

Xiaoyuan Zhu

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SKILLS and STRENGTH

- Strong machine learning background with intensive knowledge of probabilistic graphical models (e.g., HMM, Latent Dirichlet Allocation, and Bayesian networks), Bayesian learning and inference (e.g., Variational Bayesian Method), and classification methods (e.g., Neural Networks, Support Vector Machine).
- Strong research and industrial experience in designing pattern recognition system for brain-computer interface, online cursive handwriting recognition, and computer vision.
- Strong research experience in search algorithms, such as Branch-and-Bound search, Heuristic Search (e.g., A*), Beam Search, and Local Search (e.g., Tabu).
- Proficient in C/C++, Matlab, Perl, and Shell.

EDUCATION

2007, PhD, Electric Circuit and Systems, Department of Electronic Science and Technology, the University of Science and Technology of China (USTC).

Dissertation: Exploiting Information for Continuous Prediction in EEG-Based Brain-Computer Interface

Contributions: Proposed novel Bayesian probabilistic models for EEG based continuous cursor control to improve the performance of Brain-Computer Interface. The proposed models successfully handled the uncertainty contained in EEG data, and enhanced task relevant information for classification. Model parameters are estimated by using Variational Bayesian Learning method.

2002, B.S., Electronic Engineering and Information Science, Department of Special Class for the Gifted Young, the University of Science and Technology of China (USTC). (Pursued doctor degree directly)

EXPERIENCE

Research Associate in Department of Computer Science, Queens College, the City University of New York 2013—Present

- Proposed the first exact BFBnB algorithm for solving MRE inference using an upper bound based on Markov blanket decomposition of Bayesian networks.
- Improved the Markov blanket based upper bound by splitting large Markov blanket and tightened the upper bound by summing out pruned-targets in each Markov blanket.
- Proposed hierarchical beam search algorithm and pruning criteria for solving MRE inference in Bayesian networks.
- Applied Bayesian networks learning method to analyze fMRI data of human brain.
- Programming and toolbox: C/C++, SHELL, MATLAB, SMILE, R.

Postdoctoral Research Fellow in Brain and Behavior Discovery Institute, Georgia Regents University 2010—2013

- Developed visual stimuli software based on OpenGL for studying visual pathway.
- Proposed natural action structures, i.e., multi-scale spatial-temporal concatenations of local features, as intermediate-level representation for video based action recognition and achieved up to 41% error reduction (according to the existing local representations) on public datasets.
- Proposed natural scene structures, i.e., multi-scale spatial concatenations of local features, as intermediate-level representation for scene classification and achieved the best performance on UIUC Sports Event Dataset (2012).
- Studied the statistics of 3D range images and proposed probabilistic models for 2D to 3D regression.
- Programming and toolbox: C/C++, MATLAB, SHELL, LibSVM, OpenGL.

Senior Research Engineer in Motorola China Research Center (Shanghai) 2007—2010

- Improved segmentation method, accelerated the convergence of training neural networks, and designed sort-target learning method based on variational Bayesian framework for training online cursive handwriting recognition engine.
- Improved the recognition performance of Out-Of-Vocabulary (OOV) words and cursive handwriting sentence with error reduction of 38.2% and 23.7% respectively, by adopting statistical language modeling methods.

- Further improved the performance of HMM based cursive handwriting recognition engine, which covers feature extraction, allograph generation, delay stroke problem, model selection, and discriminative training.
- Developed and shipped online English cursive handwriting recognition engine used in Motorola portable device.
- Programming and toolbox: C/C++, PERL, SHELL, HTK, SRILM.

Research Intern in Institute for Infocomm Research, Singapore

2004—2005

- Developed machine learning methods to improve the performance of P300 BCI system.
- Attended the third international BCI competition and won the second position.
- Designed and implemented the signal processing part of EEG-based one dimensional four targets continuous control BCI system. Developed the experiment platform of continuous control BCI.
- Implemented the existing machine learning methods, e.g., Fisher Linear Discriminant, Bayesian Logistic Model, GMM, Discriminative GMM, HMM, and SVM on cursor control and motor imagery datasets of thirteen subjects.
- Programming and toolbox: C/C++, MATLAB, HTK, LibSVM.

