Harvard Medical School

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Education

Year	Degree	Field of Study	Institution
1997	B.S.	Biomedical Engineering	Tsinghua University
2003	Ph.D.	Biomedical Engineering (Fusheng Yang)	Tsinghua University

Postdoctoral Training

Year(s)	Title	Specialty/Discipline	Institution
02/04-06/06	Research Associate	Computer Science (Paul H. Schimpf)	Washington State University
07/06-09/09	Research Fellow	Radiology&Neuroscience (Steven M. Stufflebeam & Randy L. Buckner)	Massachusetts General Hospital

Faculty Academic Appointments

Year(s)	Academic Title	Department	Academic Institution
10/09-03/12	Instructor	Radiology	Harvard Medical School
03/12-02/16	Assistant Professor	Radiology	Harvard Medical School
03/16-	Associate Professor	Radiology	Harvard Medical School

Appointments at Hospitals/Affiliated Institutions

Year(s)	Position Title	Department	Institution
07/06-09/09	Research Fellow	Radiology	Massachusetts General Hospital
10/09-02/16	Assistant in Neuroscience	Radiology	Massachusetts General Hospital
03/16-	Associate in Neuroscience	Radiology	Massachusetts General Hospital

Professional Societies

Year(s) of Membership	Society Name
2002-2007	Member, IEEE
2006-	Member, Society for Neuroscience
2008-	Member, Organization for Human Brain Mapping
2010-	Member, American Physiological Society

Grant Review Activities

Year(s) of Membership	Name of Committee Dates of Roles	Organization Title of Roles
2012 - present	Marsden Fund	Royal Society of New Zealand
	2012	Ad hoc Reviewer
	2014	Ad hoc Reviewer
2014 - present	NSERC Discovery Grants	Natural Sciences and Engineering Research Council of Canada
	2014	Ad hoc Reviewer

Editorial Activities

Ad hoc Reviewer
Neuron
PNAS
Molecular Psychiatry
JAMA Psychiatry
Neuropsychopharmacology
Journal of Neuroscience
Cerebral Cortex
Neuroimage
Schizophrenia Bulletin
Human Brain Mapping
Brian and Language
Neuroimage: Clinical
Journal of Affective Disorders
Journal of Cognitive Neuroscience
Journal Cognitive Science
Epilepsia
IEEE transactions on Biomedical Engineering
Journal of Neuroengineering and Rehabilitation

Medical & Biological Engineering &Computing
Computer Methods and Programs in Biomedicine
Wires Cognitive Science
Neuromodulation: Technology at the Neural Interface
PLoS One
Brain Connectivity
International Journal of Geriatric Psychiatry
BioMed Research International

Other Editorial Roles

Year(s)	Role	Journal Name
2014-	Editorial Board Member	Chinese Journal of Medical Imaging Technology
2016-	Editorial Board Member	Journal of Translational Neuroscience

Honors and Prizes

Year	Name of Honor	Awarding Organization
2015	Travel Award (senior level)	The American College of Neuropsychopharmacology (ACNP)

Report of Funded and Unfunded Projects

Funding Information

Past

Year(s) funded	Grant title Grant type and number Role on Project (total direct cost) Description of the major goals
2011-2016	Task-free Presurgical Evaluation of Lateral, Eloquent Cortex & Epileptic Foci NIH/NINDS 5K25NS069805 ($827,830) PI This project aims to develop methods to determine functional laterality, eloquent cortex and epileptic foci with minimal task requirements.

2013-2015	Intrinsic Brain Hemispheric Interaction as an Intermediate Phenotype of Schizophrenia Risk NARSAD Young Investigator Grant ($60,000) PI The goal of this project is to establish and validate an imaging biomarker for schizophrenia risk based on the intrinsic interactions between brain hemispheres, and explore the genetic underpinnings of this specific imaging biomarker.

Current

Year(s) funded	Grant title Grant type and number Role on Project (total direct cost) Description of the major goals
2015-2020	Translating The Individualized Functional Connectome To Surgical Planning NIH/NINDS 1R01NS091604 ($1,489,286) PI The goal of this project is to translate cutting-edge connectivity-based imaging technology to the clinical arena by developing and validating a set of tools that can accurately map an individual subject's brain and guide surgical intervention.
2015-2020	Neurcircuitry of OCD: Effects of Neuromodulation NIH/NIMH Conte Center P50MH106435 ($2,400,000) Co-PI of Project 3 (Project Leaders: Buckner & Liu) The overall goals of this Conte Center are to explore the circuitry of OCD in humans and develop methods for productively modulating that circuitry to alleviate symptoms. Project 3 seeks to develop methods to image networks at the level of individual subjects.
2016-2021	1U01AG052564-01 (Van Essen PI WASHU) NIHAG Salat PI MGH SC ($1,622,380) Role: Co-I (17% effort) Mapping the Human Connectome During Typical Aging This project will use structural and functional imaging methods to characterize brain circuitry in a large population of health older adults, from ages 36 to 100+. It will enable assessment of changes in brain circuits and brain behavior relationships during typical aging.

