

Margrit Betke

Curriculum Vitae, February 2022
<http://www.cs.bu.edu/faculty/betke>

Margrit Betke is a Professor of Computer Science at Boston University. She co-leads the BU Artificial Intelligence (AI) Research Initiative and the Image and Video Computing and AI-Emerging Media (AIEM) Research Groups. Her focus is integrative research in AI, computer vision, and human computer interaction that benefits other fields, including social, health, and natural sciences, and the arts.

PROFESSIONAL PREPARATION

Massachusetts Institute of Technology, Cambridge, MA

Ph.D. in Electrical Engineering and Computer Science, June 1995
S.M. in Electrical Engineering and Computer Science, February 1992
Theses Advisor: Professor Ronald L. Rivest, Turing Award Winner

Bonn University, Germany

Vordiplom in Computer Science and Operations Research, September 1988

ACADEMIC APPOINTMENTS

Boston University

Professor, Department of Computer Science	<i>2011–present</i>
Professor, Faculty of Computing & Data Sciences,	<i>2020– present</i>
Affiliated Professor, Department of Biomedical Engineering	<i>2016–present</i>
Affiliated Professor, Department of Electrical and Computer Engineering	<i>2015–present</i>
Director of MS in AI Program, Department of Computer Science	<i>2019–2021</i>
Director of Graduate Studies, Department of Computer Science	<i>2014–2020</i>
Associate Chair, Department of Computer Science	<i>2009–2012</i>
Director of Undergraduate Studies, Department of Computer Science	<i>2004–2006, 2007–2008</i>
Associate Professor, Department of Computer Science	<i>2004–2011</i>
Assistant Professor, Department of Computer Science	<i>2000–2004</i>

Harvard Medical School and Massachusetts General Hospital

Research Scientist *1999–2007*

Boston College

Assistant Professor, Computer Science Department *1997–2000*

University of Maryland

Postdoctoral Research Associate, Institute for Advanced Computer Studies *1995–1997*

HONORS AND AWARDS

Data Science Fellow, Award by Boston University Provost, 2019–2022.

2021 Best Paper Award for “HGaze Typing: Head-Gesture Assisted Gaze Typing” at ETRA ’21
Full Papers: ACM Symposium on Eye Tracking Research and Applications. May 2021.

Women Leaders in Higher Education (HERS), Leadership Institute Award, Wellesley Class of 2018.

2018 ASAR Competition Award, presented by The 2nd IEEE International Workshop on Arabic and derived Script Analysis & Recognition (ASAR), held at The Alan Turing Institute, United Kingdom, March 12-14, 2018, to Saad, Elanwar, Abel Kader, Mashali, and Betke for winning the “Layout Analysis of Arabic Historical Manuscripts – Segmentation Challenge.”

2016 Best Paper Runner-up Award for “CrowdTrack: Interactive Tracking of Cells in Microscopy Image Sequences with Crowdsourcing Support” at the GroupSight Workshop at The Fourth AAI Conference on Human Computation and Crowdsourcing (HCOMP 2016), Austin, Texas, 2016.

2014 Best Paper Award for Innovative Idea for “How to use level set methods to accurately find boundaries of cells in biomedical images? Evaluation of six methods paired with automated and crowdsourced initial contours” at the MICCAI Workshop on Interactive Medical Image Computation (IMIC), 2014.

Outstanding Reviewer for the IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR), 2014.

Best Paper Award for “SAGE: An approach and implementation empowering quick and reliable quantitative analysis of segmentation quality” at the IEEE Workshop on Applications in Computer Vision (WACV), 2013.

ACM Senior Member since October 2012

IEEE Senior Member since September 2012

Top 10 Women to Watch in New England Award, one of two academic honorees, selected from more than 100 contenders in science and technology, Mass High Tech, February 2005

NSF CAREER Award (National Science Foundation Faculty Early Career Development) for “Video-Based Computer Interfaces for People with Severe Disabilities,” 2001–2006

Elected Member of the Sigma Xi Honor Society since 1995

Germanistic Society of America Scholarship, 1994–1995

Friedrich-Ebert-Stiftung Scholarship, 1987–1992

GRANTS

Principal Investigator:

Total funding as PI: ~ \$6.5 million.

DARPA: SBIR/STTR \$80,000

Principal Investigator of the subcontract to BU, D18C-006-0078, 1/1/19–10/31/19
“Visual Algorithms for Navigation and Guidance of UAVs with Autonomous Relational Decisions (VANGUARD)”

National Science Foundation: BIGDATA \$1,000,000

Principal Investigator, 09/15/18 – 09/14/22
“BIGDATA: IA: Multiplatform, Multilingual, and Multimodal Tools for Analyzing Public Communication in over 100 Language”

Google Research: Principal Investigator, AY 18/19 “Providing Real-time Content with Balanced Political Views”	\$88,301
National Science Foundation: Integration Principal Investigator, 09/01/16 – 08/30/20 “INT: Collaborative Research: Detecting, Predicting and Remediating Student Affect and Grit using Computer Vision.”	\$614,990
National Science Foundation: Robust Intelligence Principal Investigator, 08/01/14 – 07/31/18 “RI: Small: Using Humans in the Loop to Collect High-quality Annotations from Images and Time-lapse Videos of Cells.”	\$370,151
The Rafik B. Hariri Institute for Computing and Computational Science & Engineering, Boston University Principal Investigator, 6/12/2017–12/31/2018 “ExerciseCheck: Remote Monitoring and Evaluation Platform for Home Based Physical Therapy”	\$50,000
Adobe Research, Cambridge, MA Principal Investigator, AY 2016/2017 “Deep Learning of Motion Representations for Animation Movies”	\$8,100
National Science Foundation: Human-Centered Computing Principal Investigator, 10/01/13 – 09/30/16 “MRI Collaborative: Development of iRehab, an Intelligent Closed-Loop Instrument for Adaptive Rehabilitation.”	\$287,713 (\$200,109 plus \$85,604 cost share)
National Science Foundation: Human-Centered Computing Principal Investigator, 09/01/09 – 08/31/15 “HCC: Large: Intelligent Tracking Systems that Reason about Group Behavior.”	\$2,858,292
Naval Undersea Warfare Center, Division Newport Principal Investigator, 08/27/09 – 12/31/09 “Research in support of in-house laboratory independent research (ILIR) proposal for the investigation of image analysis methods for automating identification of objects for real-time large-area surveillance performed in naval environments by unmanned vehicles.”	\$10,000
National Science Foundation: Human-Centered Computing Principal Investigator, 09/15/07 – 09/14/10 “HCC: Intelligent Interfaces to Empower People with Disabilities to Participate in the Information Society.”	\$385,840
National Science Foundation Faculty Early Career Development Award Principal Investigator, 08/01/01 – 07/31/06 “CAREER: Video-Based Computer Interfaces for People with Severe Disabilities.”	\$412,734
MIT Lincoln Laboratory under US Air Force Prime Contract Principal Investigator, 09/01/05 – 12/31/05 “Detecting and Tracking People in Video Sequences.”	\$23,602

The Whitaker Foundation: Biomedical Engineering Research Grant Principal Investigator, 05/01/01 – 04/30/04 “Automated Detection of Pulmonary Nodules on Computed Tomography and Assessment of Change over Time.”	\$205,912
National Science Foundation: Major Research Instrumentation Program Principal Investigator, 09/15/1998 – 08/31/1999, “CISE Major Research Instrumentation: Research Laboratory for Computer Science.”	\$150,000

Co-Principal Investigator or Co-Investigator:

Total funding as Co-PI/I: ~ \$ 21.5 million.

Office of Naval Research: Defense University Research Instrumentation Program (DURIP) Co-Principal Investigator, 01/02/2021 – 07/31/2022 “Experiments with Brain Models for Mobile Robot Navigation”	\$497,047
The Rafik B. Hariri Institute for Computing and Computational Science & Engineering, Boston University Co-Principal Investigator, 9/23/2021–9/22/2023 “Therapy Calculator for Rehabilitation Outcomes after Acquired Brain Injury.”	\$24,935
Office of Naval Research: Multidisciplinary University Research Initiative (MURI) Co-Principal Investigator, 08/01/2019 – 07/31/2023 “ Neuro-Autonomy: Neuroscience-Inspired Perception, Navigation, and Spatial Awareness for Autonomous Robots.”	\$7,500,000
National Institutes of Health Co-Investigator, 7/27/2019–7/26/2021 “Mobile bedside ultrasound (mBSUS) for the diagnosis of pediatric pneumonia in resource limited settings.”	\$199,220
The Rafik B. Hariri Institute for Computing and Computational Science & Engineering, Boston University Co-Principal Investigator, 6/1/2019–6/11/2020 “Brain and Behavior Biomarkers of Recovery.”	\$35,000
National Institutes of Health Co-Investigator, 1/9/2018–8/31/2020 “Project SEARCH (Scanning EARs for Child Health).”	\$275,000
The Rafik B. Hariri Institute for Computing and Computational Science & Engineering, Boston University Co-Principal Investigator, 6/12/2017–6/11/2018 “IKEA: Product, Pricing, and Exchange Rate Pass-through.”	\$25,000
Office of Naval Research: Multidisciplinary University Research Initiative Co-Principal Investigator on Boston University subcontract to University of Washington 10/1/10 – 1/30/16. Subcontract award to BU: \$3,127,730 “AIRFOILS: Animal Inspired Robust Flight with Outer and Inner Loop Strategies.”	\$7,500,000

National Science Foundation: Division of Computer and Network Systems Co-Principal Investigator, 09/01/09 – 8/31/12 “II-EN: Infrastructure for Gesture Interface Research Outside the Lab.”	\$591,445
Air Force Office of Scientific Research Co-Principal Investigator, 04/15/09 – 04/14/10 “Acquisition of an Advanced Thermal Infrared Imaging System for Tracking Multiple Targets in Three Dimensions.”	\$523,050
Bat Conservation International Co-Principal Investigator, 05/01/09 – 04/30/10 “A novel BatCam for censusing maternity colonies of bats in regions affected by white-nose syndrome.”	\$5,000
US Fish and Wildlife: Illinois Natural History Survey Co-Principal Investigator, 09/01/07 – 12/31/08 “Effects of Topography and Weather in Vermont and Use of Appropriate Technology to Support Such Investigations.”	\$114,960
National Science Foundation: Information Technology Research Program Co-Principal Investigator, 10/01/03 – 09/30/08 “ITR: Advanced Imaging and Information Technology for Assessing the Ecological and Economic Impact of Brazilian Free-tailed Bats on Agroecosystems.”	\$2,400,000
National Science Foundation: Human Computer Interaction Program Co-Principal Investigator, 09/01/03 – 08/31/06 “Pattern Discovery in Signed Languages and Gestural Communications.”	\$774,096
National Science Foundation: Information and Data Management Program Co-Principal Investigator, 09/15/03 – 09/14/06 “Mining and Indexing Spatio-Temporal Patterns in Video Databases of Human Motion.”	\$494,580
National Science Foundation: Research Infrastructure Co-Principal Investigator, 09/01/02 – 08/31/07 “CISE Research Infrastructure: SENSORIUM: Research Infrastructure for Managing Spatio-Temporal Objects in Video Sensor Networks.”	\$1,247,395
Office of Naval Research: Defense University Research Instrumentation Program Co-Principal Investigator, 04/01/01 – 03/31/02 “DURIP: Lab Upgrade for Machine Vision Research and Research-Related Education.”	\$246,242

PUBLICATIONS

Peer-reviewed Book

- [B1] M. Betke and Z. Wu. Data Association for Multi-Object Visual Tracking. Morgan & Claypool Lecture Series on Computer Vision. 2016. 120 pages. pdf

