

# Allen Y. Yang, PhD

Address: TRUST Center, Cory Hall  
University of California, Berkeley  
Berkeley, CA 94720  
Office: (+1) 510-643-5798  
Fax: (+1) 510-643-2356  
Email: yang@eecs.berkeley.edu  
Web: <http://www.eecs.berkeley.edu/~yang/>

## RESEARCH INTERESTS

**Pattern Recognition:** High-Dimensional Pattern Recognition, Sparse Optimization.

**Computer Vision:** Face/Object Recognition, Multiple-View Geometry, Motion Segmentation, Image Segmentation.

**Systems:** Camera Sensor Networks, Distributed Sensor Perception.

## ACADEMIC BACKGROUND

**Ph.D. in Electrical and Computer Engineering** **October 2006**

University of Illinois at Urbana-Champaign, Urbana, IL.

Dissertation: *Estimation of Subspace Arrangements: Its Algebra and Statistics.*

Advisor: Yi Ma (ECE). Co-advisor: Robert M. Fossum (Math).

**M.S. in Mathematics** **August 2005**

University of Illinois at Urbana-Champaign, Urbana, IL.

**M.S. in Electrical Engineering** **August 2003**

University of Illinois at Urbana-Champaign, Urbana, IL.

Thesis: *Geometric Segmentation of Perspective Images based on Symmetry Groups.*

Advisor: Yi Ma (ECE).

**B.E. in Computer Science** **May 2001**

Special Class for the Gifted Young, University of Science and Technology of China, Hefei, China.

## SELECTED HONORS AND AWARDS

- Best Student Paper Award, Honorable Mention** 2010  
“Towards an Efficient Distributed Object Recognition System in Wireless Smart Camera Networks”  
*IEEE International Conference on Information Fusion.*
- Best Student Paper Award** 2009  
“Natural Image Segmentation with Adaptive Texture and Boundary Encoding”  
*The Ninth Asian Conference on Computer Vision.*
- Best Paper Award** 2009  
“Distributed Compression and Fusion of Nonnegative Sparse Signals for Multiple-View Object Recognition”  
*IEEE International Conference on Information Fusion.*

4. **Computational Science and Engineering Fellowship** 2004  
Selected to fund an interdisciplinary and computationally oriented research project: Robust Generalized Principal Component Analysis.  
*CSE Division, University of Illinois at Urbana-Champaign.*
5. **Henry Ford II Scholar Award** 2003  
Awarded to two outstanding engineering students in their second year study based on grade-point average and initiating research or contributing directly to practice.  
*College of Engineering, University of Illinois at Urbana-Champaign.*
6. **Distinguished Graduate Award** 2001  
*Special Class for the Gifted Young, University of Science and Technology of China.*
7. **Best Bachelor's Thesis** 2001  
*Institute of Automation, Chinese Academy of Sciences & University of Science and Technology of China.*

#### ACADEMIC EMPLOYMENTS

- Research Scientist** 2010 onwards  
*International Computer Science Institute, University of California, Berkeley, CA.*
- Research Engineer** 2006 onwards  
Sponsor: Shankar Sastry.  
*Department of EECS, University of California, Berkeley, CA.*
- Graduate Research Assistant** 2001 to 2006  
Advisor: Yi Ma.  
*Department of ECE, University of Illinois at Urbana-Champaign, Urbana, IL.*

#### INDUSTRIAL EMPLOYMENTS

- Research Consultant** 2010 to 2011  
*Qualcomm, Inc., San Diego, CA.*
- Visiting Researcher** 2008 to 2009  
*Microsoft Research Asia, Beijing, China.*
- Intern** 2004  
*Honda Research, Mountain View, CA.*

#### TEACHING EXPERIENCE

- Lecturer** Fall, 2006 onwards  
Lectured several graduate level courses on Computer Vision and High-Dimensional Pattern Analysis.  
*Department of EECS, University of California, Berkeley.*
- Teaching Assistant** Fall, 2005  
Assisted in teaching a senior level course on Abstract Algebra.  
*Department of Mathematics, University of Illinois at Urbana-Champaign.*
- Teaching Assistant** Fall, 2003 to Spring, 2004  
Assisted in teaching a graduate level course on Digital Signal Processing (DSP) and a graduate level course on Linear Control Systems.  
*Department of ECE, University of Illinois at Urbana-Champaign.*