2016-2021	Impact of Amyloid on the Aging Brain NIH $2,443,700 Role: Co-I (3% effort) Tau, amyloid, & white matter burden interact to impact brain networks in preclinical Alzheimer's disease This project investigates the regional impact of tau and amyloid associated with Alzheimer's disease and of white matter hyperintensities of presumed vascular origin on the function of brain networks and associated cognitive abilities.

Report of Technological and Other Scientific Innovations

Innovation	Patent Information Description of Innovation
Measuring brain functional lateralization based on connectivity without being confounded by anatomical asymmetry	US Patent Application, filed March 31, 2015 My colleagues and I have created a system for measuring the brain functional specialization in the human brain with high reliability. The system can be used to determine the dominant hemisphere before neurosurgical treatments
Mapping functional organization of individual brains using an iterative approach guided by population-wide brain parcellation and individual variability map	US Patent Application, filed March 28, 2015 My colleagues and I have invented a system to map brain functional networks in a single subject's brain with high accuracy. The system can provide useful information regarding the eloquent cortices of surgical patients.
Systems and methods for combined functional brain mapping	US Patent Application, filed March 31, 2015

My colleagues and I have designed a system to improve the accuracy of brain functional mapping by combining traditional fMRI technology with novel intrinsic functional connectivity mapping technology.

Report of Scholarship

Peer Reviewed Publications in Print or Other Media

Research investigations

1. **Liu H.**, Yang F., "Preliminary screening of epileptiform waves in EEG", *Chinese J Biomed Eng*, 20(2):97-103, 2001.
2. **Liu H.**, Yang F., "An improved automated epileptic EEG detection system", *J Tsinghua Univ (Sci&Tech)*, 42(3): 304-308, 2002.
3. **Liu H.**, Gao X., Yang F., "Theory of Hidden Markov Modeling and its implementation", *Foreign Med Sci (Biomed Eng Fascicle)* , 25(6):253-259, 2002.
4. **Liu H.**, Zhang T., Yang F., "A multistage multimethod approach for automatic detection and classification of epileptiform EEG", *IEEE trans Biomed Eng* , 49(12): 1557-1566, 2002.
5. **Liu H.**, Yang F., Gao X., "Studies on spatio-temporal pattern of 3-D EEG", *Prog Nat Sci*, 13(4): 41-45, 2003.
6. **Liu H.**, Gao X., Yang F., "A 3-Dimensional spatio-temporal EEG pattern analyzing system", *Prog Nat Sci*, 11(13): 590-595, 2003.
7. **Liu H.**, Gao X., Schimpf P., Yang F., Gao S., "A recursive algorithm for the 3-dimensional imaging of brain electric activity: Shrinking LORETA-FOCUSS", *IEEE trans Biomed Eng* 51(10): 1794-1802, 2004.
8. Dong G.，**Liu H.**，Yang F.，Bayford R., Yerworth R., Gao S.，Holder D., Yan W., "The spatial resolution improvement of EIT images by GVSPM-FOCUSS", *Physiol Meas*, 25: 209-225, 2004 .
9. Li Y., Gao X., **Liu H.**, Gao S., "Classification of single-trial electroencephalogram during finger movement", *IEEE trans Biomed Eng*, 51(6): 1019-25, 2004.
10. **Liu H.**, Schimpf P., Dong G., Gao X., Yang F., Gao S., "Standardized Shrinking LORETA-FOCUSS (SSLOFO): a new algorithm for spatio-temporal EEG source reconstruction", *IEEE trans Biomed Eng*, 52(10): 1681-1691, 2005.
11. Dong G.**, Liu H.**, Bayford R., Yerworth R., Schimpf P., Holder D., Yan W., "Spatial resolution improvement of 3D EIT images by Shrinking sLORETA-FOCUSS algorithm", *Physiol Meas*, 26: s199-s208, 2005.
12. Schimpf P., **Liu H.**, Ramon C., Haueisen J., "Spatial refinement of standardized low resolution electromagnetic tomography in an anatomically realistic EEG model," *IEEE trans Biomed Eng*, 52(5):901- 908. 2005.
13. **Liu H.**, Schimpf P., "Efficient localization of synchronous EEG source activities using a modified RAP-MUSIC algorithm", *IEEE trans Biomed Eng*, 53(4): 652-661, 2006.
14. Jia W., Kong N, Ma J., **Liu H.**, GAO X., Gao S., Yang F., "Detection of the short-term preseizure changes in EEG recordings using complexity and synchrony analysis", *Prog Nat Sci*, 16(7): 691-700,

2006.