Articles in Journals

- [J1] M. Betke, R. L. Rivest, and M. Singh. Piecemeal learning of an unknown environment. *Machine Learning*, 18(2/3):231–254, February/March 1995. pdf.
- [J2] M. Betke and L. Gurvits. Mobile robot localization using landmarks. *IEEE Transactions on Robotics and Automation*, 13(2):251–263, April 1997. pdf.
- [J3] B. Awerbuch, M. Betke, R. L. Rivest, and M. Singh. Piecemeal graph exploration by a mobile robot. *Information and Computation*, 152(2):155–172, August 1999. pdf.
- [J4] M. Betke, E. Haritaoglu, and L. S. Davis. Real-time multiple vehicle detection and tracking from a moving vehicle. *Machine Vision and Applications*, 12(2):69–83, September 2000. pdf.
- [J5] J. P. Ko and M. Betke. Chest CT: Automated nodule detection and assessment of change over time – preliminary experience. *Radiology*, 218(1):267–273, January 2001. pdf.
- [J6] M. Betke and N. C. Makris. Recognition, resolution and complexity of objects subject to affine transformation. *International Journal of Computer Vision*, 44(1):5–40, August 2001. pdf.
- [J7] M. Betke, J. Gips, and P. Fleming. The Camera Mouse: Visual tracking of body features to provide computer access for people with severe disabilities. *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, 10(1):1–10, March 2002. pdf.
- [J8] M. Betke, H. Hong, D. Thomas, C. Prince, and J. P. Ko. Landmark detection in the chest and registration of lung surfaces with an application to nodule registration. *Medical Image Analysis*, 7(3):265–281, September 2003. pdf.
- [J9] J. P. Ko, H. Rusinek, E. Jacobs, J. S. Babb, M. Betke, G. McGuinness, and D. P. Naidich. Volume measurement of small pulmonary nodules on chest CT: A phantom study. *Radiology*, 228(3):864–870, September 2003. pdf.
- [J10] K. Grauman, M. Betke, J. Lombardi, J. Gips, and G. R. Bradski. Communication via eye blinks and eyebrow raises: Video-based human-computer interfaces. *International Journal Universal Access in the Information Society*, 2(4):359–373, November 2003. pdf.
- [J11] D. P. Gierga, G. T. Y. Chen, J. H. Kung, M. Betke, J. Lombardi, and C. G. Willett. Quantification of respiration-induced abdominal tumor motion and the impact on IMRT dose distributions. *International Journal on Radiation Oncology - Biology - Physics*, 58(5):1584–1595, April 2004. pdf.
- [J12] W. Mullally, M. Betke, J. Wang, and J. Ko. Segmentation of nodules on chest computed tomography for growth assessment. *Medical Physics*, 31(4):839–848, April 2004. pdf.
- [J13] D. P. Gierga, J. Brewer, G. C. Sharp, M. Betke, C. G. Willett, and G. T. Y. Chen. The correlation between internal and external markers for abdominal tumors: Implications for respiratory gating. *International Journal on Radiation Oncology - Biology - Physics*, 61(5):1551–1558, April 2005. pdf.
- [J14] M. Betke, O. Gussyatin, and M. Urinson. SymbolDesign: A user-centered method to design pen-based interfaces and extend the functionality of pointer input devices. *Universal Access in the Information Society*, 4(3):223–236, March 2006. pdf.

- [J15] C. J. Cleveland, M. Betke, P. Federico, J. D. Frank, T. G. Hallam, J. Horn, J. D. López Jr., G. F. McCracken, R. A. Medellín, A. Moreno-Valdez, C. G. Sansone, J. K. Westbrook, and T. H. Kunz. Economic value of the pest control service provided by Brazilian free-tailed bats in south-central Texas. *Frontiers in Ecology and the Environment*, 4(5):238–248, June 2006. pdf.
- [J16] J. Wang, M. Betke, and J. P. Ko. Pulmonary fissure segmentation on CT. *Medical Image Analysis*, 10(4):530–547, August 2006. pdf.
- [J17] M. Gorman, A. Lahav, E. Saltzman, and M. Betke. A camera-based music making tool for physical rehabilitation. *Computer Music Journal*, 31(2):39–53, Summer 2007. pdf.
- [J18] P. J. McNerney, J. Konrad, and M. Betke. Block-based MAP disparity estimation under alpha channel constraints. *IEEE Transactions on Circuits and Systems for Video Technology*, 17(16):785–789, June 2007. pdf.
- [J19] M. Betke, D. E. Hirsh, N. C. Makris, G. F. McCracken, M. Procopio, N. I. Hristov, S. Tang, A. Bagchi, J. D. Reichard, J. W. Horn, S. Crampton, C. J. Cleveland, and T. H. Kunz. Thermal imaging reveals significantly smaller Brazilian free-tailed bat colonies than previously estimated. *Journal of Mammalogy*, 89(1):18–24, February 2008. pdf. Also discussed in *Nature*, 452, Research Highlights, p. 507, pdf.
- [J20] J. Wang, V. Athitsos, S. Sclaroff, and M. Betke. Detecting objects of variable shape structure with hidden state shape models. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 30(3):477–492, March 2008. pdf, videos.
- [J21] P. Federico, T. G. Hallam, G. F. McCracken, S. Purucker, W. Grant, A. N. Sandoval, J. Westbrook, R. Medellín, C. Cleveland, C. G. Sansone, J. D. López Jr., M. Betke, A. Moreno-Valdez, and T. H. Kunz. Brazilian free-tailed bats (*tadarida brasiliensis*) as insect pest regulators in transgenic and conventional cotton crops. *Ecological Applications*, 18(4):826–837, June 2008. pdf.
- [J22] N. I. Hristov, M. Betke, and T. H. Kunz. Applications of thermal infrared imaging for research in aeroecology. *Integrative and Comparative Biology*, 48(1):50–59, July 2008. pdf.
- [J23] J. J. Magee, M. Betke, J. Gips, M. R. Scott, and B. N. Waber. A human-computer interface using symmetry between eyes to detect gaze direction. *IEEE Transactions on Systems Man & Cybernetics Part A: Systems and Humans*, 38(6):1–14, November 2008. pdf, video.
- [J24] W. Mullally, M. Betke, M. Albert, and K. Lutchen. Explaining clustered ventilation defects via a minimal number of airway closure locations. *Annals of Biomedical Engineering*, 37(2):286–300, February 2009. pdf.
- [J25] N. I. Hristov, M. Betke, D. Hirsh, A. Bagchi, and T. H. Kunz. Seasonal variation in colony size of Brazilian free-tailed bats at Carlsbad Caverns using thermal imaging. *Journal of Mammalogy*, 91(1):183–192, February 2010. pdf.
- [J26] T. G. Hallam, A. Raghavan, H. Kolli, D. Dimitrov, P. Federico, H. Qi, G. F. McCracken, M. Betke, J. K. Westbrook, K. Kennard, and T. H. Kunz. Dense and sparse aggregations in complex motion: Video coupled with simulation modeling. *Ecological Complexity*, 7(1):69–75, March 2010. pdf, videos.

- [J27] D. H. Theriault, M. Walker, J. Y. Wong, and M. Betke. Cell morphology classification and clutter mitigation in phase-contrast microscopy images using machine learning. *Machine Vision and Applications*, 23(4):659–673, July 2012. Online Article.
- [J28] S. Epstein, E. Missimer, and M. Betke. Using kernels for a video-based mouse-replacement interface. *Personal and Ubiquitous Computing*, 18:47–60, January 2014. Open Access Online.
- [J29] S. Epstein and M. Betke. The kernel semi-least squares method for sparse distance approximation. *Neural Computation*, 25(3):532–548, February 2013.
- [J30] X. Yang, C. Schaaf, A. Strahler, T. Kunz, N. Fuller, M. Betke, Zu, Z. Wang, D. Theriault, D. Culvenor, D. Jupp, G. Newnham, and J. Lovell. Study of bat flight behavior by combining thermal image analysis with a LiDAR forest reconstruction. *Canadian Journal of Remote Sensing*, 39(S1):S112–S125, 2013. Online Article.
- [J31] D. H. Theriault, N. W. Fuller, B. E. Jackson, E. Bluhm, D. Evangelista, Z. Wu, M. Betke, and T. L. Hedrick. A protocol and calibration method for accurate multi-camera field videography. *The Journal of Experimental Biology*, 217:1843–1848, February 2014. Open access online, pdf.
- [J32] C. W. Kwan, I. Paquette, J. J. Magee, and M. Betke. Adaptive sliding menubars make existing software more accessible to people with severe motion impairments. *Universal Access in the Information Society*, 13(1):5–22, March 2014. Online Article.
- [J33] Z. Wu and M. Betke. Global optimization for coupled detection and data association in multiple object tracking. *Computer Vision and Image Understanding*, 143:25–37, 2016. Online Article.
- [J34] Z. Kong, N. Fuller, S. Wang, K. Özcimder, E. Gillam, D. Theriault, M. Betke, and J. Baillieul. Perceptual modalities guiding bat flight in a native habitat. *Scientific Reports*, June 2016. 10 pages, Open access.
- [J35] A. Joshi, C. Monnier, M. Betke, and S. Sclaroff. Comparing random forest approaches to segmenting and classifying gestures. *Image and Video Computing*, 58:86–95, February 2017. Online Article.
- [J36] J. Zhang, S. Ma, M. Sameki, S. Sclaroff, M. Betke, Z. Lin, X. Shen, B. Price, and R. Mech. Salient object subitizing. *International Journal of Computer Vision*, 124(2):169–186, September 2017. 10 pages, pdf.
- [J37] N. L. Brace, T. L. Hedrick, D. H. Theriault, N. W. Fuller, Z. Wu, M. Betke, J. K. Parrish, D. Grünbaum, K. A. Morgansen, and W. E. Boeing. Using collision cones to assess biological deconfliction methods. *Journal of the Royal Society Interface*, 13, September 2016. Open Access Online, pdf.
- [J38] D. Gurari, K. He, B. Xiong, J. Zhang., M. Sameki, S. D. Jain, S. Sclaroff, M. Betke, and K. Grauman. Predicting foreground object ambiguity and efficiently crowdsourcing the segmentation(s). *International Journal of Computer Vision*, 126:714–730, 2018. pdf.
- [J39] R. I. Elanwar, W. Qin, and M. Betke. Making scanned Arabic documents machine accessible using an ensemble of SVM classifiers. *International Journal on Document Analysis and Recognition*, 21:59–79, June 2018. pdf.

- [J40] W. Feng, M. Sameki, and M. Betke. Exploration of assistive technologies used by people with quadriplegia caused by degenerative neurological diseases. *International Journal of Human Computer Interaction*, 34(9):834–844, 2018. pdf.
- [J41] D. Gurari, Y. Zhao, S. Jain, M. Betke, and K. Grauman. Predicting how to distribute work between algorithms and humans to segment an image batch. *International Journal of Computer Vision*, 127(9):1198–1216, September 2019. pdf. and local pdf.
- [J42] L. Guo, K. Mays, S. Lai, M. Jalal, P. Ishwar, and M. Betke. Accurate, fast, but not always cheap: Evaluating ”crowdcoding” as an alternative approach to analyze social media data. *Journalism & Mass Communication Quarterly*, 97(3):811–834, 2020. pdf.
- [J43] W. Qin, R. Elanwar, and M. Betke. Text and metadata extraction from scanned Arabic documents using support vector machines. *Journal of Information Science*, pages 1–12, July 2020. <https://doi.org/10.1177/0165551520961256>.
- [J44] Elham Saraee, Mona Jalal, and Margrit Betke. Visual complexity analysis using deep intermediate-layer features. *Computer Vision and Image Understanding*, 195:1–17, June 2020. <https://doi.org/10.1016/j.cviu.2020.102949>.
- [J45] L. Etter, A. Simukanga, W. Qin, R. Pieciak, L. Mwananyanda, M. Betke, J. Phiri, C. Carbo, A. Hamapa, and C. Gill. Project SEARCH (Scanning EARs for Child Health): Validating an ear biometric tool for patient identification in Zambia. *Gates Open Research*, 4(168):1–14, November 2020. <https://gatesopenresearch.org/articles/4-168>.
- [J46] Lei Guo, Kate Mays, Yiyang Zhang, and Margrit Betke. What makes gun violence a (less) prominent issue? A computational analysis of compelling arguments and selective agenda setting. *Mass Communication & Society*, 24(5):651–675, April 2021. <https://doi.org/10.1080/15205436.2021.1898644>.
- [J47] Yi Zheng, Clarissa A. Cassol, Saemi Jung, Divya Veerapaneni, Vipul C. Chitalia, Kevin Ren, Shubha S. Bellur, Peter Boor, Laura M. Barisoni, Sushrut S. Waikar, Margrit Betke, and Vijaya B. Kolachalama. Deep learning-driven quantification of interstitial fibrosis in digitized kidney biopsies. *The American Journal of Pathology*, May 2021. <https://doi.org/10.1101/2021.01.03.21249179>.
- [J48] Randa Elanwar, Wenda Qin, Margrit Betke, and Derry T. Wijaya. Extracting text from scanned Arabic books: a large-scale benchmark dataset and a fine-tuned Faster-R-CNN model. *International Journal on Document Analysis and Recognition (IJDAR)*, 24:349–362, June 2021. <https://doi.org/10.1007/s10032-021-00382-4>.
- [J49] Alinani Simukanga, Misaki Kobayashi, Lauren Etter, Wenda Qin, Rachel Pieciak, Duarte Albuquerque, Yu-Jen Chen, Margrit Betke, William MacLeod, Jackson Phiri, Lawrence Mwananyanda, and Christopher J. Gill. The impact of ear growth on identification rates using an ear biometric system in young infants. *Gates Open Research*, 5(179):1–15, December 2021. <https://gatesopenresearch.org/articles/5-179>.
- [J50] Anne Billot, Sha Lai, Maria Varkanitsa, Emily J. Braun, Brenda Rapp, Todd B. Parrish, James Higgins, Ajay S. Kurani, David Caplan, Cynthia K. Thompson, Prakash Ishwar, Margrit Betke, and Swathi Kiran. Multimodal neural and behavioral data predict response to rehabilitation in

chronic post-stroke aphasia. *Stroke*, pages 1–9, January 2022.
<https://doi.org/10.1161/STROKEAHA.121.036749>.

