Sameh Khamis

Senior Scientist, Founding Team Member
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Education

Ph.D. in Computer Science *Sep '10 - May '15*

University of Maryland, College Park, MD

- Thesis: Leveraging Structure in Activity Recognition: Context and Spatiotemporal Dynamics
- Advisor: Larry S. Davis
- GPA: 3.86

M.Sc. in Computer Science *Sep '08 - Jun '10*

The University of Western Ontario, Canada

- Thesis: A Unified Framework for Multi-Class Image Segmentation with Contextual Prior
- Advisor: Yuri Boykov
- Grade: 96.5% (Equivalent GPA: 4.0)

B.Sc. in Computer Science *Sep '01 - Jun '06*

Alexandria University, Egypt

- Thesis: Modularity in Content Management Systems
- Advisor: Ayman Khalfalah
- Grade: 87.7%, with distinction

Research Interests

- 3D reconstruction: bundle adjustment, deformable models, real-time rendering, GPGPU
- Visual recognition: action recognition, person re-identification, semantic segmentation, scene parsing
- Learning and inference: deep learning, graphical models, structured prediction, risk minimization

Publications

Conference

- Mingsong Dou, Sameh Khamis, Yury Degtyarev, Philip Davidson, Sean Ryan Fanello, Adarsh Kowdle, Sergio Orts Escolano, Christoph Rhemann, David Kim, Jonathan Taylor, Pushmeet Kohli, Vladimir Tankovich, and Shahram Izadi. Fusion4D: Real-time Performance Capture of Challenging Scenes. In ACM SIGGRAPH Conference on Computer Graphics and Interactive Techniques, Anaheim, California, 2016.
- Jonathan Taylor, Lucas Bordeaux, Thomas Cashman, Bob Corish, Cem Keskin, Toby Sharp, Eduardo Soto, David Sweeney, Julien Valentin, Benjamin Luff, Aaron Topalian, Erroll Wood, Sameh Khamis, Pushmeet Kohli, Shahram Izadi, Richard Banks, Andrew Fitzgibbon, and Jamie Shotton. Efficient and Precise Interactive Hand Tracking through Joint, Continuous Optimization of Pose and Correspondences. In ACM SIGGRAPH Conference on Computer Graphics and Interactive Techniques, Anaheim, California, 2016.

- David Joseph Tan, Tom Cashman, Jonathan Taylor, Andrew Fitzgibbon, Daniel Tarlow, Sameh Khamis, Shahram Izadi, and Jamie Shotton. Fits Like a Glove: Fast and Easy Hand Model Personalization. In IEEE Conference on Computer Vision and Pattern Recognition (CVPR), Las Vegas, Nevada, 2016.
- Sameh Khamis, Jonathan Taylor, Jamie Shotton, Cem Keskin, Shahram Izadi, and Andrew Fitzgibbon. Learning an Efficient Model of Hand Shape Variation from Depth Images. In IEEE Conference on Computer Vision and Pattern Recognition (CVPR), Boston, Massachusetts, 2015.
- Sameh Khamis and Christoph H. Lampert. CoConut: Co-Classification with Output Space Regularization. In British Machine Vision Conference (BMVC), Nottingham, UK, 2014.
- Sameh Khamis, Vlad I. Morariu, and Larry S. Davis. Combining Per-Frame and Per-Track Cues for Multi-Person Action Recognition. In European Conference on Computer Vision (ECCV), Florence, Italy, 2012.
- Sameh Khamis, Vlad I. Morariu, and Larry S. Davis. A Flow Model for Joint Action Recognition and Identity Maintenance. In IEEE Conference on Computer Vision and Pattern Recognition (CVPR), Providence, Rhode Island, 2012.