15. Vandervert L., Schimpf P.,**Liu H.**, "How working memory and the cerebellum collaborate to produce creativity and innovation ", *Creativ Res J*, 19(1): 1-18, 2007.
16. Schimpf P., **Liu H.,** "Localizing sources of the P300 using ICA, SSLOFO, and latency papping", *J Biomech Biomed Biophys Eng*, 2(1):1-11, 2008.
17. **Liu H.**, Buckner R.L., Talukdar T., Tanaka N., Madsen J.R., Stufflebeam S.M., "Task-free presurgical mapping using fMRI intrinsic activity", *J Neurosurg* 111: 746-754, 2009.
18. **Liu. H.**, Agam Y., Madsen J.R., Kreiman G., "Timing, timing, timing: fast decoding of object information from intracranial field potentials in human visual cortex", *Neuron* , 62: 281-290, 2009.
19. **Liu H**., Stufflebeam S.M., Sepulcre J., Hedden T., Buckner R.L., "Evidence from Intrinsic Activity that Asymmetry of the Human Brain is Controlled by Multiple Factors", *Proc. Natl. Acad. Sci. USA*, 106: 20499-20503, 2009.
20. Wetterling F., Liehr M, Schimpf P., **Liu H**., and Haueisen J., "The localization of focal heart activity via body surface potential measurements: tests in a heterogeneous torso phantom", *Phys Med Biol* 54: 5395-5409, 2009.
21. Tanaka N., Hamalainen M.S., Ahlfors S.P., **Liu H**., Madsen J.R., Bourgeois B.F., Lee J.W., Dworetzky B.A., Belliveau J.W., Stufflebeam S.M., "Propagation of epileptic spikes reconstructed from spatiotemporal magnetoencephalographic and electroencephalographic source analysis", *Neuroimage*, 50(1): 27-222, 2009.
22. Buckner R.L., Sepulcre J., Talukdar T., Krienen F., **Liu H.**, Hedden T., Sperling R., Johnson K., "Cortical hubs revealed by intrinsic functional connectivity: mapping, assessment of stability, and relation to Alzheimer's disease", *J Neurosci*, 29(6): 1860-73, 2009.
23. Tanaka N., Cole A.J., von Pechmann D., Wakeman D.G., Hämäläinen M.S., **Liu H.**, Madsen J.R., Bourgeois B.F., Stufflebeam S.M., "Dynamic statistical parametric mapping for analyzing ictal magnetoencephalographic spikes in patients with intractable frontal lobe epilepsy." *Epilep Res* 85(2): 279-286, 2009.
24. **Liu H**., Tanaka N., Stufflebeam S.M., Ahlfors S.P., Hamalainen M.S., "Functional mapping with simultaneous MEG and EEG", *J Vis Exp*, Vol 40, pp. 1668, 2010
25. Sepulcre J., **Liu H.**, Talukdar T., Martincorena I., Yeo B.T. and Buckner R.L.,"The organization of local and distant functional connectivity in the human brain", *PLoS Comput Biol*, 6(6):e1000808, 2010
26. Agam Y., **Liu H.,** Papanastassiou A., Buia C., Golby A., Madsen J.R., Kreiman G., "Robust selectivity to two-object images in human visual cortex", *Curr Biol*, 20(9):872-9, 2010.
27. **Liu H.***, Lu J.*, Zhang M., Wang D., Cao Y., Ma Q., Rong D., Wang X., Buckner R.L., Li K., "Focal pontine lesions provide evidence that intrinsic functional connectivity reflects polysynaptic anatomical pathways", *J Neurosci.* 42(31):15065-71, 2011.
28. Stufflebeam S.M., **Liu H.**, Sepulcre J., Tanaka N., Buckner R.L., Madsen J.R. "Localization of focal epileptic discharges using functional connectivity magnetic resonance imaging", *J Neurosurg*, 114(6):1693-7, 2011.
29. Yeo B.T., Krienen F.M., Sepulcre J., Sabuncu M.R., Lashkari D., Hollinshead M., Roffman J.L., Smoller J.W., Zöllei L., Polimeni J.R., Fischl B., **Liu H.**, Buckner R.L., "The organization of the

human cerebral cortex estimated by intrinsic functional connectivity", *J Neurophysiol*., 106(3):1125-65, 2011.

