007) Selective amplification of stimulus differences during categorical processing of speech. *Neuron*, 56(4), 726-40.
- **Raizada, R.D.S.** and Grossberg, S. (2003). Towards a theory of the laminar architecture of cerebral cortex: computational clues from the visual system. *Cerebral Cortex*, 13(1), 100-13.
- **Raizada, R.D.S.** and Grossberg, S. (2001). Context-sensitive binding by the laminar circuits of V1 and V2: A unified model of perceptual grouping, attention, and orientation contrast. *Visual Cognition*, 8 (3-5), 431-466.
- Grossberg, S. and **Raizada, R.D.S.** (2000). Contrast-sensitive perceptual grouping and object-based attention in the laminar circuits of primary visual cortex. *Vision Research*, 40, 1413-1432.
- **Raizada, R.D.S.** (2000). "A fruitful blend, or a trinket-box? A book review of The MIT Encyclopedia of the Cognitive Sciences." *Neural Networks*, 13(3), 397-398.

In preparation

- **Raizada, R.D.S.** and Kriegeskorte, N. (2009) Pattern-information fMRI: current challenges and future prospects. *Invited review for International Journal of Imaging Systems and Technology*.
- Lee, Y.S., Granger, R.H. and **Raizada, R.D.S.** (2009) Distributed and overlapping neural representations of the /ba/-/da/ phonemic continuum: a comparison of multivoxel pattern-based analysis and GLM.

GRANTS

Under review

- NICHD R21 proposal: "Neural representations in dyslexia and dyscalculia" (\$275K direct costs over two years)
- NSF Cognitive Neuroscience proposal: "Brain-behaviour links without the voodoo: using fMRI and machine-learning to explain peoples abilities and disabilities" (\$280K direct costs over two years)

Funded

- NSF 0121950 Cognitive Neuroscience Pilot Grant (2001-2002, \$50K indirect, co-P.I. with Russ Poldrack): "Enhancing human cortical plasticity: Visual psychophysics and fMRI".
- General Grant Award, International Dyslexia Association (2001-2002: \$15K direct, co-P.I. with Russ Poldrack): "Magnetic resonance imaging of cross-modal processing in dyslexia"

AWARDS

McDonnell-Pew Postdoctoral Fellowship in Cognitive Neuroscience	2000 – 2003
<i>One of twenty-five awarded nationwide. \$150K over three years</i>	
Presidential University Graduate Fellowship, Boston University	1996 – 2000
<i>One of twenty-five awarded each year across all BU graduate programs</i>	
Radcliffe Prize, University of Birmingham, England	1995
<i>One of two awarded each year in the Faculty of Science</i>	

INVITED TALKS

Colloquium, Dept. of Cognitive Science, Johns Hopkins University	Oct. 2009
Neuroscience colloquium, University of Western Ontario	May 2009
Mind, Brain and Education Colloquium, Univ. of Texas at Arlington	Apr. 2009
Helen Wills Neuroscience Institute, Univ. of California, Berkeley	March 2009
CELEST Colloquium Series, Boston University	Jan. 2009
Chaired and presented symposium at Cognitive Neuroscience Society Meeting: "Pattern-based fMRI analyses as a route to revealing neural representations"	June 2008
Computational and Systems Neuroscience (CoSyNe) workshop, Snowbird	March 2008
Department of Psychology, Temple University	Jan. 2007
Department of Cognitive Science, Case Western Reserve University	Jan. 2007
Brain & Math workshop, Vanderbilt University	Nov. 2006

