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1 Education & Employment History

1.1 Education

- Ph.D., Wayne State University Detroit, Michigan, 1986, Dissertation: Multi-resolution Edge Detection, Advisor: Arun Sood, Minor Area: Mathematics.
- M.S., Wayne State University Detroit, Michigan, 1982 (Major: Computer Engineering).
- E.D.E., A post graduate diploma, from Philips International Institute of Technological Studies, Eindhoven, The Netherlands, 1980. (Major: Speech Recognition).
- B.E., National College of Engineering & Technology, Karachi, Pakistan (Major: Electronics), 1979.

1.2 Appointments

- July 2008–August 2009, Guest Professor, Klagenfurt University, Austria.
- October 2007–present, Professor of Mathematics (secondary joint appointment).
- April 2005–present, Agere Chair Professor of Computer Science, University of Central Florida, Orlando.
- February 2005–August 2006, Assistant Vice President for Research, University of Central Florida, Orlando.
- May 1998–April 1999, Member Video Technology Research Staff, Information Systems Division, Harris Corporation, Melbourne, Florida.
- Fall 1998–, Associate Faculty, Center for Electro Optics and Lasers (CREOL), UCF.
- August 1996–, Professor, Computer Science, School of Computer Science, University of Central Florida, Orlando.
- August 1991 to July 1996, Associate Professor, Computer Science, University of Central Florida, Orlando.
- August 1986 to July 1991, Assistant Professor, Computer Science, University of Central Florida, Orlando.

2 Honors

2.1 Fellows

- Fellow, SPIE, 2008.
- Fellow, IAPR (International Association of Pattern Recognition), 2006.
- Fellow, IEEE (Institute of Electrical and Electronic Engineers), 2003.

2.2 Other Awards

- ACM Distinguished Speaker (DSP), 2008-.
- University Distinguished Researcher award, 2007.
- Sindhi Association of North American award, 2007.
- Pegasus Professor, 2006.
- UCF College of Engineering & Computer Science recognition for bringing in **the most external funding** in the entire College, 2006.
- UCF Millionaires' Club, 2005, 2006.
- Agere Chair Professor, April 2005–
- Honorable mention, ICCV 2005 Where Am I? Challenge Problem.
- Research Incentive Award (**RIA**), 2003, 2009.
- Teaching Incentive Program (**TIP**) Award, 1996, 2003.
- IEEE Distinguished Visitors Program Speaker, 1997-2000.
- Engineering Achievement Award of Information Systems Division of Harris Corporation, 1999.
- IEEE Outstanding Engineering Educator Award, 1997.
- TOKTEN awards by UNDP, 1992, 1995, 2000.
- Philips International Institute Scholarship 1980.

3 Instruction

3.1 Courses Taught

- Have taught **ten** different courses at the graduate and undergraduate level, introduced a new **honors** course (co-taught with a Mathematics Professor), and directed **numerous** independent studies of undergraduate and graduate students;
- Have conducted **six** short courses in **four** different countries (US, Pakistan, Mexico, Taiwan) (<http://www.cs.ucf.edu/~vision/accv2000h-6.pdf>);
- My pedagogical contributions are covered in **three** text books by popular authors: *Robot Vision* (Haralick and Shapiro), *Introductory Techniques for 3D Computer Vision* (Veri and Trucco), *Computer Vision* (Shapiro and Stockman), and taught in introductory classes in the US and all over the world.

1. CAP 6412 Advanced Computer Vision
(<http://www.cs.ucf.edu/courses/cap6412/>)

2. CAP 5415 Computer Vision
(<http://www.cs.ucf.edu/courses/cap6411/cap5415/>)
3. CAP 6411 Computer Vision Systems
(http://www.cs.ucf.edu/courses/cap6411/cap6411/fall02/cap6411_fall02.html)
4. COT 6505 Numerical Optimization
(http://www.cs.ucf.edu/courses/cap6411/cot6505/spring03/cot6505_sp03.html)
5. CAP 3930H Computer Vision Guided Tour of Mathematics
6. CAP 6938 Special Topics: Mathematical Tools for Computer Vision
7. CAP 4932 Intro Robot Vision
8. COT 4110 Numerical Calculus
9. COP 3400 Assembly Language
10. COP 3402 Systems Concepts and Programming

