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EDUCATION

B.S.	Electrical Engineering	Massachusetts Institute of Technology	May 1988
M.S.	Electrical Engineering	Stanford University	June 1994
Ph.D.	Electrical Engineering	Stanford University	September 1999

PROFESSIONAL EXPERIENCE

1988-1993	Member of the Technical Staff, Advanced Development and Medical Ultrasound Product Development Groups, Acuson Inc., Mountain View, CA
1993-1999	Research and Teaching Assistant, Space Telecommunications and Radioscience Laboratory, Department of Electrical Engineering, Stanford University
1997-1998	Graduate Student Advisor, Department of Electrical Engineering, Stanford University
1999-2001	Postgraduate Researcher, Magnetic Resonance Physics Group Department of Radiology, University of California, San Diego
2001-2007	Assistant Professor of Radiology, University of California, San Diego
2001-2007	Associate Director for Imaging Software UCSD Center for Functional Magnetic Resonance Imaging
2007-Present	Associate Professor of Radiology, University of California, San Diego
2007-Present	Director, UCSD Center for Functional Magnetic Resonance Imaging

AWARDS AND FELLOWSHIPS

1984	White House Presidential Scholar and National Merit Scholar
1988	Letter of Commendation for Performance in Electromagnetics, M.I.T.
1993	Fannie and John Hertz Foundation Research Fellowship Grant
1997	Gerald J. Lieberman Fellowship, Stanford University
2006	National Center of Leadership in Academic Medicine, UC San Diego

PROFESSIONAL AND SCIENTIFIC SOCIETIES

2000-Present	International Society of Magnetic Resonance in Medicine
1993-Present	Institute of Electrical and Electronics Engineers (IEEE): Signal Processing Society; Engineering in Medicine and Biology Society.
1995-1997	American Geophysical Union

PUBLICATIONS

Refereed Articles:

1. Liu, T.T., Fraser-Smith, A.C. Detection of transients in $1/f$ noise with the undecimated discrete wavelet transform. *IEEE Trans. Signal Processing*, 48:1458-1462, 2000.
2. Wong, E.C., Luh, W.-M., Liu, T.T. Turbo ASL: arterial spin labeling with higher SNR and temporal resolution. *Magnetic Resonance in Medicine*, 44:511-515, 2000.
3. Wong, E.C., Liu, T.T., Luh, W.-M., Frank, L.R., Buxton, R.B. A T_1 and T_2 selective method for improved SNR in CSF attenuated imaging: T_2 -FLAIR. *Magnetic Resonance in Medicine*, 45:529-532, 2001.
4. Miller, K.L., Luh, W.-M., Liu, T.T., Martinez, A., Obata, T., Wong, E.C., Frank, L.R., Buxton, R.B. Nonlinear temporal dynamics of the cerebral blood flow response. *Human Brain Mapping*, 13:1-12, 2001.
5. Liu, T.T., Frank, L.R., Wong, E.C., Buxton, R.B. Detection power, estimation efficiency, and predictability in event-related fMRI. *NeuroImage*, 13:759-773, 2001.
6. Liu, T.T., Wong, E.C., Frank, L.R., Buxton, R.B. Analysis and Design of Perfusion Based Event-Related fMRI Experiments. *NeuroImage*, 16:262-282, 2002.
7. Frank, L.R., Wong, E.C., Liu, T.T., Buxton, R.B. Increased Diffusion Sensitivity with Hyper-Echos. *Magnetic Resonance in Medicine*, 49: 1098-1105, 2003.
8. Uludag, K., Dubowitz, D.J., Yoder, E.J., Restom K., Liu, T.T., and Buxton, R.B. Coupling of cerebral blood flow and oxygen consumption during physiological activation and deactivation measured with fMRI. *NeuroImage*, 23:148-55, 2004.
9. Obata, T., Liu, T.T., Miller, K.L., Luh, W.M., Wong, E.C., Frank, L.R., Buxton, R.B. Discrepancies between BOLD and flow dynamics in primary and supplementary motor areas: application of the balloon model to the interpretation of BOLD transients. *NeuroImage*, 21:144-153, 2004.
10. Liu, T.T., Frank, L.R. Efficiency, Power, and Entropy in Event-Related fMRI with Multiple Trial Types Part I: Theory. *NeuroImage*, 21:387-400, 2004.
11. Liu, T.T. Efficiency, Power, and Entropy in Event-Related fMRI with Multiple Trial Types Part II: Design of Experiments. *NeuroImage*, 21: 401-413, 2004.
12. Paulus, M.P., Feinstein, J.S, Tapert, S.F., Liu, T.T. Trend detection via temporal difference model predicts inferiorprefrontal cortex activation during acquisition of advantageous action. *NeuroImage*, 21:733-743, 2004.
13. Buxton R.B., Uludag K, Dubowitz D.J., Liu T.T. Modeling the Hemodynamic Response to Brain Activation. *NeuroImage*, 23:S220-33, 2004.

