

CURRICULUM VITAE

Matthew A. Turk, PhD

ACM Fellow, IEEE Fellow, IAPR Fellow, AAILA Fellow

President

Toyota Technological Institute at Chicago (TTIC)
6045 South Kenwood Ave., Chicago, IL 60637-2803

Professor Emeritus

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University of California, Santa Barbara, CA 93106-5110

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PRIMARY RESEARCH INTERESTS AND EXPERTISE:

Computer vision and image processing, machine learning, pattern recognition, human-computer interaction, augmented and virtual reality, computer graphics and imaging, multimedia, AI ethics

RECENT LITIGATION EXPERIENCE (selected):

- 2022-pres. Gibson, Dunn & Crutcher LLP (Dallas, TX)
Expert consulting for state litigation.
- 2021-pres. Baker Botts LLP (New York, NY)
Expert consulting for patent litigation.
- 2021-pres. Foley & Lardner LLP (Dallas, TX)
Expert consulting for patent litigation.
- 2021 Faegre Drinker Biddle & Reath LLP (Los Angeles, CA)
Expert consulting for patent litigation.
- 2021 Edmonds & Schlather PLLP (Los Angeles, CA)
Expert consulting for patent litigation.
- 2021 Jenner & Block LLP (Chicago, IL)
Expert consulting on technical strategy.
- 2020-2021 Greenberg Traurig LLP (Washington, DC)
Expert consulting for patent litigation involving sensing and filters.
- 2020 Morrison & Foerster LLP (San Diego, CA)
Expert consultant for patent litigation involving computer vision and HCI.
- 2020 Wolf, Greenfield & Sacks LLP (Boston, MA)
Expert consultant for IPR patent litigation involving computer vision and HCI.
- 2020 Ascenda Law Group (San Jose, CA)
Expert consultant for IPR patent litigation involving object recognition.
- 2020 Orrick Herrington & Sutcliffe LLP (Washington, DC)
Expert consultant for IPR litigation representing Microsoft (related to imaging).

- 2019 Sidley Austin LLP (Washington, DC)
Expert consultant for IPR litigation representing Microsoft (related to image alignment).
- 2018 Morgan, Lewis & Bockius LLP (Palo Alto, CA)
Expert consultant for IPR patent litigation representing tech firm (related to authentication).
- 2016-2019 Mayer Brown LLP (Los Angeles, CA)
Expert consultant for litigation representing Facebook (related to face recognition and deep learning).
- 2017-2018 Latham & Watkins LLP (San Francisco, CA)
Expert consultant for patent litigation representing tech firm (related to mobile digital image processing).
- 2014-2016 Gardner Linn Burkhardt & Flory (Grand Rapids, MI)
Expert witness for patent litigation in IPR cases covering automobile imaging technologies, representing Magna Electronics Inc.
- 2014-2015 Williams & Connolly LLP (Washington, DC)
Expert witness for patent litigation in case covering pattern recognition and face recognition technologies, representing Google Inc.
- 2013-2015 Cooley LLP (San Diego, CA)
Expert witness for patent litigation in case covering image and face matching and pattern recognition systems. Represented Face.com (Facebook) against FaceDouble. Expert consulting and declaration for European patent application appeal involving biometrics technologies. Represented EyeLock, Inc. Represented Facebook against Blue Spike.
- 2013 Bristows (London, U.K.)
Expert witness for patent litigation in case covering camera-based interaction, gaming, and virtual reality. Represented Philips against Nintendo.
- 2012-2014 Birch, Stewart, Kolasch & Birch, LLP (Falls Church, VA)
Expert witness for patent litigation in case covering face recognition and gaming technologies. Representing Intelligent Verification Systems, LLC against Microsoft Corp.
- 2011-2012 Quinn Emanuel Urquhart & Sullivan, LLP (San Francisco, CA)
Expert witness for patent litigation in Samsung vs. Apple, representing Samsung. Covered two patents related to image display and multimedia email on mobile devices. Represented Samsung against Apple.

PROFESSIONAL EXPERIENCE:

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|------------|--|-------------------|
| 2019-pres. | Toyota Technological Institute at Chicago President (2019-pres.) | Chicago, IL |
| 2020-pres. | Toyota Technological Institute at Japan Board Councilor | Nagoya, Japan |
| 2000-pres. | University of California, Santa Barbara Professor Emeritus (2019-pres.) Chair, Department of Computer Science (2017-2019) | Santa Barbara, CA |

Chair, Media Arts and Technology (2005-2010)
 Vice Chair, Media Arts and Technology (2005)
 Professor (2005-2019), Associate Professor (2000-2005)
 Appointments: Computer Science (67%), Media Arts & Technology (33%),
 Electrical & Computer Engineering (0%), Dynamical Neuroscience (0%)
 Co-director, Four Eyes Laboratory
 Steering Committees: Center for Information Technology and Society (CITS),
 Cognitive Science Program, SAGE Center for the Study of the Mind, Center for
 Spatial Research

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| 2014-2016 | Caugnate Co-founder and CEO Startup company commercializing remote telecollaboration augmented reality software. Acquired by PTC Inc. | Santa Barbara, CA |
| 2012 | University of Oulu Visiting Professor, Department of Computer Science & Engineering (Jun-Aug) | Oulu, Finland |
| 2011 | University of Tampere Visiting Professor, School of Information Science (Aug-Sept) | Tampere, Finland |
| 2003, 2004 | Ecole Polytechnique Fédérale de Lausanne (EPFL) Visiting faculty – August 2003, July 2004 | Lausanne, Switzerland |
| 1994-2000 | Microsoft Research Researcher Founding member of the Vision Technology Research Group; research in computer vision, vision-based human-computer interaction and perceptual user interfaces. | Redmond, WA |
| 1993-94 | Teleos Research Computer Scientist Research in vision-based interaction with people, object recognition, mobile robots. | Palo Alto, CA |
| 1993 | Stanford University Lecturer Computer Science Department | Palo Alto, CA |
| 1992 | LIFIA-IMAG Postdoc / Visiting Researcher Research in face recognition and visual interpretation of human gestures, applications to human-computer interfaces. | Grenoble, France |
| 1991 | Massachusetts Institute of Technology Postdoctoral Fellow, MIT Media Laboratory Research on human face recognition for applications to security and man-machine communication; image database indexing and retrieval. | Cambridge, MA |
| 1984-87 | Martin Marietta Denver Aerospace | Denver, CO |

Senior Engineer
Research in vision algorithm development and implementation for mobile robot navigation (DARPA Autonomous Land Vehicle program).

1983-84 **University of Pittsburgh** Pittsburgh, PA
Computer Technician, Dept. of Neurophysiology
Electronics, image processing, and computer system support.

EDUCATION:

1987-91 **Massachusetts Institute of Technology** Cambridge, MA
Ph.D. from the Media Laboratory, Vision and Modeling Group
Committee: Alex P. Pentland (advisor), Ted Adelson, Nicholas Negroponte
Dissertation: *Interactive-Time Vision: Face Recognition as a Visual Behavior*
The dissertation introduced “Eigenfaces,” an appearance-based approach to face and object recognition. A prototype system was built to track and recognize people as they entered a room; we showed how this approach could be used to represent, detect, and recognize other object properties such as facial expression. Papers on this work received an “Outstanding Paper” award (1991) and a “Most Influential Paper of the Decade” award (2000).

1982-84 **Carnegie Mellon University** Pittsburgh, PA
M.S. in Electrical and Computer Engineering
Advisors: Matt Mason, Marc Raibert
Thesis: *A Fine Motion Planning Algorithm for Robots*
The thesis investigated robot manipulation planning techniques in the face of uncertainty in sensing and world modeling. A 2D planner was developed to automatically construct a plan, by reasoning in configuration space, to successfully manipulate an object along a constrained path.

1978-82 **Virginia Tech (VPI&SU)** Blacksburg, VA
B.S. in Electrical Engineering, *magna cum laude*
Advisor: Robert Haralick
Senior Honors Project in computer vision; segmentation algorithms implemented in the GYPSY image processing system.