Articles in Peer Reviewed Conference and Workshop Proceedings

- [C1] M. Betke, R. L. Rivest, and M. Singh. Piecemeal learning of an unknown environment. In *Proceedings of the 1993 Conference on Computational Learning Theory (COLT)*, pages 277–286, Santa Cruz, California, July 1993. ACM Press. pdf.
- [C2] M. Betke and L. Gurvits. Mobile robot localization using landmarks. In *Proceedings of the IEEE/RSJ/GI International Conference on Intelligent Robots and Systems*, pages 135–142, Munich, Germany, September 1994. pdf.
- [C3] M. Betke and N. C. Makris. Fast object recognition in noisy images using simulated annealing. In *Proceedings of the Fifth International Conference on Computer Vision (ICCV)*, pages 523–530, Cambridge, MA, June 1995. IEEE Computer Society. pdf.
- [C4] B. Awerbuch, M. Betke, R. L. Rivest, and M. Singh. Piecemeal graph exploration by a mobile robot. In *Proceedings of the 1995 Conference on Computational Learning Theory (COLT)*, pages 321–328, Santa Cruz, California, July 1995. ACM Press. pdf.
- [C5] M. Betke, E. Haritaoglu, and L. S. Davis. Multiple vehicle detection and tracking in hard real time. In *Proceedings of the 1996 IEEE Intelligent Vehicles Symposium*, pages 351–356, Seikei University, Tokyo, Japan, September 1996. IEEE Industrial Electronics Society. pdf.
- [C6] M. Betke, E. Haritaoglu, and L. S. Davis. Multiple vehicle detection and tracking. In D. Schaefer and E. F. Williams, editors, *25th Applied Imagery Pattern Recognition (AIPR) Workshop: Emerging Applications of Computer Vision*, pages 104–110. SPIE–The International Society for Optical Engineering, Bellingham, WA, October 1996. pdf.
- [C7] M. Betke, E. Haritaoglu, and L. S. Davis. Highway scene analysis in hard real time. In *Proceedings of the IEEE Conference on Intelligent Transportation Systems*, pages 812–817, Boston, MA, November 1997. pdf.
- [C8] M. Betke and N. C. Makris. Information-conserving object recognition. In *Proceedings of the Sixth International Conference on Computer Vision (ICCV)*, pages 145–152, Mumbai, India, January 1998. IEEE Computer Society. pdf.
- [C9] M. Betke and H. Nguyen. Highway scene analysis from a moving vehicle under reduced visibility conditions. In *Proceedings of the International Conference on Intelligent Vehicles*, pages 131–136, Stuttgart, Germany, October 1998. IEEE Industrial Electronics Society. pdf.
- [C10] M. Betke and J. P. Ko. Detection of pulmonary nodules on CT and volumetric assessment of change over time. In C. Taylor and A. Colchester, editors, *Medical Image Computing and Computer-Assisted Intervention – MICCAI’99*, pages 245–252, Cambridge, UK, September 1999. Springer-Verlag, Berlin. pdf.
- [C11] M. Betke and J. Kawai. Gaze detection via self-organizing gray-scale units. In *Proceedings of the International Workshop on Recognition, Analysis, and Tracking of Faces and Gestures in Real-Time Systems*, pages 70–76, Kerkyra, Greece, September 1999. IEEE. pdf.

- [C12] M. Betke, W. J. Mullally, and J. Magee. Active detection of eye scleras in real time. In *Proceedings of the IEEE CVPR Workshop on Human Modeling, Analysis and Synthesis (HMAS 2000)*, Hilton Head Island, SC, June 2000. 8 pp., pdf.
- [C13] J. Gips, M. Betke, and P. Fleming. The Camera Mouse: Preliminary investigation of automated visual tracking for computer access. In *Proceedings of the Rehabilitation Engineering and Assistive Technology Society of North America 2000 Annual Conference (RESNA 2000)*, pages 98–100, Orlando, FL, July 2000. pdf.
- [C14] M. Betke and W. Mullally. Preliminary investigation of real-time monitoring of a driver in city traffic. In *Proceedings of the International Symposium on Intelligent Vehicles*, pages 563–568, Dearborn, MI, October 2000. IEEE Industrial Electronics Society. pdf.
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DATASETS

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SOFTWARE ARTIFACTS, PATENTS, AND TECHNOLOGY DISCLOSURES

1. *OpenFraming AI. A tool for analyzing multilingual media frames using AI technologies*. BU AIEM Team, 2020–present. <http://openframing.org>
2. *ExerciseCheck: Home-based Physical Therapy Interface*. Inventors M. Betke and BU Team, June 2019–present.
3. *Camera Mouse: Automated Visual Tracking for Computer Access*. Inventors M. Betke and J. Gips. Patent submitted June 2001 but denied 2006. The technology was commercialized by CM Solutions, Inc., Austin, TX, <http://www.cameramouse.com>. In April 2007, a new version was made available for free at <http://www.cameramouse.org>. It has emerged as a popular mouse-replacement tool for children and adults of all ages. The Camera Mouse software has been downloaded over 3,000,000 times and is used world wide as an alternative communication interface by people with severe motion impairments.

4. *Method and System for the Detection, Comparison and Volumetric Quantification of Pulmonary Nodules on Medical Computed Tomography Scans*. Inventors Margrit Betke and Jane P. Ko. U.S. Patent 7,206,462, issued on April 17, 2007.
5. *BU Microsight: An Automated Cell Tracking Protocol*. Inventors Margrit Betke, David House, Matthew Walker, and Joyce Y. Wong. Technology disclosure, February 27, 2009.
6. *Method for Detection of Shapes of Variable Structure in Images*. Inventors V. Athitsos, J. Wang, S. Sclaroff, M. Betke. Technology disclosure, June 13, 2005.
7. *Registration of Pulmonary Nodules*. Inventors M. Betke and J. P. Ko. Technology disclosure, April 8, 2002.

INVITED LECTURES, SEMINARS, AND CONFERENCE TALKS

1. Medical Image Computing and Computer Assisted Interventions (MICCAI) Workshop on Data Augmentation Labeling & Imperfections. *GLPathNet: Exploiting data size and resolution of histopathologic images with a Global-Local Pathology Network*, online presentation, October 1, 2021. <https://dalimiccai.github.io>
2. Worcester Polytechnic Institute, Seminar, Department of Electrical & Computer Engineering, *Election Week Talk on AI for Multimodal Analysis of Political News*, November 5, 2020.
3. CRA Virtual Conference 2020, *Communicating COVID-19*, online presentation, Computing Research Association, July 20, 2020.
4. Multi University Research Initiative, Kickoff Meeting, *Computer Vision for Motion Analysis of Animals*, Boston, November 13, 2019.
5. Kickoff Meeting of the Boston University Center for Autonomous and Robotics Systems, *3D Tracking with Computer Vision*, Boston, October 31, 2019.
6. MIT CSAIL and Schlumberger-Doll Research Workshop, *3D Visual Tracking and Domain Adaptation*, Cambridge, MA, October 8, 2019.
7. Tufts University, Colloquium, Computer Science Department, *Personalized Face and Gesture Analysis of Innovations in Education and Rehabilitation*, Medford, MA, September 26, 2019.
8. Symposium on Individual Freedom Versus The Hidden Persuaders – Preserving individual freedom in an age of socio-technical control via algorithmic rewards and punishments, *C/overt AI-powered Technologies and the Responsibility of Users*, Boston, September 11, 2019.
9. The 14th IEEE Conference on Automatic Face and Gesture Recognition, *Affect-driven Learning Outcomes Prediction in Intelligent Tutoring Systems*, Lille, France, May 16, 2019.
10. International Workshop on Human Community and PERpetual Contract in an Era of Artificial Intelligence. *Welcoming Remarks: AI at Boston University*, Boston, April 11, 2019.
11. Digital Health Initiative Award Roundtable, *ExerciseCheck: Remote Physical Therapy with Ease*, Boston, MA, April 3, 2019.

12. MIT, Brain and Cognitive Science Department, *Challenging Tasks for Computer Vision*, Cambridge, MA, February 28, 2019.
13. AI World, *Use Cases in AI and High-Performance Computing*, Boston, MA, December 4, 2018.
14. Invited Plenary Lecture at the ACM 11th Annual International Conference on Pervasive Technologies Related to Assistive Environments (PETRA'18), *Towards Fast and Comfortable Text Entry Using Gaze Paths*, Corfu, Greece, June 27, 2018.
15. ACM 11th Annual International Conference on Pervasive Technologies Related to Assistive Environments (PETRA'18), *Enabling Early Gesture Recognition by Motion Augmentation*, Corfu, Greece, June 28, 2018.
16. ICA Preconference: Crowdsourcing as a Content Analysis Tool. *Crowdsourcing as a Data Analysis Tool in Computer Science* Prague, Czech Republic, May 24, 2018.
17. In Face-Off: Facial Recognition Technologies and Humanity in an Era of Big Data. *How Does Face Recognition Technology Work?* Boston, MA, April 18, 2018.
18. CVPR 2018 Area Chair Workshop, *Looking at People: Personalized Face and Gesture Analysis using Hierarchical Bayesian Neural Networks*, Toronto, CA, February 19, 2018.
19. University of São Paulo, Computer Science Department, *Looking at People: Gesture Segmentation and Classification*, São Paulo, Brazil, January, 31, 2018.
20. IEEE International Conference on Computer Vision and Pattern Recognition (CVPR) Computer Vision and Microscopy Image Analysis (CVMI) Workshop. *Human Computation Approaches to Microscopy Analysis*, Honolulu, Hawaii, July 21, 2017.
21. University of São Paulo, Computer Science Department, *Vision-based Human-Computer Interfaces, Personalization, and Crowdsourcing*. São Paulo, Brazil, March 7, 2017.
22. CVPR 2017 Area Chair Workshop, *Personalizing Gesture Recognition Using Hierarchical Bayesian Neural Networks*, University of Maryland, College Park, February 27, 2017.
23. Boston University, Department of Biomedical Engineering Seminar, *Microscopic and Macroscopic Image Analysis: Crowdsourcing, Machine Learning, and 4D Modeling to Aid BME Research*, September 23, 2016.
24. ACM 9th Annual International Conference on Pervasive Technologies Related to Assistive Environments (PETRA'16), *BCE-Arabic-v1 dataset: A step towards interpreting Arabic document images for people with visual impairments*, Corfu, Greece, June 30, 2016.
25. Keynote Lecture at Science-Engineering-Technology in the City, *SET in the City: Making a Difference with Computer Vision*, Merck Research Laboratories, Boston, MA, April 2, 2016.
26. BU Data Science Day, *Image and Video Computing for Data Science*, Boston, MA, January 22, 2016.
27. IEEE International Conference on Computer Vision and Pattern Recognition (CVPR) Workshop on Perception Beyond the Visible Spectrum, *Analyzing the Flight Behavior of Bats in Thermal Infrared Video*, Keynote Address, Boston, MA, June 2015.