14. Liu, T.T, Behzadi, Y, Restom K, Uludag K, Lu K, Buracas G.T., Dubowitz D.J., Buxton R.B. Caffeine Alters the Temporal Dynamics of the Visual BOLD Response. *NeuroImage*, 23:1402-13, 2004.
15. Liu, T.T, and Wong, E.C. A signal processing model for arterial spin labeling functional MRI. *NeuroImage*, 24:207-15, 2005.
16. Behzadi, Y. and Liu, T.T. An Arteriolar Compliance Model of the Cerebral Blood Flow Response to Neural Stimulus. *NeuroImage*, 25:1100-1111, 2005.
17. Wong, E.C., Cronin M, Wu W.C., Inglis B.A., Frank L.R., Liu T.T. Velocity Selective Arterial Spin Labeling. *Magnetic Resonance in Medicine*, 55:1334-41, 2006.
18. Bolar, D.S., Levin, D.L. Hopkins, S.R., Frank L.R., Liu, T.T., Wong, E.C., Buxton R.B., Quantification of Regional Pulmonary Blood Flow Using ASL-FAIRER. *Magnetic Resonance in Medicine*, 55:1308-17, 2006.
19. Restom K., Behzadi, Y., and Liu, T.T. Physiological Noise Reduction for Arterial Spin Labeling fMRI. *NeuroImage*, 31:1104-1115, 2006.
20. Behzadi, Y. and Liu, T.T. Caffeine Reduces the Initial Dip in the Visual BOLD Response at 3T. *NeuroImage*, 32:9-15, 2006.
21. Woolrich, M.W., Chiarelli, P., Gallichan, D., Perthen, J.E., Liu, TT. Bayesian Inference of Hemodynamic Changes in Functional ASL Data, *Magnetic Resonance in Medicine*, 58:891-906, 2006.
22. Liu, T.T., and Brown, G.G. Measurement of Cerebral Perfusion with Arterial Spin Labeling: Part 1. Methods, *Journal of the International Neuropsychological Society*, 13:526-38, 2007.
23. Brown, G.G., Clark C., Liu T.T. Measurement of Cerebral Perfusion with Arterial Spin Labeling: Part 2. Clinical Applications, *Journal of the International Neuropsychological Society*, 13:517-25, 2007.
24. Behzadi, Y., Restom, K., Liau J., Liu, T.T. A Component Based Noise Correction Method (CompCor) for BOLD and Perfusion Based fMRI, *NeuroImage*, 37:90-101, 2007.
25. Brown, G.G., Perthen, J.E., Liu, T.T., Buxton, R.B. A Primer on Functional Magnetic Resonance Imaging, *Neuropsychology Review*, 17:107-25, 2007.
26. Restom, K., Bangen, K.J., Bondi, M.W., Perthen, J.E., Liu, T.T., Cerebral Blood Flow and BOLD Responses to a Memory Encoding Task: A Comparison Between Healthy Young and Elderly Adults, *NeuroImage*, 37:430-9, 2007.
27. Lu, K., Liu, T.T., Bydder, M. Optimal Phase Difference Reconstruction: Comparison of Two Methods, *Magnetic Resonance Imaging*, (In Press).
28. Lu, K., Perthen, J.E., Duncan, R.O., Zangwill, L.M., Liu, T.T., Noninvasive Measurement of the Cerebral Blood Flow Response in Human Lateral Geniculate Nucleus with Arterial Spin Labeling fMRI, *Human Brain Mapping* (In Press).

Peer Reviewed Conference Papers:

1. Liu, T.T., Fraser-Smith, A.C. Identification and removal of man-made transients from geomagnetic array time series: A wavelet transform based approach. *32nd Asilomar Conference on Signals, Systems, and Computers*, pp. 1363-1367, 1998.
2. Liu, T.T., Fraser-Smith, A.C. An undecimated wavelet transform based detector for transients in 1/f noise. *1999 IEEE International Conference on Acoustics, Speech, and Signal Processing, Phoenix*, pp. 1185-1188, 1999.

Conference Abstracts:

1. Fraser-Smith, A.C. and Liu T.T. "ULF magnetic field observations preceding the M 5.0 earthquake of 20 December 1994 at Parkfield, California," *EOS*; 76, 360 (1995).
2. Liu, T.T. and Fraser-Smith A.C. "Techniques for monitoring ULF geomagnetic fields in the presence of interference due to a mass transit system (BART)," *EOS*; 77, 457 (1996).
3. Liu, T.T., Miller, K.L., Wong, E.C., Frank, L.R., Buxton, R.B. Identifying meaningful components in independent component analysis. *Sixth Annual Conference on Functional Mapping of the Human Brain, San Antonio*, p. 652, 2000.
4. Liu, T.T., Luh, W.-M., Wong, E.C., Frank, L.R., Buxton, R.B. Dynamic imaging of blood volume during functional activation. *Sixth Annual Conference on Functional Mapping of the Human Brain, San Antonio*, p. 449, 2000.
5. Wong, E.C., Luh, W.-M., Liu, T.T. Turbo ASL: Arterial spin labeling with higher SNR and temporal resolution. *Sixth Annual Conference on Functional Mapping of the Human Brain, San Antonio*, p. 452, 2000.
6. Buxton, R.B., Liu, T.T., Martinez, A., Frank, L.R., Luh, W.-M., Wong, E.C. Sorting out event-related paradigms in fMRI: The distinction between detecting an activation and estimating the hemodynamic response. *Sixth Annual Conference on Functional Mapping of the Human Brain, San Antonio*, p. 457, 2000.
7. Luh, W.-M., Wong, E.C., Liu, T.T., Frank, L.R., Buxton, R.B. Is arterial spin labeling better than BOLD for functional MRI? *Sixth Annual Conference on Functional Mapping of the Human Brain, San Antonio*, p. 605, 2000.
8. Obata, T., Liu, T.T., Miller, K.L., Luh, W.-M., Wong, E.C., Frank, L.R., Buxton, R.B. BOLD overshoots at task-switching points in supplementary motor area. *Eighth Meeting, International Society for Magnetic Resonance in Medicine*, p. 989, 2000.
9. Miller, K.L., Luh, W.-M., Liu, T.T., Martinez, A., Obata, T., Wong, E.C., Frank, L.R., Buxton, R.B. Characterizing the dynamic perfusion response to stimuli of short duration. *Eighth Meeting, International Society for Magnetic Resonance in Medicine*, p. 500, 2000.
10. Liu, T.T., Luh, W.-M., Wong, E.C., Bandettini, P. A., Obata, T., Frank, L.R., Buxton, R.B. On the nonlinear relation between BOLD and CBF. *Eighth Meeting, International Society for Magnetic Resonance in Medicine*, p. 948, 2000.
11. Liu, T.T., Miller, K.L., Wong, E.C., Frank, L.R., Buxton, R.B. Using image entropy to select meaningful spatial maps in independent component analysis. *Eighth Meeting, International Society for Magnetic Resonance in Medicine*, p. 847, 2000.

12. Liu, T.T., Luh, W.-M., Wong, E.C., Frank, L.R., Buxton, R.B. A method for dynamic measurement of blood volume with compensation for T_2 changes. *Eighth Meeting, International Society for Magnetic Resonance in Medicine*, p. 52, 2000.
13. Wong, E.C., Liu, T.T., Frank, L.R., Buxton, R.B. Close Tag, Short TR Continuous ASL for Functional Brain Mapping: High Temporal Resolution ASL with a BOLD Sized Signal at 1.5T. *Ninth Meeting, International Society for Magnetic Resonance in Medicine*, p. 1162, 2001.
14. Buxton, R.B., Liu, T.T., Wong, E.C. Nonlinearity of the Hemodynamic Response: Modeling the Neural and BOLD Contributions. *Ninth Meeting, International Society for Magnetic Resonance in Medicine*, p. 1164, 2001.
15. Liu, T.T., Stark, C.E.L., Wong, E.C., Buxton, R.B. Quantitative Imaging of Hippocampal Perfusion During a Memory Encoding Task. *Ninth Meeting, International Society for Magnetic Resonance in Medicine*, p. 1285, 2001.
16. Liu, T.T., Wong, E.C., Sidaros, K., Frank, L.R., Buxton, R.B. Event-Related Perfusion fMRI with Randomized Designs. *Ninth Meeting, International Society for Magnetic Resonance in Medicine*, p. 1212, 2001.
17. Liu, T.T., Frank, L.R., Wong, E.C., Buxton, R.B. Are Semi-Random Designs Better than Random Designs for Event-Related fMRI? *Ninth Meeting, International Society for Magnetic Resonance in Medicine*, p. 1707, 2001.
18. Moses, P., Frank, L.R., Liu, T.T., Wong, E.C., Stiles, Buxton, R.B., Stiles, J. High Angular Resolution Diffusion Imaging and Arterial Spin Labeling: Assessment of White Matter Integrity and Cerebral Blood Flow Subsequent to Prenatal Brain Injury. *Seventh Annual Conference on Functional Mapping of the Human Brain, Brighton*, p. 32, 2001.
19. Paulus, M.P., Zauscher, B., Liu, T.T. Event-related fMRI to evaluate different components of decision-making. *31st Annual Meeting of the Society for Neuroscience*, p. 456.6, 2001.
20. Bolar, D.S., Levin, D.L., Hopkins, S.R., Mai, V.M., Chen, Q., Frank, L.R., Liu, T.T., Wong, E.C., Buxton, R.B. "Investigation of Pulmonary Disease using ASL-FAIRER Perfusion MRI," in "Tenth Meeting, International Society for Magnetic Resonance in Medicine, Honolulu, 2002," p. 1973.
21. Bolar, D.S., Levin, D.L., Hopkins, S.R., Frank, L.R., Liu, T.T., Wong, E.C., Buxton, R.B. "A Single-Subtraction Method for Quantitative ASL Pulmonary Perfusion Imaging," in "Tenth Meeting, International Society for Magnetic Resonance in Medicine, Honolulu, 2002," p. 1975.
22. Sidaros, K., Liu, T.T., Wong, E.C., Buxton, R.B. "Improved SNR in Perfusion fMRI by Offset Correction," in "Tenth Meeting, International Society for Magnetic Resonance in Medicine, Honolulu, 2002," p. 624.
23. Sidaros, K., Liu, T.T., Wong, E.C., Buxton, R.B. "Offset Correction in PICORE QUIPSS II Imaging," in "Tenth Meeting, International Society for Magnetic Resonance in Medicine, Honolulu, 2002," p. 1063.
24. Wong, E.C., Liu, T.T., Sidaros, K., Frank, L.R., Buxton, R.B. "Velocity Selective Arterial Spin Labeling," in "Tenth Meeting, International Society for Magnetic Resonance in Medicine, Honolulu, 2002," p. 621.
25. Frank, L.R., Wong, E.C., Liu, T.T., Buxton, R.B. "Improved Diffusion Sensitivity with Hyperechoes," in "Tenth Meeting, International Society for Magnetic Resonance in Medicine, Honolulu, 2002," p. 434.