HONORS AND AWARDS:

2022 Appointed to the *Computing Community Consortium (CCC) Council*, charged with catalyzing and empowering the U.S. computing research community to articulate and advance major research directions for the field

2022 Named as Fellow of the Asia-Pacific Artificial Intelligence Association (AAIA)

2020 Elected as *ACM Fellow* (Association for Computing Machinery) for “contributions to face recognition, computer vision, and multimodal interaction”

2016 *Best Paper Honorable Mention* at the 2016 IEEE Symposium on 3D User Interfaces (3DUI) for “Interpreting 2D Gesture Annotations in 3D Augmented Reality,” with B. Nuernberger, K. Lien, and T. Höllerer

- 2015 *Winner, ACM Multimedia Open Source Software Competition* for “Theia: A Fast and Scalable Structure-from-Motion Library,” with C. Sweeney and T. Höllerer
- 2015 *Best Short Paper Award* at the 2015 International Symposium on Mixed and Augmented Reality (ISMAR), for “Efficient Computation of Absolute Pose for Gravity-Aware Augmented Reality,” with C. Sweeney, B. Nuernberger, and T. Höllerer
- 2015 *Outstanding Reviewer Award* at the 2015 IEEE International Conference on Automatic Face and Gesture Recognition
- 2014 Elected as *IAPR Fellow* (International Association for Pattern Recognition) for “contributions to computer vision and vision-based interaction”
- 2014 Received inaugural *ICMI Community Service Award* for organizational and service contributions to the multimodal interaction research community
- 2012 Elected as *IEEE Fellow* for “contributions to computer vision and perceptual interfaces”
- 2012 *Best Paper Award* at the 2012 International Symposium on Mixed and Augmented Reality (ISMAR), for “Live tracking and mapping from both general and rotation-only camera motion,” with S. Gauglitz, C. Sweeney, J. Ventura, and T. Höllerer
- 2012 *Best Paper Honorable Mention* at the 2012 International Conference on Human-Computer Interaction with Mobile Devices and Services (MobileHCI), for “Integrating the physical environment into mobile remote collaboration,” with S. Gauglitz, C. Lee, and T. Höllerer
- 2012 *Best Student Paper Finalist* (PhD student Victor Fragoso) at the 2012 International Conference on Image Processing (ICIP), for “Locating Binary Features for Keypoint Recognition using Noncooperative Games,” with V. Fragoso and J. Hespanha
- 2012 Selected to participate in the National Academy Keck Futures Initiative on The Informed Brain in a Digital World (invitation only)
- 2011 Awarded the *2011-2012 Fulbright-Nokia Distinguished Chair in Information and Communications Technologies*
- 2010 *Best Paper Award* at the 2010 IEEE International Workshop on Mobile Vision, for “Location-based augmented reality on mobile phones,” with R. Paucher
- 2006 *One of the Best Image Processing and Computer Vision Papers* in SIBGRAPI 2006, for “Dealing with multi-scale depth changes and motion in depth edge detection,” with R. Feris and R. Raskar
- 2004 *Best Paper Award* at the 2004 IEEE Workshop on Real-Time Vision for Human Computer Interaction, for “Fast 2D hand tracking with flocks of features and multi-cue integration,” with M. Kölsch
- 2004 *Communication and Technology Top Paper Award*, for “Non-zero sum gaze and persuasion,” with J. Bailenson, A. Beal, J. Blascovich, and J. Loomis; selected for presentation at the 54th Annual Conference of the International Communication Association (2004)
- 2000 *Most Influential Paper of the Decade Award* from the International Association for Pattern Recognition (IAPR) Workshop on Machine Vision Applications (MVA-2000)
- 1999 Selected to attend the National Academy of Engineering Symposium on Frontiers of Engineering (one of 70 chosen nationwide)
- 1992 Selected to attend *Comparative Approaches to Cognitive Science* international summer school (with scholarship)
- 1991 C.N.O.U.S. post-doctoral fellowship grant (France)
- 1991 IEEE Computer Society Outstanding Paper Award, Conference on Computer Vision and

1988-90 Pattern Recognition (CVPR), for “Face recognition using eigenfaces,” with A. Pentland
 SPIE Scholarships in Optical Engineering
 1990 MIT Japan Science, Technology, Management Prize
 1988 Author of the Year award, Martin Marietta Information Systems , for “VITS – a vision
 system for autonomous vehicle navigation,” with D. Morgenthaler, K. Gremban, and M.
 Marra
 1978-82 Marshall Hahn Engineering Scholarship (Virginia Tech)

RECENT INVITED TALKS:

Jan 2022 Keynote Speaker, WACV Workshop on Real-World Surveillance: Applications and
 Challenges (Waikoloa, Hawaii)
 Dec 2021 Keynote Speaker, International Conference on 4th Industrial Revolution and Beyond
 (Dhaka, Bangladesh)
 Oct 2021 Keynote Speaker, IEEE International Workshop on Machine Learning for Signal
 Processing
 Mar 2021 Brandeis University (Waltham, MA)
 Nov 2020 Keynote Speaker, IEEE Conference on Automatic Face and Gesture Recognition
 Aug 2020 Invited Speaker, ECCV Workshop on Fair Face Recognition and Analysis
 Mar 2020 Invited Speaker and Panelist, California State Assembly Committee on Privacy and
 Consumer Protection (Sacramento, CA)
 Nov 2019 Distinguished Speaker, Ohio State University ECE Department (Columbus, OH)
 Oct 2019 Invited speaker, ICCV Workshop on Real-World Recognition from Low-Quality Images
 and Videos (Seoul, South Korea)
 Jul 2019 Keynote speaker, 14th International Symposium on Signals,
 Circuits, and Systems (Iasi, Romania)
 Aug 2018 Invited talk, Forum on The Future of ISEA (Port Hueneme, CA)
 Mar 2018 University of Primorska (Slovenia)
 Mar 2018 Arizona State University
 Jul 2017 PTC (San Diego, CA)
 Jun 2017 Keynote speaker, Global Virtual Reality Conference (CVRC) (Shanghai, China)
 Jun 2017 Invited talk, Shanghai Tech (Shanghai, China)
 Nov 2016 Keynote speaker, The Chinese Conference on Pattern Recognition (Chengdu, China)
 Oct 2016 Invited talk, Science and Engineering Council of Santa Barbara (Santa Barbara, CA)
 Apr 2016 Invited talk, Field Service USA 2016 (Palm Springs, CA)
 Apr 2016 Invited talk, Computer Science Academy, Santa Barbara High School (Santa Barbara, CA)
 Mar 2016 Invited panelist, Graduate Student Workshop on Computing, UCSB (Santa Barbara, CA)
 Feb 2016 University of Massachusetts, Amherst (Amherst, MA)
 Oct 2015 University of Notre Dame (South Bend, IN)
 Sept 2015 Invited talk, Andreessen Horowitz Academic Roundtable (Menlo Park, CA)
 Sept 2015 Invited talk, Citrix Online (Santa Barbara, CA)
 June 2015 Keynote speaker, 4th International Conference on Informatics, Electronics, and Vision
 (Fukuoka, Japan)
 May 2015 Keynote speaker, 11th IEEE International Conference on Face and Gesture Recognition
 (Ljubljana, Slovenia)

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| May 2015 | Invited panelist, 11 th IEEE International Conference on Face and Gesture Recognition (Ljubljana, Slovenia) |
| Mar 2015 | Invited speaker, San Marcos High School Distinguished Educator/Innovative Researcher (Santa Barbara, CA) |
| Dec 2014 | Keynote speaker, 17 th International Conference on Computer and Information Technology (Dhaka, Bangladesh) |
| Dec 2014 | Daffodil University (Dhaka, Bangladesh) |
| Nov 2014 | Zhejiang University (Hangzhou, CA) |
| Nov 2014 | CTO Forum: Rethink Disruption (San Francisco, CA) |
| Jan 2014 | Keynote speaker, Gsolutionz, Inc. (Carpinteria, CA) annual company meeting |
| Dec 2013 | Panelist, ICCV Workshop on Visual Commerce |
| Oct 2013 | Ohio State University |
| Jul 2013 | Google (Mountain View, CA) |
| Apr 2013 | Amazon (Seattle, WA) |
| Sept 2012 | Proceedings of the IEEE 100 th Anniversary Forum on Improving Quality of Life Through Engineering Innovations (scheduled keynote) |
| Aug 2012 | University of Oulu, Finland |
| May 2012 | Hong Kong University of Science and Technology (Invited workshop talk) |
| Apr 2012 | Qualcomm Research (San Diego, CA) |
| Aug 2011 | University of Oulu, Finland |
| Aug 2011 | University of Tampere, Finland |
| Aug 2011 | Nokia Innovation Center, Tampere, Finland |
| Apr 2011 | University of Texas, Austin |
| Mar 2011 | Keynote speaker, Infoplosion Symposium (Tokyo, Japan) |
| Mar 2011 | University of Kyoto |
| Feb 2011 | University of Houston |
| Jan 2011 | University of California, Riverside |
| Nov 2010 | Keynote speaker, 15th Ibero-American Congress on Pattern Recognition (Sao Paulo, Brazil) |
| Sept 2010 | Keynote speaker, IEEE Fourth International Conference On Biometrics: Theory, Applications And Systems (Washington, D.C.) |
| Jul 2010 | Lecturer, Sino-USA Summer School in Vision, Learning and Pattern Recognition (Xi'an, China) |
| Feb 2010 | University of Denver (Denver, CO) |
| Apr 2010 | Rensselaer Polytechnic Institute (Troy, NY) |