28. IEEE International Conference on Robotics and Automation, Workshop on Recent Advances in Sensing and Navigation for Bioinspired Agile Flight, *3D Flight Analysis: Individual and Group Motion*, Seattle, May 2015.
29. University of Maryland Institute for Advanced Computer Studies, *Pedestrians of the Sidewalk and the Sky: Visual Tracking of Humans and Bats*, College Park, January 29, 2015.
30. Office of Naval Research Investigator Meeting, *3D Sensing of Bat and Bird Flight*, University of Maryland, College Park, September 22, 2014.
31. National Academies of Science, Engineering, and Medicine, Workshop on *Robust Methods for the Analysis of Images and Videos for Fisheries Stock Assessment Multi-Object Multi-View Tracking*, Washington DC, May 16, 2014.
32. Massachusetts Institute of Technology, Computer Vision Group Seminar *Pedestrian of the Sidewalk and the Sky: Visual Tracking of Humans and Animals*, Cambridge, MA, April 15, 2014.
33. Biomedical Signal Analysis Conference – 3D Imaging in Medicine, *Microscopy Imaging of Living Cells – Research Questions and Solutions, including “I’m Cell: A Touch Pad Tool for Annotating Cell Images”*, Florianópolis, Brazil, March 26, 2014.
34. University of São Paulo, Computer Science Department, *Computer Vision for Tracking of Humans and Animals*, São Paulo, Brazil, March 21, 2014.
35. Massachusetts Institute of Technology, Graphics Group Seminar *Insight into Animals in Flight*, Cambridge, MA, November 20, 2013.
36. 2nd ACM International Workshop on Multimedia Analysis for Ecological Data (MAED 2013), *Understanding Animal Flight with Three-dimensional and Infrared Computer Vision*, Barcelona, Spain, October 21.
37. The 12th European AAATE Conference by the Association for the Advancement of Assistive Technology in Europe, *emPower, an Infrastructure for Remote Assessment of Interfaces for Individuals with Severe Motion Impairments*, Vilamoura, Portugal, September 20, 2013.
38. The 16th International Bat Research Conference, *Seeing in the Dark – an Analysis of Bat Flight through Stereographic Infrared Videography*, San José, Costa Rica, August 15, 2013.
39. Office of Naval Research Investigator Meeting, *Computer Vision Techniques to Estimate Flight Paths of Bats*, Arlington, VA, April 24, 2013.
40. GE Global Research, *Evaluation of Image Segmentation, Cell Morphology Classification, and Computational Models of the Airway Tree*, Niskayuna, NY, January 11, 2013.
41. Video Analytics: Applying Automated Feature Extraction to Questions of Driver Behavior Workshop, *Challenges of Video-based Human-Computer Interfaces and Experiences in Analyzing Videos of Driver Faces*, FHWA Turner-Fairbank Highway Research Center, McLean, VA, October 2012.
42. Fudan University, Shanghai, China, *Seeing in the Dark – Unveiling the Flight Behavior of Gregarious Bats Using Thermal Imaging*, USA-Sino Summer School in Vision, Learning, Pattern Recognition (VLPR 2012), July 29, 2012.

43. The 14th International Conference on Human Computer Interaction (HCII International), *An Information Theoretic Mouse Trajectory Measure*, Orlando, Florida, July 2011.
44. First Workshop on Computer Vision Tracking of Cell Populations, *Cell Tracking and Cell Morphology Classification*, Carnegie Mellon University and Intel Labs Pittsburgh, Pittsburgh, PA, March 2011.
45. University of Washington, *Bio-Inspired Flight Control: Flight Control in Bats*, Investigator Meeting for ONR Project “AIRFOILS: Animal Inspired Robust Flight with Outer and Inner Loop Strategies,” Seattle, WA, October 2010.
46. Keynote Lecture at The 3rd ACM International Conference on Pervasive Technologies Related to Assistive Environments (PETRA), *Assistive Environments that Empower Individuals with Severe Disabilities*, Pythagorion, Samos, Greece, June 2010.
47. National Technical University of Athens, Colloquium, School of Electrical and Computer Engineering, Division of Computer Science, *Image and Video Computing Research in Computer Science at Boston University*, Athens, Greece, June 2010.
48. Keynote Address at the Second Annual New England Undergraduate Computing Symposium: Celebrating Excellence and Diversity in Computing, *Video-based Human-Computer Interaction*, Boston, MA, April 2010.
49. Technical University Berlin, Department of Computer Science, Computer Vision and Remote Sensing Group, *Camera-based Human-Computer Interfaces for People with Disabilities and 3D Video Understanding*, Berlin, March 2010.
50. Deutsches Zentrum für Luft- und Raumfahrt, Institut für Verkehrssystemtechnik, *2D and 3D Feature Tracking for Human-Computer Interfaces and Animal Flight Analysis*, Berlin, March 2010.
51. University of Maryland, Department of Computer Science, *Camera-based Human-Computer Interfaces and 3D Video Understanding*, College Park, MD, September 2009.
52. Naval Undersea Warfare Center, *Automated Video-Based Interpretation of the Behavior of Moving Objects*, Newport, RI, July 2009.
53. IEEE Computer Society Workshop on Mathematical Methods in Biomedical Image Analysis (MMBIA), *Tracking of Cell Populations to Understand their Spatio-Temporal Behavior in Response to Physical Stimuli*, Miami Beach, FL, June 2009.
54. Invited Plenary Lecture at The 2nd International Conference on Pervasive Technologies Related to Assistive Environments (PETRA), *Camera-based Interfaces for People with Severe Motion Impairments*, Corfu, Greece, June 2009.
55. INRIA, the French National Institute for Research in Computer Science and Control, *Diagnostic Image Analysis of the Chest: Computational Models and Approaches*, Sophia Antipolis, May 2009.
56. The 9th International Workshop on Pattern Recognition in Information Systems – PRIS 2009, *RefLink: An Interface that Enables People with Motion Impairments to Analyze Web Content and Dynamically Link to References*, Milan, Italy, May 2009.

57. Tufts University, Colloquium, Computer Science Department, *Visual Tracking of Large Numbers of Bats*, Medford, MA, November 2008.
58. 2007 RUMBUS, Research by Undergraduates in Mathematics Boston University Symposium, *What Is Mathematics?* Boston, MA, November 2007.
59. BBN Technologies, *A Method to Track Large Variable Numbers of Objects in Clutter and its Application to Censusing Millions of Bats*, Cambridge, MA, June 2007.
60. 2007 NSF CISE/CRI PI Meeting, *Overview of Sensorium Research at Boston University* with Azer Bestavros, Boston, MA, June 2007.
61. Harvard University, Women, Science, and Society Lecture Series, *Video-based Tracking for Human-computer Interaction and Conservation Biology* Cambridge, MA, May 2007.
62. Harvard University, National Symposium for the Advancement of Women in Science, *The Future of Computer Science*, Cambridge, MA, April 2007.
63. Massachusetts Institute of Technology, Path of Professorship Workshop @ MIT, *Running A Lab*, Cambridge, MA, October 2006.
64. The 9th International ERCIM Workshop “User Interfaces For All” UI4ALL 2006, *Web Mediators for Accessible Browsing*, Königswinter, Germany, September 2006.
65. The 6th International Workshop on Pattern Recognition in Information Systems – PRIS 2006, *Tracking and Prediction of Tumor Movement in the Abdomen*, Paphos, Cyprus, June 2006.
66. Massachusetts Institute of Technology, Machine Vision Colloquium 2005/2006, *Detection, Segmentation, and Registration Techniques for Lung Image Analysis*, Cambridge, MA, May 2006.
67. University of Massachusetts Lowell, Colloquium Series, Department of Computer Science, *Video-based Communication Interfaces for People with Severe Paralysis*, Lowell, MA, February 2005.
68. Massachusetts Institute of Technology, Human-Computer Interaction Seminar Series, *Communication Interfaces for People with Severe Disabilities via Video-based Gesture Detection*, Cambridge, MA, October 2004.
69. 34th Annual North American Symposium on Bat Research (NASBR 2004), *Censusing Brazilian Free-tailed Bats with Infrared Thermal Imaging – Challenges, Lessons Learned, and Initial Results*, Salt Lake City, UT, October 2004.
70. Tufts University, Computer Science Colloquium, *Video-Based Computer Interfaces for People with Severe Disabilities*, Medford, MA, December 2003.
71. University of Massachusetts, Computer Science Department, *Video-based Human-Computer Interfaces for People with Severe Disabilities*, Boston, MA, April 2003.
72. ERCIM Workshop “User Interfaces for All” (UI4ALL 2002) *Experiments with a Camera-Based Human-Computer Interface System*, Paris, France, October 2002.
73. Childrens Hospital, Communication Enhancement Center, *Video-based Assistive Communication Devices*, Boston, MA, October 2002.

74. Zhejiang University, State Key Laboratory of CAD & CG and Institute of Information & Communication Engineering, *Research on Medical Image Analysis and Video-Based Human Computer Interfaces at Boston University*, Hangzhou, P.R. China, August 2002.
75. Rutgers, The State University of New Jersey, Computer Science Department, *Diagnostic Image Analysis of Chest Computed Tomography Scans*, Piscataway, NJ, May 2002.
76. International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI 2001), *Registration of Lung Surfaces in Computed Tomography Scans*, Utrecht, The Netherlands, September 2001.
77. Boston University, TeacherTech'01, Gender Equity and Technology Workshop, *Video-Based Human Computer Interfaces*, Boston, MA, August 2001.
78. University of Maryland, Institute for Advanced Computer Studies, *Image Segmentation and Registration to Support Lung Cancer Detection*, College Park, MD, May 2001.
79. Boston University, Multi-Dimensional Signal Processing Laboratory, *Chest CT: Nodule Detection and Assessment of Change over Time*, Boston, MA, March 2001.
80. Wellesley College, Computer Science Colloquium, *Computer Vision to Support Lung Cancer Diagnosis*, Wellesley, MA, March 2001.
81. Boston University, Cognitive and Neural Systems Department, *Computer Vision to Support Lung Cancer Diagnosis*, Boston, MA, March 2001.
82. Massachusetts General Hospital, Department of Radiation Oncology, *Chest CT: Nodule Detection and Assessment of Change over Time*, Boston, MA, March 2001.
83. New York University, Department of Radiology, *Detection of Pulmonary Nodules on CT and Volumetric Assessment over Time*, New York, NY, September 2000.
84. IEEE CVPR Workshop on Human Modeling, Analysis and Synthesis, *Active Detection of Eye Scleras in Real Time*, Hilton Head Island, SC, June 2000.
85. Boston University, Computer Science Colloquium, *Recognition, Resolution, and Complexity of Objects*, Boston, MA, April 2000.
86. Tufts University, Department of Computer Science and Electrical Engineering, *Recognition, Resolution, and Complexity of Objects*, Boston, MA, March 2000.
87. Boston University, Computer Science Colloquium, *Detection of Pulmonary Nodules on CT and Volumetric Assessment over Time*, Boston, MA, November 1999.
88. International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI 1999), *Detection of Pulmonary Nodules on CT and Volumetric Assessment over Time*, Cambridge, UK, September 1999.
89. IEEE International Workshop on Recognition, Analysis, and Tracking of Faces and Gestures in Real-Time Systems, *Gaze Detection via Self-Organizing Gray-Scale Units*, Kerkyra, Greece, September 1999.

90. University of Maryland, Center for Automation Research, Computer Vision Laboratory, *Detection and Tracking Problems in Computer Vision*, College Park, May 1999.
91. International Conference on Computer Vision, *Information-Conserving Object Recognition*, Mumbai, India, January 1998.
92. Boston University, Computer Science Colloquium, *Information-Conserving Object Recognition*, Boston MA, November 1997.
93. IEEE Conference on Intelligent Transportation Systems, *Highway Scene Analysis*, Boston, November 1997.
94. National Institute of Standards and Technology, *Multiple Vehicle Detection and Tracking in Hard Real Time*, Gaithersburg, January 1997.
95. 25th Applied Imagery Pattern Recognition Workshop, *Multiple Vehicle Detection and Tracking in Hard Real Time*, Washington, DC, October 1996.
96. Advanced Telecommunication Research Institute International, Media Integration and Communications Research Laboratories, *Multiple Vehicle Detection and Tracking in Hard Real Time*, Kyoto, Japan, September 1996.
97. IEEE Symposium on Intelligent Vehicles, *Multiple Vehicle Detection and Tracking in Hard Real Time*, Tokyo, Japan, September 1996.
98. Daimler-Benz Research, *Fast Object Recognition in Noisy Images Using Simulated Annealing*, Ulm, Germany, December 1995.
99. Catholic University of America, Computer Science Department, *Fast Object Recognition in Noisy Images Using Simulated Annealing*, Washington, DC, December 1995.
100. Siemens Corporate Research, *Fast Object Recognition in Noisy Images Using Simulated Annealing*, Princeton, November 1995.
101. University of Massachusetts, Computer Science Department, *Fast Object Recognition in Noisy Images Using Simulated Annealing*, March 1995.
102. The Pennsylvania State University, Computer Science Department, *Fast Object Recognition in Noisy Images Using Simulated Annealing*, March 1995.
103. University of Maryland Institute for Advanced Computer Studies, *Fast Object Recognition in Noisy Images Using Simulated Annealing*, College Park, March 1995,
104. Rheinische Friedrich-Wilhelms Universität Bonn, Institut für Informatik, *Fast Object Recognition in Noisy Images Using Simulated Annealing*, Bonn, Germany, December 1994.
105. University of Dortmund, Fachbereich Informatik, *Piecemeal Exploration of General Graphs*, Dortmund, Germany, December 1994.
106. IEEE/RSJ/GI International Conference on Intelligent Robots and Systems 1994, *Mobile Robot Localization Using Landmarks*, Munich, Germany, September 1994.

