XIAOGANG WANG

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Research Interests

Computer vision, machine learning and medical vision.

Professional Experience

Department of Electronic Engineering, the Chinese University of Hong Kong, Hong Kong Assistant Professor (2009 – present)

Education

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Cambridge, MA

Ph.D. Candidate in Computer Science (2009)

Computer vision group, Computer Science and Artificial Intelligence Lab (CSAIL) Thesis: *Hierarchical Bayesian Approaches for Unsupervised Activity Analysis and Scene Modeling* Advisor: Professor W. Eric L. Grimson Minor: Statistics Research projects:

- **Bayesian Statistical modeling**. Proposed and developed new hierarchical Bayesian models to solve computer vision problems.
- Visual surveillance. Proposed and developed several unsupervised frameworks for activity analysis and scene modeling in sparse or crowded scenes in a single camera view or across multiple camera views using hierarchical Bayesian models.
- **Object recognition**. Proposed and developed a hierarchical Bayesian model which Learns models of objects from a large collection of images without supervision.
- **Object detection and tracking**. Proposed and developed an algorithm for detecting and tracking multiple interacting objects assuming that the number of objects was unknown and object-class-specific models were not available.
- **Diffusion tensor MRI**. Propose a hierarchical Bayesian model to segment fiber trajectories extracted from DT-MRI into anatomical structures of white matter.

THE CHINESE UNIVERSITY OF HONG KONG

M. Phil. in Information Engineering (2004)

Thesis: A Unified Framework for Subspace Face Recognition Advisor: Professor Xiaoou Tang Research projects:

- Face recognition. Develop a unified framework for popular subspace face recognition methods and proposed several novel subspace methods to solve the well known small sample size problem and the large intrapersonal variation problem in face recognition.
- Face sketch synthesis and recognition. Developed the first system which transformed a face photo to a sketch drawing and recognized people from a face photo gallery using a face sketch as input.

Hong Kong

UNIVERSITY OF SCIENCE AND TECHNOLOGY OF CHINA

B. S. in Electrical Engineering and Information Science (2001) *Graduated from the Special Class for Gifted Young Ranked Number one in GPA over five years undergraduate study* Thesis: *Integration of Remote Sensing and Geographic Information System* Advisor: Professor Nenghai Yu

Internships in Industry

MICROSOFT RESEARCH (summer 2008)

• Developed a system for identifying faces of celebrities from images and videos on the web.

Generic Electric (GE) Global Research Center (summer 2006)

- Developed a system for identifying persons walking across a network of cameras. It reduced identification error by 40% compared with the state-of-the-art methods and ran in real time.
- Proposed a generalized integral image technique which efficiently computed statistics over arbitrary domains and could speed up computation in many applications.

Teaching

- 1. ENGG1100: Introduction to Engineering Design I
- 2. ELEG1110C: Basic Circuit Theory
- 3. ELEG5410: Pattern Recognition
- 4. ELEG5742: Image Processing and Video Technology
- 5. BMEG4320: Biomedical Imaging Applications

Grants

- 1. <u>Hong Kong Research Grant Council General Research Fund (RGC/GRF)</u>, *Scene-specific Pedestrian and Vehicle Detectors in Video Surveillance for Traffic Management*, Principal Investigator, HK\$681K, Jan 2012 Dec 2014.
- 2. <u>Hong Kong Research Grant Council General Research Fund (RGC/GRF)</u>, *Large Crowded Scenes Visual Surveillance with a Distributed Network of Cameras*, Principal Investigator, HK\$640K, Jan 2011 Dec 2013.
- 3. <u>National Natural Science Foundation of China (NSFC)</u>, Develop a New Intelligent Video Surveillance System for Traffic Control and Driving Safety, Principal Investigator, RMB¥ 210K, 2010-2012.
- 4. <u>Shun Hing Institute of Advanced Engineering Research Fund #BME-p3-10</u>, *Diffusion Tensor MRI Predictors of Cognitive Impairment in Confluent White Matter Lesion*, Principal Investigator, HK\$630k, July 2010 June 2012.
- 5. <u>Research Grant from Hong Kong Applied Science and Technology Research Institute Company Ltd (ASTRI)</u>, Human Detection and Re-Identification Technology Research, HK\$900K, May 2011 – April 2012.
- <u>CUHK Research Fellowship Scheme</u>, a half support for a postdoctoral fellow for 12 months working on the project of "Scene-specific Pedestrian and Vehicle Detectors in Video Surveillance for Traffic Management", HK\$141k, July 1, 2012 – June 30, 2013.
- 7. <u>Direct Grant for Research from the Chinese University of Hong Kong</u>, *Video Surveillance Based on Large Scale Camera Networks*, Principal Investigator, HK\$150k, Nov. 2009 Nov. 2011.