GRANTS, CONTRACTS, AND INDUSTRY GIFTS:

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| 2019-2022 | “Robust Inside-Out Simultaneous Localization and Mapping for Environment Monitoring and Equipment Maintenance,” U.S. Navy (PI), \$447,845 |
| 2018-2019 | “EAGER: Attention-Aware Mixed Reality Interfaces,” NSF (Co-PI), \$244,997 |
| 2015 | Equipment gift (in-kind), Nokia Corp., OZO professional VR camera, \$60,000 |
| 2015-2017 | “One+ Class Support Vector Machine Learning for Interactive Object Detection,” U.S. Navy, \$47,000 |
| 2015-2016 | “Improving Live Telecollaboration,” Citrix Online, \$80,000 |

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| 2015 | Equipment gift (in-kind), FLIR Systems, Inc.: FLIR ONE thermal infrared cameras |
| 2014-2015 | “Eye Gaze Correction for Improving Video Interaction,” Citrix Online, \$70,500 |
| 2014-2017 | “Crowd-Sourcing the World: Scalable Methods for Dynamic Structure from Motion,” NSF (PI), \$477,428 |
| 2012-2015 | “US-Finland Planning Visit: Transformed Social Interaction and Telecollaboration for Collaborative Learning,” NSF (PI), \$40,791 |
| 2012-2016 | “Telecollaboration in Physical Spaces,” NSF (PI), \$499,970 |
| 2012-2015 | “Interactive Panoramas on Google Glass,” Google, Inc. Google Glass Research Awards Program, \$18,000 + \$4500 equipment gift (in-kind) |
| 2011-2012 | Equipment gift (in-kind), NVIDIA Research: Tegra Tablet, \$1500 |
| 2009-2013 | “CRI: Equipping the Allosphere, an Environment for Immersive Data Exploration,” NSF (PI), \$749,894 |
| 2010 | Research and equipment gift funding, Nokia Corp., \$9,600 |
| 2009 | Equipment gift (in-kind), Nokia Corp., \$11,033 |
| 2009 | Equipment gift (in-kind), HRL Labs, \$16,832 |
| 2009 | Research gift funding, Nokia Corp., \$10,000 |
| 2008-2011 | Internal funding for Allosphere facility and research, UCSB (PI), \$622,052 |
| 2008-2011 | “MRI: Development of the Allosphere, an Immersive Instrument for Scientific Exploration,” NSF (PI), \$500,000 |
| 2008-2009 | “Scalable Visualization and Constrained Interaction for Large Graphs – Supporting the Collaborative Analysis of High-dimensional Data Sets,” NSF (Co-PI), \$263,000 |
| 2006-2007 | “Scalable Visualization and Constrained Interaction for Large Graphs – Supporting the Collaborative Analysis of High-dimensional Data Sets,” NSF (Co-PI), \$230,000 |
| 2008-2009 | “Multimodal Wireless Sensor Network Infrastructure,” DARPA (Key personnel), \$655,174 |
| 2006-2007 | “Scalable Visualization and Constrained Interaction for Large Graphs,” DOD/NSF (Co-PI), \$234,321 |
| 2005-2009 | “A Tangible Interaction Window between Korea and the United States,” Korean Institute of Science and Technology (Co-PI), \$274,605 |
| 2006 | “Foundations of Multimedia Research,” UC Opportunity Award, \$14,950 |
| 2005-2008 | “Detecting and Analyzing Discontinuities in Computer Vision,” NSF (PI), \$328,303 |
| 2003 | Microsoft unrestricted gift, \$65,000 |
| 2003 | “STTR Phase I: Sensors and Methods to Handle UAV,” U.S. Navy Air Systems Command (PI, subcontract to Develosoft Corp.), \$21,000 |
| 2003 | Lawrence Livermore Laboratory UCRP Award (PI), \$40,000 |
| 2003 | Microsoft Research Learning Science and Technology (co-PI), \$40,000 |
| 2003 | Mitsubishi Equipment Gift, \$650 |
| 2003 | UCSB Instructional Improvement Grant (PI), \$12,150 |
| 2003 | DiMI Opportunity Award (PI), \$14,000 |
| 2003 | Microsoft Equipment Gifts, \$50,000 |
| 2003-2008 | NSF, “Digital Multimedia IGERT: Graduate Training Program in Interactive Digital Multimedia” (Co-PI), \$3,426,376 |
| 2002-2005 | NSF, “ITR: Using Virtual Environment Technology to Understand and Augment Social Interaction” (Co-PI), \$1,100,000 |

2002 UCSB Research Across Disciplines (Co-PI), \$14,400
 2002 UCSB Research Across Disciplines (Co-PI), \$11,000
 2001 DiMI Opportunity Award (Co-PI), \$8000

TEACHING EXPERIENCE:

(* - created new course)

2000-2019 *Graduate courses:* Human Computer Interaction Technologies*, Computer Imaging*, Mobile Imaging*, Computer Vision, Probabilistic Models and Methods in Computer Science*, Artificial Intelligence, Multimodal Interaction on Mobile Computing Platforms*
Undergraduate courses: Foundations of Computer Science, Computer Graphics, Artificial Intelligence*, Machine Learning, Introduction to Computer Vision, Introduction to C, C++, and Unix
Seminar courses: Topics in Computer Vision, Human-Computer Interaction, A History of Computing*, Perceptual User Interfaces*, Visualization, Media Arts and Technology*

2012 Mobile Computer Vision course, Computer Science and Engineering Department, University of Oulu, Finland

2011 Computational Illumination course, School of Information Sciences, University of Tampere, Finland

2010 Guest lecturer, Sino-US Summer School in Vision, Learning, and Pattern Recognition (Perception, Motion, and Events), Xi'an, China

1993 Lecturer, Stanford University – Taught *Concurrent Programming* (CS140) in the Department of Computer Science, televised via the Stanford Instructional Television Network.

1990, 1991 MIT Media Lab – Co-organized and co-taught *Practical Issues in Color Processing* (4.999), lecturing on color imaging and human color vision.*

1989-90 MIT – Guest lecturer at MIT Summer Course on flight simulation.

1989-90 Graduate Tutor at “pika,” an MIT undergraduate living group. Responsible for tutoring students in a variety of subjects.

1986 Created and taught *Computer Vision* course (CS-369) for the Martin Marietta Institute *

1985-86 Organized weekly computer vision seminars at Martin Marietta. Lectured on topics in vision and AI.

RECENT PROFESSIONAL ACTIVITIES AND SERVICE:

Journal editorships, conference board positions, professional society positions, key service:

Member, CRA Computing Community Consortium (CCC) (2022-2025)
 Founding Associate Editor, ACM Transactions on Interactive Intelligent Systems (2009-present)
 Chair, Editor-in-Chief Search Committee, ACM Transactions on Interactive Intelligent Systems (2015)
 Associate Editor, Journal of Image and Vision Computing (2006-2019)
 Associate Editor, International Journal of Computer Vision and Signal Processing (2011-present)
 Guest Editor, Special Issue on Behavior Understanding for Arts and Entertainment, ACM Transactions on Interactive Intelligent Systems (TiiS) (2015)
 Guest Editor, Special Issue on Machine Learning for Vision Based Motion Analysis, Journal of Image and Vision Computing (2012)
 Guest Editor, Special Issue on Real-World Face Recognition, IEEE Transactions on Pattern Analysis and

Machine Intelligence (PAMI) (2011)
 Guest Editor, Special Issue on Mobile Computer Vision, International Journal of Computer Vision (2011)
 Chair, ICMI Advisory Board (2006-2009)
 Chair, IEEE PAMI-TC Open Access Committee (2013)
 Member, Advisory Board, IEEE International Conference on Imaging, Vision, & Pattern Recognition (2016-present)
 Member, ICMI Advisory Board (2003-2015)
 Member, Traumatic Brain Injury Resource Optimization Center Advisory Board (2008-present)
 Member, STEAM Advisory Council, MOXI: The Wolf Museum of Exploration and Innovation, Santa Barbara, CA (2012-2016)
 Member, Project Career Advisory Board, National Institute on Disability and Rehabilitation Research (NIDRR) Field Initiated Program research study on Cognitive Support Technologies for Traumatic Brain Injury, (2014-2018)
 Member, IEEE Automatic Face and Gesture Recognition Steering Committee (2011-2015)
 Member, IEEE International Conference on Social Computing Steering Committee (2010-2015)
 Member, External Review Committee for Korean Institute of Science and Technology (2009)
 Member, NSF Committee of Visitors for CISE-IIS (2005)
 Member, DARPA IXO Immersive Operations Planning Panel (2006-2007)
 Member, ACM Transactions on Interactive Intelligent Systems (TiiS) Best Article Award Committee (2015)
 Member, ICMI Career Awards Committee (2016)
 Member, International Advisory Board, Idiap Research Institute, Martigny, Switzerland (2021-present)
 Member, Advisory Board, CHIL (Computers in the Human Interaction Loop) Program, University of Karlsruhe (2005)
 External Reviewer, Virginia Tech Center for Human Computer Interaction (2017)
 External Reviewer, John Hopkins University Department of Computer Science and Engineering (2021)