107. University of Dortmund, Fachbereich Informatik, *Piecemeal Learning and Distributed Algorithms*, Dortmund, Germany, January 1994.
108. Sixth Annual Conference on Computational Learning Theory 1993, *Piecemeal Learning of an Unknown Environment*, Santa Cruz, CA, July 1993.
109. The International Computer Science Institute, *Piecemeal Learning of an Unknown Environment*, Berkeley, CA, July 1993.
110. Action Learning Workshop, *On the Job Learning*, GTE, MA, April 1993.
111. Siemens Corporation, *Exploring Unknown Graphs*, Munich, Germany, January 1991.

TEACHING ACTIVITIES

- Design of the Boston University graduate program “Master in Artificial Intelligence,” 2018–2019. The program was launched in September 2019.
- Course webpages: <http://www.cs.bu.edu/faculty/betke>
- Undergraduate Courses: Algorithms (F 1998), Computers in Management (F 1999, S 2000), Computer Vision (S 1998, S 2000, developed course), Data Structures (F 1997, S 1998, F 1998, S 1999), Introduction to Artificial Intelligence (F 2002–2005, F 2007, F 2009, S 2012, 2015–2019, revamped course several times). Geometric Algorithms (F 2010). Between 20 and 144 students per course.
- Graduate Courses: Artificial Intelligence (F 2002–2005, F 2007, F 2009, S 2015–2020, revamped course), Image and Video Computing (S 2001–2011, F 2011, 2012, 2014–2020, partially 2021, revamped course several times), Topics in Computer Science: Video-based Human Computer Interfaces (F 2001, developed course), Graduate Initiation Seminar (S 2017, S 2018). Between 20 and 120 students per course.
- Invited lecture “Imagining Possibilities – Research in AI to Bring About Positive Change in the World.” Undergraduate Research Opportunity Program (UROP), Boston University, July 10, 2019. Lecture to 175 students.
- Panelist and Faculty Evaluator of team projects in the MIT course “6.811: Principles and Practice of Assistive Technology,” October 2015.
- Discussion and evaluation of team projects in the undergraduate course “CS 411: Software Engineering,” December 6, 2011.
- Guest Lecture on “The Camera Mouse, a human-computer interface for people with severe motion impairments” in the undergraduate course “CS 101: Introduction to Computers,” February 25, 2011.
- Guest Lecture on “Video-based Human-Computer Interaction and the Camera Mouse” in the undergraduate course “CS 108: Introduction to Application Programming,” April 27, 2010.
- Guest Lecture on “Designing Video-based Interfaces for People with Disability – How Students are Involved” in the course “CS108: Introduction to Application Programming,” November 11, 2008.

- Guest Lecture “A Manual for Writers in Computer Science” in the computer science initiation course for graduate students, May 21, 2008 and April 9, 2010.
- Guest Lecture on “Computer Vision” to students in Boston University’s Trustee Scholars Program, April 14, 2005.
- Guest Lectures in Boston University’s Medical Informatics Program, 2004 and 2005.
- Guest Lecture on “Chest CT: Automated Nodule Detection and Assessment of Change over Time” in the course “CN 730 Models of Visual Perception,” April 14, 2001.
- Ph.D. qualifying exam in computer vision with Prof. Stan Sclaroff. Fall 2002–2009.
<http://www.cs.bu.edu/groups/ivc/exam>

RESEARCH ADVISING

Advisor of 4–8 PhD students and several MS or BA students per year.

Co-Director of the **Artificial Intelligence Research (AIR) Initiative** with Prof. Kate Saenko, Prof. Brian Kulis, and Prof. Stan Sclaroff, Fall 2017–present, <http://www.bu.edu/hic/air>

Co-Leader of the **Image and Video Computing Group** with Prof. Stan Sclaroff, Fall 2001–present, and Prof. Kate Saenko, Fall 2016–present, <http://www.cs.bu.edu/groups/ivc>

Co-Leader of the **Artificial Intelligence and Emerging Media (AIEM)** Research Group with Prof. Lei Guo, Prof. Prakash Ishwar, and Prof. Derry Wijaya, Spring 2016–present, <http://sites.bu.edu/aiem>

Created and led the **Computer Vision Research Group** at Boston College, 1998–2001.

Ph.D. Thesis Supervision

- Wenda Qin, “Image Analysis for Arabic Documents,” expected 2023.
- Yi Zheng, “Text Spotting,” expected 2023.
- Sha Lai, “Machine Learning for News Content Aggregation,” expected 2023.
- Yiwen Gu, “Computer Vision for Rehabilitation,” expected 2023.
- Kaihong Wang, “Segmentation and Pose Estimation,” expected 2024.
- Hao Yu, “Facial Expression Analysis for Intelligent Tutors,” expected 2024.

Graduated Ph.D. Advisees

1. Elham Saraee, “Data Analytics for Image Visual Complexity and Kinect-Based Videos of Rehabilitation Exercises,” September 2019. Now at Adhark Inc., CA.
2. Ajjen Joshi, “Personalized Face and Gesture Analysis Using Hierarchical Neural Networks,” September 2018. Co-Advised with Stan Sclaroff, Boston University. Now at Affectiva, MA.
3. Wenxin Feng, “Dwell-free Input Methods for People with Motor Impairments,” September 2018. Now at Google Research, CA.
4. Andrew Kurauchi, “Gaze and Motion Based Interfaces,” March 2018. Co-Advised with Prof. Carlos Morimoto, University of Sao Paulo, Brazil.

5. Mehrnoosh Sameki, “Accurate and Budget-efficient Text, Image, and Video Analysis Systems Powered by the Crowd,” September 2017. Now at Microsoft Research, Cambridge, MA.
6. Mikhail Breslav, “3D Pose Estimation of Flying Animals in Multi-view Datasets” September 2016. Now at Microsoft, San Francisco, CA.
7. Diane Hirsh Theriault, “An Optimization-based Model of Collective Motion,” September 2015. Now at Google, Cambridge, MA.
8. Danna Gurari, “Combining Crowd Worker, Algorithm, and Expert Efforts to Find Boundaries of Objects in Images,” September 2015. Now Assistant Professor at University of Texas, Austin.
9. Samuel Epstein, “Information and Distances,” May 2013. Co-Advised with Leonid Levin, Boston University.
10. Zheng Wu, “Occlusion Reasoning for Multiple Object Visual Tracking,” September 2012. Now at Stealth AI Startup – AI in Medicine, CA.
11. John J. Magee, “Adaptable Interfaces for People with Motion Disabilities,” May 2012. Now Assistant Professor at Clark University, Worcester, MA.
12. William Mullally, “Image Registration and Computational Modeling of the Lung,” May 2009. Rapiscan Systems, CA.
13. Jingbin Wang, “Object Segmentation Using Shape Constraints,” May 2007. Now Senior Software Engineer at Google Research, Mountain View, CA.

M.A. Thesis Supervision

- Ajjen Joshi, “A Random Forest Approach to Segmenting and Classifying Gestures,” July 2014. Co-advised with Stan Sclaroff. Currently PhD student at BU.
- Seule Ki Kim, “Integrating Computer Vision Techniques into a Touch Pad System,” May 2013. Now at Intuit in San Francisco.
- Lisa Premerlani, “Stereoscopic Reconstruction and Analysis of Infrared Video of Bats,” May 2007. Now at MIT Lincoln Labs.
- Wajeeha Akram, “Designing and Evaluating Computer Vision Based Interfaces for Users with Disabilities,” May 2007. Computer science professor in Pakistan.
- Angshuman Bagchi, “A Clustered Data Association Technique for Expedited Multi Target Tracking,” September 2006. Now at Bloomberg.
- Johanna Brewer, “3D Tracking and Prediction of Abdominal Tumor Motion using Internal and External Markers,” September 2004. Now in PhD program in Human-Computer Interaction at UC Irvine.
- Stephen C. Crampton, “Counting Fingers in Real Time Using Computer-Vision Techniques,” September 2004. Now at Amazon.
- John J. Magee, “A Real-Time Human-Computer Interface Based on Gaze Detection from a Low-Grade Video Camera,” May 2004. Graduated with a PhD degree from Boston University and is now Professor at Clark University, Worcester, MA.
- Jason Ruel, “Tracking and Predicting of Tumor Motion in the Abdomen,” May 2003. MBA at University of Washington, Seattle, then consultant for Microsoft.

- William Mullally, “Segmentation and Registration of Pulmonary Nodules,” May 2003. Graduated with a PhD degree from Boston University and is now at the KEYW Corporation, Boston, MA.
- Harrison Hong, “Landmark Detection in the Chest and Registration of Lung Surfaces with an Application to Nodule Registration,” May 2003. Now at Reveal Imaging Technologies, Bedford, MA.

Supervision of Research Projects by M.S. Students

- Chenhongyi Yang, “Learning to Separate: Detecting Heavily-Occluded Objects in Urban Scenes,” fall 2019 and spring 2020
- Yiwen Gu, “Home-based Physical Therapy with an Interactive Computer Vision System,” fall 2018, spring–summer 2019
- Shreya Pandit, “ExerciseCheck: A Scalable Platform for Remote Physical Therapy Deployed as a Hybrid Desktop and Web Application,” fall 2018 and spring 2019
- Lunhao Lihang, “Field of View Estimation of Individuals Flying in Group Formations,” fall 2018 and spring 2019.
- Kaihong Wang, “Instagram Image Analysis of Kenyan Foods,” spring 2019.
- Qitong Wang, “Text Spotting,” fall 2018 and spring 2019.
- Zhitong Wu and Chengongyi Yang, “3D view estimation,” co-advisor Dr. Vitaly Ablavsky, fall 2018.
- Siqi Zhang, “ExerciseCheck trajectory comparisons,” spring 2018.
- Muhammad Zuhayr Raghil, “Using 3D-CNNs for Emotion Perception in Intelligent Tutoring Systems,” spring 2018.
- Rohit Agrawal, “Enabling Early Gesture Recognition by Motion Augmentation,” fall 2017 and spring 2018.
- Wenda Qin “LABA: Logical Layout Analysis of Book Page Images in Arabic Using Multiple Support Vector Machines,” fall 2017

M.A. Project Supervision

In 2017, the CS Department stopped requiring Master’s projects.

1. Srivathsa Rajagopal, “Video Analysis of Politicians,” M.S., January 2017.
2. Saurabh Singh, “Exercising with the Proficio Robotic Arm in Virtual Reality,” M.Eng., January 2017.
3. Jun Xu, “Newborn Recognition using Ear Biometrics Controlling for Growth Pattern,” May 2016. Co-advised with Stan Sclaroff.
4. Ming Chen, “Improving the Selection Mechanism “Goal Crossing” used in Mouse-replacement Interfaces,” May 2014.
5. Andrew Barbarello, “A Semi-supervised Approach for Classifying Tens of Thousands of 3D Trajectories,” 12 pages, December 2013. Now at the National Institute of Standards and Technology (NIST), Gaithersburg, MD.
6. Zhongchen Shen. “Determining the Orientation of Driver’s head by measuring the length of nose shadow,” May 2013.