Hefei, China

Redmond, WA

Niskayuna, NY

8. <u>Large Equipment Grant from the Chinese University of Hong Kong</u>, A Large Scale Video Surveillance System, HK\$1,000k, Dec. 2009 – April 2010.

Professional Service

- IEEE Member
- Consultant for Hong Kong Applied Science and Technology Research Institute Company Limited (ASTRI) on Environment Adaptive Object Detection and Tracking, May 2011 – April 2012
- Associate Editor of Image and Visual Computing Journal
- Area chair of IEEE International Conference on Computer Vision 2011
- Program committee member for the first IEEE workshop on modeling, simulation, and visual analysis of large crowds, 2011
- Program committee member for the third Chinese Conference on Intelligent Visual Surveillance, 2011
- Program committee member for the 2011 Workshop on Behavior Informatics

• Referee – Journals

IEEE Transactions on Pattern Analysis and Machine Intelligence IEEE Transactions on Image Processing IEEE Transactions on Multimedia IEEE Transactions on Medical Imaging IEEE Transactions on Circuits and Systems for Video Technology IEEE Transactions on Systems, Man and Cybernetics - Part B IEEE Transactions on Biomedical Engineering Elsevier Computer Vision and Image Understanding **Elsevier Image and Vision Computing Elsevier Neurocomputing Elsevier Signal Processing** Springer International Journal of Computer Vision Springer Machine Learning Springer Pattern Recognition Letters Springer Journal of Computer Science and Technology International Journal of Image and Graphics

Referee – Conferences

European Conference on Computer vision 2012 European Conference on Computer vision 2010 IEEE Computer Society Conference on Computer Vision and Pattern Recognition 2012 IEEE Computer Society Conference on Computer Vision and Pattern Recognition 2010 IEEE Computer Society Conference on Computer Vision and Pattern Recognition 2010 IEEE Computer Society Conference on Computer Vision and Pattern Recognition 2009 IEEE Computer Society Conference on Computer Vision and Pattern Recognition 2008 IEEE Computer Society Conference on Computer Vision and Pattern Recognition 2007 IEEE International Conference on Computer Vision 2009 IEEE International Conference on Computer Vision 2007 Asian Conference on Computer Vision 2007

• Referee – Funding Agencies

Hong Kong Research Grant Council General Research Fund (RGC/GRF) National Natural Science Foundation of China (NFSC)

Award

• Outstanding Young Researcher in Automatic Human Behaviour Analysis award in 2011. The Award is sponsored by the European Research Council Starting Grant agreement no. ERC-2007-StG-203143 (MAHNOB) and is administered by the Awards Committee of the CVPR4HB Workshop Organization.

Patents

- 1. Gianfranco Doretto, **Xiaogang Wang**, Thomas Sebastian, Jens Rittscher, and Peter Tu, "Decivce and Methods for Fast Computation of Region Based Image Features," application number: 11/987785, USA, August 07, 2008.
- 2. Gianfranco Doretto, Xiaogang Wang, Thomas Sebastian, Jens Rittscher, and Peter Tu, "Image Processing for Person and Object Re-Identification," application number: 11/987777, USA, Dec, 04, 2007.

Publications

1500+ citations in Google Scholar with an H-index of 20.

Profile at Google Scholar: <u>http://scholar.google.com/citations?user=-B5JgjsAAAAJ&hl=en</u>

Book Chapters

- 1. X. Wang, "Action Recognition Using Topic Models," in the book of "Visual Analysis of Humans: Looking at People," edited by Thomas B. Moeslund, Adrian Hilton, Volker Kruger, and Leonid Sigal, published by Springer, 2011.
- 2. X. Wang, "Semantic Object Segmentation," in the book of "Video Segmentation and Its Applications", edited by King N. Ngan and Hongliang Li, published by Springer, 2011.

