Ji Liu

708 Eagle Heights, ATP B
Madison, WI 53705
Phone: +1-(480)388-9026
Email: ji.liu.uwisc@gmail.com
Homepage: http://pages.cs.wisc.edu/~ji-liu
Most Recent CV: http://pages.cs.wisc.edu/~ji-liu/paper/JiLiu-CV.pdf

Research Interests

Asynchronous Parallel Optimization for Big Data
Stochastic Optimization
Online Learning / Predication
Recommendation System
Abnormal Event Detection
Feature Selection
Compressed Sensing Theory
Multi-task Learning
Reinforcement Learning
Biological / Medical Data Analysis
Optimization Problems in Machine Learning
High Dimensional Data Analysis
Video Surveillance

Education

Ph.D, Computer Science (major) & Industrial and System Engineering (minor), 2014 (expected)
University of Wisconsin-Madison (UW), US
Advisor: Stephen J. Wright
GPA: 4.0/4.0, Qualifying Exam: P+ (highest grade)

Masters, Computer Science, 2010
Arizona State University (ASU), US
Advisors: Jieping Ye and Peter Wonka
Thesis: Tensor Nuclear Norm for Tensor Completion and Applications in Visual Data

Bachelor, Automation (major) & Business Administration (minor), 2005
University of Science and Technology of China (USTC), China

Honers and Awards

Honorable mention of the best research paper in KDD, 2010
ICML Travel Grant, 2013
NIPS Travel Grant, 2010
PAMI TC Travel Grant, 2009
1st Prize, Mathematics Contest in Modeling of Northeast China, 2007 (7/2000+)
3rd Prize, Chinese National Graduate Mathematical Contest in Modeling, 2007
Excellent Student Scholarship, Chinese Academy of Sciences (CAS), 2007
Graduate Fellowship with Honor, CAS, 2006
Outstanding Students Scholarship, USTC, 2003, 2004

Employment

Research Assistant Department of Computer Sciences & Wisconsin Institute of Discovery, UW, 01/2012-now
Intern Student NEC Media Analytics Lab, CA, 06/2012-09/2012
Teaching Assistant Department of Computer Sciences, UW, 09/2010-01/2012
Research Assistant Department of Computer Sciences & Biodesign Institute, ASU, 08/2008-08/2010
Research Assistant Shenyang Institute of Automation (SIA), CAS, 09/2006-07/2008

Professional Services

Reviewer for
Mathematical Programming (MP)
NIPS 2013
IEEE Transactions on Pattern Analysis and Machine Intelligence (T-PAMI)
IEEE Transactions on Information Theory (TIT)
IEEE Transactions on Signal Processing (T-SP)
IEEE Transactions on Neural Networks and Learning Systems (T-NNLS)
IEEE Transactions on Knowledge and Data Engineering (T-KDE)
Numerical Algorithms (NUMA)
Neurocomputing
Computer Vision and Image Understanding, Elsevier (CVIU)
Digital Signal Processing, Elsevier (DSP)
International Journal of Engineering, Science and Technology (IJEST)

Invited Talks
SIA, CAS, Shenyang, China, Dec., 2011
ICML oral presentation, Atlanta, Jun, 2013
INFORMS Optimization Society Conference, Houston, Mar., 2014
SIAM Conference on Optimization, San Diego, May, 2014

Selected Projects

Parallel Optimization for Big Data Analysis: SVM, LASSO, Linear Systems, Logistic Regression, Semi-supervised Learning

- Goal: Design efficient parallel optimization algorithms to solve Big Data learning and analysis problems
- Proposed an asynchronous parallel SCD algorithm to solve convex optimization problems and an asynchronous parallel RK algorithm to solve super large scale linear systems
- Designed several efficient asynchronous parallel solvers: Boxed QP solver, Relatexed LP solver, Sparse linear equations solver, LASSO solver
- The asynchronous parallelization is more efficient than the synchronous parallelization
- Provided the convergence and linear speedup guarantees
- Take around 70 seconds to solve a $20GB$ problem on 40 cores

Tensor Completion / Recovery: Recommendation System, Image and Video Inpainting, Missing Traffic Data Estimation