Key organizing committee positions:

IEEE Conference on Computer Vision and Pattern Recognition (CVPR) (General Chair 2014, Area Chair 2001, 2007, 2009, 2012, 2017, 2019, 2022)
 International Conference on Computer Vision (ICCV) (Area Chair 2019, 2021)
 IEEE Winter Conference on Applications of Computer Vision (WACV) (Program Chair 2017, Area Chair 2005)
 International Conference on Informatics, Electronics & Vision (General Chair 2012, 2013, 2014, 2015, 2016, 2019, 2021)
 IEEE Conference on Automatic Face and Gesture Recognition (General Chair 2011, Special Session Chair 2008, 2013, Test of Time Award Committee 2013)
 ACM Conference on Multimedia (General Chair 2006)
 International Conference on Multimodal Interfaces (ICMI) (General Chair 2008, 2019, Paper Awards Committee Chair 2007, 2008, Program Chair 2004, Area Chair 2005, 2006, Publicity Chair 2010)
 ACM CHI (Area Chair 2001, Area Chair 2013, Associate Chair for CHI Notes 2006)
 IEEE Workshop on Analysis and Modeling of Faces and Gestures (AMFG) (General Chair 2013, 2018, Honorary Chair 2021)
 IEEE Workshop on Recognizing Families In the Wild (RFIW) (Honorary Chair 2020)
 ACM Conference on Intelligent User Interfaces (IUI) (Senior Program Committee 2018)
 IEEE Workshop on CVPR for Human Communicative Behavior Analysis (2008, 2009, 2010, 2011)

IEEE Workshop on Machine Learning for Vision-Based Motion Analysis (2011)
Workshop on Media Arts, Science, and Technology (2009)
Workshop on Perceptive User Interfaces (2001)
Workshop on Multimodal User Authentication (2003, 2006)
DiMI Workshop on Perceptive Animated Interfaces (2003)
NSF Virtual Human Workshop (2004)
Award Committee, Outstanding Young Researcher in Automatic Human Behaviour Analysis (2011)

STUDENTS SUPERVISED:

Postdoctoral researcher supervised:

Changbo Hu (2001-2003)
Ismo Rakkolainen (2004-2006)
Jae Sik Chang (2005-2007)
Chunghoon Kim (2007-2009)
Masahiro Toyoura (2008-2009)
Erno Makinen (2009)
Stefan Arisona (2007-2008)
Julia Kuosmanen (2015)
Steffen Gauglitz (2014)

Ph.D. Thesis Committees Chaired:

Mathis Kölsch, 2004
Rogerio Feris, 2006
Ya Chang, 2006
Haiying Guan, 2007
Longbin Chen, 2010
Daniel Vaquero, 2012
Steffen Gauglitz (co-chair), 2014
Victor Fragoso, 2014
Chris Sweeney (co-chair), 2016
Kuo-Chin Lien (ECE), 2016
Domagoj Baricevic (co-chair), 2016
Dianna Han, 2017
Ben Nuernberger (co-chair), 2017
Jedrzej Kozerański, 2021
Pushkar Shukla, current

NON-LITIGATION CONSULTING:

2016-2018 PTC, Inc. (San Diego, CA)
Technical consulting on augmented reality for remote collaboration
2013-2018 Kent State University
NIDRR Project Career – Development of technology to support the transition of students
with traumatic brain injuries from postsecondary education to employment
2011-2013 3DiVi Inc. (Chelyabinsk, Russia) – 3D gesture recognition

2011-2012 InTouch Health, Inc. – Computer vision
 2009 Scholastic, Inc.
 2007 I2R, Singapore
 2006 Capstone Press for Inventions and Discovery
 2005 National ICT Australia (NICTA), Sydney, Australia
 2004 Biometrics Engineering Research Center, Yonsei University (Korea)
 2004 Korea Institute of Science and Technology (KIST), Seoul, Korea
 2004 Samsung Corporation (Korea)
 2001 Toyon Corporation (Santa Barbara)
 2000 Startup company managed by incubator Global Technology (Los Angeles)

PATENTS:

2017 Pending U.S. patent application – “Systems and methods for augmented reality-based remote collaboration,” with S. Gauglitz, B. Nuernberger, and T. Höllerer
 2016 U.S. Patent #9,495,761 – “Environment Mapping with Automatic Motion Model Selection,” with S. Gauglitz, C. Sweeney, J. Ventura, and T. Höllerer
 2004 U.S. Patent #6,674,877 B1 – “System and method for visually tracking occluded objects in real time,” with N. Jojic
 1992 US Patent #5,164,992: “A Face Recognition System,” with A. Pentland

OPEN SOURCE SOFTWARE, DATA SETS:

2014 Theia: A Fast and Scalable Structure-from-Motion Library, available at <http://www.theia-sfm.org/>
 Winner, ACM Multimedia Open Source Software Competition (C. Sweeney, T. Höllerer, M. Turk)
 2010 Visual tracking dataset with ground truth, available at <http://ilab.cs.ucsb.edu/index.php/datasets>
 2009 Partial shape matching source code, available at <https://code.google.com/p/shapematching/source/list>
 2004 “The HandVu Vision-Based Hand Gesture Interface,” available at <http://www.movesinstitute.org/~kolsch/HandVu>

PEER-REVIEWED DEMONSTRATIONS:

2014 “World-Stabilized Annotations and Virtual Scene Navigation for Remote Collaboration,” S. Gauglitz, B. Nuernberger, M. Turk, and T. Höllerer, ACM Conference on User Interface Software and Technology (UIST), Honolulu, HI, October 2014.
 2012 “A Prototype Setup to Integrate the Physical Environment into Mobile Remote Collaboration,” S. Gauglitz, C. Lee, M. Turk, and T. Höllerer, MobileHCI, San Francisco, September 2012.
 2005 “Depth Edges in Real Time using Multi-Flash Camera,” A. Agrawal, V. Branzoi, R. Chellappa, R. Feris, R. Raskar, K. Tan, and M. Turk, CVPR, New York, 2005.

- 2004 “HandVu – Vision-Based Hand Gesture Recognition,” M. Kölsch, M. Turk, and T. Höllerer), ISMAR ’04, Arlington, VA, Oct 31-Nov 5, 2004

REFEREED PUBLICATIONS:

- E.R. Davies and M. Turk (editors), *Advanced Methods and Deep Learning in Computer Vision*, Elsevier 2021.
- J. Robinson, C. Qin, M. Shao, M. Turk, R. Chellappa, and Y. Fu, “Recognizing Families In the Wild (RFIW): The 5th Edition,” IEEE Conference on Automatic Face and Gesture Recognition, December 2021.
- J. Kozerawski, V. Fragoso, N. Karianakis, G. Mittal, M. Turk, and M. Chen, “BLT: Balancing Long-Tailed Datasets with Adversarially-Perturbed Images,” Asian Conference on Computer Vision (ACCV), Nov-Dec 2020.
- J. Robinson, Y. Yin, Z. Khan, M. Shao, S. Xia, M. Stopa, S. Timoner, M. Turk, R. Chellappa, and Y. Fu, “Recognizing Families In the Wild (RFIW): The 4th Edition,” IEEE Conference on Automatic Face and Gesture Recognition, November 2020.
- M. Turk and V. Athitsos, “Gesture recognition,” in *Computer Vision: A Reference Guide*, Springer 2019.
- Y. Ding, B. Huynh, A. Xu, T. Bullock, H. Cecotti, M. Turk, B. Giesbrecht, and T. Höllerer, “Multimodal classification of EEG during physical activity,” International Conference on Multimodal Interfaces (ICMI), Suzhou, China, October 2019.
- P. Shukla, C. Elmadjian, R. Sharan, V. Kulkarni, M. Turk, and W. Y. Wang, “What should I ask? Using conversationally informative rewards for goal-oriented visual dialog,” Association for Computational Linguistics (ACL), Florence, Italy, July-August 2019.
- B. Nuernberger, T. Höllerer, and M. Turk, “Hybrid orbiting-to-photos in 3D reconstructed visual reality,” ACM Symposium on Virtual Reality Software and Technology (VRST), Tokyo, Japan, November 2018.
- I. Rakkolainen, R. Raisamo, M. Turk, and T. Höllerer, “Illumination for 360 degree cameras” (poster), ACM Symposium on Virtual Reality Software and Technology (VRST), Tokyo, Japan, November 2018.
- Y. Gizatdinova, O. Špakov, O. Tuisku, M. Turk, and V. Surakka, “Gaze and head pointing for hands-free text entry: applicability to ultra-small virtual keyboards,” ACM Symposium on Eye Tracking Research & Applications (ETRA), Warsaw, Poland, June 2018.
- P. Shukla, H. Sadana, A. Bansal, D. Verma, C. Elmadjian, B. Raman, and M. Turk, “Automatic cricket highlight generation using event-driven and excitement-based features,” 4th International Workshop on Computer Vision in Sports (CVsports), Salt Lake City, June 2018.
- J. Kozerawski and M. Turk, “CLEAR: Cumulative LEARning for One-Shot One-Class Image Recognition,” IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), Salt Lake City, June 2018.
- B. Nuernberger, M. Turk, and T. Höllerer, “Evaluating snapping-to-photos virtual travel interfaces for 3D reconstructed visual reality,” ACM Symposium on Virtual Reality Software and Technology (VRST), Gothenburg, Sweden, November 2017.
- V. Fragoso, C. Sweeney, P. Sen, and M. Turk. “ANSAC: Adaptive Non-Minimal Sample and Consensus,” British Machine Vision Conference (BMVC), London, September 2017.