3.2 Post Doc Supervision

1. Shandong Wu, Ph.D. City University of Hong Kong, May 2009-.
2. Arjun Nagendran, Ph.D. University of Manchester, February 2009-.
3. Aidtya Gupta, Ph.D. UCF, May 2008-, Medical Image Analysis.
4. Youngrock Yoon, Ph.D. Purdue University, June 2006-December 2006, currently at USAF/DFEC Colorado.
5. June Xie, Ph.D. Hong Kong University, May 2006-, Medical Image Analysis, currently at Janelia Farm Research Campus, Howard Hughes Medical Institute, Ashburn, VA.
6. Pingkun Yan, Ph.D. National University of Singapore, May 2005-, Medical Image Analysis, currently at Philips Medical Systems, Briar Cliff, New York.
7. Khurram Hassan Shafique, Ph.D. UCF, March 2005–April2006, Computer Vision, currently at ObjectVideo, Reston, VA.
8. Alper Yilmaz, Ph.D. UCF, August 2004-May 2006, Video Analysis, currently Assistant Professor at Ohio State University.

3.3 Students Supervision

Summary

- Have supervised **nineteen** Ph.D., **twelve** M.S. and **nine** B.S. theses to completion.
- Currently supervising **sixteen** Ph.D. students.

3.3.1 Doctoral Dissertations Supervised

1. Donald Bryant, “Analysis of Kolmogorov’s Superposition Theorem and its implementation in applications with low and high dimensional data”, Mathematics, graduation date August 2008. (Joint with Xin Li)
2. Saad Ali ”Taming Crowded Visual Scenes”, Ph.D., graduation date: May 2008; currently at CMU.
3. Saad Masood Khan, Ph.D., ”Exploiting Multi-view Data for Image-based Tracking Reconstruction, Recognition”, graduation date: May 2008; currently at Sarnoff Corporation, Princeton, NJ.
4. Aleksey Gritsay, “View invariant Video Alignment”, Ph.D., graduation date: August 2007, Sernium, VA.
5. Asad Hakeem, “Learning, Detection, Representation, Indexing and Retrieval of Multi-Agent Events in Videos”, Ph.D., starting date: graduation date: May 2007; currently at ObjectVideo, Reston, Virginia.
6. Yun Zhai, “Video Content Exploitation by Structuring, Linking and Attention Detection”, graduation date: August 2006; currently at IBM TJ Watson, NY.
7. Yaser Shaikh, “Object association across multiple moving cameras in planar scenes”, Ph.D., graduation date: May 2006; currently at CMU.
8. Paul Smith, “Multiple Level of Zooms for Activity Recognition”, Ph.D., graduation date: December 2005, currently at Northrop Grumman, Herndon, VA. (joint with Niels Lobo)
9. Omar Javed, “Scene Monitoring With a Forest of Cooperative Sensors ”, Ph.D., graduation date: May, 2005, currently at Object Video, Reston, VA, USA.
10. Jiangjian Xiao, “View Morphing”, Ph.D., graduation date: December 2004; currently at Sarnoff Corporation, Princeton, NJ.
11. Alper Yilmaz, “Object Tracking and Activity Recognition in Video Acquired Using Mobile Cameras”, Ph.D., graduation date: July, 2004, currently at Ohio State University.
12. Zeeshan Rasheed, “Video Categorization”, Ph.D., graduation date: December 2003, currently at Object Video, Reston, VA, USA.
13. Cen Rao, “View Invariant Representation and Recognition of Human Action”, Ph.D., graduation date: May 2003, currently at Sarnoff Corporation, Princeton, NJ.
14. Sohaib Khan, “Visual Tracking of People and Object-Based Video Segmentation”, Ph.D., graduation date: August 2002, currently Assistant Professor at Lahore University of Management and Sciences, Lahore, Pakistan.
15. Yu Tian, Topic: Estimating Motion and Shape of Multiple Objects from Image Sequences, Graduation Date: June 1997, Apple Micro Computers, CA.