## RESEARCH GRANTS

1. **CITRIC v2**: A Wireless Smart Camera Mote based on OMAP 2011  
Sponsor: Texas Instruments.  
*Department of EECS, University of California, Berkeley, CA.*
2. **Qualcomm Research Contract** 2010 to 2011  
*Qualcomm, San Diego, CA.*
3. **GRID**: Geometric Representation Integrated Dataspace 2010 to 2011  
PI: Shankar Sastry,  
Sponsor: DARPA (seedling grant).  
*Department of EECS, University of California, Berkeley, CA.*
4. **MAST**: Micro Autonomous Systems and Technology 2008 onwards  
Co-PI: Shankar Sastry.  
Sponsor: Army Research Lab.  
*Department of EECS, University of California, Berkeley, CA.*
5. **HSN MURI**: Heterogeneous Sensor Webs for Automated Target Recognition and Tracking in Urban Terrain 2006 to 2012  
PI: Shankar Sastry.  
Sponsor: Army Research Office.  
*Department of EECS, University of California, Berkeley, CA.*
6. **California MICRO**: Wireless Body Sensor Networks for Persistent Monitoring of Multiple-Subject Activities 2008 to 2009  
PI: Shankar Sastry. co-PI: Ruzena Bajcsy.  
Sponsor: State of CA and Telecom Italia  
*Department of EECS, University of California, Berkeley, CA.*

## RECENT PROFESSIONAL SERVICES

1. Tutorial on Sparse Representation and Low-Rank Representation for Biometrics, International Joint Conference on Biometrics, 2011.
2. Tutorial on Sparse Representation and Its Applications in High-Dimensional Pattern Recognition, IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2009.
3. Proposal Reviews:
  - Army Research Office, USA.
4. Journal Reviews:
  - ACM Transactions on Sensor Networks.
  - Computer Vision and Image Understanding.
  - IEEE Sensors Journal.
  - IEEE Signal Processing Magazine.
  - IEEE Transactions on Image Processing.
  - IEEE Transactions on Multimedia.
  - IEEE Transactions on Neural Networks.
  - IEEE Transactions on Pattern Analysis and Machine Intelligence.
  - IEEE Transactions on Robotics.
  - IEEE Transactions on Systems, Man and Cybernetics.
  - Image and Vision Computing
  - Journal of Mathematical Imaging and Vision
  - Pattern Recognition

## RECENT INVITED TALKS

1. *Image Segmentation and 3-D Reconstruction via Low-Rank Texture*. Lawrence Berkeley Lab, 2011.
2. *Distributed Sensing, Perception, and Applications on Mobile Devices*. Texas Instruments R&D Center, 2011.
3. *Distributed Sensing and Perception via Sparse Representation*. UT Austin, ECE Department, 2011.
4. *Distributed Sensing and Perception via Sparse Representation*. Johns Hopkins University, Center for Imaging Sciences, 2011.
5. *Distributed Sensing and Perception via Sparse Representation*. Carnegie Mellon University, CS Department, 2010.
6. *Distributed Sensing and Perception via Sparse Representation*. UC Berkeley DSP Seminar, 2010.
7. *Distributed Sensing and Perception via Sparse Representation*. UC Merced, Engineering College, 2010.
8. *WARD 2.0: Building a comprehensive human activity database for muscular dystrophy patients via body sensors and mobile cameras*. Wireless Healthcare Workshop, 2010.
9. *Towards Compressive Geospatial Sensing via Fusion of LIDAR and Hyperspectral Imaging*. DARPA GRID Workshop, 2010.
10. *Distributed Sensing and Perception via Sparse Representation*. Qualcomm Research Center Seminar, 2010.