26. Yoder, E.J., Liu, T.T., Ghobrial, E., Buxton, R.B. Nonlinearity of BOLD Hemodynamic Response as Revealed by Periodic and Randomized Single Trial Experimental Designs, in *"Tenth Meeting, International Society for Magnetic Resonance in Medicine, Honolulu, 2002,"* p. 1384.
27. Liu, T.T., Wong, E.C., Frank, L.R., Buxton, R.B. "Processing Strategies for Event-Related Perfusion fMRI," in *"Tenth Meeting, International Society for Magnetic Resonance in Medicine, Honolulu, 2002,"* p. 746.
28. Liu, T.T., Buxton, R.B., Ghobrial, E. "Unbiased Volterra Kernel Analysis of Event-Related fMRI Data," in *"Tenth Meeting, International Society for Magnetic Resonance in Medicine, Honolulu, 2002,"* p. 752.
29. Sidaros, K., Andersen, I.K., Liu, T.T., Wong, E.C., Buxton, R.B. "The Effects of the Order of Saturation and Inversion in Pulsed Arterial Spin Labeling," in *"Eleventh Meeting, International Society for Magnetic Resonance in Medicine, Toronto, 2003,"* p. 2214.
30. Sidaros, K., Andersen, I.K., Liu, T.T., Wong, E.C., Buxton, R.B. "Presaturation Efficiency in Pulsed Arterial Spin Labeling in the Presence of B_1 Inhomogeneities," in *"Eleventh Meeting, International Society for Magnetic Resonance in Medicine, Toronto, 2003,"* p. 2217.
31. Liu, T.T., Frank, L.R. "Estimation Efficiency and Detection Power in Event-Related fMRI Experiments with Multiple Trial Types," in *"Eleventh Meeting, International Society for Magnetic Resonance in Medicine, Toronto, 2003,"* p. 1810.
32. Behzadi, Y., Restom, K., Liu, T.T. Volterra Kernel Analysis of Event-Related fMRI Data Using Laguerre Basis Functions, in *"Eleventh Meeting, International Society for Magnetic Resonance in Medicine, Toronto, 2003,"* p. 491.
33. Moses, P., Mazaheri, Y., Liu, T.T., Sepeta, L.N., Wong, E.C., Buxton, R.B., Stiles, J. "Comparison of arterial transit delays and bolus widths in children and adults as measured with arterial spin labeling" in *"12th Meeting, International Society for Magnetic Resonance in Medicine, Kyoto, 2004,"* p. 1394
34. Mazaheri, Y., Liu, T.T., Wong, E.C., Moses P., Buxton, R.B. "Analysis of flow dispersion as a source of systematic error in quantitative arterial spin labeling" in *"12th Meeting, International Society for Magnetic Resonance in Medicine, Kyoto, 2004,"* p. 1375.
35. Mazaheri, Y., Wong, E.C., Liu, T.T., "Dual-resolution Multi-shot Partial k-space EPI acquisition" in *"12th Meeting, International Society for Magnetic Resonance in Medicine, Kyoto, 2004,"* p. 1001.
36. Restom, K., Behzadi, Y., Liu, T.T. "Image-based physiological noise correction for perfusion-based fMRI" in *"12th Meeting, International Society for Magnetic Resonance in Medicine, Kyoto, 2004,"* p. 2525.
37. Behzadi, Y., Restom, K., Liu, T.T. "Background 0.1 Hz fluctuations are not in phase with post-stimulus oscillations in BOLD fMRI" in *"12th Meeting, International Society for Magnetic Resonance in Medicine, Kyoto, 2004,"* p. 1073.
38. Behzadi, Y., Restom, K., Liu, T.T. "Modeling the effect of baseline arteriolar compliance on BOLD dynamics" in *"12th Meeting, International Society for Magnetic Resonance in Medicine, Kyoto, 2004,"* p. 279.
39. Mazaheri, Y., Liu, T.T., Wong, E.C., Scadeng, M., Buxton, R.B. "Analysis of Flow Dispersion as a Meaningful Measurable Parameter in Arterial Spin Labeling" in *"10th Annual Meeting, Organization for Human Brain Mapping, Budapest, 2004,"* p. WE 238.
40. Uludag, K., Liu, T.T., Buxton, R.B. "Estimation of CBF/CMRO₂ coupling from fMRI data without hypercapnia" in *"10th Annual Meeting, Organization for Human Brain Mapping, Budapest, 2004,"* p. TU 157.