16. Ping-Sing Tsai, Topic: Shape From Shading, Graduation Date: July 1995, currently Assistant Professor, Department of Computer Science The University of Texas - Pan American.
17. Ruo Zhang, Topic: Shape From Photomotion, Graduation Date: January 1995, Research Scientist, SAIC, Orlando, FL.
18. Krishnan Rangarajan, Topic: Motion Trajectories, Graduation Date: May 1990, Research Scientist, Motorola, Bangalore, India.
19. Donna Williams, Topic: Edge Contours, Graduation Date: August 1989, Associate Professor, Computer Science and Mathematics, Stetson University, DeLand FL.

3.3.2 Currently Advising

1. Arslan Basharat, "Visual Monitoring of Outdoor Activities", Ph.D., starting date: Fall 2003, passed qualifying exam expected graduation date: May 2009.
2. Jingen Liu, "Scene Classification", Ph.D., starting date: Fall 2005, passed qualifying exam, expected graduation August 2009.
3. Pavel Bebnko, Ph.D., "Visual inspection of rail road tracks", starting date: Fall 2004, passed qualifying exam, expected graduation date: December 2009.
4. Mikel Rodriguez, "Human Detection and Tracking", Ph.D., starting date: Summer 2005, passed qualifying exam, expected graduation date: August 2009.
5. Imran Saleemi, "Scene Modelling", Ph.D., starting date: Fall 2005, passed qualifying exam, expected graduation date: December 2009.
6. Vladimir Reilly, "Human Detection and Tracking", Ph.D., starting date: Summer 2006.
7. Enrique G. Ortiz, "Semi Supervised Learning", Ph.D. starting date: Fall 2007.
8. Ramin Mehran, "Motion Analysis", starting date Fall 2007.
9. Yang Yang, "Manifold Learning", starting date Fall 2008.
10. Berkan Solmaz, "UAV Video Analysis", starting date Fall 2008.
11. Subhabrata Bhattacharya, "Computer Vision", starting date Fall 2008.
12. Kishore Reddy, "Human Action Recognition from Arial Videos", starting date Fall 2008.
13. Omar Oreifej, "Matching Humans Across Different Videos", starting date Fall 2008.
14. Harron Idress, "Computer Vision", starting date Spring 2009.
15. Syed Naveed Imran, "Computer Vision", starting date Spring 2009.
16. Amir Roshan Zamir, "Visual Inspection of Railroads", Spring 2009.

3.3.3 Masters Theses Supervised

1. Phillip Berkowitz, M.S., Automatic Target Recognition, Graduation date: August 2009.
2. Ryan Faircloth, M.S., "Combining Audio and video tempo analysis for dance detection", Graduation date: August 2008, currently at NAVAIR, Orlando, FL.
3. Yusuf Aytar, "Semantic Video Retrieval using High-level Context", graduation date: May 2008; currently at Google.
4. Eric John, area: Biomedical Image Analysis, Starting date January 2006, Graduation date: August 2007, PBS&J in Orlando.
5. Li Nan, area: Detecting Stepwise Moving Objects From Spatiotemporal Projections", July 2000, currently at Intel, Phoenix, Arizona.
6. Avinash Seethara, area: Advanced Vehicle Control Systems-A Computer Vision Perspective, Graduation Date: April 1998, currently at Intel, Folsom, CA.
7. Calin Cojocariu, area: Registration of MR and CT Data, Graduation Date: May 1997, Austin, TX.
8. Shawn Dettmer, area: Visual Lipreading, Graduation Date: May 1997, Oracle, Orlando, FL.
9. Kathalene Gray Bridges, area: Multi-Sensor Fusion for Generating Line Maps for 3-D Objects, Graduate Date: December 1994, Lockheed-Martin.
10. Claudette Cedras, area: Motion-Based Recognition, Graduation Date: May 1993, University of Laval, Canada.
11. Jim Cryer, area: Combining Stereo and Shading, Graduation Date: April 1993.
12. Kristine Gould, area: Knowledge Based Crystal Growth, Graduation Date: August 1990, currently at GE Medical Systems.
13. Jay Hackett, area: Multisensor Fusion, Graduation Date: August 1989, currently at Harris Corporation, Melbourne, FL.