## PATENTS

1. **Recognition via High-Dimensional Data Classification** (US patent application No. 61/025,039; International patent application pending).  
University of Illinois, Urbana, IL.  
Website: [http://www.eecs.berkeley.edu/~yang/software/face\\_recognition](http://www.eecs.berkeley.edu/~yang/software/face_recognition)
2. **Improved System for Recognition of Human Actions**. (US patent application No. 61/119,861)  
University of California, Berkeley, CA.  
Website: <http://www.eecs.berkeley.edu/~yang/software/WAR/index.html>
3. **Interface for Robot Motion Control** (US patent application No. 11/296,174).  
Honda Research USA, Mountain View, CA.  
Website: <http://perception.csl.uiuc.edu/demos/RoboTalk>

## PUBLICATIONS

### Books / Chapters

1. Arvind Ganesh, Andrew Wagner, John Wright, **Allen Yang**, Zihan Zou, and Yi Ma. *Face recognition by sparse representation*. (accepted) *Compressed Sensing: Theory and Applications*, Cambridge University Press, 2011.
2. **Allen Yang**, Subhransu Maji, Mario Christoudias, Trevor Darrell, Jitendra Malik, and Shankar Sastry. *Multiple-view object recognition in smart camera networks*. *Distributed Video Sensor Networks*, Springer, 2010.
3. **Allen Yang**. *Estimation of Subspace Arrangements: Its Algebra and Statistics*. VDM Verlag, Germany, 2009. (**Google: 3 citations**)

### Journals (Refereed)

1. **Allen Yang**, Parvez Ahammad, Lung-Chung Chang, Phoebus Chen, Kirak Hong, Leon Lin, Edgar Lobaton, Nikhil Naikal, Songhwei Oh, Simon Wang, Posu Yan, Doug Tygar, and Shankar Sastry. *A low-bandwidth camera sensor*

- platform with applications in smart camera networks*. ACM Transactions on Sensor Networks, 2012.
2. Hossein Mobahi, Shankar Rao, **Allen Yang**, Shankar Sastry, and Yi Ma. *Natural image segmentation with adaptive texture and boundary encoding*. International Journal of Computer Vision, 2011.
  3. **Allen Yang**, Michael Gastpar, Ruzena Bajcsy, and Shankar Sastry. *Distributed sensor perception via sparse representation*. Proceedings of the IEEE: Special Issue on Applications of Sparse Representation and Compressive Sensing, 2010. (**Google: 8 citations**)
  4. Shankar Rao, **Allen Yang**, Shankar Sastry, and Yi Ma. *Robust algebraic segmentation of mixed rigid-body and planar motions*. International Journal of Computer Vision (IJCV), 2010. (**Google: 8 citations**)
  5. Eric Guenterberg, **Allen Yang**, Roozbeh Jafari, Rezena Bajcsy, and Shankar Sastry. *A lightweight and real-time fine-grained signal annotation technique based on Markov models in body sensor networks*. IEEE Transactions on Information Technology in BioMedicine, 2009.
  6. **Allen Yang**, Roozbeh Jafari, Shankar Sastry, and Ruzena Bajcsy. *Distributed recognition of human actions using wearable motion sensor networks*. Journal of Ambient Intelligence and Smart Environments (JAISE), 2009. (**Google: 21 citations**)
  7. John Wright, **Allen Yang**, Arvind Ganesh, Shankar Sastry, and Yi Ma. *Robust face recognition via sparse representation*. IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI), 2009. (**Google: 618 citations. Top 100 IEEE Download, June, 2010.**)
  8. **Allen Yang**, John Wright, Yi Ma, and Shankar Sastry. *Unsupervised segmentation of natural images via lossy data compression*. Computer Vision and Image Understanding (CVIU), 2008. (**Google: 69 citations**)
  9. Yi Ma, **Allen Yang**, Harm Derksen, and Robert Fossum. *Estimation of subspace arrangements with applications in modeling and segmenting mixed data*. SIAM Review, 2008. (**Google: 58 citations**)
  10. **Allen Yang**, Shankar Rao, Kun Huang, Wei Hong, and Yi Ma. *Symmetry-based 3-D reconstruction from perspective images*. Computer Vision and Image Understanding (CVIU), 2005. (**Google: 20 citations**)
  11. Wei Hong, **Allen Yang**, and Yi Ma. *On symmetry and multiple-view geometry: structure, pose, and calibration from a single image*. International Journal of Computer Vision (IJCV), 2004. (**Google: 33 citations**)

#### Journals / Books in Progress

1. **Allen Yang**, Arvind Ganesh, Zihan Zhou, S. Shankar Sastry, and Yi Ma. *Fast  $\ell^1$ -minimization algorithms for robust face recognition*. Preprint, 2011.