Journals

- 3. X. Wang, "Intelligent Multi-Camera Video Surveillance: A Review," accepted to Pattern Recognition Letters.
- 4. K. Jia, X. Wang, and X. Tang, "Image Transformation based on Learning Dictionaries across Image Spaces," accept to *IEEE Transactions on Pattern Analysis and Machine Intelligence* (PAMI). (Impact factor: 5.960).
- 5. X. Tang, K. Liu, J. Cui, F. Wen and X. Wang, "IntentSearch: Capturing User Intention for One-Click Internet Image Search," accept to *IEEE Transactions on Pattern Analysis and Machine Intelligence* (PAMI). (Impact factor: 5.960)
- 6. X. Wang, E. Grimson and C. F. Westin, "Tractography Segmentation Using a Hierarchical Dirichlet Processes Mixture Model," *NeuroImage*, Vol. 54, pp. 290-302, 2011. (Impact factor: 5.739)
- 7. X. Wang, K. Ma, G. Ng, and E. Grimsion, "Trajectory Analysis and Semantic Region Modeling Using Nonparametric Hierarchical Bayesian Models," *International Journal of Computer Vision*, Vol. 96, pp. 287-321, 2011. (Impact factor: 5.35)
- 8. C. Zhao, X. Wang and W. Cham, "Background Subtraction via Robust Dictionary Learning," EURASIP Journal on Image and Video Processing, 2011.
- 9. X. Wang, K. Tieu, and W. E. L. Grimson, "Correspondence-Free Activity Analysis and Scene Modeling in Multiple Camera Views," *IEEE Transactions on Pattern Analysis and Machine Intelligence* (PAMI), Vol. 32, pp. 56-71, 2010. (Impact factor: 5.960)
- 10. X. Wang and X. Tang, "Face Photo-Sketch Synthesis and Recognition Using Multiscale Markov Random Fields," *IEEE Transactions on Pattern Analysis and Machine Intelligence* (PAMI), Vol. 31, pp. 1955-1967, 2009. (Impact factor: 5.960)

- X. Wang, X. Ma, and W. E. L. Grimson, "Unsupervised Activity Perception in Crowded and Complicated Scenes Using Hierarchical Bayesian Models," *IEEE Transactions on Pattern Analysis and Machine Intelligence* (PAMI), Vol. 31, pp. 539-555, 2009. (Impact factor: 5.960)
- 12. **X. Wang**, and X. Tang, "Random Sampling for Subspace Face Recognition," *International Journal of Computer Vision* (IJCV), Vol. 70, No. 1, pp 91-104, 2006. (Impact factor: 5.35)
- 13. X. Wang, and X. Tang, "A Unified Framework for Subspace Face Recognition," *IEEE Transactions on Pattern Analysis and Machine Intelligence* (PAMI), Vol. 26, No.9, pp. 1222-1228, 2004. (Impact factor: 5.960)
- 14. X. Wang, and X. Tang, "Hallucinating Face by Eigentransformation," *IEEE Trans. on System Man and Cybernetics*, Part C, Vol. 35, No. 3, pp. 425-434, 2005. (Impact factor: 2.016)
- 15. X. Tang, and X. Wang, "Face Sketch Recognition," *IEEE Transactions on Circuits and Systems for Video Technology* (CSVT), Special Issue on Image- and Video- Based Biometrics, Vol. 14, No. 1, pp. 50-57, January, 2004. (Impact factor: 2.548)