3.3.4 B.S. (Honors in The Major) Supervised

1. Brandyn White, "Using FPGAs to Perform Embedded Image Registration", Graduation date, May 2009.
2. Vladimir Reilly, "Human Detection", Honors in the Major B.S, Graduation date: May 2006, currently Ph.D. student SEECS, UCF.
3. Alfred K. Levy III, "Object Tracking in Low-Frame-Rate Video Sequences", Honors in the Major B.S., graduation date: May 2004, currently at Harris Corporation.

4. Ankur Datta, “Gait Based Recognition”, Honors in the Major B.S., graduation date: May 2004, admitted to CMU, received three-year NSF fellowship (\$30,000 per year). Currently at CMU.
5. Rusty Philips, “Implementation of Vision Algorithms in FPGAs”, Honors in the Major B.S., graduation date: August 2001, currently at Purdue University.
6. Chris Ingrassia, topic: Tracking and Recognition of Coronary Arteries Angiograms”, Graduation Date December, 1998, currently at NYU.
7. Doug Ayers, topic: Monitoring Human Behavior in An Office Environment, Graduation Date: April, 1998, SAIC.
8. Anna Ortega, topic: From Shape from Shading to Recognition, Graduation Date: August, 1994.
9. James Davis, topic: Recognizing Hand Gestures, Graduation Date: May 1994, Assistant Professor Ohio State University.
10. Matt Lavoie: topic: Object recognition using multiple sensors, Graduation Date: May 1991.

3.3.5 Non-UCF Students Supervision

1. Humera Noor, “Automatic Target Recognition Using View Morphing”, Ph.D., 2007, NED University, Karachi, Pakistan.
2. Javed Sheikh, “Visual Tracking”, Ph.D., 2008, Military College of Signals, Islamabad, Pakistan.
3. Sohail Sattar, “optical Character Recognition”, NED University, Karachi, Pakistan.

3.3.6 Member Ph.D. Committees

1. Yifan Shi, “Representing and Recognizing Temporal Sequences”, Georgia Tech, Graduation date: July 2006.
2. Faisal I. Bashir, “MotionSearch: Object Motion Trajectory-Based Video Search and Classification System”, University of Illinois Chicago, Graduation date: March 2006.
3. Hongsheng Zhang, “structure & motion from stereo”, University of Miami, Graduation date: November 2005.

4 Research, Creative & Other Scholarly Activities

4.1 Laboratory Development

- *Computer Vision Lab*, 254/234 Harris Engineering Center Building. The equipment in the lab has been acquired through three NSF instrumentation awards.

- According to **Google**, the UCF vision web site is the **most visited** Computer Vision Lab site in the world.

4.2 Research Accomplishments Summary

(<http://www.cs.ucf.edu/~vision/projects/projects.html>)

4.2.1 Video Understanding

(<http://www.cs.ucf.edu/~vision/projects/projectsVideoUnderstanding.html>)

- I have advocated a “Motion-Based” Recognition approach, which consists of the recognition of objects and/or motions directly from motion information extracted from a video sequence.
 - Starting with a paper on Trajectory Primal sketch in 1989 (IEEE CVPR-89), during the last decade I have published a constant stream of papers on topics related to gesture recognition and human activity recognition, visual lipreading, gait analysis, cyclic motion detection, etc.
 - Have co-authored a survey paper on “Motion-Based Recognition”, which appeared in promising research directions tracks of IVC.
 - Have co-edited a highly acclaimed book (**Motion-Based Recognition, Kluwer Academic Publishers**, co-edited with Ramesh Jain), which is a collection of key papers in human activity recognition, facial expression and gesture recognition, and visual lipreading. This work is an important addition to vision literature.
- My work on human behavior recognition and view invariant representation of human action have an enormous impact on the field and has generated lots of interest in the media.
- We have developed a novel method for object recognition from video.

- **Visual Tracking**

(<http://www.cs.ucf.edu/~vision/projects/projectsTracking.html>)

Tracking is crucial in the context of motion-based recognition, we have developed a series of tracking algorithms.

