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Education UNIVERSITY OF CALIFORNIA, BERKELEY Berkeley, CA
M.S. in Electrical Engineering and Computer Sciences, 1997.
Ph.D. in Electrical Engineering and Computer Sciences, 2000.
Dissertation: *Image Segmentation and Shape Matching for Object Recognition*
Advisor: Jitendra Malik.

CALIFORNIA INSTITUTE OF TECHNOLOGY Pasadena, CA
B.S. in Electrical Engineering with Honor, 1995

Research Experience

UNIVERSITY OF CALIFORNIA, SAN DIEGO La Jolla, CA
July 2007–present
Associate Professor, Department of Computer Science and Engineering.

CARCODE CORPORATION Del Mar, CA
March 2007–present
Co-founder and Technical Advisor.

UNIVERSITY OF CALIFORNIA, SAN DIEGO La Jolla, CA
July 2001–June 2007
Assistant Professor, Department of Computer Science and Engineering.

UNIVERSITY OF CALIFORNIA, BERKELEY Berkeley, CA
August 1995–December 2000
Graduate Student Researcher, Department of Electrical Engineering and Computer Sciences.

DIGITAL PERSONA, INC. Redwood City, CA
June 1993–present
Co-founder and Chief Researcher. Currently member of Technical Advisory Board.

CALIFORNIA INSTITUTE OF TECHNOLOGY Pasadena, CA
Summer 1993 & 1994
Summer Undergraduate Research Fellow (SURF), Department of Electrical Engineering.

CORNELL UNIVERSITY Ithaca, NY
Summer 1992
NSF-REU Research Assistant, Department of Electrical Engineering.

Teaching Experience

UNIVERSITY OF CALIFORNIA, SAN DIEGO La Jolla, CA
CSE252, *Computer Vision*, Spring 2002-2003
CSE190A, *Projects in Vision & Learning*, Winter 2006-present
CSE166, *Image Processing*, Winter 2002, Fall 2002-present
CSE252C, *Topics in Vision & Learning*, Fall 2001-present
CSE252B, *Computer Vision II*, Spring 2004-present.

COGS87, Freshman Seminar: *Computation, Vision and Cognition in Film*, Winter 2006.
ENG100L, *Teams in Engineering Service*, Winter 2007-present.

UNIVERSIDADE ESTADUAL DE CAMPINAS (UNICAMP) Campinas, Brazil
Short Course on *Grouping and Recognition*, Summer 2005.

UNIVERSITY OF CALIFORNIA, BERKELEY Berkeley, CA
CS188, *Introduction to Artificial Intelligence*, Fall 1998: Graduate Student Instructor

CALIFORNIA INSTITUTE OF TECHNOLOGY Pasadena, CA
EE32ab, *Signals and Systems*, 1994-1995: Teaching Assistant
EE1, *Introduction to Electrical Engineering*, 1995: Teaching Assistant

Honors

Intel Outstanding Senior Scholarship, 1991.
Robert J. Kieckhefer, Jr. Memorial Scholarship, 1992 & 1993.
NSF Research Experiences for Undergraduates (REU) Program, 1992.
Carl and Shirley Larson SURF Fellow, 1993 & 1994.
NSF Incentives for Excellence Scholarship Prize, 1994.
Caltech Merit Award, 1994-1995.
NSF Graduate Research Fellowship, 1996-1999.
U.C. Berkeley Chancellor's Opportunity Predoctoral Fellowship, 1995-1998.
T-Sector Magazine's Ten Top Talents for the Future of San Diego Technology, 2003.
Hellman Faculty Fellow, 2003-2004.
MIT Technology Review TR100 (top 100 innovators under the age of 35), 2004.
NSF CAREER Award, 2005-2010.
Alfred P. Sloan Research Fellow, 2005-2007.
NAE Frontiers of Engineering participant, 2005.
DARPA Computer Science Futures participant, 2007.

Professional Activities

Reviewer: IEEE Transactions on Pattern Analysis and Machine Intelligence, IEEE Transactions on Image Processing, IEEE Conference on Computer Vision and Pattern Recognition, IEEE International Conference on Computer Vision, European Conference on Computer Vision, Neural Information Processing Systems, Journal of Image and Vision Computing, Journal of Machine Learning Research, ACM Transactions on Graphics, SIGGRAPH.

Local Arrangements Chair: IEEE Conference on Computer Vision and Pattern Recognition, 2005.

Area Chair: IEEE Conference on Computer Vision and Pattern Recognition, 2006, 2007.