41. Moses, P., Mazaheri, Y., Liu, T.T., Sepeta, L.N., Wong, E.C., Buxton, R.B., Stiles, J. "Developmental Differences in Arterial Transit Delays Between School-Age Children and Adults Demonstrated with Arterial Spin Labeling in "10th Annual Meeting, Organization for Human Brain Mapping, Budapest, 2004," p. MO 325.
42. Liu, T.T., Uludag, K., Behzadi, Y., Restom, K. "Caffeine alters the dynamics of the visual BOLD response" in "10th Annual Meeting, Organization for Human Brain Mapping, Budapest, 2004," p. TU 148.
43. Dyer, E.A., Theilmann, R.J., Perthen, J.E., Behzadi, Y., Restom K., Liu, T.T. Dubowitz, D.J. "Cerebral hemodynamics and fluid shifts during normobaric hypoxia." In "13th Meeting, International Society for Magnetic Resonance in Medicine, Miami, 2005," p.1098.
44. Lu, K., Wu, W.C., Wong, E.C. Liu, T.T. "Functional perfusion imaging of human retina with arterial spin labeling MRI." in "13th Meeting, International Society for Magnetic Resonance in Medicine, Miami, 2005," p.1476.
45. Behzadi Y., Liu, T.T. "The viscoelastic properties of the venous compartment are dependent on baseline CBF." In "13th Meeting, International Society for Magnetic Resonance in Medicine, Miami, 2005," p.1490.
46. Moses, P., Perthen, J.E., Mier, C. Liu, T.T., "Arterial Spin Labeling in Children: BOLD and CBF Hemodynamic Response to Visual Stimulation." In "14th Meeting, International Society for Magnetic Resonance in Medicine, Seattle, 2006," p. 3414.
47. Woolrich, M.W., Chiarelli, P., Gallichan, D., Perthen, J.E., Liu, T.T., "Inferring Blood Volume, Blood Flow and Blood Oxygenation Changes from Functional ASL Data." In "14th Meeting, International Society for Magnetic Resonance in Medicine, Seattle, 2006," p. 538.
48. Lu, K., Perthen, J.E., Duncan, R.O., Zangwill, L.M., Liu, T.T., "Perfusion-based fMRI in Human LGN and Visual Cortex Reveals a Regional Difference in the Coupling Between Cerebral Blood Flow and BOLD." In "14th Meeting, International Society for Magnetic Resonance in Medicine, Seattle, 2006," p. 3252
49. Lu, K., Perthen, J.E., Duncan, R.O., Zangwill, L.M., Liu, T.T., "Detecting LGN Activation in Human Using Quantitative Perfusion-based fMRI: A Feasibility Study." In "14th Meeting, International Society for Magnetic Resonance in Medicine, Seattle, 2006," p. 3255.
50. Perthen, J.E., Bydder, M., Restom, K., Liu, T.T., "Noise characteristics of arterial spin labeling fMRI using spiral SENSE at 3T." In "14th Meeting, International Society for Magnetic Resonance in Medicine, Seattle, 2006," p. 290.
51. Perthen, J.E., Restom, K., Behzadi, Y., Lu, K., Liu, T.T., "Accurate perfusion quantification using pulsed arterial spin labeling: Choosing appropriate sequence parameters." In "14th Meeting, International Society for Magnetic Resonance in Medicine, Seattle, 2006," p. 3428.
52. Liau, J., Behzadi, Y., Liu, T.T., "Caffeine Reduces the Initial Dip in the Visual BOLD Response." In "14th Meeting, International Society for Magnetic Resonance in Medicine, Seattle, 2006," p. 2781.
53. Roller, E., Restom, K., Liu, T.T., "Modeling of BOLD Components in the Statistical Analysis of Perfusion-Based fMRI Experiments." In "14th Meeting, International Society for Magnetic Resonance in Medicine, Seattle, 2006," p. 540.
54. Behzadi, Y., Restom, K., Perthen, J.E. Liu, T.T., "Reducing inter-voxel variability of the BOLD response with measurement of resting blood flow." In "14th Meeting, International Society for Magnetic Resonance in Medicine, Seattle, 2006," p. 373.