- Goal: Estimate values of the missing elements in low rank tensors
- Proposed the *tensor nuclear norm* to capture the low rank structure in tensors
- Proposed several efficient algorithms to solve this challenging problem
- A funny video in image / video inpainting: `https://www.youtube.com/watch?v=kbnmXM3uZFA`
- This method has been used in image / video inpainting, traffic data estimation, and recommendation system

Tensor Decomposition: Drosophila Data Analysis

- Goal: Extract the key patterns from a large volume of Drosophila images
- Formulate it into the sparse nonnegative tensor decomposition problem
- Proposed an efficient CCD algorithm to solve this problem

Dictionary Learning: Abnormal Event Detection in Video Surveillance

- Goal: Detect the abnormal frame from a video

- Proposed a group sparse dictionary model to learn the normal and abnormal bases

Online Learning / Predication: Online Scene Classification

- Goal: Learn the metric online for the scene classification purpose
- Proposed a general model to overcome two types of overfitting: feature redundancy and rank redundancy

Feature / Sensor Selection: Human Activity Recognition

- Goal: Recognize indoor human activities to optimize the energy control by using sensors as few as possible
- Proposed to use the CRFs model to describe the human activities
- Proposed a Forward-Backward (FoBa) algorithm to select features / sensors, which outperforms the popular ℓ_1 norm based methods
- Provided theoretical guarantees for the FoBa algorithm, which significantly improves existing analysis

Sparse Regression: Model / Feature Selection, Prediction

- Proposed a general multi-stage framework to theoretically and empirically improve the performance of the traditional sparse regression approaches, like LASSO and Dantzig Selector
- Proposed a general model against quantization noise, which theoretically and empirically outperforms the popular BPDN model
- Extended the sparse regression to the structural sparsity case and provided a general theoretical analysis to improve existing results

Teaching Assistant

CS 525 Linear Programming, Computer Sciences Department, UW, 2010 Fall
CS 525 Linear Programming, Computer Sciences Department, UW, 2011 Spring
CS 420 Numerical Analysis, Computer Sciences Department, UW, 2011 Summer
CS 525 Linear Programming, Computer Sciences Department, UW, 2011 Fall

Articles under Review

Ji Liu and Stephen J. Wright, "Asynchronous Stochastic Coordinate Descent: Parallelism and Convergence Properties", arXiv:1403.3862, 2014.

Ji Liu, Stephen J. Wright, Christopher Ré, Victor Bittorf, and Srikrishna Sridhar, "An Asynchronous Parallel Stochastic Coordinate Descent Algorithm", ICML arXiv:1311.1873, 2013.

Ji Liu, Stephen J. Wright, and Srikrishna Sridhar, "An Asynchronous Parallel Randomized Randomized Kaczmarz Algorithm", arXiv:1401.4780, 2013.

Ji Liu and Stephen J. Wright, "An Accelerated Randomized Kaczmarz Algorithm", Mathematics of Computation, arXiv:1310.2887, 2013.

Maxwell Collins, Ji Liu, Jia Xu, Lopamudra Mukherjee, and Vikas Singh, "Spectral Clustering with a Convex Regularizer on Millions of Examples", 2014.

Ji Liu, Yang Cong, and Jiebo Luo, "Online Metric Learning against Overfitting", 2014.

Ji Liu, Lei Yuan, and Jieping Ye, "Dictionary LASSO: Guaranteed Sparse Recovery under Linear Transformation", arXiv:1305.0047v2, 2013.

Journal Publications

Ji Liu and Stephen J. Wright, "Robust Dequantized Compressive Sensing", Applied and Computational Harmonic Analysis, 2013.

Yang Cong, Ji Liu, Junsong Yuan, and Jiebo Luo, "Self-supervised Online Metric Learning with Low Rank Constraint for Scene Categorization", IEEE Transaction on Image Processing, 2013.

Ji Liu, Przemyslaw Musialski, Peter Wonka, and Jieping Ye, "Tensor Completion for Estimating Missing Values in Visual Data", IEEE Transaction on Pattern Analysis and Machine Intelligence, 2013.

Ji Liu, Peter Wonka, and Jieping Ye, "A Multi-stage Framework for Dantzig Selector and Lasso", Journal of Machine Learning Research, 2012.