Workshop

- Sameh Khamis and Larry S. Davis. Walking and Talking: A Bilinear Approach to Multi-Label Action Recognition. In CVPR Workshop on Group And Crowd Behavior Analysis And Understanding, Boston, Massachusetts, 2015.
- Sameh Khamis, Cheng-Hao Kuo, Vivek K. Singh, Vinay Shet, and Larry S. Davis. Joint Learning for Attribute-Consistent Person Re-Identification. In ECCV Workshop on Visual Surveillance and Re-Identification (ECCVW), Zurich, Switzerland, 2014.
- Ben London, Sameh Khamis, Stephen H. Bach, Bert Huang, Lise Getoor, and Larry S. Davis. Collective Activity Detection using Hinge-loss Markov Random Fields. In CVPR Workshop on Structured Prediction: Tractability, Learning and Inference (CVPRW), Portland, Oregon, 2013.
- Cheng-Hao Kuo, Sameh Khamis, and Vinay Shet. Person Re-identification using Semantic Color Names and RankBoost. In IEEE Workshop on the Applications of Computer Vision (WACV), Clearwater Beach, Florida, 2013.

Patents

- Cheng-Hao Kuo, Vinay D. Shet, Sameh Khamis, Larry S. Davis, and Vivek K. Singh. Machine-Learnt Person Re-Identification. US Patent App. 13/913,685.

Experience

Senior Scientist, perceptiveIO (San Francisco, CA) *Jul '16 - Present*

- A new Bay Area startup working on bleeding-edge research and products at the intersection of real-time computer vision, applied machine learning, novel displays, sensing, and human-computer interaction. Our team has a proven track record of taking research to products, shipping high-impact products that touch millions of peoples lives, working on bleeding-edge research highly visible in public forums and top-rated scientific conferences, and making moonshot projects a reality.

Researcher, I3D, Microsoft Research (Redmond, WA) *Jun '15 - Jun '16*

- Worked on Holoportation, a new type of 3D capture technology that allows high-quality 3D models of people to be reconstructed, compressed and transmitted anywhere in the world in real time. When combined with mixed reality displays such as HoloLens, this technology allows users to see, hear, and interact with remote participants in 3D as if they are actually present in the same physical space. Communicating and interacting with remote users becomes as natural as face-to-face communication.

Research Assistant, University of Maryland (College Park, MD) *Jan '11 - May '15*

- *Multi-Label Action Recognition:* Recast action recognition as a multi-label problem, where each actor can be performing more than one action at a time. Developed a biconvex objective that jointly trains the label classifiers and estimates their correlation matrix.
- *Coupling Tracking and Action Recognition:* Developed a discrete model to jointly classify actions, track individuals, and label scenes from video. Devised an inference algorithm that is globally optimal in many cases through a problem (dual) decomposition approach.

Research Intern, SRI International (Princeton, NJ) *Oct '14 - Dec '14*

- Developed a stochastic regular grammar for compound action recognition, where each compound action can be represented by one or more ordered sequences of atomic actions.

Research Intern, Microsoft Research (Cambridge, UK) *Jul '14 - Sep '14*

- Developed a data-driven approach to building personalized mesh-based hand models from Kinect depth sequences. We learn a low-dimensional representation of the human hand using subdivision surfaces from a large number of subject hands performing various poses, where at test time the learned model can be deformed and posed to fit an input point cloud.

Research Intern, IST Austria (Klosterneuburg, Austria) *Feb '13 - May '13*

- Proposed co-classification, the task of jointly classifying multiple independent test samples, to exploit the fact that test samples occur in batches in many applications. We base our approach on imposing certain classification priors through a regularization term at test time.

Research Intern, Siemens Corporate Research (Princeton, NJ) *Jun '12 - Aug '12*

- Developed an attribute-consistent metric learning approach for person re-identification. Leveraging attribute labels during training intuitively introduces some invariance to illumination and pose changes in the matching process and improves the ranking accuracy.

Teaching Assistant, University of Maryland (College Park, MD) *Sep '10 - Dec '10*

- *CMSC 498F: Machine Learning*

  Instructors: Lilyana Mihalkova (Fall '10)

Research Assistant, The University of Western Ontario (London, ON) *Sep '08 - Aug '10*

- *Region Push-Relabel:* Developed a parallel out-of-core locality-preserving max-flow/min-cut algorithm for massive regular graphs common in medical imaging. Code is open-source and available online.
- *Context in Semantic Segmentation:* Developed a conditional random field model that integrates long-range location-based contextual relationships into semantic image segmentation.