55. Behzadi, Y., Liu, T.T., “Modeling the Temporal Dynamics of the Positive and Negative BOLD Response.” In “*14th Meeting, International Society for Magnetic Resonance in Medicine, Seattle, 2006,*” p. 2779.
56. Behzadi, Y., Restom, K., Perthen, J.E. Liu, T.T., “Effect of background suppression and physiological noise removal on the sensitivity of arterial spin labeling fMRI.” In “*14th Meeting, International Society for Magnetic Resonance in Medicine, Seattle, 2006,*” p. 3295.
57. Behzadi, Y., Restom, K., Perthen, J.E. Liu, T.T., “Component Based Noise Correction for Perfusion fMRI.” In “*14th Meeting, International Society for Magnetic Resonance in Medicine, Seattle, 2006,*” p. 235.
58. Liu, T.T., Behzadi, Y., Restom K., Smith G., Townsend, J.E., “An Index of Low Frequency (0.1 Hz) Spectral Power Predicts Changes in the Amplitude and Shape of the BOLD Response.” In “*14th Meeting, International Society for Magnetic Resonance in Medicine, Seattle, 2006,*” p. 535.
59. Liu, T.T., Behzadi, Y., Restom K., Smith G., Townsend, J.E., “An Index of Low Frequency (0.1 Hz) Spectral Power Predicts Changes in the Amplitude and Shape of the BOLD Response.” In “*14th Meeting, International Society for Magnetic Resonance in Medicine, Seattle, 2006,*” p. 535.
60. Restom, K., Behzadi, Y., Perthen, J.E., Liu, T.T., “A Filtered Subtraction Approach for the Reduction of Physiological Noise in Perfusion Based fMRI.” In “*14th Meeting, International Society for Magnetic Resonance in Medicine, Seattle, 2006,*” p. 3301.
61. Restom, K., Bangen, K.J., Perthen, J.E., Bondi M.W., Liu, T.T., “Quantitative Hippocampal Perfusion Response to a Memory Encoding Task: A Comparison Between Healthy Young and Elderly Adults,” In “*14th Meeting, International Society for Magnetic Resonance in Medicine, Seattle, 2006,*” p. 377.
62. Moses, P., Perthen, J.E., Mier, C. Liu, T.T., “Comparison of Cerebral Blood Flow and BOLD Response Dynamics Between Children and Adults Using ASL During Visual Stimulation,” in “*12th Annual Meeting, Organization for Human Brain Mapping, Florence, 2006,*” p. 668.
63. Bangen, K.J., Restom, K., Liu, T.T., Jak, A.J., Han, S.D., Fleisher, A.S., Salmon, D.P., Thal, L.J., Bondi, M.W., “Hippocampal perfusion during picture encoding: A comparison between younger and older adults,” in “*12th Annual Meeting, Organization for Human Brain Mapping, Florence, 2006,*” p. 263.
64. Restom, K., Bangen, K.J., Perthen, J.E., Bondi, M.W., Liu, T.T., “Physiological Noise Correction is Critical for Quantitative Perfusion fMRI of the Hippocampus in Elderly Adults,” in “*12th Annual Meeting, Organization for Human Brain Mapping, Florence, 2006,*” p. 428.
65. Woolrich, M.W., Chiarelli, P., Gallichan, D., Perthen, J.E., Liu, T.T., “Inferring Blood Volume, Blood Flow and Blood Oxygenation Changes from Functional ASL Data,” in “*12th Annual Meeting, Organization for Human Brain Mapping, Florence, 2006,*” p. 661.

Theses and Technical Reports:

1. Liu, T.T. Swelling and permeability of poly-methacrylic acid polymer membranes. *B.S. Dissertation, Massachusetts Institute of Technology, 72 pages, 1988.*
2. Liu, T.T. Dithering requirements for analog-to-digital conversion in an ultrasound receiver system. *Internal Technical Report, Acuson Inc., 18 pages, 1991.*

3. Liu, T.T., Fraser-Smith, A.C. Hayward Fault earthquake prediction project: ULF magnetic field measurements. *Technical Report D180-1, Space, Telecommunications, and Radioscience Laboratory, Stanford University*, 57 pages, 1996.
4. Liu, T.T. Ultra-low frequency magnetic fields in the San Francisco Bay Area: Measurements, models, and signal processing. *Ph.D. Dissertation, Stanford University*, 190 pages, 1999.

Patents:

1. Cole, C.R., Gee, A., Liu, T.T. Method and apparatus for transmit beamformer system. *Patent #5,675,554*, Oct. 7, 1997, USA.