#### Conferences (Refereed)

- Computer Vision
  1. Chris Slaughter, **Allen Yang**, Justin Bagwell, Costa Checkles, Luis Sentis, Sriram Vishwanath. *Sparse online low-rank projection and outlier rejection (SOLO) for 3-D rigid-body motion registration*. International Conference on Robotics and Automation (ICRA), 2012.
  2. Hossein Mobahi, Zihan Zhou, **Allen Yang**, and Yi Ma. *Holistic 3D reconstruction of urban structures from low-rank textures*. ICCV Workshop on 3D Representation and Recognition, 2011.

3. Nikhil Naikal, **Allen Yang**, Shankar Sastry. *Towards an efficient distributed object recognition system in wireless smart camera networks*. International Conference on Information Fusion (FUSION), 2010. (**oral presentation, best student paper award honorable mention. Google: 1 citation**)
  4. Shankar Rao, Hossein Mobahi, **Allen Yang**, Shankar Sastry, and Yi Ma. *Natural image segmentation with adaptive texture and boundary encoding*. Asian Conference on Computer Vision (ACCV), 2009. (**oral presentation, best student paper award. Google: 19 citations**)
  5. **Allen Yang**, Subhransu Maji, Mario Christoudias, Trevor Darrell, Jitendra Malik, and Shankar Sastry. *Multiple-view object recognition in band-limited distributed camera networks*. International Conference on Distributed Smart Cameras (ICDSC), 2009. (**oral presentation. Google: 9 citations**)
  6. **Allen Yang**, Subhransu Maji, Kirak Hong, Posu Yan, and Shankar Sastry. *Distributed compression and fusion of nonnegative sparse signals for multiple-view object recognition*. International Conference on Information Fusion (FUSION), 2009. (**oral presentation. best paper award. Google: 4 citations**)
  7. Shankar Rao, **Allen Yang**, Andrew Wagner, and Yi Ma. *Segmentation of hybrid motions via hybrid quadratic surface analysis*. International Conference on Computer Vision (ICCV), 2005. (**oral presentation. Google: 6 citations**)
  8. **Allen Yang**, Shankar Rao, Andrew Wagner, and Yi Ma. *Segmentation of a piece-wise planar scene from perspective images*. International Conference on Computer Vision and Pattern Recognition (CVPR), 2005. (**Google: 8 citations**)
  9. Kun Huang, **Allen Yang**, and Yi Ma. *Sparse representation of images with hybrid linear models*. International Conference on Image Processing (ICIP), 2004. (**Google: 18 citations**)
  10. Kun Huang, **Allen Yang**, Wei Hong, and Yi Ma. *Large-baseline matching and reconstruction from symmetry cells*. International Conference on Robotics and Automation (ICRA), 2004. (**Google: 7 citations**)
  11. **Allen Yang**, Shankar Rao, Kun Huang, Wei Hong, and Yi Ma. *Geometric segmentation of perspective images based on symmetry groups*. International Conference on Computer Vision (ICCV), 2003. (**Google: 19 citations**)
  12. **Allen Yang**, Wei Hong, and Yi Ma. *Structure and pose from single images of symmetric objects with applications to robot navigation*. International Conference on Robotics and Automation (ICRA), 2003. (**Google: 9 citations**)
  13. Yi Ma, Kun Huang, and **Allen Yang**. *Classification of rank conditions for multiple views of dynamic scenes*. Workshop on Dynamic Scenes, European Conference on Computer Vision (ECCV), 2002.
- Pattern Analysis
    14. **Allen Yang**, Zihan Zhou, Yi Ma, and Shankar Sastry. *Towards a robust face recognition system using compressive sensing*. InterSpeech, 2010. (**oral presentation. Google: 1 citation**)
    15. **Allen Yang**, Roozbeh Jafari, Philip Kuryloski, Sameer Iyengar, Shankar Sastry, and Ruzena Bajcsy. *Distributed segmentation and classification*

*of human actions using a wearable sensor network*. Workshop on Human Communicative Behavior Analysis, International Conference on Computer Vision and Pattern Recognition (CVPR), 2008. **(oral presentation. Google: 9 citations)**