Refereed Conferences

- 16. W. Ouyang and X. Wang, "A Discriminative Deep Model for Pedestrian Detection with Occlusion Handling," in Proceedings of IEEE Computer Society Conference on Computer Vision and Patter Recognition (CVPR) 2012.
- 17. M. Wang, W. Li and X. Wang, "Transferring a Generic Pedestrian Detector Towards Specific Scenes," in Proceedings of IEEE Computer Society Conference on Computer Vision and Patter Recognition (CVPR) 2012.
- 18. B. Zhou, X. Tang and X. Wang, "Understanding Collective Crowd Behaviors: Learning Mixture Model of Dynamic Pedestrian-Agents," in Proceedings of IEEE Computer Society Conference on Computer Vision and Patter Recognition (CVPR) 2012.
- 19. P. Luo, X. Wang and X. Tang, "Hierarchical Face Parsing via Deep Learning," in Proceedings of IEEE Computer Society Conference on Computer Vision and Patter Recognition (CVPR) 2012.
- 20. W. Luo, F. Lu, X. Wang and X. Tang, "Synthesizing Oil Painting Surface Geometry from a Single Photograph," in Proceedings of IEEE Computer Society Conference on Computer Vision and Patter Recognition (CVPR) 2012.
- 21. C. Li, X. He, V. Mok, W. Chu, J. Yuan, Y. Sun and X. Wang, "Free-Form Fibers: A Whole Brain Fiber-to-DTI Registration Method," in Proceedings of Workshop on Computational Diffusion MRI, 2011.
- 22. B. Gong, J. Liu, X. Wang, and X. Tang, "3D Object Retrieval with Semantic Attributes," in Proceedings of ACM Multimedia, 2011.
- 23. W. Luo, X. Wang, and X. Tang, "Content-Based Photo Quality Assessment," in Proceedings of IEEE International Conference on Computer Vision (ICCV) 2011.
- 24. K. Jia, X. Wang, and X. Tang, "Optical Flow Estimation Using Learned Sparse Model," in Proceedings of IEEE International Conference on Computer Vision (ICCV) 2011.
- 25. X. Wang, K. Liu and X. Tang, "Query-Specific Visual Semantic Spaces for Web Image Re-ranking," in Proceedings of IEEE Computer Society Conference on Computer Vision and Patter Recognition (CVPR) 2011.
- 26. M. Wang and X. Wang, "Automatic Adaption of a Generic Pedestrian Detector to a Specific Traffic Scene," in Proceedings of IEEE Computer Society Conference on Computer Vision and Patter Recognition (CVPR) 2011.
- 27. W. Zhang, X. Wang and X. Tang, "Coupled Information-Theoretic Encoding for Face Photo-Sketch Recognition," in Proceedings of IEEE Computer Society Conference on Computer Vision and Patter Recognition (CVPR) 2011. (oral)
- 28. B. Zhou, X. Wang and X. Tang, "Random Field Topic Model for Semantic Region Analysis in Crowded Scenes from Tracklets," in *Proceedings of IEEE Computer Society Conference on Computer Vision and Patter Recognition* (CVPR) 2011.
- 29. C. Zhao, X. Wang and W. Cham, "Joint Face Alignment with a Generic Deformable Face Model," in Proceedings of IEEE Computer Society Conference on Computer Vision and Patter Recognition (CVPR) 2011.
- 30. W. Zhang, **X. Wang** and X. Tang, "Lighting and Pose Robust Face Sketch Synthesis," in Proceedings of European Conference on Computer Vision (*ECCV*), 2010.
- 31. X. Wang, E. Grimson and C.-F. Westin, "Tractography Segmentation Using a Hierarchical Dirichlet Processes Mixture Model," in Proceedings of Information Processing in Medical Imaging, 2009.