7. Gordon Towne, "Error Analysis and Design Considerations for Stereo Vision Systems Used to Analyze Animal Behavior," May 2012. Now at TrainingPeaks.
8. Luis Carrasco, "Picture Identification by Mining Existing Image Search Platforms," January 2012. Now at Microsoft, Seattle.
9. Tianqiang Liu, "Hand Detection and Tracking with Multiple Dynamic Hidden State Shape Models," September 2011. Now at Orbeus.
10. Leyong Tan, "A Gesture-based Human-computer Interface of Google Earth using the Kinect Game Console," September 2011.
11. Christopher Kwan, "Camera Canvas: Image Editing Software for People with Disabilities," May 2011. Now at Lattice Engines.
12. Jiayu Fu, "3D Camera Mouse by Virtual Tracking of 3D Face Features Using Stereo Cameras," May 2011. Co-advisor: Janusz Konrad.
13. Byung Hyung Kim, "Interactive Art Using a Camera-based Hands Tracking Tool for Interaction between Humans and Computers," September 2010. Now at UC Riverside.
14. Chao Chung Hsieh, "Data capture and calibration of a multi-camera system," September 2010.
15. Yili Pan, "Diagnostic Image Analysis of the Chest: Intensity-based Registration Techniques," May 2010. Co-advisor: Thomas Little. Now at Mathworks.
16. Shuo Zeng, "Diagnostic Image Analysis of the Chest: Feature-based Registration Techniques," May 2010. Co-advisor: Thomas Little.
17. Hari Mohan, "Visual Tracking at Sea using the Covariance Tracking Algorithm," May 2010. Co-advisor: Thomas Little.
18. Yun Wang, "Visual Tracking at Sea using the Mean Shift Algorithm," May 2010. Co-advisor: Thomas Little.
19. Harshith Chennamaneni, "MCC: A Multi-Camera Capture System for Human-Computer Interaction," January 2010. Now at WhitePages.
20. Esra Ataer Cansizoglu, "An Information Fusion Approach for Multiview Feature Tracking," May 2009. Now at Northeastern University.
21. Jawad Mahmood, "Facial Modeling: Progeny Phenotype Revelation," January 2009. Co-advisor: M. Alanyali.
22. Kevin Hu, "Segmentation of the Minor Fissure on CT," May 2007. Now at Bloomberg.
23. Marianne Procopio, "Bat Flight Analysis: Further Insight into the Emergence of Brazilian Free-Tailed Bats," May 2007. Now at MIT Lincoln Labs.
24. Jared Wickman, "Graphical User Interface Layouts and the Camera Mouse," May 2007.
25. Benjamin N. Waber, "Web Mediators for Accessible Browsing," May 2006. Now in PhD program at MIT.
26. Laura Tiberii, "A customizable camera-based human computer interaction system allowing people with disabilities autonomous hands free navigation of multiple computing tasks," May 2006. Now at Raytheon.
27. Mikhail Gorman, "MusicMaker: A Camera-based Music Making Tool for Physical Rehabilitation," January 2006. Now at Bluestreak.

28. Omar Al-Hinai, "Real-time Suppression of Tremor Motion from Camera Mouse Signal Using Finite Impulse Response Filters," September 2005. Now at Aramco.
29. Vladimir Rydzevsky, "Computing a Uniform Scaling Parameter for 3D Registration of Lung Surfaces," September 2005.
30. Michael Chau, "Real Time Eye Tracking and Blink Detection with USB Cameras," May 2005. Now analyst at Goldman Sachs in New York.
31. Edward Lee, MA project and NASBR conference abstract on "Bats in Motion: Stereo Object Recognition and Trajectory Analysis of Flying Bats," May 2005.
32. Michelle Paquette, MA project on "IWebExplorer: A Web browser designed for use with an eye controlled mouse device," May 2005. Now at Fidelity.
33. Eugen Tsykinovskyy, "Segmentation of the Respiratory Vessel Tree on CT," May 2005.
34. Shuang Tang, MA project and NASBR conference abstract on "Challenges of censusing colonies of Brazilian free-tailed bats at Eckert James River, Frio, and Davis Blowout caves using infrared thermal imaging and initial censusing results," January 2005.
35. Kashan Arshad, "Dimensionality Reduction and Efficient Retrieval of Medical Images from Large Databases," September 2004 (co-supervision with George Kollios).
36. Peter McNerney, "A Stereo-based Approach to Digital Image Compositing," September 2003 (co-supervision with Janusz Konrad). Now at DreamWorks.
37. Oleg Gussyatin and Mikhail Urinson, "A Method to Extend Functionality of Pointer Input Devices," September 2003.
38. Thomas J. Castelli, "Facial Feature Tracking and Detection of Facial Occlusion due to Hand Gestures," September 2003. Now at Raytheon.
39. Ramasri Raghavan, "Chromosome Detection Using Image Analysis," September 2003.
40. Emily Stuckey, "Methods of Token-Based Authorship Attribution for an English-Language Online Discussion Community," May 2004.
41. Haobing Wang, "Comparison of Methods to Predict Abdominal Tumor Motion," May 2003. Now at Massachusetts Eye and Ear Infirmary.
42. Yannis Minadakis, "GazePoint: Tracking Eye Movement to Determine Gaze Direction," January 2003. Now at Teradyne.
43. Jonathan Lombardi, "A Self-initializing Eyebrow Tracker for Binary Switch Emulation," May 2002. Now at Massachusetts General Hospital.
44. Robyn Cloud, "Experimentation and Evaluation of a Human-Computer Interface System," May 2002. Now at Lockheed Martin.

B.A. Thesis Supervision

- Diane E. Hirsh, "Evaluation of Computer Vision Methods for Analyzing Infrared Thermal Video and Censusing Brazilian Free-tailed Bats," May 2004. Now at Google.
- Christopher Fagiani, "An Evaluation of Tracking Methods for Human-Computer Interaction," Honor's Thesis, May 2002. Now at NBC.
- Kristen Grauman, "Automatic Eye Blink Detection and Duration Analysis in Real Time for Communication Purposes," Honor's Thesis, May 2001. PhD at MIT, now computer science professor at University of Texas at Austin.

- John J. Magee, “Finding Eyes in Faces,” May 2001. Now professor at Clark University.
- William Mullally, “Region Classification for Factory Circuit Board Error Detection,” May 2001. Now at Reveal Imaging, Bedford, MA.
- Peter Fleming, “The Camera Mouse,” Honor’s Thesis, May 2000. Now at Accenture, formerly Andersen Consulting.
- Cleo V. Bertrand, “Computer Enhancement Techniques for CT Scans,” May 2000. MA at NYU.
- Jun Kawai, “Gaze Detection via Self-Organizing Gray-Scale Units,” May 1999. J. Kawai works at Sony in Japan.

Undergraduate Research Projects, Advisor

1. Kevin Delgado, “Head pose estimation for intelligent tutors,” spring & summer 2021.
2. Eugenia Shandelman, “Graphical Interface Improvements for ExerciseCheck,” summer 2018–spring 2019.
3. Sabrina Charania, “Data management for ExerciseCheck,” spring 2018.
4. Shreya Ramesh, “Patient Movement Feedback for Exercise Check,” spring 2017, fall 2017, spring 2018.
5. Jia Yao, “Rendering OptFlock in Action to Simulate Group Behavior,” fall 2016.
6. Mattia Gentil, “Crowdsourcing the cell tracking problem” and “Finding the Optimal Number of Crowdworkers to Analyze Political Tweets,” summer 2016.
7. Brian Borucki, “Multi-view Tracking of Fish Schools,” summer 2014. MS 2015.
8. Sridevi Suresh, REU project “Image Segmentation and Multi-view Tracking in Videos of Bat Flight,” Fall 2013, and spring and summer 2014.
9. Dasom Lee, “Multi-view Multi-object Tracking in Videos of Schools of Fish,” February–December 2013.
10. Ester Wu, REU project “Annotating Videos of Bat Flight,” Fall 2013.
11. Tatiana Schmidt Goncalves, REU project “Video Annotation via Crowd Sourcing,” Spring and Summer 2013.
12. Maxwell Porter, UROP project “Expanding a 3D Computer Model of Bats in Flight Using Visible Light Footage,” Summer 2012
13. Seule Ki Kim and Eugene Yang, REU project “Generating Ground Truth for Cell Segmentation,” Summer 2012.
14. Ashley Banks and Alison Greco, REU project “Annotating Ground Truth for 3D Flight Analysis of Foraging Bats,” Summer 2012.
15. Gordon Towne, UROP project “Three Dimensional Reconstruction for Intelligent Tracking Systems,” Summer 2011.
16. Sarah Hall, REU project “Hand gesture based drawing using the Kinect,” AY 2011/2012.
17. Jamal Rasheed, REU project “Visualization of flight paths of bats,” Summer 2011 and AY 2011/2012.
18. Christopher Kwan, UROP project “Camera Canvas: Image Editing Software for People with Disabilities,” Summer 2010, and BA/MA project AY 2010/2011.

19. Gordon Towne, UROP project “A Computer Vision Approach to Track Running Performance,” Summer 2010.
20. Eric Missimer, REU project “Automatic eye blink detection,” Summer 2009 – Summer 2010.
21. Rufat Mammadyarov, REU project “Hand gesture recognition,” Fall 2009.
22. David House, UROP project “Image Analysis of Microorganisms: Developing a System for the Detection, Segmentation, and Tracking of Cells and Cell Populations,” Summer and Fall 2008 and 2009.
23. Caitlin Connor, UROP project “Automated Initialization of HCI and Automated Recovery from Breakdown of HCI Features of Camera Mouse for Users with Severe Disabilities,” Summer and Fall 2008.
24. Emily Yu, Williams College, Computing Research Association Distributed Mentor Project “Improving the Camera Mouse,” Summer 2008.
25. Jacqueline Crescimanno, REU project “Stereo Reconstruction of Bat Flight,” Summer 2008.
26. Eric Immermann, BA’08, “EcoTracker Software,” Spring 2007–2008.
27. Maria Shugrina, BA’07, “Animate!” A program that enables people with disabilities to create animations of an anthropomorphic figure. Spring 2007. Now software engineer at Google, New York, NY.
28. Maria Shugrina, “Empathic Painting: Interactive stylization through observed emotional state.” Spring-Fall 2006.

Doctoral Thesis, Examining Committee Member

- Geetha M., “Methodology for Continuous Sign Language Recognition with Focus on Movement Epenthesis Segmentation,” Amrita School of Engineering, India, August 2019 (reader).
- Xingchao Peng, “Synthetic-to-Real Adaptation for Object Detection,” August 2019
- Jacob Harer, “Improved Neural Machine Translation Systems for Low Resource Correction Tasks,” July 2019 (3rd reader and committee chair)
- Hanwen Wu, “Session Types in Practical Programming,” September 2018 (Chair).
- Sarah A. Bargal, “Grounding Deep Models of Visual Data,” November 30, 2018 (2nd reader).
- Huijuan Xu, “Vision and Language Understanding with Localized Evidence,” September 2018 (2nd reader).
- Kun He, “Learning Deep Embeddings by Learning to Rank,” September 2018 (Chair).
- Fatih Cakir, “Online Hashing for Fast Similarity Search,” May 2017 (2nd reader).
- Qinxun Bai, January 2017 (3rd reader).
- Jianming Zhang, “Visual Saliency Computation for Image Analysis,” September 2016 (2nd reader).
- Shugao Ma, “Learning Space-time Structures for Human Action Recognition and Localization,” May 2016 (2nd reader).
- Jonathan Wu, “Gesture Passwords: Concepts, Methods, and Challenges,” May 2016 (3rd reader).
- Matthew Walker, “Analysis of Fibroblast Morphology and Migration on Bioengineered Substrata Aided by Machine Vision and Learning Techniques,” May 2013 (4th reader).