Teaching Assistant, The University of Western Ontario (London, ON) *Sep '08 - Jan '10*

- *CS1037a: Computer Science Fundamentals II (C++)*

  Instructors: Yuri Boykov (Fall '09)
- *CS1027a: Computer Science Fundamentals II (Java)*

  Instructors: Aija Downing and Steven Beauchemin (Spring '08)
- *CS1032a: Information Systems and Design*

  Instructors: Diane Goldstein (Fall '08)

Talks

- Learning an Efficient Model of Hand Shape Variation from Depth Images.
  UMD Computer Vision Student Seminars, College Park, MD. April, 2015.
- What Recognizing Activities and Tracking Hands Have in Common.
  Microsoft Research, Redmond, WA. February, 2015.
- Learning a Model of Hand Shape Variation from Depth Images.
  Microsoft Research, Cambridge, UK. September, 2014.
- Combining Per-Frame and Per-Track Cues for Multi-Person Action Recognition.
  KU Leuven, Heverlee, Belgium. March, 2013.
- Combining Per-Frame and Per-Track Cues for Multi-Person Action Recognition.
  IST Austria, Klosterneuburg, Austria. March, 2013.
- Combining Per-Frame and Per-Track Cues for Multi-Person Action Recognition.
  University of Maryland, College Park, MD. September, 2012.
- Person Re-Identification in Surveillance Scenarios via Attributes.
  Siemens Corporate Research, Princeton, NJ. August, 2012.
- Energy Minimization with Graph Cuts.
  University of Maryland, College Park, MD. February, 2012.
- A Flow Model for Joint Action Recognition and Identity Maintenance.
  Siemens Corporate Research, Princeton, NJ. November, 2011.

Honors and Awards

- First Place Travel Grant, Graduate Research Interaction Day, University of Maryland, 2014.
- International Research Fellowship, University of Maryland, College Park, 2013.
- Second Place Travel Grant, Graduate Research Interaction Day, University of Maryland, 2012.
- Best Poster Award, AI Day, University of Maryland, 2012.
- Dean's Fellowship, University of Maryland, College Park, 2010-2012.
- Western Graduate Research Scholarship, University of Western Ontario, 2008-2009.
- Cairo Microsoft Innovation Center Award for Exceptional Graduation Projects, 2006.
- Faculty of Engineering Certificate of Honor, Alexandria University, 2002-2006.

Technical Skills

Recent experience using:

- *Languages:* C/C++, Python/NumPy, MATLAB, C#, Java, HTML5/CSS3/JS, Bash, LaTeX
- *Libraries:* CUDA, SIMD, Boost, OpenGL/GLSL, BLAS/LAPACK, WxWidgets, OpenCV, NodeJS
- *Systems:* PostgreSQL, SQLite, Hadoop/MapReduce, Redis

Activities and Service

- Reviewer for PAMI (2013-2015), IJCV (2015), CVIU (2014-2015), ECCV (2016, 2014, 2012), CVPR (2012-2016, 2009), ICCV (2015, 2013, 2009), NIPS (2013), UAI (2013), IJCAI (2013)
- Website Chair of the NSF/FBI/DARPA workshop on Frontiers in Video and Image Analysis, held Jan 2014 in Arlington, VA.
- Co-Chair of the 1st Workshop on Understanding Human Activities: Context and Interactions, held in conjunction with ICCV 2013 in Sydney, Australia.
- Co-Organizer of the Computer Vision Student Seminar Series, University of Maryland, 2011-2014.

References

- Jeff Han. CEO and Co-Founder, perceptiveIO (jhan@perceptiveio.com)
- Shahram Izadi. CTO and Co-Founder, perceptiveIO (shahram@perceptiveio.com)
- Andrew Fitzgibbon. Principal Researcher, Microsoft Research (awf@microsoft.com)
- Jamie Shotton. Principal Researcher, Microsoft Research. (jamiesho@microsoft.com)

- Larry S. Davis. Professor, University of Maryland. (lsd@umiacs.umd.edu)
- Christoph H. Lampert. Professor, IST Austria. (chl@ist.ac.at)
- Yuri Boykov. Professor, The University of Western Ontario. (yuri@csd.uwo.ca)

More references available upon request.