- I. Rakkolainen, R. Raisamo, M. Turk, and T. Höllerer, "Field-of-View Extension for VR Viewers," Mindtrek 2017: 21th International Technology Conference, Tampere, Finland, September 2017.
- D. Baričević, T. Höllerer, P. Sen, and M. Turk, "User-perspective AR magic lens from gradient-based IBR and semi-dense stereo," IEEE Transactions on Visualization and Computer Graphics, Vol. 23, Issue 7, pp. 1838-1851, 2017.
- I. Rakkolainen, R. Raisamo, M. Turk, and T. Höllerer, "Extreme field-of-view for head-mounted displays," 3DTV Conference (3DTV-CON), Copenhagen, Denmark, June 2017.
- D. Baričević, T. Höllerer, and M. Turk, "Densification of semi-dense reconstructions for novel view generation of live scenes," IEEE Winter Conference on Applications of Computer Vision (WACV), Santa Rosa, CA, March 2017.
- I. Rakkolainen, M. Turk, and T. Höllerer, "A superwide-FOV optical design for head-mounted displays," International Conference on Artificial Reality and Telexistence / European Symposium on Virtual Environments (ICAT-EGVE), Little Rock, AR, December 2016.
- D. Baričević, T. Höllerer, P. Sen, and M. Turk, "User-perspective AR magic lens from gradient-based IBR and semi-dense stereo," IEEE Transactions on Visualization and Computer Graphics, Vol. 23, Issue 7, pp. 1838-1851, 2017.
- V. Fragoso, W. Scheirer, J. Hespanha, and M. Turk, "One-class slab support vector machine," International Conference on Pattern Recognition, Cancun, Mexico, December 2016.
- I. Rakkolainen, M. Turk, and T. Höllerer, "A compact, wide-FOV optical design for head-mounted displays," ACM Symposium on Virtual Reality Software and Technology (VRST), Munich, Germany, November 2016.
- B. Nuernberger, K.-C. Lien, L. Grinta, C. Sweeney, M. Turk, and T. Höllerer, "Multi-view gesture annotations in image-based 3D reconstructed scenes," ACM Symposium on Virtual Reality Software and Technology (VRST), Munich, Germany, November 2016.
- C. Sweeney, V. Fragoso, M. Turk and T. Höllerer, "Large scale SfM with the distributed camera model," International Conference on 3D Vision (3DV), Stanford, CA, October 2016.
- I. Rakkolainen, R. Raisamo, M. Turk, and T. Höllerer, "Casual immersive viewing with smartphones," Mindtrek 2016: 20th International Technology Conference, Tampere, Finland, October 2016.
- K. Lien, B. Nuernberger, M. Turk, and T. Höllerer, "PPV: pixel-point-volume segmentation for object referencing in collaborative augmented reality," IEEE International Symposium on Mixed and Augmented Reality (ISMAR), Merida, Mexico, September 2016.
- X. Zhao, M. Turk, W. Li, and K. Lien, "A multilevel image thresholding segmentation algorithm based on two-dimensional K-L divergence and modified particle swarm optimization," Applied Soft Computing, Vol. 48, pp. 151-159, 2016.
- B. Nuernberger, K. Lien, M. Turk and T. Höllerer, "Anchoring 2D gesture annotations in augmented reality," IEEE Virtual Reality (VR 2016), Greenville, SC, March 2016.
- B. Nuernberger, K. Lien, M. Turk and T. Höllerer, "Interpreting 2D gesture annotations in 3D augmented reality," IEEE Symposium on 3D User Interfaces (3DUI 2016), Greenville, SC, March 2016. (Best Paper

Honorable Mention)

M. Turk and V. Fragoso, "Computer vision for mobile augmented reality," in G. Hua and X.-S. Hua (eds.), *Mobile Cloud Visual Media Computing*, Springer International Publishing, 2015.

C. Sweeney, T. Sattler, M. Turk, T. Höllerer, and M. Pollefeys, "Optimizing the viewing graph for structure-from-motion," *International Conference on Computer Vision*, Santiago, Chile, December 2015.

Y. Qin, K. Lien, M. Turk, and T. Höllerer, "Eye gaze correction with a single webcam based on eye-replacement," *11th International Symposium on Visual Computing*, Las Vegas, NV, December 2015.

C. Sweeney, T. Höllerer, and M. Turk, "Theia: a fast and scalable structure-from-motion library," *ACM Conference on Multimedia*, Brisbane, Australia, October 2015.

C. Sweeney, J. Flynn, B. Nuernberger, M. Turk, and T. Höllerer, "Efficient computation of absolute pose for gravity-aware augmented reality," *IEEE International Symposium on Mixed and Augmented Reality (ISMAR)*, Fukuoka, Japan, October 2015. (Best Short Paper Award)

K. Lien, B. Nuernberger, M. Turk, and T. Höllerer, "2D-3D co-segmentation for AR-based remote collaboration" (poster), *IEEE International Symposium on Mixed and Augmented Reality (ISMAR)*, Fukuoka, Japan, October 2015.

K. Lien and M. Turk, "On preserving structure in stereo seam carving," *IEEE International Conference on 3D Vision (3DV)*, Lyon, France, October 2015.

A. A. Salah, H. Hung, O. Aran, H. Gunes, and M. Turk, "Behavior understanding for arts and entertainment," *ACM Transactions on Interactive Intelligent Systems* Vol. 5, No. 3, September 2015.

K. Lien, J. Gibson, and M. Turk, "High-order regularization for stereo color editing," *IEEE International Conference on Image Processing (ICIP)*, Québec City, Canada, September 2015.

A. A. Salah, H. Hung, O. Aran, H. Gunes, and M. Turk, "Brief Introduction to the Special Issue on Behavior understanding for arts and entertainment," *ACM Transactions on Interactive Intelligent Systems* Vol. 5, No. 2, July 2015.

C. Sweeney, L. Kneip, T. Höllerer, and M. Turk, "Computing similarity transformations from only image correspondences," *IEEE Conference on Computer Vision and Pattern Recognition*, Boston, MA, June 2015.

N. Moreno, J. Cornick, S. Savage, M. Turk, A. Leal, and T. Höllerer, "Motivating crowds to volunteer neighborhood data," *ACM Conference on Computer-Supported Cooperative Work (CSCW)*, Vancouver, CA, March 2015.

N. Moreno, J. Cornick, S. Savage, M. Turk, A. Leal, and T. Höllerer, "Inspiring neighborhood data contributions through different motivators," *SCSW Workshop on Information Technology and City Life*, Vancouver, CA, March 2015.

M. Rodrigue, J. Son, B. Giesbrecht, M. Turk, and T. Höllerer, "Spatio-temporal detection of divided attention in reading applications using EEG and eye tracking," *ACM Conference on Intelligent User Interfaces (IUI)*, Atlanta, GA, March 2015.

D. Vaquero and M. Turk, "Composition context photography," *IEEE Winter Conference on Applications*

of Computer Vision (WACV), Waikoloa Beach, HI, January 2015.

M. Turk, “Gesture Recognition,” in K. Hale and K. Stanney (eds.), *Handbook of Virtual Environments: Design, Implementation, and Applications*, CRC Press, 2015. (Book chapter)

C. Sweeney, J. Flynn, and M. Turk, “Solving for relative pose with a partially known rotation is a quadratic eigenvalue problem,” International Conference on 3D Vision (3DV), Tokyo, Japan, December 2014.

D. Baričević, T. Höllerer, P. Sen, and M. Turk, “User-perspective augmented reality magic lens from gradients,” ACM Symposium on Virtual Reality Software and Technology (VRST), Edinburgh, UK, November 2014.

