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Huan Wang

Education

PhD 2013
Supervised by Prof. **Daniel A. Spielman**,
Department of Computer Science,
Yale University, New Haven, U.S.A.

M.Phil 2007
Supervised by Prof. **Xiaoou Tang**, and Prof. **Shuicheng Yan**,
Multimedia Laboratory, Information Engineering (IE),
The Chinese University of Hong Kong, Hong Kong, China

B. Eng (with honors) 2004
Mixed Honor Class, **Chu Kechen Honors College,**
Information Science and Electrical Engineering (ISEE),
Zhejiang University, Hang Zhou, P. R. China

Working Experience

Senior Researcher, Salesforce Research	2018-
Senior Applied Researcher, Microsoft	2015-2018
Research Scientist, Yahoo Labs, New York	2013-2015
Adjunct Professor (machine learning CS6923), Computer Science Department, Engineering School, New York University	2014
Adjunct Professor (algorithm design and data structure), MFE program, Baruch College, The City University of New York	2014
Intern at Microsoft Research, Redmond	2011
Intern at Microsoft Research Asian, Beijing	2010
Teaching Fellow of “Graph and Networks”, Yale	2010
Teaching Fellow of “Design and Analysis of Algorithms”, Yale	2010
Teaching Fellow of “Computer Science and Modern Intellectual Agenda”, Yale	2009
Research Assistant [supervised by Prof. **Jianzhuang Liu**], Multimedia Laboratory, CUHK (Quality Migrant Admission Scheme)	2007
Teaching Assistant of ‘Probability Models and Application’, CUHK	2007
Teaching Assistant of ‘Image and Video Processing’, CUHK	2006
Teaching Assistant of ‘Multimedia Coding and Processing’, CUHK	2006

Fields of Interest

- **Machine Learning and Data Mining**
  Dictionary Learning, Compressed Sensing, Graph Theory, Semi-supervised Learning, Subspace Learning, Manifold Analysis, Spectral Analysis, Clustering, Classification, Regression, Deep Learning
- **Big Data Analytics**
  Stream Data Analytics, Distributed Learning on top of Apache Spark, Storm, and Hadoop. Big Data Compression and Representation.
- **Computer Vision and Cognition**
  Object/Face Representation and Recognition, Image Registration, Segmentation, Age Estimation
- **Data Mining**
  Search Engine on Web and Maps

Research/Engineering Experience*

Language Modeling for ASR 2018-2019
- Transformer / convolutional network comparison on FairSeq
- Integration into the acoustic models

Accelerated Neural Network Serving using Taylor Expansion and Memorization 2017-2018
- Using Taylor series to approximate the neural network function
- Flatten the deep network into a single "shallow" network

Rademacher Regularization for Dynamic Dropout Training 2017-2018
- Connect the dropout rate and Rademacher complexity
- Automatic tuning of the dropout rate

Offline Deep Learning Based Ranker on Bing 2017-2018
- Expensive offline query-url ranker for higher accuracy
- Memorization table for fast service

AI Question Answer on Bing 2016-2017
- Concept embedding for better answer accuracy
- Bi-LSTM+Attention model for passage ranking

Address Search Engine (GeoCoder) on Bing Maps 2016-2016
- Model training for the new generation address search engine (GeoCoder) on Bing Maps
- Model shipped with 100% traffic on Bing Maps.

Category/Entity Recommendation for Bing Local 2015-2016
- Model training and system design for category/entity recommendation based on user behaviors
- On flight on Bing Maps and SERP

Ads Click Prediction using Neural Network 2014-2015
- Implemented a simple back-propagation algorithm for the neural network training
- On the production data, the algorithm gives the best performance.

Compromised Account Detection using Random Forest on top of Apache Spark and Storm 2014
- Implemented a distributed random forest training algorithm on top of Apache Spark framework
- Testing stage is implemented on top of apache storm
- Encouraging performance on the real-world data.