- Our widely used motion correspondence algorithm for point tracking.
- A recent algorithm for multi-frames point correspondences using a graph theoretical formulation.
- Object tracking in imagery acquired by a moving camera using mean shift and global motion compensation.
- Contour-based object tracking using a Bayesian approach.
- Tracking in multiple overlapping cameras using Field of View lines.
- Tracking in multiple non-overlapping cameras.
- Tracking in multiple levels of zoom.

- **KNIGHT**

(<http://www.cs.ucf.edu/~vision/projects/Knight/Knight.html>)

- KNIGHT is a realtime surveillance system. **KNIGHT** has been implemented in 6,000 lines of code in C++ following object oriented principles, runs on a 1.7 GHz Pentium IV machine, and processes 12-15 frames a second for a frame size of 320×240 pixels.
- The system automatically detects important changes, events, and activities using computer vision techniques, flags significant events, and presents a summary in terms of key frames and textual description of activities to a monitoring officer for final analysis and response decision.
- A preliminary version of **KNIGHT**, with tracking and activity detection capabilities, has been installed and is currently being field tested at four locations in **downtown Orlando**, Florida.
- KNIGHT is also be used in Visual Monitoring of Railroad Crossings funded by the **Florida Department of Transportation**, and for Night-Time Surveillance supported by **DARPA**.
- KNIGHT will be used in the Army's Future Combat Systems (**FCS**) for human detection and tracking.
- KNIGHT is a one of a kind system, which has received significant attention from the media including articles in Business Week (11/13/2002), New Scientist (11/3/01), Orlando Sentinel (3/31/01), Information Week (11/6/01).

- **COCOA**

- A system for automatic indexing of videos taken from an aerial platform.
- **COCOA** integrates different stages of UAV video exploitation process into one monolithic system.
- It provides end users with the features of robust frame to frame alignment, moving target detection, target tracking, event detection and indexing of the videos.
- The archived videos can be searched and retrieved using a query event of interest or a query video.
- **COCOA** has four core modules: Ego Motion Compensation, Independent Motion Detection, Tracking and Event Recognition.
- The system has been tested on video clips from the DARPA VIVID data collection collected at Eglin AFB.

- **PEGASUS**

- A web-based search system with an interactive user interface for broadcast news.
- The indexing system for ASR is established using the Lucene technology.
- To achieve fast indexing and retrieval, the regions (features) are archived in the database using the SR-tree structure.

- The system has been tested on a large open-benchmark dataset, which contains 140 news program videos provided by the US National Institute of Standards and Technologies (NIST) for the TRECVID 2005 forum.

- **Taxonomy and Ontology of Video Events**

(<http://www.cs.ucf.edu/~vision/papers/aaai-caseE.pdf>)

- A representational gap exists between low-level measurements (segmentation, object classification, tracking) and high-level understanding of video sequences. We have proposed a novel representation of events in videos to bridge this gap, based on the CASE representation of natural languages.
- We have also defined a meeting ontology that is determined by the knowledge base of various meeting sequences. This ontology validates and refines the taxonomy based on the hierarchy of events and behaviors, and regroups similar meetings in one category, refining the classes.

4.2.2 Video Registration

(<http://www.cs.ucf.edu/~vision/projects/videoReg/videoReg.html>)

- Contributed to DARPA Airborne Video Surveillance and Monitoring (AVS) project at Harris Corporation during my sabbatical in 1998-99. Have co-authored papers on robust method for registering video images with geodetically accurate reference image.
- Organized the first ever IEEE Workshop on Video Registration in 2001.
- Published a book on “**Video Registration**”, **Kluwer Academic Publishers, 2003**.

4.2.3 Video Categorization and Segmentation

(<http://www.cs.ucf.edu/~vision/projects/projects.html/VideoSegmentation>)

- Have developed automatic methods for segmenting interview videos, classifying Hollywood movies based on their previews, story segmentation in broadcast news, and for scene detection in Hollywood movies and TV Shows.
- Have participated in TREC Video 2003, 2004 and 2005 competitions organized by NIST.
- Have also contributed to object-based segmentation of video. We have proposed a maximum a posteriori probability (MAP) framework that uses multiple cues, like spatial location, color and motion, for segmentation.
- Recently, have proposed method for Motion Layer Extraction in the Presence of Occlusion using Graph Cuts, the idea is to segment scene into multiple planar regions.