Program Committee: European Conference on Computer Vision, 2002, 2004; IEEE Conference on Computer Vision and Pattern Recognition, 2003, 2004; IEEE International Conference on Computer Vision, 2003; IEEE International Workshop on Dynamical Vision, 2005.

NSF Panels: Robotics and Human Augmentation (RHA), 2002; Small Business Innovation Research (SBIR), 2002.

Contributor to *Revealing Bodies* exhibit, Exploratorium, San Francisco, Mar.–Sept. 2000.

IEEE Member, 1993–present.

University Activity: Colloquium and Distinguished Lecture Series Committee, 2001-2003; Graduate Admissions Committee, 2001-2003, 2004-2007; Faculty Recruiting Committee, 2005-2006; CSE New Building Committee, 2003-2004.

Invited Seminars

“Recognizing Spoken Words from Lip Movement,” Linköping University, Sweden, June 1995.

“The Normalized Cuts Approach to Grouping,” Caltech, Mar. 1998.

“Matching Shapes,” UCSD, Feb. 2001; U.C. Santa Cruz, Mar. 2001; Michigan State University, Mar. 2001; UCLA, Apr. 2001.

“Shape Matching and Image Segmentation,” U.C. Irvine, Feb. 2002, LLNL, June 2002.

“Three Brown Mice: See How They Run – Monitoring Rodent Behavior in the Smart Vivarium,” Naval Research Laboratory, Washington DC, Nov. 2003; LLNL, Jan. 2004; Columbia University, Feb. 2004; New York University, Feb. 2004.

“Smart Vivarium for Medical Research,” UCSD Jacobs School Research Review Keynote Lecture, Feb. 2004.

“Methods for Shape Matching and Motion Segmentation,” Max Planck Institute, Tübingen, Germany, May 2004.

“Monitoring Animal Behavior in the Smart Vivarium,” UCLA, Sept. 2004; Caltech, Nov. 2004.

“Behavior Recognition via Spatio-Temporal Features,” LLNL, Nov. 2004.

“Beyond Pairwise Clustering,” U.C. Irvine, March 2005; Johns Hopkins University, May 2005; Instituto de Matemática Pura e Aplicada (IMPA), Rio de Janeiro, July 2005; U.v. Amsterdam, August 2005; T.U. Delft, August 2005; University of São Paulo, São Carlos, August 2005; Columbia University, September 2005.

“Toward a Perceptual Space for Reflectance,” Caltech March 2006, UCLA April 2006, Microsoft Research (Redmond) July 2006, U. Washington July 2006, UBC July 2006.

“Assistive Vision Technology for the Blind: Recognizing Objects in the Grocery Store,” UC Riverside April 2007.

Grants

Computationally Efficient Example-Based Image Segmentation, DOE, 2002-2003, \$39,494.

Automated Tissue Microarray Analysis, Hellman Fellowship Program, 2003-2004, \$20,000.

Feature-Based Approaches for Long-Range Motion Segmentation and Object Tracking, DOE, 2003-2004, \$40,121.

Multiple Animal Tracking in the Smart Vivarium, DOE, 2004, \$30,500.

A Regularization Based Approach to Non-Rigid Structure from Motion, DOE, 2004-2005, \$30,000.

CAREER: Algorithms for Nonrigid Structure from Motion, NSF, 2005-2010, \$400,000.

Alfred P. Sloan Research Fellowship, 2005-2007, \$45,000.

IGERT: Vision and Learning in Humans and Machines, NSF, 2003-2008, \$3,400,000 (senior personnel).

Vision-based Object Detection/Recognition for Mobile Robots, SPAWAR, 2006, \$36,000.

NSF Research Experience for Undergraduates (REU) supplement, 2006-2007, \$12,000.

IGERT: Machine Perception for Assistive Technology, NSF, 2007-2013 (pending).

Journal Articles

J. Malik, S. Belongie, T. Leung, and J. Shi, "Contour and Texture Analysis for Image Segmentation," *International Journal of Computer Vision (IJCV)*, **43**(1):7-27, June 2001.

S. Belongie, J. Malik, and J. Puzicha, "Shape Matching and Object Recognition Using Shape Contexts," *IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI)*, **24**(4):509-522, April 2002.

C. Carson, S. Belongie, H. Greenspan, and J. Malik, "Color- and Texture-Based Image Segmentation Using Expectation-Maximization and Its Application to Image Querying and Classification," *IEEE Trans. on Pattern Analysis and Machine Intelligence (PAMI)*, **24**(8), Aug. 2002.

S. Agarwal, R. Ramamoorthi, S. Belongie and H.W. Jensen, "Structured Importance Sampling of Environment Maps," *ACM Transactions on Graphics - Proceedings of SIGGRAPH*, **22**(3):605-612, July 2003.