S. Gauglitz, B. Nuernberger, M. Turk, and T. Höllerer, “In touch with the remote world: remote collaboration with augmented reality drawings and virtual navigation,” ACM Symposium on Virtual Reality Software and Technology (VRST), Edinburgh, UK, November 2014.

E. Fujimoto and M. Turk, “Non-visual navigation using combined audio music and haptic cues,” ACM International Conference on Multimodal Interaction (ICMI), Istanbul, Turkey, November 2014.

S. Gauglitz, B. Nuernberger, M. Turk, and T. Höllerer, “World-stabilized annotations and virtual scene navigation for remote collaboration,” ACM Symposium on User Interface Software and Technology (UIST), Honolulu, Hawaii, USA, October 2014.

C. Sweeney, V. Fragoso, M. Turk, and T. Höllerer, “gDLS: A scalable solution to the generalized pose and scale problem,” European Conference on Computer Vision, Zurich, Switzerland, September 2014.

M. Toyoura, H. Aruga, M. Turk, and X. Mao, “Mono-spectrum marker: an AR marker robust to image blur and defocus,” *The Visual Computer*, Vol. 30, Issue 9, September 2014.

V. Fragoso, M. Turk, G. Srivastava, A. Nagar, Z. Li, and K. Park, “Cascade of Box (CABOX) Filters for Optimal Scale Space Approximation,” IEEE International Workshop on Mobile Vision, June 2014.

S. Gauglitz, C. Sweeney, J. Ventura, M. Turk, and T. Höllerer, “Model Estimation and selection towards unconstrained real-time tracking and mapping,” *IEEE Transactions on Visualization and Computer Graphics*, Vol. 20, Issue 6, pp. 825-838, 2014.

B. Nuernberger, S. Gauglitz, T. Höllerer, and M. Turk, “Investigating Viewpoint Visualizations for Click & Go Navigation” (poster), IEEE Symposium on 3D User Interfaces, 2014.

M. Turk, “Multimodal interaction – a review,” *Pattern Recognition Letters*, Vol. 36, pp. 189-195, January 2014.

M. Turk and G. Hua, *Vision-Based Interaction*, Morgan & Claypool Synthesis Lectures on Computer Vision, 2013. (Book)

V. Fragoso, P. Sen, S. Rodriguez, and M. Turk, “EVSAC: accelerating hypotheses generation by modeling matching scores with Extreme Value Theory,” IEEE International Conference on Computer Vision, Sydney, Australia, December 2013.

M. Turk, “Over 20 years of Eigenfaces,” *ACM Transactions on Multimedia Computing Communications*

and Applications, Volume 9, Issue 1s, October 2013.

V. Fragoso and M. Turk, "SWIGS: a swift guided sampling method," IEEE Conference on Computer Vision and Pattern Recognition, Portland, OR, June 2013.

M. Toyoura, H. Aruga, M. Turk, and X. Mao, "Detecting markers in blurred and defocused images," International Conference on Cyberworlds, Yokohama, Japan, May 2013

M. Pietikäinen, M. Turk, L. Wang, G. Zhao, and L. Cheng, "Machine learning in motion analysis: New advances," Image and Vision Computing, available online 3 May 2013.

S. Gauglitz, C. Lee, M. Turk, and T. Höllerer, "Live tracking and mapping from both general and rotation-only camera motion," IEEE International Symposium on Mixed and Augmented Reality (ISMAR), Atlanta, GA, November 2012. (Best Paper Award)

D. Baričević, C. Lee, M. Turk, T. Höllerer, and D. Bowman, "A hand-held AR magic lens with user-perspective rendering," IEEE International Symposium on Mixed and Augmented Reality (ISMAR), Atlanta, GA, November 2012.

V. Fragoso, M. Turk, and J. Hespanha, "Locating binary features for keypoint recognition using noncooperative games," IEEE International Conference on Image Processing, Sept/Oct 2012.

S. Gauglitz, C. Lee, M. Turk, and T. Höllerer, "Integrating the physical environment into mobile remote collaboration," ACM SIGCHI International Conference on Human-Computer Interaction with Mobile Devices and Services (MobileHCI), September 2012

D. Vaquero and M. Turk, "Composition context photography," International Conference on Computational Photography, April 2012.

C. Kim and M. Turk, "A new biased discriminant analysis using composite vectors for eye detection," IEEE Transactions on Systems, Man, and Cybernetics B, Vol. 42, No. 4, pp. 1095-1106, August 2012.

C. Chen, D. Vaquero, and M. Turk, "Illumination demultiplexing from a single image," International Conference on Computer Vision, Barcelona, Spain, November 2011.

M. Petter, V. Fragoso, M. Turk, and C. Baur, "Automatic text detection for mobile augmented reality translation," Workshop on Mobile Computer Vision, Barcelona, Spain, November 2011.

S. Gauglitz, M. Turk, and T. Höllerer, "Improving keypoint orientation assignment," British Machine Vision Conference (BMVC 2011), Dundee, Scotland, Aug-Sept 2011.

S. Gauglitz, L. Foschini, M. Turk, and T. Höllerer, "Efficiently selecting spatially distributed keypoints for visual tracking," IEEE International Conference on Image Processing (ICIP 2011), Brussels, Belgium, September 2011.

S. Gauglitz, T. Höllerer, and M. Turk, "Evaluation of interest point detectors and feature descriptors for visual tracking," International Journal of Computer Vision, vol. 94(3), pp. 335-360, 2011.

D. Vaquero, N. Gelfand, M. Tico, K. Pulli, and M. Turk, "Generalized autofocus," IEEE Workshop on Applications of Computer Vision (WACV 2011), January 2011.

V. Fragoso, S. Gauglitz, S. Zamora, J. Kleban, and M. Turk, "TranslatAR: A mobile augmented reality

translator,” IEEE Workshop on Applications of Computer Vision (WACV 2011), January 2011.

M. Jang and M. Turk, “Car-Rec: A real-time car recognition system,” IEEE Workshop on Applications of Computer Vision (WACV 2011), January 2011.

E. Eyjolfssdottir and M. Turk, “Multisensory, embedded pose estimation,” IEEE Workshop on Applications of Computer Vision (WACV 2011), January 2011.

M. Turk, “Computational illumination,” in I. Bloch and R. M. Cesar, Jr. (Eds.), CIARP 2010, LNCS 6419, p. 5, Springer-Verlag, 2010. (Abstract of keynote talk)

D. Vaquero, M. Turk, K. Pulli, M. Tico, and N. Gelfand, “A survey of image retargeting techniques,” SPIE Applications of Digital Image Processing XXXIII, San Diego, CA, August 2010.

S. Venkatesha and M. Turk, “Human activity recognition using local shape descriptors,” International Conference on Pattern Recognition, Istanbul, Turkey, August 2010.

R. Paucher and M. Turk, “Location-based augmented reality on mobile phones,” IEEE International Workshop on Mobile Vision (Best Paper Award), San Francisco, June 2010.

J.-K. Na, J.-Y. Park, J.-H. Yi and M. Turk, “Parameterized structured light imaging for depth edge detection,” Electronics Letters, Vol. 46, No. 1, pp. 46-47, 2010.

D. Vaquero, R. Feris, L. Brown, A. Hampapur, and M. Turk, “Attribute-based people search,” Y. Ma and G. Qian (eds.), *Intelligent Video Surveillance: Systems and Technology*, Taylor & Francis, 2009.

D. Vaquero, R. Feris, L. Brown, A. Hampapur, and M. Turk, “Attribute-based people search in surveillance environments,” Workshop on Applications of Computer Vision (WACV 2009), Snowbird, UT, Dec. 7-8, 2009.

D. Vaquero, R. Raskar, R. Feris, and M. Turk, “A projector-camera setup for geometry-invariant frequency demultiplexing,” IEEE Conference on Computer Vision and Pattern Recognition (CVPR 2009), Miami, FL, June 2009.

L. Chen, J. McAuley, R. Feris, T. Caetano, and M. Turk, “Shape classification through structured learning of matching measures,” IEEE Conference on Computer Vision and Pattern Recognition (CVPR 2009), Miami, FL, June 2009.

C. Kim, M. Turk, and C.-H. Choi, “Biased discriminant analysis using composite vectors for eye detection,” IEEE Conference on Automatic Face and Gesture Recognition, Amsterdam, September 2008.

L. Chen, R. S. Feris, and M. Turk, “Efficient partial shape matching using Smith-Waterman algorithm,” CVPR Workshop on Non-Rigid Shape Analysis and Deformable Image Alignment (NORDIA'08), Anchorage, Alaska, June 27-28, 2008.

D. A. Vaquero, R. S. Feris, M. Turk, and R. Raskar, “Characterizing the shadow space of camera-light pairs,” IEEE Conference on Computer Vision and Pattern Recognition (CVPR 2008), Anchorage, Alaska, June 24-26, 2008.

