Bin Lou

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Education Background

2009 - present **Columbia University, New York, USA**
Doctor of Philosophy in Biomedical Engineering (GPA 4.14/4.0)
Thesis: "The time course of a perceptual decision: linking neural correlates of pre-stimulus brain state, decision formation and response evaluation"

2006 - 2009 **Tsinghua University, Beijing, China**
Master of Science in Biomedical Engineering (GPA 90.5/100)
Thesis: "Study on critical techniques of the active portable brain-computer interface system"
Awarded Best Master Thesis of Tsinghua University

2002 - 2006 **Tsinghua University, Beijing, China**
Bachelor of Science in Biomedical Engineering (GPA 90.2/100)
Thesis: "Implementation of portable brain-computer interface system based on motor imagery"
Awarded Best Undergraduate Thesis of Tsinghua University

Research Experience

09/2009 - present **Laboratory for Intelligent Imaging and Neural Engineering, Columbia Univ., New York, USA**
Research Assistant
Project: Multimodal Neuroimaging for Mapping Decision Making in the Human Brain

- Collecting and analyzing neuroimaging data (EEG and EEG-fMRI) of healthy subjects and MDD patients while they perform perceptual detection tasks;
- Investigating the spatial-temporal characteristics of the neural correlates of perceptual decision making via machine learning approaches and statistical analysis;
- Proposed computational models for estimating reward prediction error in the value-based multi-target perceptual decision making paradigm;
- Collaborated with teammates on developing the brain-computer interface (BCI) system that used human and computer vision together in a closed loop to speed up image search.

06/2014 - 08/2014 **Siemens Corporation Corporate Research, Princeton, New Jersey, USA**
Department of Imaging & Computer Vision
Summer Intern
Project: *Knowledge Representation in Neural Systems*

- Developed systems that aim to decode the mental state from fMRI data and predict patterns of neural activity associated with particular concepts;
- Researched on multivariate pattern analysis methods for decomposing brain image into weighted combination of basis images.

06/2013 - 08/2013 **Philips Research North America (PRNA), Briarcliff Manor, New York, USA**
Department of Clinical Decision Support Solutions (CDSS)
Summer Intern
Project: *Hemodynamic Instability Indicator*

- Investigated different patterns of intervention for treating hemodynamic instability by analyzing multi-parameter recordings of ICU patients, and proposed criteria for labeling

successful intervention;
- Identified data features for developing a predictive model of intervention outcomes;
- Researched on Pharmacokinetic/Pharmacodynamic (PK/PD) models of common medications for hemodynamic instability treatment in ICU.

09/2005 - 07/2009 **Institute of Neural Engineering, Tsinghua Univ., Beijing, China**
Research Assistant
Project: *Principle and method of neural signal analysis*
- Investigated temporal and spatial features of scalp EEG to optimize the electrode layout for a portable BCI system;
- Researched on signal processing and machine learning algorithms for improving feature selection and classification performance in EEG data analysis;
- Developed software platform of portable BCI system by integrating Visual C++ and Matlab Engine and exhibited demo systems in the Science Museum of Zhengzhou.

09/2007 - 10/2007 **IRCCS Fondazione Santa Lucia, University of Rome "La Sapienza", Rome, Italy**
Visiting Student
Project: *Brain-computer interface by using high and low resolution EEG*
- Developed an plug-in program for interface between Symtop portable EEG amplifier and BCI2000, which is a widely used BCI platform (based on Borland C++);
- Developed a novel MATLAB toolbox for analyzing event-related potential (ERP) data.

08/2005 - 09/2005 **Xin'Ao Multi-Dimension Technology Ltd., Hebei, China**
Summer Intern, MRI Department
- Designed circuits for monitoring respiration of subjects during MRI scanning;
- Tested the performance of circuits. o reduce the artifact caused by respiration

Journal Publications

B. Lou and P. Sajda, "Perceptual salience and reward both influence feedback-related neural activity arising from choice" (in preparation)

B. Lou and P. Sajda, "Simultaneous EEG-fMRI reveals spatiotemporal characteristics of reward-related processing in major depressive disorder" (in preparation)

B. Lou, Y. Li, M. Philiastides, and P. Sajda, "Prestimulus alpha power predicts fidelity of sensory encoding in perceptual decision making," *Neuroimage*, Vol. 87, pp. 242-251, 2014.