RESEARCH

Active Grants:

1. Principal Investigator, Vascular Dynamics in Functional MRI, NIH R01 NS051661, 8/15/2006 – 3/31/2009.
2. Co-Investigator, (L. Thal, PI) Alzheimer's Disease Research Center, NIH P50 AG005131 04/01/2004-03/31/2009.
3. Co-Investigator, (M. Stein, PI). Neural Substrates of Decision-Making in Anxiety, NIH R01 MH65413, 04/01/2003 - 03/31/2007.
4. Co-Investigator, (S. Potkin, PI). Function Biomedical Informatics Research Network, NIH U24 RR021992, 02/08/2006-11/30/2010.
5. Co-Investigator, (I. Grant, PI), NeuroAIDS: Effects of Methamphetamine and HCV - 3: Functional MRI, NIH P01 DA12065, 04/01/2005 - 03/31/2010.
6. Co-Investigator, (R. Buxton, PI) Physiological Basis of Functional MRI, NIH R01 NS36722, 07/01/2003 – 06/30/2008.
7. Co-Investigator, (M. Paulus, PI) Neurobiology of Transition to Stimulant Dependence, NIH R01 DA016663, 04/01/2004-03/31/2009.
8. Co-Investigator, (J. Stiles, PI) Developmental Changes in Visuospatial Processes: RT-fMRI, NIH R01 HD041481, 04/01/2003-03/31/2008.
9. Co-Investigator, (L. Frank, PI) High Angular Resolution Diffusion Imaging with MRI, NIH R01 MH64729, 12/01/2003-11/30/2008.
10. Co-Investigator, (G. Buracas, PI), Neuromodulation of BOLD fMRI Signal during Cognitive Tasks, NIH R21 MH70625, 2/01/2006 - 01/31/2008.
11. Co-Investigator, (D. Swinney, PI), Neural Correlates of Language Recovery in Aphasia: fMRI Investigations, NIH R01 DC007213, 07/01/2005-6/30/2010.
12. Co-Investigator, (M. Stein, PI), PharmacofMRI to Identify New Anxiolytics: A Human Bioassay, NIH R01 MH75792, 07/01/2006-6/30/2009.
13. Co-Investigator, (M. Schukit, PI), Level of Response to Alcohol and Brain Functioning, NIH R01 AA0015760, 08/15/06-06/30/2011.

Completed Grants

1. Principal Investigator, Nonlinear Analysis and Design of Experiments for Functional MRI, Whitaker Foundation Biomedical Engineering Research Grant, 9/1/2002 – 8/31/2006.
2. Principal Investigator, Alteration of Hippocampal Perfusion as an Early Indicator of Alzheimer's Disease, Dana Foundation Clinical Hypotheses Program In Imaging, 4/1/2002 – 3/31/2006.
3. Co-Investigator, (E.C. Wong, PI), Arterial Spin Labeling for fMRI, NIH R01 NS41925, 09/25/2001 - 08/31/2005.
4. Co-Investigator, (P.J. Townsend, PI), Neuroanatomic Change and Attention Dynamics in Aging, NIH R01 AG18030, 09/01/2001 - 08/31/2006.
5. Co-Investigator, (R.B. Buxton, PI), Hemodynamic Response to Brain Activation, NIH R01 NS42069, 9/30/2002 - 8/30/2006.

TEACHING

Formal Courses

Winter 2002 Bioengineering 207, Introduction to Magnetic Resonance Imaging

Fall 2003 to 2006 Bioengineering 280A Principles of Biomedical Imaging

Supervision and Mentorship of Students

Postdoctoral Scholars:

Kun Lu, Ph.D., Postdoctoral Scholar at UCSD from 2003-2005. Current Position: Assistant Project Scientist at the UCSD Center for Functional MRI.

Joanna Perthen, Ph.D., Postdoctoral Scholar at UCSD from 2004-2006. Current Position: Assistant Project Scientist at the UCSD Center for Functional MRI.

Graduate Students:

Yashar Behzadi, Ph.D. Thesis: "Variability in Functional Magnetic Resonance Imaging: Influence of the Baseline Vascular State and Physiological Fluctuations," Department of Bioengineering, University of California, San Diego; 2002-2006. Current Position: Senior Scientist, Proteus Biomedical, Redwood City, CA.

Joy Liao, M.D./ Ph.D. Candidate, Department of Bioengineering, University of California, San Diego; 2005-Present.

Anna Leigh Rack-Gomer, Ph.D. Candidate, Department of Bioengineering, University of California, San Diego; 2007-Present.

Khaled S. Restom, M.S. Thesis: "Image based physiological noise correction for perfusion-based functional MRI." Department of Bioengineering, University of California, San Diego, 2005.

Karam S. Sidaros, Ph.D. Technical University of Denmark, 2002, "Slice Profile Effects in MR Perfusion Imaging using Pulsed Arterial Spin Labeling." Served as co-advisor during Dr. Sidaros's visit to UCSD in 2000-2001.