J. Park, C. Kim, J. Na, J. Yi, and M. Turk, “Using structured light for efficient depth edge detection,” Journal of Image and Vision Computing, Vol. 26, Issue 11, pp. 1449-1465, November 2008.

- M. Turk, T. Höllerer, S. M. Arisona, J. Kuchera-Morin, C. Coffin, R. Hoetzlein, L. Putnam, and D. Overholt, "Creative collaborative exploration in multiple environments," AAAI Spring Symposium on Creative Intelligent Systems, Stanford University, March 26-28, 2008.
- R. Feris, R. Raskar, L. Chen, K. Tan, and M. Turk, "Multi-flash stereopsis: depth edge preserving stereo with small baseline illumination," IEEE Transactions on Pattern Analysis and Machine Intelligence, Vol. 30, No. 1, pp. 147-159, January 2008.
- S. Zhang and M. Turk, "Eigenfaces," Scholarpedia, 3(9):4244, 2008.
- H. Guan and M. Turk, "The hierarchical isometric self-organizing map for manifold representation", IEEE Workshop on Component Analysis Methods for Classification, Clustering, Modeling, and Estimation Problems in Computer Vision (in conjunction with CVPR07), Minneapolis, Minnesota, June 18-23, 2007.
- R. Feris, R. Raskar, and M. Turk, "Dealing with multi-scale depth changes and motion in depth edge detection," Brazilian Symposium on Computer Graphics and Image Processing, October 2006. (Awarded "One of the Best Image Processing and Computer Vision Papers")
- Y. Zana, R. M. Cesar-Jr., R. Feris, and M. Turk, "Local approach for face verification in polar frequency domain," Image and Vision Computing, Vol. 24, No. 8, pp. 904-913, 2006.
- Y. Chang, C. Hu, R. Feris, and M. Turk, "Manifold based analysis of facial expression," Image and Vision Computing, Vol 24, No. 6, pp. 605-614, 2006.
- H. Guan, T. Kubota, X. Huang, X. S. Zhou, and M. Turk, "Automatic hot spot detection and segmentation in whole body FDG-PET images," IEEE International Conference on Image Processing (ICIP 2006), Atlanta, GA, October 2006.
- H. Guan, J. Chang, L. Chen, R. Feris, and M. Turk, "Multi-view appearance-based 3D hand pose estimation," IEEE Workshop on Vision for Human Computer Interaction, New York, NY, June 2006.
- M. Turk, "Vision-Based Interaction," in H. Ip (Ed.), *Encyclopedia of Multimedia*, Springer, 2006.
- M. Kölsch, R. Bane, T. Höllerer, and M. Turk, "Multimodal interaction with a wearable augmented reality system," IEEE Computer Graphics and Applications, Vol. 26, No. 3, pp. 62 -71, May/June 2006.
- J. Muncaster and M. Turk, "Continuous multimodal authentication using dynamic Bayesian networks," Second Workshop on Multimodal User Authentication, Toulouse, France, May 11-12, 2006.
- H. Guan, R. Feris, and M. Turk, "The isometric self-organizing map for 3D hand pose estimation," International Conference on Face and Gesture Recognition, Southampton, UK, pp. 263-268, April 2006.
- R. Feris, R. Raskar, K. Tan, and M. Turk, "Specular highlights detection and reduction with multi-flash photography," Journal of the Brazilian Computer Society, Vol. 1, No. 12, pp. 35-42, 2006.
- C. Kim, J. Park, J. Yi, and M. Turk, "Efficient depth edge detection using structured light," International Symposium on Visual Computing, Lake Tahoe, NV, December 5-7, 2005.
- Y. Zana, R. Cesar, R. Feris, and M. Turk, "Face verification in polar frequency domain: a biologically motivated approach," International Symposium on Visual Computing, Lake Tahoe, NV, December 5-7,

2005.

V. Nayak and M. Turk, "Emotional expression in virtual agents through body language," International Symposium on Visual Computing, Lake Tahoe, NV, December 5-7, 2005.

H. Guan and M. Turk, "3D hand pose reconstruction with ISOSOM," International Symposium on Visual Computing, Lake Tahoe, NV, December 5-7, 2005.

M. Kölsch and M. Turk, "Flocks of features for tracking articulated objects," in B. Kisacanin, V. Pavlovic, and T. Huang (eds.), *Real-Time Vision for Human-Computer Interaction*, Springer, 2005.

R. Feris, M. Turk, R. Raskar, K. H. Tan, and G. Ohashi, "Recognition of isolated fingerspelling gestures using depth edges," in B. Kisacanin, V. Pavlovic, and T. Huang (eds.), *Real-Time Vision for Human-Computer Interaction*, Springer, 2005.

M. Turk, "Multimodal human-computer interaction," in B. Kisacanin, V. Pavlovic, and T. Huang (eds.), *Real-Time Vision for Human-Computer Interaction*, Springer, 2005.

M. Turk, "RTV4HCI: A historical overview," in B. Kisacanin, V. Pavlovic, and T. Huang (eds.), *Real-Time Vision for Human-Computer Interaction*, Springer, 2005.

M. Turk, "Eigenfaces and beyond," in W. Zhao and R. Chellappa (eds.), *Face Processing: Advanced Modeling and Methods*, Academic Press, 2005.

Y. Chang, M. Vieira, M. Turk, and L. Velho, "Automatic 3D facial expression analysis in videos," IEEE International Workshop on Analysis and Modeling of Faces and Gestures, Beijing, China, October 2005.

R. Feris, R. Raskar, L. Chen, K. Tan, and M. Turk, "Discontinuity preserving stereo with small baseline multi-flash illumination," International Conference on Computer Vision (ICCV'05), Beijing, China, 2005.

J. N. Bailenson, A. C. Beall, J. Blascovich, J. Loomis, and M. Turk, "Transformed social interaction, augmented gaze, and social influence in immersive virtual environments," Human Communication Research, Vol. 31, No. 4, pp. 511-537, October 2005.

Y. Chang, R. Cutler, Z. Liu, Z. Zhang, A. Acero, and M. Turk, "Automatic head-size equalization in panorama images for video conferencing," IEEE International Conference on Multimedia & Expo (ICME), Amsterdam, The Netherlands, July 2005.

C. Kim, J. Park, J. Yi, and M. Turk, "Structured light based depth edge detection for object shape recovery," IEEE International Workshop on Projector-Camera Systems, San Diego, June 25, 2005.

J. Kim, J. Choi, J. Yi, and M. Turk, "Effective representation using ICA for face recognition robust to local distortion and partial occlusion," IEEE Transactions on Pattern Analysis and Machine Intelligence, Vol. 27, No. 12, pp. 1977-1981, December 2005.

R. Raskar, K. Tan, R. Feris, J. Kobler, J. Yu, and M. Turk, "Harnessing real-world depth edges with multi-flash imaging," IEEE Computer Graphics and Applications, Vol. 25, Issue 1, pp 32-38, January 2005.

Y. Wang, Y. Jia, C. Hu, and M. Turk, "Non-negative matrix factorization framework for face recognition," International Journal of Pattern Recognition and Artificial Intelligence, Vol. 19, No. 4, pp.

1-17, 2005.

R. Feris, R. Raskar, K. Tan, and M. Turk, "Specular reflection reduction with multi-flash imaging," Brazilian Symposium on Computer Graphics and Image Processing, pp. 316-323, Curitiba, PR, Brazil, October 2004.

M. Turk, J. Bailenson, A. Beall, J. Blascovich, and R. Guadagno, "Multimodal transformed social interaction," Proc. International Conference on Multimodal Interfaces, pp. 46-52, State College, PA, October 13-15, 2004.

M. Kölsch, M. Turk, and T. Höllerer, "Vision-based interfaces for mobility," In Proc. MobiQuitous '04 (1st IEEE Intl. Conf. on Mobile and Ubiquitous Systems: Networking and Services), pages 86-94, Boston, MA, Aug. 22-26 2004.

M. Kölsch and M. Turk, "Analysis of rotational robustness of hand detection with a Viola-Jones detector," International Conference on Pattern Recognition, Cambridge, U.K., August 2004.

R. Raskar, K. Tan, R. Feris, J. Yu, and M. Turk, "A non-photorealistic camera: depth edge detection and stylized rendering using multi-flash imaging," ACM SIGGRAPH, Los Angeles, August 2004 (also ACM Transactions on Graphics, Vol. 23, No. 3, pp. 676-685, August 2004.)

R. Feris, M. Turk, R. Raskar, K. Tan, and G. Ohashi, "Exploiting depth discontinuities for vision-based fingerspelling recognition," IEEE Workshop on Real-Time Vision for Human-Computer Interaction, Washington DC, USA, June 2004.

M. Kölsch and M. Turk, "Fast 2D hand tracking with flocks of features and multi-cue integration," IEEE Workshop on Real-Time Vision for Human-Computer Interaction, Washington DC, USA, June 2004. Best Paper Award

C. Hu, Y. Chang, R. Feris, and M. Turk, "Manifold based analysis of facial expression," IEEE Workshop on Face Processing in Video, Washington, D.C., June 2004.