Charless Fowlkes, Serge Belongie, Fan Chung and Jitendra Malik, "Spectral Grouping Using the Nyström Method," *IEEE Trans. on Pattern Analysis and Machine Intelligence (PAMI)*, **26**(2):214-225, Feb. 2004.

J. Carballido Gamio, S. Belongie and S. Majumdar, "Normalized Cuts in 3D for Spinal MRI Segmentation," *IEEE Transactions on Medical Imaging*, **23**(1):36-44, January 2004.

G. Mori, S. Belongie and J. Malik, "Efficient Shape Matching Using Shape Contexts," *IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI)*, **27**(11):1832-1837, November 2005.

A. Rabinovich, S. Krajewski, M. Krajewska, A. Shabaik, S.M. Hewitt, S. Belongie, J.C. Reed, J.H. Price, "Automated Scanning and Display of Tissue Microarrays," *IEEE Transactions on Information Technology in Biomedicine*, **10**(12):209-219, April 2006.

J. Wills, S. Agarwal and S. Belongie, "A Feature-based Approach for Dense Segmentation and Estimation of Large Disparity Motion," to appear, *International Journal of Computer Vision (IJCV)*, **68**(2):125-143, June 2006.

Papers in Reviewed Proceedings

H. Greenspan, S. Belongie, P. Perona, R. Goodman, S. Rakshit and C. H. Anderson, "Overcomplete Steerable Pyramid Filters and Rotation Invariance," *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 1994, pp. 222-228.

H. Greenspan, S. Belongie, P. Perona and R. Goodman, "Rotation Invariant Texture Recognition Using a Steerable Pyramid," *IEEE International Conference on Pattern Recognition (ICPR)*, 1994, pp. 162-167, vol 2.

J. Malik, D. Forsyth, M. Fleck, H. Greenspan, T. Leung, C. Carson, S. Belongie, and C. Bregler, "Finding Objects in Image Databases by Grouping," *International Conference on Image Processing (ICIP)*, special session on "Images in Digital Libraries," 1996.

D. Forsyth, J. Malik, M. Fleck, H. Greenspan, T. Leung, S. Belongie, C. Carson, and C. Bregler, "Finding Pictures of Objects in Large Collections of Images," *International Workshop on Object Representation in Computer Vision*, 1996, pp. 761-764, vol.2.

C. Carson, S. Belongie, H. Greenspan and J. Malik, "Region-Based Image Querying," *IEEE Workshop on Content-based Access of Image and Video Libraries*, 1997, pp. 42-49.

- S. Belongie, C. Carson, H. Greenspan, and J. Malik, "Color- and Texture-based Image Segmentation Using the Expectation-Maximization Algorithm and Its Application to Content-Based Image Retrieval," *International Conference on Computer Vision (ICCV)*, 1998, pp. 675-682.
- S. Belongie and J. Malik, "Finding Boundaries in Natural Images: A New Method Using Point Descriptors and Area Completion," *European Conference on Computer Vision (ECCV)*, 1998, pp. 751-766, vol.1.
- J. Shi, S. Belongie, T. Leung and J. Malik, "Image and Video Segmentation: The Normalized Cut Framework," *International Conference on Image Processing (ICIP)*, 1998, pp. 943-947, vol.1.
- C. Carson, M. Thomas, S. Belongie, J.M. Hellerstein, and J. Malik, "Blobworld: A system for region-based image indexing and retrieval," *Third International Conference on Visual Information Systems (VISUAL)*, 1999, pp. 509-516.
- J. Malik, J. Shi, S. Belongie, and T. Leung, "Grouping in the Normalized Cut Framework," D.A. Forsyth et al. (Eds.): *Shape, Contour and Grouping in Computer Vision*, Springer Verlag LNCS 1681, pp. 155-164, 1999.
- J. Malik, S. Belongie, J. Shi and T. Leung, "Textons, Contours and Regions: Cue Combination in Image Segmentation," *International Conference on Computer Vision (ICCV)*, 1999, pp. 918-925, vol.2.
- J. Puzicha and S. Belongie, "Model-based Halftoning for Color Image Segmentation," *International Conference on Pattern Recognition, (ICPR)* 2000, pp. 629-632, vol.3.
- S. Belongie and J. Malik, "Matching with Shape Contexts," *IEEE Workshop on Content-based Access of Image and Video Libraries*, 2000, pp. 20-26.
- S. Belongie, J. Malik, and J. Puzicha, "Shape Context: A new descriptor for shape matching and object recognition," *Advances in Neural Information Processing Systems (NIPS)* 13, 2000, pp. 831-837.
- S. Belongie, J. Malik, and J. Puzicha, "Matching Shapes," *International Conference on Computer Vision (ICCV)*, 2001, pp. 454-461 vol.1.
- C. Fowlkes, S. Belongie, and J. Malik, "Efficient Spatiotemporal Grouping Using the Nyström Method," *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2001, pp. 231-238, vol.1.
- G. Mori, S. Belongie, and J. Malik, "Shape Contexts Enable Efficient Retrieval of Similar Shapes," *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2001, pp. 723-730, vol. 1.
- C. Fowlkes, Q. Shan, S. Belongie, and J. Malik, "Extracting Global Structure from Gene Expression Profiles," *Critical Assessment of Microarray Data Analysis*, 2001.
- J. Carballido Gamio, S. Belongie and S. Majumdar, "Normalized Cuts for Spinal MRI Segmentation," *International Conference on Computer Assisted Radiology and Surgery*, 2002.
- S. Belongie, C. Fowlkes, F.R.K. Chung and J. Malik, "Spectral Partitioning with Indefinite Kernels using the Nyström Extension," *European Conference on Computer Vision (ECCV)*, 2002, pp. 21-31, vol.2.
- G. Donato and S. Belongie, "Approximate Thin Plate Spline Mappings," *European Conference on Computer Vision (ECCV)*, 2002, pp. 531-542, vol.2.