PUBLICATIONS

Sitaram Ranganatha, Cuntai Guan, Manoj Thulasidas, Wenjie Xu, **Xiaoyuan Zhu**, Jiankang Wu (2004) Comparison of Artifact Removal Methods on Their Effect on Motor Task and Imagery Classification in a Brain-Computer Interface, *In Proceedings of the 2nd Inter. Conf. on Advances in Medical Signal and Information Processing (MEDSIP)*, 117-123.

Cuntai Guan, **Xiaoyuan Zhu**, Sitaram Ranganatha, Manoj Thulasidas, Jiankang Wu (2004) Robust Classification of Event-related Potential for Brain-Computer Interface, *In Proceedings of the 2nd Inter. Conf. on Advances in Medical Signal and Information Processing (MEDSIP)*, 5-8. (**best paper award**)

Manoj Thulasidas, Cuntai Guan, Sitaram Ranganatha, Jiankang Wu, **Xiaoyuan Zhu**, Wenjie Xu (2004) Effect of Ocular Artifact Removal in Brain Computer Interface Accuracy, *in Proceedings of the 26th Annual Inter Conf IEEE Engineering in Medicine and Biology Society (EMBS)*, 1-5.

Xiaoyuan Zhu, Cuntai Guan, Jiankang Wu, Yimin Cheng, and Yixiao Wang (2005) Bayesian Method for Continuous Cursor Control in EEG-based Brain-Computer Interface, *in Proceedings of the 27th Annual Inter. Conf. IEEE Eng. in Med. and Bio. Society (EMBS)*, 1-4.

Xiaoyuan Zhu, Jiankang Wu, Yimin Cheng, and Yixiao Wang (2006) GMM-Based Classification Method for Continuous Prediction in Brain-Computer Interface, *in Proceedings of the 18th International Conference on Pattern Recognition (ICPR)*, 20-24.

Xiaoyuan Zhu, Cuntai Guan, Jiankang Wu, Yimin Cheng, and Yixiao Wang (2007) Expectation-Maximization Method for EEG-Based Continuous Cursor Control, *EURASIP Journal on Advances in Signal Processing*, doi:10.1155/2007/49037.

Xiaoyuan Zhu, Jiankang Wu, Yimin Cheng (2007) Accumulated Information for Continuous Prediction in Brain-Computer Interface, *Chinese Journal of Biomedical Engineering*, 523-527.

Xiaoyuan Zhu, Jiankang Wu, Yimin Cheng (2007) Accumulating Information Based on DGMM Model and Its Application in Brain-Computer Interface, *Beijing Biomedical Engineering*, 26(5), 480-484.

Xiaoyuan Zhu, Jiankang Wu, Yimin Cheng, and Yixiao Wang (2008) A Unified Framework to Exploit Information in BCI Data for Continuous Prediction, *Neurocomputing*, 1022-1033.

Xiaoyuan Zhu, Yong Ge (2008) Stochastic Meta-Descent for Online Cursive Handwriting Recognition, the 5th *Motorola China Technology Symposium*, Beijing, 1-5.

Xiaoyuan Zhu, Yong Ge, Fengjun Guo, Lixin Zhen (2009) A Probabilistic Framework for Soft Target Learning in Online Cursive Handwriting Recognition, *In Proceeding of the 10th International Conference on Document Analysis and Recognition (ICDAR)*, 1246-1250.

Xiaoyuan Zhu, Meng Li, Xiaojian Li, Zhiyong Yang, and Joe Z. Tsien (2012) Robust Action Recognition Using Multi-Scale Spatial-Temporal Concatenations of Local Features as Natural Action Structures, *PLoS One* 7(10): e46686. doi:10.1371/journal.pone.0046686.

Xiaoyuan Zhu, Zhiyong Yang (2013) Multi-scale Spatial Concatenations of Local Features in Natural Scenes and Scene Classification, *PLoS One* 8(9): e76393. doi:10.1371/journal.pone.0076393.

Xiaoyuan Zhu, Changhe Yuan (2015) An Exact Algorithm for Solving Most Relevant Explanation in Bayesian Networks, *In Proceedings of the 29th National Conference on Artificial Intelligence (AAAI)*, 3649-3655.

Xiaoyuan Zhu, Changhe Yuan (2015) Hierarchical Beam Search for Solving Most Relevant Explanation in Bayesian Networks, *In Proceedings of the 28th International Florida Artificial Intelligence Research Society Conference (FLAIRS)*, 594-599. (**best paper award**)