16. Shankar Rao, Harm Derksen, Robert Fossum, Yi Ma, Andrew Wagner, and **Allen Yang**. *The algebra and statistics of Generalized Principal Component Analysis*. SPIE conference on Visual Communications and Image Processing (VCIP), 2007. **(oral presentation)**
17. **Allen Yang**, Shankar Rao, and Yi Ma. *Robust statistical estimation and segmentation of multiple subspaces*. Workshop on 25 Years of RANSAC, International Conference on Computer Vision and Pattern Recognition (CVPR), 2006. **(oral presentation. Google: 26 citations)**
18. **Allen Yang**, Shankar Rao, Andrew Wagner, Robert Fossum, and Yi Ma. *Hilbert functions and applications to the estimation of subspace arrangements*. International Conference on Computer Vision (ICCV), 2005. **(Google: 8 citations)**
- Optimization
  19. Dheeraj Singaraju, Roberto Tron, Ehsan Elhamifar, **Allen Yang**, and Shankar Sastry. *On the Lagrangian biduality of sparsity minimization problems*. ICASSP, 2012.
  20. Nikhil Naikal, **Allen Yang**, and Shankar Sastry. *Informative feature selection for object recognition via Sparse PCA*. International Conference on Computer Vision (ICCV), 2011. **(most remembered poster award)**
  21. **Allen Yang**, Arvind Ganesh, Yi Ma, and Shankar Sastry. *Fast  $\ell_1$ -minimization algorithms and an application in robust face recognition: A review*. International Conference on Image Processing (ICIP), 2010. **(oral presentation. Google: 18 citations)**
- Systems
  22. Philip Kuryloski, Annarita Giani, Roberta Giannantonio, Katherine Gilani, Ville-Pekka Seppa, Edmund Seto, Raffaele Gravina, Victor Shia, Curtis Wang, Posu Yan, **Allen Yang**, Jari Hyttinen, Shankar Sastry, Stephen Wicker, and Ruzena Bajcsy. *DexterNet: An open platform for heterogeneous body sensor networks and its applications*. Body Sensor Networks Workshop (BSN), 2009. **(Google: 21 citation)**
  23. Phoebus Chen, Parvez Ahammad, Colby Boyer, Shih-I Huang, Leon Lin, Edgar Lobaton, Marci Meingast, Songhwai Oh, Simon Wang, Posu Yan, **Allen Yang**, Chuohao Yeo, Lung-Chung Chang, Doug Tygar, and Shankar Sastry. *CITRIC: A low-bandwidth wireless camera network platform*. International Conference on Distributed Smart Cameras (ICDSC), 2008. **(oral presentation. Google: 70 citations)**
  24. **Allen Yang**, Hector Gonzalez-Banos, Victor Ng-Thow-Hing, and James Davis. *RoboTalk: controlling arms, bases and androids through a single motion interface*. International Conference on Advanced Robotics (ICAR), 2005. **(oral presentation. Google: 3 citations)**

### Invited Papers

1. Victor Shia, **Allen Yang**, and Shankar Sastry. *Fast  $\ell_1$ -minimization and algorithm parallelization for face recognition*. Asilomar Conference on Signals, Systems, and Computers, 2011.

2. Dheeraj Singaraju, Roberto Tron, Ehsan Elhamifar, **Allen Yang**, and Shankar Sastry. *Lagrangian biduality of the  $\ell_0$  and  $\ell_1$ -minimization problems*. Signal Processing with Adaptive Sparse Structured Representations Workshop, 2011.
3. Edmund Seto, Eladio Martin, **Allen Yang**, Posu Yan, Raffaele Gravina, Lrving Lin, Curtis Wang, Michael Roy, Victor Shia, and Ruzena Bajcsy. *Opportunistic strategies for lightweight signal processing for body sensor networks*. Pervasive Technologies Related to Assistive Environments, 2010.
4. **Allen Yang**, Philip Kuryloski, and Ruzena Bajcsy. *WARD: A wearable action recognition database*. CHI Workshop on Developing Shared Home Behavior Datasets, 2009.
5. Edmund Seto, Annarita Giani, Victor Shia, Curtis Wang, Posu Yan, **Allen Yang**, Michael Jerret, and Ruzena Bajcsy. *A wireless body sensor network for the prevention and management of asthma*. IEEE Symposium on Industrial Embedded Systems, 2009.