30. Sabuncu M.R., Desikan R.S., Sepulcre J., Yeo B.T., **Liu H**, Schmansky N.J., Reuter M., Weiner M.W., Buckner R.L., Sperling R.A., Fischl B., "The dynamics of cortical and hippocampal atrophy in Alzheimer disease", *Arch Neurol*., 68(8):1040-8, 2011.
31. Fang J., Wang X., **Liu H.**, Wang Y., Zhou K., Hong Y., Liu J., Wang L., Xue C., Song M., Liu B., Zhu B., "The limbic-prefrontal network modulated by electroacupuncture at CV4 and CV12", *Evid Based Complement Alternat Med*. 515893-516903, 2012.
32. Gallagher A., Tanaka N., Suzuki N.; **Liu H.,** Thiele E., Stufflebeam S.M., "Decreased language laterality in tuberous sclerosis complex: a relationship with tuber location and history of epilepsy", *Epilepsy & Behavior*, 25(1):36-41, 2012.
33. Sepulcre J., Sabuncu M.R., Yeo B.T., **Liu H.**, Johnson K.A., "Stepwise connectivity of the modal cortex reveals the multimodal organization of the human brain", *J Neurosci.* 32(31):10649-61,2012.
34. Gallagher A., Tanaka N., Suzuki N., **Liu H.**, Thiele E.A., Stufflebeam S.M., "Diffuse cerebral language representation in tuberous sclerosis complex", *Epilepsy Res.* 104:125-133, 2013.
35. Sweet A., Venkataraman A., Stufflebeam S. M., **Liu H.,** Tanaka N., Madsen J., Golland, P. "Detecting Epileptic Regions Based on Global Brain Connectivity Patterns". *Medical Image Computing and Computer-Assisted Intervention–MICCAI*, 98-105, 2013.
36. Kong J., Spaeth R.B., Wey H.Y., Cheetham A., Cook A.H., Jensen K., Tan Y., **Liu H.**, Wang D., Loggia M.L., Napadow V., Smoller J.W., Wasan A.D., Gollub R.L., "S1 is associated with chronic low back pain: a functional and structural MRI study", *Mol Pain*, 9(1):43-54, 2013.
37. Tanaka N., **Liu H.,** Reinsberger C., Madsen J.R., Bourgeois B.F., Dworetzky B.A., Hämäläinen M.S., Stufflebeam S.M., "Language lateralization represented by spatiotemporal mapping of magnetoencephalography", *Am J Neuroradiol* , 34:558-563, 2013
38. Qian T., Zhou W., Ling Z., Gao S., **Liu H.**, Hong B., "Fast presurgical functional mapping using task-related intracranial high gamma activity", *J Neurosurg.* 119(1): 26-36, 2013
39. Fox M.D., **Liu H**, Pascaul-Leone A., "Identification of reproducible individualized targets for treatment of depression with TMS based on intrinsic connectivity", *Neuroimage*, 66:151-160, 2013.
40. Ge M*., Wang D*., Dong G*., Guo B., Gao R., Sun W., Zhang J., **Liu H.**, "Transient impact of spike on theta rhythm in temporal lobe epilepsy". *Exper Neurol* 250:136-42, 2013
41. Wang D., Buckner R.L., **Liu H**., "Cerebellar asymmetry and its relation to cerebral asymmetry estimated by intrinsic functional connectivity", *J Neurophysiol.* 109(1): 49-57, 2013
42. Mueller S., Wang D., Fox M.D., Yeo B.T.T., Sepulcre J., Sabuncu M.R., Shafee R., Lu J., **Liu H., "**Individual variability in functional connectivity architecture of the human brain", *Neuron*, 77(3): 586-595, 2013 (**Highlighted in *Trends In Cognitive Sciences, 2013***).
43. Fox M.D., Buckner R.L., **Liu H.**, Chakravarty M.M., Lozano A.M., Pascual-Leone A. Resting-state networks link invasive and noninvasive brain stimulation across diverse psychiatric and neurological diseases. *Proc Natl Acad Sci U S A.* 11(41): E4367-E4375, 2014.
44. Zhang M., Lin Q., Lu J., Rong D., Zhao Z., Ma Q., **Liu H.**, Shu N., He Y., Li K. Pontine Infarction: Diffusion-Tensor Imaging of Motor Pathways—A Longitudinal Study. *Radiology,* 274 (3): 841-850, 2014.