Undergraduate Students:

Jeannette Guziel, B.S., Department of Psychology, 2002, "Visualization Software for MR Angiography," Final report for UCSD Faculty Mentor Program.

Ph.D. Dissertation Committees

August Tuan, Department of Neurosciences, UCSD.

Ashok Swaminathan, Department of Electrical and Computer Engineering, UCSD.

Katherine Bangen, SDSU-UCSD Joint Doctoral Program in Psychology.

Seminars, Invited Lectures

1. "ULF Magnetic Field Measurements Along the Hayward Fault." Invited speaker, STARLAB Seminar, Department of Electrical Engineering, Stanford University. November 13, 1996.
2. "ULF Magnetic Fields in the San Francisco Bay Area." Invited speaker, Applied Electromagnetics Laboratory, SRI International, Menlo Park, CA. April 26, 1999.
3. "Designing Experiments for Event-Related fMRI." Invited Speaker, fMRI Users Group Meeting, University of California, San Diego. March 2, 2001.
4. "Detection Power, Estimation Efficiency, and Predictability in the Design of Experiments for fMRI." Invited Speaker, Department of Psychiatry, University of California, San Diego. April 16, 2001.
5. "The Design of fMRI Experiments with Multiple Trial Types." Invited Speaker, Department of Psychiatry, University of California, San Diego. December 16, 2002.
6. "Perfusion Functional MRI", Invited Educational Talk for the 11th Meeting of the International Society for Magnetic Resonance in Medicine, Toronto, Canada, July 7, 2003.
7. "Perfusion Functional MRI", Invited Educational Talk for the 12th Meeting of the International Society for Magnetic Resonance in Medicine, Kyoto, Japan, May 18, 2004.
8. "The Geometry of fMRI Statistics", Invited Talk for UCLA Institute of Pure and Applied Mathematics, Graduate Summer School in Mathematics in Brain Imaging, July 22, 2004.
9. "Probing the Dynamics of Neurovascular Coupling with Functional MRI," Grand Rounds, Department of Radiology, University of California, San Diego, April 26, 2005.
10. "The Hemodynamic Response in Functional MRI," Invited Lecture for Methods in Genetics and Imaging Workshop, Department of Neuroscience, University of California, San Diego, August 2, 2005.
11. "Perfusion Functional MRI", Invited talk for the ISMRM Educational Program on Multi-Modal fMRI: Physiology, Acquisition, and Analysis, 14th ISMRM Scientific Meeting, May 7, 2006, Seattle WA
12. "Vascular Dynamics in Functional MRI", Invited Speaker, Center for Mind and Brain and Department of Biomedical Engineering, University of California, Davis, February 21, 2007.
13. "Vascular Dynamics in Functional MRI", Invited Speaker, Imaging Research Center and Department of Biomedical Engineering, University of Texas at Austin, February 22, 2007.
14. "Vascular Dynamics in Functional MRI", Invited Speaker, Brain Imaging and Analysis Center, Duke University, February 28, 2007.
15. "Perfusion Functional MRI", Invited talk for the ISMRM Educational Program on fMRI: Basics to Cutting Edge, 15th ISMRM Scientific Meeting, May 19, 2007, Berlin, Germany.

SERVICE

Service to Profession:

Conferences Organized:

North American Siemens Integrated Development Environment For Applications (IDEA) Users Group Meeting, October 10-13, 2002, La Jolla, CA.

Sessions Chaired:

1. fMRI: Spatial and temporal signal characteristics. Session Co-Moderator. 12th ISMRM Scientific Meeting, Kyoto, Japan, May 18, 2004.
2. Brain Activation. Scientific Discussion Leader. Gordon Research Conference on In Vivo Magnetic Resonance Imaging, July 24, 2006.
3. fMRI: Encoding, Resolution, and Response. Session Co-Moderator. 15th ISMRM Scientific Meeting, Berlin, Germany, May 21, 2007.

Journal Referee:

2001-Present	Human Brain Mapping
2000-Present	NeuroImage
2001-Present	IEEE Transactions on Medical Imaging
2001	IEEE Transactions on Electron Devices
1999, 2002-2005	IEEE Transactions on Signal Processing
1998	IEEE Signal Processing Letters
2004	Journal of the Acoustical Society of America
2003	Journal of Magnetic Resonance
2005-Present	Magnetic Resonance in Medicine
2005	Journal of Neurophysiology
2005	Neuroscience Letters
2005	Vision Research
2006	NMR in Biomedicine
2006	Neurobiology of Aging
2007	Biological Psychiatry

Grant Referee

2006	Ad-hoc reviewer for Major Research Instrumentation Grant Program, National Science Foundation.
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Service to University:

2001-Present	Executive Committee, Center for Functional Magnetic Resonance Imaging, University of California San Diego
2006-Present	General Clinical Research Center Advisory Committee, University of California San Diego

Last updated on August 2, 2007