Y. Chang, C. Hu, and M. Turk, "Probabilistic expression analysis on manifolds," International Conference on Computer Vision and Pattern Recognition, pp. 520-527, Washington, D.C., June 2004.

M. Kölsch and M. Turk, "Robust hand detection," IEEE Conference on Automatic Face and Gesture Recognition, pp. 614-619, Seoul, Korea, May 17-19, 2004.

J. N. Bailenson, A. Beall, J. Blascovich, J. Loomis, and M. Turk, "Non-zero-sum gaze and persuasion," The 54th Annual Conference of the International Communication Association: Communication in the Public Interest, New Orleans, May 27-31, 2004. (Top Papers in Communication and Technology session – 4 or 5 top papers out of ~120 submissions)

Y. Wang, Y. Jiar, C. Hu, and M. Turk, "Fisher non-negative matrix factorization for learning local features," Proc. Asian Conference on Computer Vision (ACCV-2004), Jeju Island, Korea, Jan. 28-30, 2004.

Y. Wang, Y. Jiar, C. Hu, and M. Turk, "Face recognition based on kernel radial basis function networks," Proc. Asian Conference on Computer Vision (ACCV-2004), Jeju Island, Korea, Jan. 28-30, 2004.

- M. Turk, "Computer vision in the interface," *Communications of the ACM*, Vol. 47, No. 1, pp. 60-67, January 2004.
- J. Bailenson, A. Beall, J. Blascovich, J. Loomis, and M. Turk, "Transformed social interaction: decoupling representation from behavior and form in collaborative virtual environments," *PRESENCE: Teleoperators and Virtual Environments*, MIT press, Vol. 13, No. 4, pp. 428-441, August 2004.
- M. Turk and M. Kölsch, "Perceptual Interfaces," G. Medioni and S.B. Kang (eds.), *Emerging Topics in Computer Vision*, Prentice Hall, 2004.
- A. Altinok and M. Turk, "Temporal integration for continuous multimodal biometrics," *Proc. Workshop on Multimodal User Authentication*, Santa Barbara, CA, Dec. 11-12, 2003.
- Y. Chang, C. Hu, and M. Turk, "Manifold of facial expression," *Proc. IEEE International Workshop on Analysis and Modeling of Faces and Gestures*, Nice, France, Oct. 17, 2003.
- C. Hu, R. Feris, and M. Turk, "Real-time view-based face alignment using active wavelet networks," *Proc. IEEE International Workshop on Analysis and Modeling of Faces and Gestures*, Nice, France, Oct. 17, 2003.
- C. Hu, R. Feris, and M. Turk, "Active wavelet networks for face alignment," *Proc. British Machine Vision Conference*, Norwich, U.K., Sept. 9-11, 2003.
- M. Kölsch, A. Beall, and M. Turk, "Postural comfort zone for reaching gestures," *Human Factors and Ergonomics Society Annual Meeting*, 2003.
- M. Kölsch, A. Beall, and M. Turk, "An objective measure for postural comfort," *Human Factors and Ergonomics Society Annual Meeting*, 2003.
- M. Turk, C. Hu, R. Feris, F. Lashkari, and A. Beall, "TLA based face tracking," *International Conference on Vision Interface*, Calgary, Canada, May 27-29, 2002.
- M. Kölsch and M. Turk, "Keyboards without keyboards: a survey of virtual keyboards," *Workshop on Sensing and Input for Media-centric Systems*, Santa Barbara, CA, June 20-21, 2002.
- M. Turk, "A random walk through eigenspace," *IEICE Trans Information and Systems*, 2001.
- M. Turk, "Perceptive media: machine perception and human computer interaction," *Chinese Computing Journal*, 2001.
- M. Turk, "Gesture Recognition," in K. Stanney (ed.), *Handbook of Virtual Environment Technology*, Lawrence Erlbaum Associates, Inc., 2001.
- M. Turk, "Perceptual User Interfaces," in Earnshaw et al. (eds.), *Frontiers of Human-Centred Computing, Online Communities and Virtual Environments*, Springer-Verlag, 2001.
- P. Hong, M. Turk, and T. Huang, "Constructing finite state machines for fast gesture recognition," *Proc. International Conference on Pattern Recognition*, September 2000.
- M. Turk and G. Robertson, "Perceptual user interfaces," *Communications of the ACM*, March 2000.
- P. Hong, M. Turk, and T. Huang, "Gesture modeling and recognition using finite state machines," *Proc.*

- IEEE International Conference on Face and Gesture Recognition, Grenoble, France, March 2000.
- N. Jojic, T. Huang, and M. Turk, "Tracking articulated structures in stereo image sequences," Proc. IT Workshop on Detection, Estimation, Classification, and Imaging, Sante Fe, NM, Feb. 24-25, 1999.
- N. Jojic, M. Turk, and T. Huang, "Tracking self-occluding articulated objects in dense disparity maps," Proc. International Conference on Computer Vision, Corfu, Greece, 1999.
- M. Turk, "Moving from GUIs to PUIs," Proc. Fourth Symposium on Intelligent Information Media, Tokyo, Japan, December 1998. (also Microsoft Research Technical Report #MSR-TR-98-69)
- R. Cutler and M. Turk, "View-based interpretation of real-time optical flow for gesture recognition," Proc. 1998 IEEE Conference on Automatic Face and Gesture Recognition, April 14-16, 1998, Nara, Japan.
- M. Turk and Y. Takebayashi (eds.), Proceedings of the Workshop on Perceptual User Interfaces, Banff, Canada, October 1997.
- M. Turk, "Visual interaction with lifelike characters," Proc. IEEE Conference on Automatic Face and Gesture Recognition, Killington, Vermont, October 13-16, 1996.
- M. Turk and S. Rosenschein, "A vision architecture for perceiving human action," in Proc. Looking at People: Recognition and Interpretation of Human Action, IJCAI Workshop, Chambéry, France, Aug. 1993.
- A. Pentland, T. Starner, N. Etcoff, A. Masoiu, O. Oliyide, and M. Turk, "Experiments with Eigenfaces," Looking at People Workshop, IJCAI'93, Chambéry, France, August 1993.
- M. Turk and A. Pentland, "Face recognition using eigenfaces," Proc. IEEE Conference on Computer Vision and Pattern Recognition, Maui, Hawaii, pp. 586-591, 1991. (IEEE Computer Society Outstanding Paper Award)
- M. Turk and A. Pentland, "Eigenfaces for recognition," Journal of Cognitive Neuroscience, Vol. 3, No. 1, pp. 71-86, 1991.
- M. Turk and A. Pentland, "Face recognition without features," Proc. IAPR MVA, Tokyo, Nov. 1990.
- M. Turk and A. Pentland, "Recognition in face space," Intelligent Robots and Computer Vision IX, SPIE Vol. 1381, Boston, MA, 1990. (Reprinted in H. Nasr (ed.), *Selected Papers on Automatic Object Recognition*, SPIE Optical Engineering Press, Washington, 1991.)
- M. Turk and A. Pentland, "Face processing: models for recognition," Intelligent Robots and Computer Vision VIII, SPIE, Philadelphia, PA, 1989.
- A. Pentland, T. Darrell, M. Turk, and W. Huang, "A simple, real-time range camera," Proc. IEEE Conference on Computer Vision and Pattern Recognition, San Diego, CA, June 1989.
- M. Turk, "A review of color vision and imaging," Intelligent Robots and Computer Vision VII, SPIE, Cambridge, MA, 1988.
- M. Turk, D. Morgenthaler, K. Gremban, M. Marra, "VITS - a vision system for autonomous land vehicle navigation," IEEE Trans. on Pattern Analysis and Machine Intelligence, Vol. 10, No. 3, pp. 342-361,

May, 1988. (Reprinted in S. Iyengar and A. Elfes (eds.), *Autonomous Mobile Robots: Control, Planning, and Architecture*, IEEE Computer Society Press, Los Alamitos, California, 1991.)

M. Turk, D. Morgenthaler, K. Gremban, M. Marra, "Video road-following for the Autonomous Land Vehicle," Proc. IEEE International Conference on Robotics and Automation, Raleigh, N. C., April, 1987.

M. Turk and M. Marra, "Color road segmentation and video obstacle detection," *Advances in Intelligent Robotic Systems: Mobile Robots*, SPIE, Cambridge, MA, 1986.

M. Turk, "A fine-motion planning algorithm," *Intelligent Robots and Computer Vision*, Proc. SPIE 579, Cambridge, MA, 1985.

M. Turk, "Range image correction and its effect on range data processing," Proc. 1985 Conference on Intelligent Systems and Machines, Rochester, MI, 1985.