45. DeSalvo M.N., Douw L., Takaya S., **Liu H.**, Stufflebeam S.M. Task-dependent reorganization of functional connectivity networks during visual semantic decision making. *Brain and Behavior*. 4 (6): 877-885, 2014.
46. Wang D., **Liu H.,** "Functional Connectivity Architecture of the Human Brain: Not All the Same". *Neuroscientist*, 20 (5): 432-438
47. Wang D., Buckner R.L., **Liu H.,** "Functional Specialization in the Human Brain Estimated By Intrinsic Hemispheric Interaction". *J Neurosci.* 34 (37):12341-12352, 2014.
48. Zeng L., Wang D., Fox M.D., Sabuncu M., Hu D., Ge M., Buckner R.L., **Liu H.,** "Neurobiological basis of head motion in brain imaging". *Proc Natl Acad Sci U S A.* 111(16):6058-62, 2014. (**Highlighted in *Proc Natl Acad Sci U S A, 2014***)
49. Douw L., DeSalvo M. N., Tanaka N., Cole A. J., **Liu H.**, Reinsberger C., & Stufflebeam S. M. "Dissociated multimodal hubs and seizures in temporal lobe epilepsy". *Annals of Clinical and Translational Neurology*, 2(4): 338-353, 2015.
50. Takaya S., Kuperberg G., **Liu H.,** Greve D., Makris N., Stufflebeam S.M., "Asymmetric projections of the arcuate fasciculus to the temporal cortex underlie lateralized language function in the human brain". *Frontiers in Neuroanatomy* , 9: 119, 2015.
51. Fang J, Wang D, Zhao Q, Hong Y, Jin Y, Liu Z, Zhou K, Jing X, Yu X, Pan R, Chang A, **Liu H*,** Zhu B*. Brain-Gut Axis Modulation of Acupuncture in Functional Dyspepsia: a preliminary resting-state fcMRI study. *Evid. Based Complement. Alternat. Med*. 2015.
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53. Mueller S., Wang D., Fox M.D., Pan R., Lu J., Li K., Sun W., Buckner R.L., **Liu H.**, "Reliability Correction for Functional Connectivity: Theory and Implementation", *Human Brain Mapping*, 36 (11): 4664-4680, 2015.
54. Langs G., Wang D., Golland P., Mueller S., Pan R., Sabuncu M., Sun W., Li K., **Liu H.**, "Identifying Shared Brain Networks in Individuals by Decoupling Functional and Anatomical Variability", *Cerebral Cortex*, bhv189, 2015.
55. Mueller S., Wang D., Pan R., Holt D., **Liu H.,** "Abnormalities in hemispheric specialization of caudate nucleus connectivity in schizophrenia". *JAMA Psychiatry.* 72(6): 552-560, 2015.
56. Wang D., Buckner R.L., Fox M.D., Holt D.J., Holmes A.J., Mueller S., Langs G., Pan R., Qian T., Li K., Baker J., Stufflebeam S.M., Wang K., Wang X., Hong B., **Liu H.** "Parcellating Brain Functional Networks in the Individual", *Nature Neuroscience* , 18: 1853–1860, 2015.
57. Takaya S, **Liu H,** Greve DN, Tanaka N, Leveroni C, Cole AJ, Stufflebeam SM. "Altered anterior-posterior connectivity through the arcuate fasciculus in temporal lobe epilepsy". *Hum Brain Mapp.* doi: 10.1002/hbm.23319, 2016
58. Taylor AN, Kambeitz-Ilankovic L, Gesierich B, Simon-Vermot L, Franzmeier N, Araque Caballero MÁ, Müller S, **Liu H,** Ertl-Wagner B, Bürger K, Weiner MW, Dichgans M, Duering M, Ewers M; Alzheimer's Disease Neuroimaging Initiative (ADNI). "Tract-specific white matter hyperintensities disrupt neural network function in Alzheimer's disease." *Alzheimers Dement*. pii:S1552-5260(16)32660-7, 2016

59. Fox M.D., Qian T., Madsen J.R., Wang D., Li M., Ge M., Zuo H., Groppe D.M., Mehta A.D., Hong B., **Liu H**. "Combining task-evoked and spontaneous activity to improve pre-operative brain mapping with fMRI", *Neuroimage*, 124:714-723, 2016.

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