Jianhui Chen, Ji Liu, and Jieping Ye, "Learning Incoherent Sparse and Low-Rank Patterns from Multiple Tasks", ACM Transaction on Knowledge Discovery from Data, 2012.

Yang Cong, Junsong Yuan, and Ji Liu, "Abnormal Event Detection in Crowded Scenes Using Sparse Representation", Pattern Recognition, 2012.

Ji Liu, Jun Liu, Peter Wonka, and Jieping Ye, "Sparse Non-negative Tensor Factorization Using Columnwise Coordinate Decent", 45(1), 649-656, Pattern Recognition, 2011.

Conference and Early Publications

Ji Liu, Ryohei Fujimaki, and Jieping Ye, "Forward-Backward Greedy Algorithms for General Convex Smooth Functions over A Cardinality Constraint", ICML, 2014.

Srikrishna Sridhar, Victor Bittorf, Ji Liu, Ce Zhang, Christopher Ré, and Stephen J. Wright, "An Approximate, Efficient LP Solver for LP Rounding", NIPS, 2013.

Ji Liu, Lei Yuan, and Jieping Ye, "Guaranteed Sparse Recovery under Linear Transformation", ICML, 2013 (oral).

Bo Liu, Sridhar Mahadevan, and Ji Liu, "Regularized Off-Policy TD-Learning", NIPS, 2012 (spotlight).

Yang Cong, Junsong Yuan, and Ji Liu, "Sparse Reconstruction Cost for Abnormal Event Detection", CVPR, 2011.

Ji Liu, Peter Wonka, and Jieping Ye, "Multi-stage Dantzig Selector", NIPS, 2010.

Jianhui Chen, Ji Liu, and Jieping Ye, "Learning Incoherent Sparse and Low-Rank Patterns from Multiple Tasks", KDD, 2010 (Honorable Mention for the Best Research Paper).

Ji Liu, Przemyslaw Musialski, Peter Wonka, and Jieping Ye, "Tensor Completion for Estimating Missing Values in Visual Data", ICCV, 2009.

Ji Liu, Yang Cong, Yuechao Wang, and Yandong Tang, "Lunar Terrain Reconstruction Based on PDEs Method", ICIP, 2008.

Ji Liu, Junjian Peng, Yuechao Wang, and Yandong Tang, "A PDEs Method Preserving Boundaries on Dense Disparity Map Reconstruction", 3rd Conference of Computer Vision Theory and Application (VISAPP), 2008.

Ji Liu, Yuechao Wang, Chuan Zhou, and Yanfeng Geng, "A Navigation Simulation

System of Lunar Rover", 2008 IEEE International Conference on Networking, Sensing and Control (ICNSC), 2008.

Ji Liu, Yuechao Wang, Chuan Zhou, and Yongzhi He, "A Method of Eliminating the Wheel-terrain Interaction Errors in Lunar Rover Simulation", Chinese Journal of System Simulation, ISSN 1004-731X, vol. 14, 2008.

Yang Cong, Xiaomao Li, Ji Liu, and Yandong Tang, "A Stairway Detection Algorithm based on Vision for UGV Stair Climbing", 2008 IEEE International Conference on Networking, Sensing and Control (ICNSC), 2008.

Junjian Peng, Ji Liu, Yanfeng Geng, Jianda Han, and Yandong Tang, "A Dynamic Stereo Matching Method Based on Epipaolar-region", Chinese Journal of Computer engineering, ISSN 1000-3428, vol.24, 2008.

Yanfeng Geng, Kai Kang, Ji Liu, and Hong Wang, "Manufacturing Schedule of Dual-armed Cluster Tools Based on Heuristic Search", International Conference on Industry Technology (ICIT), 2008.

Yongzhi He, Chuan Zhou, Ji Liu, and Dalong Tan, "Research on Movement Simulation for Wheeled Mobile Robot", Chinese Journal of Scientific Instrument, 2007.

Activities

Vice-Chairman of Graduate Union in SIA, CAS, 2006-2008
Practice Ministry of Student Union, USTC, 2004-2005
Vice-Chairman of Student Union of Department of Automation, USTC, 2002-2003
Chairman of Student Union, No. 2 High School of Wanzhou, 1999-2000

Skills

Matlab, C/C++, Python, Linux, Windows