- S. Agarwal and S. Belongie, "On the Non-Optimality of Four Color Coding of Image Partitions," *International Conference on Image Processing (ICIP)*, 2002, pp. 677-680, vol. 2.
- J. Wills, S. Agarwal and S. Belongie, "What Went Where," *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2003, pp. 37-44, vol. 1.
- A. Rabinovich, S. Agarwal, C. Laris, J. Price and S. Belongie, "Unsupervised Color Decomposition of Histologically Stained Tissue Samples," *Advances in Neural Information Processing Systems (NIPS)* 16, 2003.
- K. Branson, V. Rabaud and S. Belongie, "Three Brown Mice: See How They Run," *Joint International Workshop on Visual Surveillance and Performance Evaluation of Tracking and Surveillance (VS-PETS)*, 2003, pp. 78-85.
- S. Agarwal, S. Mallick, D. Kriegman and S. Belongie, "On Refractive Optical Flow," *European Conference on Computer Vision (ECCV)*, 2004, pp. 483-494, vol. 2.
- J. Wills and S. Belongie, "A feature based method for determining dense long range correspondences," *European Conference on Computer Vision (ECCV)*, 2004, pp. 170-182, vol. 3.
- S. Belongie and J. Wills, "Structure from Periodic Motion," *International Workshop on Spatial Coherence for Visual Motion Analysis*, 2004.
- S. Agarwal, J. Lim, L. Zelnik-Manor, P. Perona, D. Kriegman and S. Belongie, "Beyond Pairwise Clustering," to appear, *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2005.
- K. Branson and S. Belongie, "Tracking Multiple Mouse Contours (without Too Many Samples)," to appear, *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2005.
- V. Rabaud and S. Belongie, "Big Little Icons," to appear in *IEEE Workshop on Computer Vision Applications for the Visually Impaired*, 2005.
- S. Kumar, M. Biswas, S. Belongie and T. Nguyen, "Spatio-temporal texture synthesis and image inpainting for video applications," to appear in *International Conference on Image Processing (ICIP)*, 2005.
- S. Belongie, K. Branson, P. Dollár, and V. Rabaud, "Monitoring Animal Behavior in the Smart Vivarium," *International Conference on Methods and Techniques in Behavioral Research*, 2005.
- I. Laptev, S. Belongie, P. Pérez and J. Wills, "Periodic Motion Detection and Segmentation via Approximate Sequence Alignment," *International Conference on Computer Vision (ICCV)*, 2005, pp. 816-823, vol. 1.
- P. Dollár, V. Rabaud, G. Cottrell and S. Belongie, "Behavior Recognition via Sparse Spatio-Temporal Features," *Joint International Workshop on Visual Surveillance and Performance Evaluation of Tracking and Surveillance*, 2005.
- S. Agarwal, M. Chandraker, F. Kahl, D. Kriegman and S. Belongie, "Practical Global Optimization for Multiview Geometry," to appear, *European Conference on Computer Vision (ECCV)*, 2006.
- S.P. Mallick, S. Agarwal, B. Carragher, C. Potter, S. Belongie, and D. Kriegman. "Structure and view estimation for tomographic reconstruction: A Bayesian approach," *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2006.