Approximate Matrix Multiplication 2013-2014
- Approximate large matrix multiplication using randomized algorithms
- Provable performance guarantee

Online K-Nearest Neighbor Classifier on top of Apache Storm 2013
- Designed and implemented an online k-nearest neighbor classifier on top of apache storm.
- Locality sensitive hashing and sketching techniques are used to accelerate the prediction

Dictionary Learning on Large Natural Image Data 2012
- Designed a monotone dictionary learning algorithm with unbalanced coefficient assumptions
- Evaluated the algorithm on natural image data sets

Anomaly Detection in Bing Clusters 2011
- Anomaly detection using the log data generated by the Bing cluster
- Modeled the time series log data using multivariate Brownian Motion

Matrix Decomposition and Dictionary Learning 2010
- Proof on the uniqueness of dictionary learning
- Fast algorithms on the approximate dictionary learning

Curvature Analysis of Image Manifold 2010
- Relation between the image derivatives and image manifold
- An upper bound on the image manifold using image bandwidth

Linear Regression by Localized Sample Selection 2009
- A survey on local sample selection for regression
- Proposed an l_1 based local sample selection algorithm for regression

Graph Construction and Semi-supervised Learning 2008
- A global way of graph construction
- A sparse graph was derived without explicit sparse constraints.

Correspondence Propagation for Image Registration 2007
- Designed a transductive algorithm that utilizes prior knowledge to guide the bipartite matching process
- Derived a closed-form solution that simultaneously preserves feature domain consistency and models geometric distribution.

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* **Details available at: http://cs.yale.edu/homes/wang-huan/project.html**

Factor Analysis for Image Ensembles 2007
- Presented a statistical learning technique, the mode-kn factor analysis, to explore image ensembles.
- Employed statistical Inference for the estimation of pose, illumination and identity
- Enhanced the classification capability by interacting with the process of synthesizing data

Misalignment Robust Face Recognition 2007
- Proposed a misalignment robust framework for subspace learning algorithms to deal with the curse of correspondence problem in face recognition
- Formulated the misalignment correction process as an L1 norm optimization.

Human Age Estimation from Facial Images 2006—2007
- Took the nonnegative and uncertain properties of the human age into consideration
- Formulated the age estimation problem as a two-phase semi-definite programming (SDP).

Semi-supervised Regression on Multi-class/Multi-modality data 2006—2007
- Derived a transductive procedure for the regression problem over multi-class/multi-modality data
- Transduced labels across different class samples to pilot the regression.

Tensor Subspace Analysis for Face Recognition 2006
- Proposed the first convergent solution to Tensor Subspace Learning algorithms
- Integrated Bayesian methods in model learning and inference for pose, illumination and identity estimation
- Evaluated the recognition performance on face databases.

Discriminant Analysis with Applications in Face Recognition and Data Classification 2006
- Presented a novel solution that directly optimizes the trace quotient objective
- Investigated the proposed algorithm systematically on face datasets and machine learning databases.

Manifold Embedding and Clustering 2006
- Proposed a spectral analysis algorithm for image clustering
- Designed a new manifold embedding framework: Maximum Unfolded Embedding.

Error Control Coding (Convolutional Code, Turbo Code and LDPC Code) 2003—2004
- Simulated the encoding and decoding process using C++
- Utilized maximum likelihood (ML/Viterbi) and maximum a posteriori (MAP/BCJR) decoding for the convolutional code.

Embedded System Design and Implementation (a Digital Fiscal Register) 2004
- Designed and implemented an embedded system, including hardware, software drivers and Graphic User Interface (GUI), to facilitate fiscal registration to local computer systems using an IC card.

Micro-Control Unit Design 2002—2003
- Used Schematic and Verilog-HDL in the design process
- Four levels of pipelines
- Implemented using an FPGA.

Publications*

Conference Papers:

[1] Huan Wang, Stephan Zheng, Caiming Xiong, Richard Socher, 'On the Generalization Gap in Reparameterizable Reinforcement Learning', International Conference On Machine Learning (ICML), 2019.