Y. Li, **B. Lou**, X. Gao, and P. Sajda, "Post-stimulus Endogenous and Exogenous Oscillations Are Differentially Modulated by Task Difficulty," *Frontiers in Human Neuroscience*, vol. 7:9, 2013.

E. Pohlmeyer, J. Wang, D. Jangraw, **B. Lou**, S. Chang, and P. Sajda, "Closing the loop in cortically-coupled computer vision: a brain-computer interface for searching image databases," *Journal of Neural Engineering*, vol. 8, no. 3: 036025, 2011.

B. Lou, B. Hong, X. Gao and S. Gao, "Bipolar electrode selection for a motor imagery based brain-computer interface," *Journal of Neural Engineering*, vol. 5, no. 3, pp. 342-349, 2008.

Conference Papers/Abstracts

B. Lou and P. Sajda, "Perceptual salience and reward both influence feedback-related neural activity arising from choice," *Society for Neuroscience*, 2014.

J. Walz, M. Carapezza, **B. Lou**, R. Goldman, T. Brown, and P. Sajda, "Variability in Distribution of fMRI BOLD Response Linked to Prestimulus Alpha Power in Simultaneously acquired EEG," ISMRM, 2013.

B. Lou, Y. Li, J. M. Walz, and P. Sajda, "Post-stimulus Trial-by-trial EEG Variability Indexes Mean and Variance

of Pre-stimulus α Power," *18th Annual Meeting of the Organization for Human Brain Mapping*, 2012.

Y. Li, **B. Lou**, X. Gao, and P. Sajda, "Exogenous oscillations index task difficulty in perceptual decisions," *Society for Neuroscience*, 2012.

B. Lou, J. Walz, J. Shi and P. Sajda, "Single-trial EEG Discriminators Predict Prestimulus Alpha Power During Perceptual Decision-making," *Computational and Systems Neuroscience Meeting*, 2011.

B. Lou, J. Walz, J. Shi and P. Sajda, "Learning EEG Components for Discriminating Multi-class Perceptual Decisions," *5th International IEEE EMBS Conference on Neural Engineering*, pp. 675-678, 2011.

B. Hong, **B. Lou**, J. Guo and S. Gao, "Adaptive active auditory brain-computer interface," *31th Annual International IEEE EMBS Conference*, pp. 4531-4534, 2009.

B. Lou, B. Hong and S. Gao, "Task-irrelevant alpha component analysis in motor imagery based brain computer interface," *30th Annual International IEEE EMBS Conference*, pp. 1021-1024, 2008.

Conference Talks

April 2011 "Learning EEG Components for Discriminating Multi-class Perceptual Decisions", The 5th International IEEE EMBS Conference on Neural Engineering, Cancun, Mexico

Technical Skills

MATLAB, C/C++, Visual Basic, R, SQL/MySQL, Shell Script;

Digital Signal Processing, Machine Learning, Data mining, Pattern Recognition algorithms, Statistical Analysis, Linear Regression, Generalized Linear Regression, Sparse Coding, Matrix Factorization;

EEG/fMRI data collection and analysis, SPM, FSL.

Review Activities

Reviewer
- IEEE Transactions on Neural Systems and Rehabilitation Engineering
- Pattern Recognition
- IEEE Transactions on Image Processing
- IEEE Transactions on Biomedical Engineering
- IEEE Journal on Emerging and Selected Topics in Circuits and Systems
- Neurocomputing
- The Annual International IEEE EMBS Conference, 2011-2014
- The 5th International IEEE EMBS Conference on Neural Engineering, 2011

Teaching Experience

Teaching Assistant
- "Quantitative Physiology I", Columbia University, 2012
- "Signal Modeling", Columbia University, 2011&2013
- "Biomedical Pattern Recognition", Tsinghua University, 2007&2008

Honors & Fellowships

- 2009 Honored Master Graduate of Tsinghua University
- 2009 Award for Outstanding Master Thesis of Tsinghua University
- 2008 First-Class Fellowship for Outstanding Graduate Student, Tsinghua University
- 2006 Honored Graduate Student of Beijing
- 2006 Honored Graduate Student of Tsinghua University
- 2006 Award for Outstanding Undergraduate Thesis of Tsinghua University
- 2005 First Prize in China Undergraduate Mathematical Contest in Modeling (CUMCM-2005)
- 2005 Yi-Er-Jiu Fellowship for Outstanding Undergraduate, Tsinghua University
- 2004 First-Class National Fellowship for Outstanding Undergraduate
- 2003 S.T. Wu Fellowship for Outstanding Undergraduate, Tsinghua University