- A. Rabinovich, T. Lange, J. Buhmann and S. Belongie, "Model Order Selection and Cue Combination for Image Segmentation," *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2006.
- P. Dollár, Z. Tu and S. Belongie, "Learning Edges from Low-level, Mid-level and Context Information," *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2006.
- V. Rabaud and S. Belongie, "Motion Segmentation for Crowded Moving Objects," *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2006.
- S. Agarwal, K. Branson and S. Belongie, "Higher Order Learning with Graphs," *International Conference on Machine Learning (ICML)*, 2006.
- B. Ochoa and S. Belongie, "Covariance Propagation for Guided Matching," *International Workshop on Statistical Methods in Multi-Image and Video Processing*, 2006.
- N. Ben-Haim, B. Babenko and S. Belongie, "Improving Web-based Image Search via Content Based Clustering," *International Workshop on Semantic Learning Applications in Multimedia*, 2006.
- R. Hewitt and S. Belongie, "Active Learning in Face Recognition: Using Tracking to Build a Face Model," *IEEE Workshop on Vision for Human Computer Interaction*, 2006.
- P. Dollár, V. Rabaud and S. Belongie, "Learning to Traverse Image Manifolds," *Advances in Neural Information Processing Systems (NIPS)* 19, 2006.
- S. Agarwal, J. Wills, L. Cayton, G. Lanckriet, D. Kriegman and S. Belongie, "Generalized Non-metric Multidimensional Scaling," *International Conference on Artificial Intelligence and Statistics (AISTATS)*, 2007.
- P. Dollár, Z. Tu, H. Tao and S. Belongie, "Feature Mining for Image Classification," *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2007.
- M. Merler, C. Galleguillos and S. Belongie, "Recognizing Groceries in situ Using in vitro Training Data," *IEEE Workshop on Semantic Learning Applications of Multimedia (SLAM)*, 2007.
- P. Dollár, V. Rabaud and S. Belongie, "Non-Isometric Manifold Learning: Analysis and an Algorithm," *International Conference on Machine Learning (ICML)*, 2007.
- B. Babenko, P. Dollár and S. Belongie, "Task Specific Local Region Matching," to appear, *International Conference on Computer Vision (ICCV)*, 2007.
- M. Chandraker, S. Agarwal, D. Kriegman and S. Belongie, "Globally Convergent Algorithms for Affine and Metric Upgrades in Stratified Autocalibration," to appear, *International Conference on Computer Vision (ICCV)*, 2007.
- A. Rabinovich, A. Vedaldi, C. Galleguillos, E. Wiewiora and S. Belongie, "Objects in Context," to appear, *International Conference on Computer Vision (ICCV)*, 2007.
- S. Steinbach, V. Rabaud and S. Belongie, "Soylent Grid: it's Made of People!" to appear, *International Workshop on Interactive Computer Vision*, 2007.

Book Chapters

- B.S. Manjunath, Y. Deng, D.A. Forsyth, C. Carson, S. Ioffe, S. Belongie, J. Malik, W.-Y. Ma, "Image retrieval in digital libraries," in *Multimedia: Standards, Systems and Networks*, A. Puri and T. Chen editors, Marcel Dekker, 1999.

J. Malik, S. Belongie, T. Leung, and J. Shi, "Contour and Texture Analysis for Image Segmentation," in *Perceptual Organization for Artificial Vision Systems*, K.L. Boyer and S. Sarkar, editors. Kluwer Academic Publishers, 2000.

C. Fowlkes, Q. Shan, S. Belongie, and J. Malik, "Extracting Global Structure from Gene Expression Profiles," in *Methods of Microarray Data Analysis II*, S. M. Lin and K. F. Johnson, editors. Kluwer Academic Publishers, 2002.

S. Belongie, G. Mori and J. Malik, "Matching with Shape Contexts," to appear in *Analysis and Statistics of Shapes*, A. Yezzi and A.H. Krim, editors. Birkhäuser Verlag, 2006.

Video

M. Maschion, V. Rabaud and S. Belongie, *Computer Vision: Fact and Fiction*, Instructional DVD, 2005.

Patents

H. Greenspan and S. Belongie, "DFT encoding of oriented filter responses for rotation invariance and orientation estimation in digitized images," Patent US5956427, 1999.

S. Belongie and V. Bjorn, "Fingerprint detection apparatus with partial fingerprint images," Patent US6097035, 2000.

V. Bjorn and S. Belongie, "Fingerprint recognition system," Patent US6125192, 2000.

V. Bjorn and S. Belongie, "Configurable multi-function touchpad device," Patent US6950539, 2005.

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