	Institute of Cognitive Neuroscience, UCL	May 2006
	MRC Cognition and Brain Sciences Unit, Cambridge, UK	May 2006
	Stanford NSF-LIFE Center Workshop	2005
	BrainMap Colloquium Series, MGH-NMR Center	2002
	Brain, Behavior & Cognition Colloq. Series, Dept. of Psychology, Boston University	2000
	Invited workshop talk: Computation in the Cortical Column,	2000
	Neural Information Processing Systems Conference, Breckenridge, Colorado	
TEACHING AND MENTORING EXPERIENCE	Co-advising a Ph.D. student: Yune-Sang Lee, Psych. Dept., Dartmouth	2008 – present
	Guest lecturer, Boston Univ. Course CN 730: Models of Visual Perception	Jan. 2009
	Guest lecturer, Dartmouth Course Math 126: Topics in Visual Neuroscience	Oct. 2008
	Guest lecturer, Univ. of Washington Course SPHSC 425: “Language and fMRI”	2004 – 2006
	Guest lecturer, MIT Course HST583: “Matlab for fMRI: convolution, design matrices and image display”	2002
	Guest lecturer, Boston University Course CNS510: “Neurobiological evidence for Adaptive Resonance Theory mechanisms”	2000
TUTORIAL WEBPAGES	<ul style="list-style-type: none"> • Matlab for fMRI Used for teaching at the Univ. of Arizona and the Max Planck Inst. for Biological Cybernetics • Matlab for neural networks Used for teaching at the University of Stirling, UK and the Institute for Theoretical Biology in Berlin. 	
MEDIA COVERAGE	<ul style="list-style-type: none"> • News article in Science magazine describing my research work, and also the symposium that I chaired at the Cognitive Neuroscience Society Meeting (see p.3 of the article). Details of the symposium, “Pattern-based fMRI analyses as a route to revealing neural representations,” are at http://www.dartmouth.edu/~raj/CNS_symposium.html. • Press reports about my paper on neural amplification in Neuron, at Science Daily and Medical News Today. • Report about my paper on SES and Broca’s area in NeuroImage in the British Psychological Society Research Digest. 	
EXPERIENCE WITH CHILDREN AND PATIENT POPULATIONS	<ul style="list-style-type: none"> • Performed fMRI and psychophysical testing of dyslexic and normal children, aged 5-14 • Sept. 1995 - July 1996: Carried out voluntary work in a residential school for disabled children, Überlingen, Germany. Responsible for day-to-day care, activities and supervision of a group of three boys, ages 8 to 14. Two were autistic, one epileptic with “frontal-lobe”-esque behavioural difficulties. 	
PROFESSIONAL MEMBERSHIPS	<ul style="list-style-type: none"> • Society for Neuroscience • Cognitive Neuroscience Society 	
REFeree DUTIES	<ul style="list-style-type: none"> • National Science Foundation, Trends in Cognitive Sciences, NeuroImage, Developmental Science, Journal of Cognitive Neuroscience, Frontiers in Human Neuroscience, Neural Networks, Neuropsychologia, American Educational Research Association (AERA), IEEE Transactions on Robotics, IEEE Transactions on Autonomous Mental Development. 	
CONFERENCE PRESENTATIONS (PARTIAL LISTING)	<ul style="list-style-type: none"> • Raizada, R.D.S., Tsao, F.M., Liu, H.M., Holloway, I.D., Ansari, D. and Kuhl, P.K. (2009) Linking whole brain activation patterns to behaviour: examples from language and math. <i>Society for Neuroscience</i>, 673. 	

- Lee, Y.S., Granger, R.H. and Raizada, R.D.S. (2009) Distributed and Overlapping Neural Representation of The /ba/-/da/ Phonemic Continuum: MVPA (Multi-Variate Pattern based Analysis) vs. GLM. *Human Brain Mapping*.
- Raizada, R.D.S., Tsao, F.M., Liu, H.M. and Kuhl, P.K. (2008) Individual differences in speech perception are predicted by the distinctness of underlying neural representations. *Cognitive Neuroscience Society Annual Meeting*, 15, G118.
- Raizada, R.D.S., Tsao, F.M., Liu, H.M. and Kuhl, P.K. (2007) Perceptual discriminability of stimuli is predicted by separability of evoked neural patterns. *Society for Neuroscience*, 864.1
- Raizada, R.D.S., Schwartz, D., O'Mahony, T.K., Bransford, J. and Kuhl, P.K. (2006) Trial-and-error learning and the neural reward system. *Society for Neuroscience Satellite Symposium, "From Synapse to Schoolroom: The Science of Learning"*
- Raizada, R.D.S. and Kuhl, P.K. (2006) Socioeconomic status predicts hemispheric specialisation of Broca's area. *Society for Neuroscience*, 779.1
- Raizada, R.D.S. and Poldrack, R.A. (2004) Probing the structure of phonetic categories in the human brain. *Cognitive Neuroscience Society Annual Meeting*, 11, B133.
- Raizada, R.D.S. and Poldrack, R.A. (2003). Difficult, unpredictable trials coactivate noradrenergic and frontal attentional systems. *Society for Neuroscience*, 401.4
- Raizada, R.D.S. and Poldrack, R.A. (2002). Adaptation-fMRI of categorical processing of speech. *Society for Neuroscience*, 17.7
- Raizada, R.D.S. and Poldrack, R.A. (2001) Event-related fMRI of audio-visual simultaneity perception. *Society for Neuroscience Abstracts*, 31, 511.14
- Raizada, R.D.S. and Grossberg, S. (2000) Interactions between attention, collinear grouping and orientation contrast in the laminar circuits of V1 and V2. *Society for Neuroscience*, 30, 211.12
- Raizada, R.D.S. and Grossberg, S. (1999) Laminar substrates of attention, grouping and perceptual learning in V1 and V2. *Investigative Ophthalmology and Visual Science (ARVO)*, 40(4), S645
- Raizada, R.D.S. and Grossberg, S. (1999) Context-sensitive processing in the laminar circuits of V1 and V2: Interacting attention, collinear grouping and orientation-contrast effects. *Society for Neuroscience*, 29, 427.13
- Raizada, R.D.S. and Grossberg, S. (1998) What are the layers of cortex for? A neural model of attention, perceptual grouping and learning in V1 and V2. *Society for Neuroscience*, 28, 105.10

REFEREES

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