- Vitaly Ablavsky, “Layers of Graphical Models for Tracking and Action Recognition,” March 2011 (2nd reader).
- Tai-Peng Tian, “Efficient Discrete Optimization for Large State Space Pictorial Structures with Non-Tree Graphs,” January 2011 (Chair and 5th reader)
- Mingyan Shao, “Feature Analysis of Diagrams with Applications to Retrieval and Classification,” Northeastern University, May 2010 (2nd reader)
- Rui Li, “Switching Dynamic Global Coordination Model,” January 2010 (2nd reader)
- Panagiotis Papapetrou, “Embedding-Based Subsequence Matching,” January 2010 (3rd reader)
- Quan Yuan, “Learning of a Family of Detectors,” January 2010 (2nd reader)
- Kyle Burke, “Science for Fun: New Impartial Board Games,” May 2009 (2nd reader)
- Michael Ocean, “The Sensor Network Workbench: Towards Functional Specification, Verification and Deployment of Constrained Distributed Systems,” January 2009 (4th reader)
- Jason Horn, “Nightly and Seasonal Behavior of Bats in the Aerosphere Assessed with Thermal Infrared Imaging and NEXRAD Doppler Radar,” May 2007 (2nd reader)
- Vassilis Athitsos, “Learning Embeddings for Indexing, Retrieval, and Classification, with Applications to Object and Shape Recognition in Image Databases,” May 2006 (3rd reader)
- Jonathan Alon, “Spatiotemporal Gesture Segmentation,” May 2006 (2nd reader)
- John Isidoro, “Stochastic Mesh-based Multiview Reconstruction,” May 2004 (2nd reader)
- Romer Rosales, “The Specialized Mappings Architecture, with Applications to Vision-Based Estimation of Articulated Body Pose,” January 2002 (4th reader)
- Lifeng Liu, “Shape Model-Based Region Grouping, a Method for Deformable Object Detection and Retrieval,” January 2001 (reader)

Master’s Thesis, Examining Committee Member

- Harish Sathishchandra, “Compressive Sensing-based Reconstruction of Lissajous-like Nodding LIDAR data,” (3rd reader)
- He Kun, “Stochastic Functional Descent for Learning Support Vector Machines,” August 2013 (2nd reader)
- Gokberk Cinbis, “Learning Actions from the Web,” September 2010 (2nd reader)
- Alexandra Stefan, “Indexing Methods for Efficient Multiclass Recognition,” September 2008 (2nd reader)
- Luke Skelly, “Rotation Invariant 3D Feature Description,” May 2007 (2nd reader)

Bachelor’s Thesis, Examining Committee Member

- Kunihiro Ken Hayakawa, “Made in our Image: Japanese and Western Views of Robots and Their Creators,” May 2006 (2nd reader)

STUDENT AWARDS

PhD student Mona Jalal won the 2019 Hariri Institute for Computing Graduate Student Fellowship which recognizes outstanding PhD students who pursue computational and data-driven research at Boston University.

PhD student Wenxin Feng received the Department of Computer Science Teaching Fellow Excellence Award for 2017/2018.

PhD student Wenxin Feng and her team at the startup Pison Technolgy won the Assistive Technology Challenge in December 2016. The \$400,000 award was given by two teams by the ALS Association and Price4Life. Wenxin’s team was praised for creating a “motionless communication and control system for people with ALS and other neuromuscular conditions. It will allow a person with little to no movement ability to have full control of a laptop, a phone, and home robotics 24/7.” Wenxin is responsible for designing and implementing the interaction software.

PhD student Danna Gurari won the 2014/2015 Boston University Computer Science Research Excellence Award.

PhD student Ajjen Joshi won the 2014/2015 Boston University Computer Science Teaching Excellence Award.

Ph.D. advisees Danna Gurari, Diane Theriault and Mehrnoosh Sameki were authors of the paper “How to use level set methods to accurately find boundaries of cells in biomedical images? Evaluation of six methods paired with automated and crowdsourced initial contours,” which won the “Best Paper Award for Innovative Idea” at the MICCAI Workshop on Interactive Medical Image Computation (IMIC) in September 2014. BU Announcement.

Ph.D. student Danna Gurari and MA. student Seule Ki Kim were first and second authors on the paper “SAGE: An Approach and Implementation Empowering Quick and Reliable Quantitative Analysis of Segmentation Quality,” which won a “Best Paper Award” at the IEEE Workshop on the Applications of Computer Vision (WACV) in Clearwater, Florida, in January 2013. This was one of two awards selected among 161 submitted and 75 accepted papers at WACV.

Ph.D. advisee Zheng Wu won the Boston University Computer Science Department’s Research Achievement Award for 2011–2012 for his contributions to “video-based multi-object tracking.” BU CS Award Announcement.

Ph.D. student Samuel Epstein won a 2011 Solomonoff Student Prize at the Fourth Conference on Artificial General Intelligence (AGI) for the co-authored paper “An Information Theoretic Representation of Agent Dynamics as Set Intersections,” August 2011.

MA student Christopher Kwan won the Graduate School of Arts and Sciences Award on his work entitled “Camera Canvas: Image Editing Software for People with Disabilities,” Boston University Science Day, March 2011. Award Announcement

Undergraduate research assistant Christopher Kwan won the 2nd Place Poster Award at the Boston University Undergraduate Research Symposium for the presentation *Camera Canvas: Image Editing Software for People with Disabilities* in Fall 2010. UROP News.

Undergraduate research assistant David House won the “Best Poster Award” at the Boston University Undergraduate Research Symposium for the presentation of *Image Analysis of Microorganisms: Developing a System for Tracking Cell Populations* in Fall 2009. BU CAS Magazine.

Undergraduate research assistant Caitlin Connor was selected the 2008 Clare Boothe Luce Summer Research Fellow.

Undergraduate research assistant Maria Shugrina won the Boston University “College Prize for Excellence in Computer Science” in May 2007.

Ph.D. advisee Jingbin Wang won the Boston University Computer Science Department’s Research Achievement Award for 2006–2007. BU CS Announcement.

Undergraduate research assistant Benjamin Waber won the Boston University Computer Science Department “Research Achievement Award” in May 2006.

Research assistant Michael Chau won the Boston University “College Prize for Excellence in Computer Science” in May 2005.

Boston University President’s Award for Science and Technology to Betke’s graduate student Angshuman Bagchi for *Tracking Large Variable Numbers of Objects in Clutter*, selected from more than 150 contenders, March 2005. BU Research Spotlight.

Lubee Bat Conservancy Award at the 33rd Annual North American Symposium on Bat Research to Betke’s undergraduate student Diane E. Hirsh for the outstanding oral presentation on *Censusing Brazilian Free-tailed Bats Using Infrared Thermal Imaging and Computer Vision Methods*, October 2003. Award Report. She also won the Boston University Computer Science Department “Academic Achievement Award” in May 2004.

Boston University Chancellor’s Award for Science and Technology to Betke’s graduate student Stephen Crampton for *Counting Fingers in Real Time: A Webcam-based Human-Computer Interface with Game Applications*, selected from 165 contenders, March 2003. BU Research.

Boston University Provost’s Award for Science and Technology to Betke’s graduate student Harrison Hong for *Automatic 3D Registration of Lung Surfaces in Computed Tomography Scans*, selected from more than 120 contenders, March 2002. BU Bridge.

MENTORING AND OUTREACH

Mentor for postdoctoral researcher Randa Elanwar, 2015–present. Sponsored by the Cairo Initiative Scholarship Program of the U.S.–Egypt Higher Education Initiative.

Mentor of Assistant Professor Emily Whiting, Department of Computer Science, 2017–2020.

Mentor of Associate Professor Rosina Georgiadis, Department of Chemistry, Boston University, 2019–2020.

Co-Host of about 15 middle school children who visited the BU CS Department on a field trip during the Driscoll Science Solstice Day, December 17, 2018.

Lecturer for Artemis project, a five-week summer day camp for twenty 9th grade girls who are interested in exploring computer science, June 2012, July 2013, July 2017, and July 2018

Supervised PhD student Ajjen Joshi in developing “Interactive Projections” for the Experimental Performance “Victory Over the Sun: The First Futurist Opera” by Aleksei Kruchenykh, directed by Anna Winestein, in collaboration with Yuri Corrigan, Assist. Prof. of Russian and Comparative Literature, and Minou Arjomand, Assist. Prof. of English, Boston, MA, April 23, 2015.

Mentor for six computer science undergraduate students attending the 2014 Grace Hopper Celebration of Women in Computing conference, Phoenix, AZ, October 2014.

Panelist for the Massachusetts Institute of Technology EECS Postdoc Career Workshop, “Academic Life” Cambridge, MA, January 30, 2014.

Mentor on proposal writing, in particular, NSF Career Grants, for junior faculty at Sargent College, Boston University, June 11, 2013. Helped secure a NSF Career grant for Assistant Professor Cara Stepp, Sargent College and Hariri Junior Faculty Fellow, Boston University, awarded in December 2014.

Mentor for Christopher Hung in the Boston University “Research Internship in Science & Engineering” summer program for high school students. Summer 2013.

Mentor for postdoctoral researcher Zheng Wu, 2012–2013.

Lecture on “Fostering Interest in Computer Science via Computer Vision Case Studies” at the Workshop “Counselors for Computing” by the National Center for Women and Information Technology, Boston, November 2012.

Lecturer and host for Boston University Workshop on “Designing Leadership – Celebrating Creativity and Innovation,” September 24, 2011.

Lecturer and host for a laboratory visit of the Artemis project, a five-week summer day camp for twenty 9th grade girls who are interested in exploring computer science. Summer 2011.

Director of Undergraduate Studies. Advised undergraduate students in computer science and other disciplines. This involved discussion of the student’s current and past course performance, course selection for the upcoming semester, course substitutions and credit transfer, career opportunities, continued education in graduate programs, scholarships, etc.

Mentor for the women students in the Computer Science Department. During AYs 2000–2009, Prof. Betke was the only female faculty member in the Computer Science Department at Boston University. She organizes meetings with the students and provides them with information about fellowship programs for women, support networks, career opportunities, conferences, etc.

Host for visit of 20 high school students in the “Pathways to Science” one-week summer program at Boston University to the Image and Video Computing laboratory in 2007– 2018.

Host for the visit of 20 middle school girls in the Tech Savvy Camp at Boston University to Image and Video Computing laboratory, July 2010.

Panelist, “Women in Networks: Pre-tenure Mentoring Panel,” Boston University, Fall 2009.

Mentor, Collaborative Research Opportunity for Undergraduate Women (CREW) Project, Computing Research Association, AY 2002/3 and 2003/4.

Mentor, CRA-W Distributed Mentor Project, Computing Research Association’s Committee on the Status of Women in Computing Research, Summer 2002 and Summer 2003.

Supervisor for the senior thesis of high school student Tameem Hasan, Boston University Academy, 2002/2003.

Organizer and Mentor, Pathways to Science, one-day visit of hundreds of female public high school students in Massachusetts at Boston University, 2001–2003.

Panelist for the Massachusetts Institute of Technology 2002 Seminar Series on Academic Careers: “Why Choose an Academic Career?” Cambridge, MA, June 2002.

Lecturer, GirlTECH’s TeacherTECH’01 Workshop for increasing the participation of inner-city girls in science, mathematics, and technology, Summer 2001.

Co-Host, Belmont Brownie Troop 19-19, November 2002, and Belmont GirlScouts, May 2005, May 2009, and November 2010.

SERVICE TO PROFESSION

Editorship

Associate Editor, Editorial Board of the journal *IEEE Transactions on Pattern Analysis and Machine Intelligence* (PAMI), August 2016–present.

Associate Editor, Editorial Board of the journal *Computer Vision and Image Understanding* (CVIU), August 2016–present.

Co-Editor, 2011–2012. Special issue “Assistive Environments for the Disabled and Senior Citizens: Theme Issue of the PETRA 2010 and 2011 Conferences” of the journal *Personal and Ubiquitous Computing*, January 2014 (online November 4, 2012).

Co-Editor, 2013. Special issue “Animal and Insect Behaviour Understanding in Image Sequences,” *EURASIP Journal on Image and Video Processing*. Published online August 12, 2013.

Co-Editor, 2011–2013. Special issue “Pervasive technologies and assistive environments: Cognitive systems for assistive environments: Special issue of PETRA 2010 and 2011 conferences” in the *International Journal Universal Access in the Information Society*. Published online, July 19, 2013.

Chair of Program Committees

Area Chair, IEEE Conference on Computer Vision and Pattern Recognition (CVPR 2020), November 2021–June 2022.

Workshop Co-Chair, IEEE Winter Conference on Applications of Computer Vision (WACV), July 2021–February 2022.

Workshop Co-Chair, IEEE Winter Conference on Applications of Computer Vision (WACV), July 2020–February 2021.

Area Chair, IEEE Conference on Computer Vision and Pattern Recognition (CVPR 2020), November 2019–June 2020.

Program Committee Chair, The Academic Data Science Alliance (ADSA) 2019 Leadership Summit, November 2018–November 2019.

Area Chair, IEEE Conference on Computer Vision and Pattern Recognition (CVPR 2018), November 2017–June 2018.

Area Chair, IEEE Conference on Computer Vision and Pattern Recognition (CVPR 2017), November 2016–June 2017.

Program Committee Chair, The 7th International Conference on Pervasive Technologies Related to Assistive Environments (PETRA), Rhodes, Greece, May 2014.