- 32. X. Wang, C. Zhang and Z. Zhang, "Boosted Multi-Task Learning for Face Verification with Applications to Web Image and Video Search," in Proceedings of IEEE Computer Society Conference on Computer Vision and Patter Recognition (CVPR) 2009.
- 33. X. Wang, K. Tieu, and E. Grimson, "Correspondence-Free Multi-Camera Activity Analysis and Scene Modeling," in Proceedings of IEEE Computer Society Conference on Computer Vision and Patter Recognition (CVPR) 2008. (31.9% acceptance ratio)
- 34. X. Wang, and E. Grimson, "Trajectory Analysis and Semantic Region Modeling Using A Nonparametric Bayesian Model," in Proceedings of IEEE Computer Society Conference on Computer Vision and Patter Recognition (CVPR) 2008. (31.9% acceptance ratio)
- 35. X. Wang, X. Ma and E. Grimson, "Unsupervised Activity Perception by Hierarchical Bayesian Models," in Proceedings of IEEE Computer Society Conference on Computer Vision and Patter Recognition (CVPR) 2007. (28.2% acceptance ratio)
- 36. B. Bose, **X. Wang**, and E. Grimson, "Multi-class Object Tracking Algorithm that Handles Fragmentation and Grouping," in *Proceedings of IEEE Computer Science on Computer Vision and Patter Recognition* (CVPR) 2007. (28.2% acceptance ratio)
- 37. X. Wang, G. Doretto, T. Sebastian, J. Rittscher, and P. Tu, "Shape and Appearance Context Modeling", in Proceedings of IEEE International Conference on Computer Vision (ICCV) 2007. (23% acceptance ratio)
- 38. G. Dalley, and X. Wang, "Event Detection Using An Attention Based Tracker," in Proceedings of the tenth International Workshop on Performance Evaluation of Tracking and Surveillance System (PETS) in Conjunction with ICCV 2007, 2007.
- 39. X. Wang and E. Grimson, "Spatial Latent Dirichlet Allocation," in Proceedings of Neural Information Processing Systems Conference (NIPS) 2007. (24% acceptance ratio)
- 40. X. Wang, K. Tieu and E. Grimson, "Learning Semantic Scene Models by Trajectory Analysis," in Proceedings of European Conference on Computer Vision (ECCV) 2006. (21.4% acceptance ratio)
- 41. X. Wang, and X. Tang, "Subspace Analysis using Random Mixture Models," in Proceedings of IEEE Computer Society Conference on Computer Vision and Patter Recognition (CVPR) 2005. (28.1% acceptance ratio)
- 42. X. Wang, and X. Tang, "Random Sampling LDA for Face Recognition," in Proceedings of IEEE Computer Society Conference on Computer Vision and Patter Recognition (CVPR) 2004. (oral, 6.2% acceptance ratio)
- 43. X. Wang, and X. Tang, "Dual-Space Linear Discriminant Analysis for Face Recognition," in Proceedings of IEEE Computer Society Conference on Computer Vision and Patter Recognition (CVPR) 2004. (29.8% acceptance ratio)
- 44. X. Wang, and X. Tang, "Unified Subspace Analysis for Face Recognition," in Proceedings of IEEE International Conference on Computer Vision (ICCV), 2003. (20.5% acceptance ratio)
- 45. X. Tang, and X. Wang, "Face Sketch Synthesis and Recognition," in Proceedings of IEEE International Conference on Computer Vision (ICCV), 2003. (20.5% acceptance ratio)
- 46. X. Wang, and X. Tang, "Using Random Subspace to Combine Multiple Features for Face Recognition," in Proceedings of IEEE International Conference on Automatic Face and Gesture Recognition, pp. 284-289, 2004.
- 47. X. Wang and X. Tang, "Bayesian Face Recognition Based on Gaussian Mixture Models," in Proceedings of International Conference on Pattern Recognition (ICPR), Vol. 4, pp. 23-26, 2004. (oral, 18.0% acceptance ratio)
- 48. X. Wang and X. Tang, "Improving Indoor and Outdoor Face Recognition Using Unified Subspace Analysis and Gabor Features," *in Proceedings of International Conference on Image Processing* (ICIP), Vol. 3, pp. 24-27, 2004. (44.2% acceptance ratio)
- 49. X. Wang and X. Tang, "Experimental Study on Multiple LDA Classifier Combination for High Dimensional Data Classification," Multiple Classifier Systems, pp. 344-353, 2004.
- 50. X. Wang, and X. Tang, "An Improved Bayesian Face Recognition Algorithm in PCA Subspace," in Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), Vol. 3, pp. 129-132, 2003. (56.2% acceptance ratio)
- 51. **X. Wang**, and X. Tang, "Face Hallucination and Recognition," in Proceedings of the 4th International Conference on Audio- and Video-Based Person Authentication, Guildford, UK, June 2003.

- 52. X. Wang, and X. Tang, "Bayesian Face Recognition Using Gabor Features," in Proceedings of ACM SIGMM 2003 Multimedia Biometrics Methods and Applications Workshop, Berkeley, CA, Nov. 2003.
- 53. B. Luo, **Xiaogang Wang**, and X. Tang, "A World Wide Web Based Image Search Engine Using Text and Image Content Features," in Proceedings of IS&T/SPIE Electronic Imaging 2003, Internet Imaging IV, 2003.
- 54. **X. Tang**, and X. Wang, "Face Photo Recognition Using Sketch," in Proceedings of IEEE International Conference on Image *Processing* (ICIP), Vol. 1, pp. 257-260, Rochester, New York, Sept. 2002. (58.3% acceptance ratio)