[2] Huan Wang, Nitish Shirish Keskar, Caiming Xiong, Richard Socher, 'Identifying Generalization Properties in Neural Networks', NIPS workshop on Integration of Deep Learning Theories / Arxiv, 2018. [Blog]

[3] Ke Zhai, Huan Wang, 'Adaptive Dropout Training with Rademacher Complexity Regularization', ICLR 2018. [Authors contribute equally]

[4] Huan Wang, Christos Boutsidis, Edo Liberty, Daniel Hsu, 'Fast Matrix Multiplication via One-Side Element-wise Sparsification', preprint available upon request, 2015.

[5] Huan Wang, John Wright, and Daniel Spielman, 'A Batchwise Monotone Algorithm for Dictionary Learning', arxiv, 2015.

[6] Daniel Spielman, Huan Wang, and John Wright, 'Exact Recovery of Sparse-Used Dictionaries', **Best paper award** of the 25th Conference on Learning Theory (COLT), Jun.2012. [authors are ranked in alphabetical order in COLT]

[7] Shuicheng Yan, and Huan Wang, 'Semi-supervised Learning by Sparse Representation', SIAM International Conference on Data Mining (SDM) Apr. 2009.

[8] Huan Wang, Shuicheng Yan, Thomas Huang and Xiaoou Tang, 'A Convergent Solution to Tensor Subspace Learning', International Joint Conferences on Artificial Intelligence (**IJCAI 07 Accepted for Oral presentation**) , Jan. 2007.

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* **I have got 1300 citations. Please visit my google scholar page:** http://scholar.google.com/citations?hl=en&user=7NpTttkAAAAJ

[9] Huan Wang, Shuicheng Yan, Jianzhuang Liu, Thomas Huang and Xiaoou Tang, 'Misalignment Robust Face Recognition', IEEE Conference on Computer Vision and Pattern Recognition (**CVPR 08**), Jun. 2008.
[10] Huan Wang, Shuicheng Yan, Thomas Huang and Xiaoou Tang, 'Trace Ratio vs. Ratio Trace for Dimensionality Reduction', IEEE Conference on Computer Vision and Pattern Recognition (**CVPR 07**), Jun. 2007.
[11] Huan Wang, Shuicheng Yan, Thomas Huang, Jianzhuang Liu and Xiaoou Tang, 'Transductive Regression Piloted by Inter-Manifold Relations', International Conference on Machine Learning (**ICML 07 Accepted for Oral presentation**), Jun. 2007.
[12] Shuicheng Yan, Huan Wang, Thomas Huang and Xiaoou Tang, 'Learning Auto-Structured Regressor from Uncertain Labels', International Conference on Computer Vision (**ICCV 07**), Oct. 2007.
[13] Huan Wang, Shuicheng Yan, Thomas Huang and Xiaoou Tang, 'Maximum Unfolded Embedding: Formulation, Solution, and Application for Image Clustering ', ACM International Conference on Multimedia (**ACM SIGMM06**), Oct. 2006.
[14] Shuicheng Yan, Huan Wang, Thomas Huang and Xiaoou Tang, 'Ranking with Uncertain Labels', IEEE International Conference on Multimedia & Expo (**ICME07 Accepted for Oral presentation**), May. 2007.
[15] Shuicheng Yan, Huan Wang, Xiaoou Tang and Thomas Huang, 'Exploring Feature Descriptors for Face Recognition', IEEE International Conference on Acoustics, Speech, and Signal Processing (**ICASSP07 Accepted for oral presentation, ~15%**), Apr. 2007.

Journal Papers:

[16] Daniel Spielman, Huan Wang, and John Wright, 'Exact Recovery of Sparse-Used Dictionaries', (Arxiv), 2012.
[17] Shuicheng Yan, Huan Wang, Jianzhuang Liu, Xiaoou Tang, and Thomas S. Huang, 'Ranking with Uncertain Labels and Its Applications', Frontiers of Computer Science in China (Journal), 2007.
[18] Shuicheng Yan, Huan Wang, Xiaoou Tang, and Thomas S. Huang, 'Learning Auto-Structured Regressor from Uncertain Labels', IEEE Transactions on Information Forensics and Security (**TIFS**), 2008
[19] Huan Wang, Shuicheng Yan, Jianzhuang Liu, Thomas Huang and Xiaoou Tang, 'Correspondence Propagation with Weak Priors', IEEE Transaction on Image Processing (**TIP**), 2008
[20] Shuicheng Yan, Huan Wang, Xiaoou Tang, and Thomas Huang, 'Synchronized Submanifold Embedding for Person-Independent Pose Estimation and Beyond', IEEE Transaction on Image Processing (**TIP**), 2008.
[21] Shuicheng Yan, Huan Wang, Jilin Tu, Thomas S. Huang, and Xiaoou Tang, 'Mode-kn Factor Analysis for Image Ensembles', IEEE Transactions on Image Processing(**TIP**), 2008.

Thesis:

[22] Huan Wang, 'Dictionary Learning: Algorithms and Analysis', Computer Science Department, Yale University. **(Ph.D Thesis**)
[23] Huan Wang, 'Exploring Intrinsic Structures from Samples: Supervised, Unsupervised, and Semisupervised Frameworks', Department of Information Engineering, the Chinese University of Hong Kong. **(M.Phil Thesis**)
[24] Huan Wang, 'Design and Implementation of an Embedded Fiscal Register', Chu Kechen Honors College, Zhejiang University. (**B.Eng Thesis**)

Academic Service

Reviewer:
- Journal of Machine Learning Research (JMLR)
- International Conference on Artificial Intelligence and Statistics (AISTATS 2017, 2018)
- International Conference on Machine Learning (ICML2013, 2014, 2016, 2017, 2018, 2019)
- Neural Information Processing Systems Foundation (NIPS2013, 2017, 2018)
- Association for the Advancement of Artificial Intelligence (AAAI 2017)
- IEEE Transactions On Image Processing
- Neurocomputing (Elsevier)
- Pattern Recognition Letters (Elsevier)
- IEEE Trans. on Circuits and Systems for Video Technology
- IEEE Trans. on Systems, Man and Cybernetics, Part B
- International Journal of Computer Mathematics

Organizer:
- "Big Data and Stream Analytics" Workshop @ SIAM Conference on Data Mining 2015

Honors & Awards

Chinese Government Award for Outstanding Self-Financed Students Abroad	2013
Best Paper Award at Conference Of Learning Theory (COLT)	2012
Award of Excellence (**Stars of Tomorrow**), Microsoft Research Asia	2010
Fellowship award, Yale University	2008
Studentship award, Chinese University of Hong Kong	2005-2007
Bachelor's degree with Honors, Zhejiang University	2004
Excellent B.Eng Thesis, Zhejiang University	2004
Yongqian Tang Outstanding Student Exchange Fellowship, Zhejiang Univ.	2003
Champion, **University Chorus Competition**, Zhejiang University	2002
Excellence award for moral, intellective and physical merits, Zhejiang University	2001
Outstanding Student Scholarship, Zhejiang University	2000-2003
Freshman Award for Academic Excellence, Zhejiang University	2000
Honorary Enrollment, Zhejiang University	2000

Extracurricular Activities & Global Experience

Invited presentation on IJCAI13 track on Best Papers in Sister Conferences `	2013
Best paper presentation on COLT12, Edinburgh, Britain	2012
Oral presentation on ICML07, Corvallis, OR, USA	2007
Oral presentation on IJCAI07, Hyderabad, India	2007
Cultural exchange, University of Leeds, Britain	2003
Piano accompanist for the college chorus	2001

Engineering Skills

Software Programming
C/C++/C#/Matlab/Java/Python, Pytorch/Tensorflow/Keras, Hadoop/Spark/Storm, MPI Programming, DirectX Game Programming
Hardware Programming
Verilog HDL / VHDL, CPLD, FPGA programming, Single Chip Programming
Hardware Design
Printed Circuit Board (PCB) Design

Music Related

Piano Playing: Level 10 (Topmost Assessment by Chinese Ministry of Education)
Music Composition:
[the song "A Ripple of Love" produced by myself has **millions** of online playbacks]