Program Committee Chair, The 6th International Conference on Pervasive Technologies Related to Assistive Environments (PETRA), Rhodes, Greece, May 2013.

Program Committee Chair, The 5th International Conference on Pervasive Technologies Related to Assistive Environments (PETRA), Crete, Greece, June 2012.

Program Committee Chair, The 4th International Conference on Pervasive Technologies Related to Assistive Environments (PETRA), Crete, Greece, May 2011.

Workshop Co-Chair, IEEE Conference on Computer Vision and Pattern Recognition (CVPR), Columbus, Ohio, June 2014.

Organizing Chair, IEEE International Workshop on Cues in Communication, Cues 2001.

Member of Technical Program Committees

International Conference on Pervasive Technologies Related to Assistive Environments (PETRA) 2016, 2017, 2021, 2022

The Academic Data Science Alliance (ADSA) 2020 Leadership Summit

HCOMP 2019: The 7th AAAI Conference on Human Computation and Crowdsourcing

CVPR 2018 Workshop and Challenge: Automated Analysis of Marine Video for Environmental Monitoring

IEEE Workshop on Perception Beyond the Visible Spectrum (PBVS) 2013, 2015, 2016, 2017, 2018, 2019

Workshop on Computer Vision for Microscopy Image Analysis (CVMI) at CVPR 2016, 2017, 2018, 2019

IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2003, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014

European Conference on Computer Vision (ECCV) 2010, 2014

IEEE International Conference on Computer Vision (ICCV) 2003, 2005, 2007, 2009

The Eleventh IEEE International Conference on Automatic Face and Gesture Recognition (FG), 2015

Workshop on Automated Analysis of Video Data for Wildlife Surveillance (AVDWS), 2015, 2016

International Conference on Universal Access in Human-Computer Interaction (UAHCI) 2011, 2012

International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI) 2004, 2007, 2008, 2009, 2010

The International Conference on Human Computer Interaction (HCI International) 2011, 2013, 2014

International Conference on Pattern Recognition (ICPR) 2006, 2010, 2014

IEEE International Workshop on Human Computer Interaction (HCI) 2007

IEEE International Conference on Image Processing (ICIP) 2003, 2004, 2005

The 12th European AAATE Conference by the Association for the Advancement of Assistive Technology in Europe, 2013

International Workshop on Video and Image Ground Truth for Computer Vision Applications (VIGTA) 2013

3rd ACM International Regular-Data Challenge Workshop on Multimedia Analysis of Ecological Data (MAED) 2014

International Workshop on Visual Observation and Analysis of Animal and Insect Behavior (VAIB) 2012

International Workshop on Visual Observation and Analysis of Vertebrate and Insect Behavior (VAIB) 2014, 2016

IEEE Workshop on Projector-Camera Systems (ProCams) 2006, 2007

IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP) 2005

IEEE ICCV Workshop on Computer Vision for Biomedical Image Applications 2005

IEEE Workshop on Applications of Computer Vision (WACS) 2005

4th Indian Conference on Computer Vision, Graphics, and Image Processing (ICVGIP) 2004

IEEE Workshop on Articulated and Nonrigid Motion (ANM) 2004

IEEE Symposium on Bioinformatics and Bioengineering (BIBE) 2003

IEEE Workshop on Motion and Video Computing (WMVC) 2002

IEEE Intelligent Vehicles Symposium (IV) 2000.

Other Professional Service

- Member, Site Visit Review Panel, Insight Science Foundation Ireland Research Centre for Data Analytics, National University of Ireland, Fall 2021.
- Reviewer, Grant proposal, AI Singapore, National Research Foundation, Singapore, November 2021.
- Advisory Board Member for the NSF-funded “Growing Convergence Research” project *Understanding virus evolution through deep Raman spectroscopy* led by Mauricio Terrones, Department of Physics, The Pennsylvania State University

- Evaluator, U.S. permanent residency applications for outstanding researchers, 2012–present
- Full professor promotion evaluator, external, Fall 2021
- Tenure evaluator, external cases, Summer and Fall 2021
- Tenure evaluator, internal, Fall 2020
- Member of the Faculty Search Committee, University of Luxembourg, June 2020
- Tenure evaluator, external, October 2019
- Tenure evaluator, external, September 2019
- Interviewee “Executive Order on Maintaining American Leadership in Artificial Intelligence,” Boston University Public Relations, May 1, 2019
- Tenure evaluator, external, May 2019
- Tenure evaluator, internal, 2018–2019
- Center Director evaluator, January 2019
- Full professor promotion evaluator, 2018
- Co-sponsor and speaker, 2019 Workshop on Human Community and Perpetual Contact
- Co-sponsor and speaker, 2019 Workshop on Should Robots Be Our Friends. Ethical and social scientific implications of the growing emotional engagement of humans with AI agents and robots
- Tenure evaluator, external, April 2018
- Reviewer of research programs at a foreign university. Review process was conducted by the Oak Ridge Associated Universities (ORAU), 2012–2016, 2018, and twice in 2019.
- Reviewer, American Institute of Biological Sciences, April 2017.
- Promotion evaluator, internal, September 2017
- Promotion evaluator, external, September 2016
- Ad hoc Reviewer, National Science Foundation, 2016 and 2017.
- Reviewer, National Academies for Science, Engineering, and Medicine, September 2014.
- Promotion evaluator, external, May 2015
- Tenure evaluator, external, October 2009
- Member, Site Visit Panel of the National Science Foundation, May 2002.
- Member, National Science Foundation Panels, 1999, 2000, 2001, 2003, 2004, 2005, 2007, 2008, 2010, 2012, 2014, 2015
- Reviewer, Dutch National Science Foundation, May 2007.
- Member, Bat Working Group, National Center for Ecological Analysis and Synthesis, January 2003–2009.
- Session Chair, International Conference on Universal Access in Human-Computer Interaction (UAHCI) 2011, The 3rd International Conference on Pervasive Technologies Related to Assistive Environments (PETRA), June 2010, The 2nd International Conference on Pervasive Technologies Related to Assistive Environments (PETRA), June 2009, IEEE Computer Society Workshop on Mathematical Methods in Biomedical Image Analysis, June 2009, IEEE Workshop on Applications in Computer Vision, December 2002.
- Reviewer for Journals:
 - Algorithmica
 - Annals of Biomedical Engineering
 - Assistive Technology
 - Autonomous Robots
 - Behavior & Information Technology
 - Biological Cybernetics Review
 - British Journal of Applied Science & Technology

Computer Aided Surgery
 Computer Vision and Image Understanding
 Ecological Informatics
 EURASIP Journal on Image and Video Processing
 IEEE Transactions on Education
 IEEE Transactions on Human-Machine Systems
 IEEE Transactions on Information Theory
 IEEE Transactions on Intelligent Transportation Systems
 IEEE Transactions on Robotics and Automation
 IEEE Transactions on Medical Imaging
 IEEE Transactions on Pattern Recognition and Machine Intelligence
 IEEE Transactions on Vehicular Technology
 IEE Proceedings – Vision, Image and Signal Processing
 Image and Video Computing
 Information and Computation
 Integrated Computer-Aided Engineering
 Interacting with Computers
 International Journal of Computer Vision
 International Journal on Human-Computer Interaction
 International Journal of Pattern Recognition and Artificial Intelligence
 Iranian Journal of Electrical and Computer Engineering
 Journal of Field Robotics
 Journal of Zhejiang University – Science
 Machine Vision and Applications
 Medical Image Analysis
 Medical Physics
 Methods in Oceanography
 Multimedia Systems Journal
 Neurocomputing
 Optics Letters
 Pattern Recognition Letters
 Proceedings of the IEEE
 Real-Time Imaging
 Sensors
 Signal, Image and Video Processing
 Transactions on Accessible Computing
 Universal Access in the Information Society

- Reviewer for Conferences:
 ACM Conference on Human Factors in Computing Systems (CHI) 2016, IEEE International Conference on Robotics and Automation (ICRA) 1999, 2003, IEEE Computer Vision and Pattern Recognition Conference (CVPR) 2001, Sixth International Conference on Computer Vision (ICCV) 1998, Annual ACM Conference on Computational Learning Theory (COLT) 1993, 1996, 1995, 1997, 4th Workshop on Computational Learning and Natural Learning (CLNL) 1993.

INSTITUTE AND CENTER AFFILIATIONS

Data Science Faculty Fellow of the Boston University Rafik B. Hariri Institute for Computing and Computational Science and Engineering, September 2018.

Faculty Member of the Center for Systems Neuroscience at Boston University since 2019.

Faculty Affiliate of the Boston University Rafik B. Hariri Institute for Computing and Computational Science and Engineering since 2011.

Participating Faculty at the Boston University Center for Reliable Information Systems and Cyber Security (RISCS) since 2005.

Faculty Associate at the Boston University Center for Ecology and Conservation Biology (CECB) since 2004.

UNIVERSITY SERVICE

Co-Director of the Boston University Artificial Intelligence Research (AIR) Initiative	2017–present
Member of the “BU Strategic Planning Task Force,” charged by Provost Morrison	2018–2020
Member of the Data Science Faculty Fellow Advisory Committee, charged by Director Bestavros	2018–2019
Member of the “Envision BU Data Sciences” Committee, charged by President Brown	2018–2019
Member of the Search Committee for the Dean of the BU College of Communications, charged by Provost Morrison	2018–2019
Member of the Graduate Academic Affairs Committee, Graduate School of Arts and Sciences, charged by Graduate School Dean Hughes	2014–2017
Member of the Office of the Provost Committee on Senior Faculty Hiring, charged by Provost Morrison	2013–present
Member of the Executive Steering Committee of the Boston University Rafik B. Hariri Institute for Computing and Computational Science and Engineering	2010–2017
Member of the Committee for the Provost Faculty Hiring Initiative in Data Science	2014–2016
Participant of the Academic Program Review Process, Department of Biology	3/2013
Member of the Teaching & Learning Technologies Governance Committee	2010–2012
Member of the Faculty Advisory Committee for the Undergraduate Research Opportunity Program (UROP)	2006–2009
Chair, Women in Science and Engineering (WISE) Faculty Group	2008–2009
Member, faculty focus group on restructuring of BU’s research administration	12/2009
Member of the Search Committee for the Boston University Vice President of Information Systems and Technology	2008–2009
Speaker and Panel Leader, College of Arts and Sciences Leadership Advisory Board meeting	10/2008
Speaker, College of Arts and Sciences “CAS 101” meeting with The Office of Development and Alumni Relations	1/2008
Member of the University Appointment, Promotion and Tenure Committee (UAPT)	2007–2008
Co-Chair, Women in Science and Engineering (WISE) Faculty Group	2007–2008
Alternate Member of the Faculty Council	2002–2007
Faculty Advisor during Summer Academic Orientation	2005, 2007

Speaker, Spring Open House, College of Arts and Sciences	2007, 2008
Member of the “Institute for the Environment and Global Health” Planning Committee	2006
Member of the Faculty Search Committee, Metropolitan College	2002–2003
Member of the Pathways Planning Committee	2001–2003

SERVICE TO COMPUTER SCIENCE DEPARTMENT

Director of MS in AI Program	2019–2021
Member of the Tenure & Promotion Committee	2020
Director of Graduate Studies	2014–2020
Admissions Director of the “Master in Artificial Intelligence” program	2019–2021
Chair of the “Professor of the Practice in AI” Search Committee	2019–2021
Member of the 5-Year Merit Review Committee for Research Faculty	2019
Co-Chair of the Computer Vision Doctoral Written Examination Committee	2001–present
Developer of the “Master in Artificial Intelligence” program	2018–2019
Chair of the Faculty Search Committee	2014–2015
Associate Chair	2009–2012
Member of the New Building Planning Committee	2011–2013
Member of the Annual Faculty Merit Review Committee	2002, 2003, 2009, 2013
Member of the CS Distinguished Alumni Award Selection Committee	2009
Director of Undergraduate Studies	2004–2006, 2007–2008
Member, Committee to Study Enrollments in Computer Science Courses	2007–2008
Member of the Faculty Search Committee	2001, 2004, 2005, 2007
Chair of the Space Committee	2001–2004
Member, Committee for the Selection of the Graduate Research Excellence Award	Spring 2004, 2014-present
Member of the Outreach and Public Relations Committee	2003–2004
Member of the Sensorium Acquisition and Hiring Committee	2003
Member of the Planning Committee for the New Computer Science Building	2000–2002
Computer Science Colloquium Chair	2000–2001