4.2.4 Video Synthesis

(<http://www.cs.ucf.edu/~vision/projects/viewMorphing/index.html>)

- **Dynamic View Morphing**

We have developed a novel technique for synthesizing *dynamic* scene between two images without use of 3D model. The scene can contain rigid or non-rigid objects, each of them can move in any orientation or direction.

- **Wide-baseline Matching**

We have also developed a complete approach to automatically recover corresponding features and epipolar geometry over two wide baseline frames.

- **Tri-View Morphing**

Have developed an efficient image-based approach to navigate a scene based on only three wide-baseline uncalibrated images without the use of a 3D model. We have demonstrated three applications of the tri-view morphing algorithm: 4D video synthesis, multiple view morphing, and dynamic scene synthesis using three still images.

- **Video Completion**

Have developed methods for large object removal in a single image and a video.

- **Realistic Shadow Synthesis**

Have developed a method to generate a realistic shadow of an object matted from a natural scene and composited into a novel target background with different lighting condition.

4.2.5 Active Contours

<http://www.cs.ucf.edu/~vision/papers/shah/92/WIS92A.pdf>

- My highly cited (**536 citations**) work on active contours or snakes is now a classic, which is covered in text books, and is widely used in industry, academia, and other fields like medical imaging and entertainment.
- It is the part of the **Intel Open CV library**, and numerous implementations are available on the internet.
- This work has made one of the most fundamental contributions to the field, and has popularized snakes in vision community and beyond.
- The recent work on object contour tracking in imagery acquired by moving camera extends active contour work and obtains the one of the best results in the field.

4.2.6 Shape From Shading

(<http://www.cs.ucf.edu/~vision/projects/ShapeFromShading/ShapeFromShading.html>)

- Have developed a very simple algorithm for shape from shading (sfs), which outperforms many known sfs algorithms, and generated lots of follow up work.

- Subsequently, have demonstrated that the recovered shape can successfully be used for object recognition based on shape from shading; and using symmetry property of faces shape from shading can be simplified for face images.
- Also conceived photomotion technique for recovering shape from shading using multiple images, which essentially generalizes well known photometric stereo technique.
- The work in combining shape from shading and stereo demonstrated somewhat amazing reconstruction results, which are significantly better than stereo or shading alone.
- An extensive survey paper on “Shape from shading” which appeared in PAMI is an excellent resource for other researchers.

4.2.7 Research Experience for Undergraduates in Computer Vision

(<http://www.cs.ucf.edu/~vision/reu-web/REU.html>)

- I have involved a large number of undergraduates in computer vision research during the last 20 years (this is detailed in “Mentoring Undergraduates in Computer Vision Research”, co-authored with Kevin Bowyer, IEEE Transactions on Education, Volume 44, Number 3, pp 252–257, August 2001)
- This work has been supported by a series of REU grants totaling in amount of **over a million dollars from NSF**. In December 2005, I received another three year REU grant from NSF, this is continuous **twenty one years** of NSF REU, which is unprecedented.
- In 2009, I received yet another NSF REU three-year grant of \$300,000, which will end in 2011, resulting in unprecedented quarter century of NSF REU in Computer Vision at UCF.
- In August 2007, we celebrated Twenty Years of NSF REU. We invited current and previous participants, their advisors, and some distinguished guests. These guests included the Computer Vision Program Director at NSF, Dr. Daniel DeMenthon, as well as President Hitt , Provost Hickey, M.J. Soileau, Debra Reinhart, and Issa Batarseh, who honored us with their presence and remarks at the celebrations kick-off. A full day of events was scheduled and included panels, a poster session by current students and a keynote talk at the banquet was given by Professor Ruzena Bacjysy of UC Berkeley, who is also former NSF CISE director. (visit: <http://server.cs.ucf.edu/~vision/reu-web/Picture>
- More than 200 undergraduates from more than twenty five institutions throughout the country have participated in this project.
- These undergraduates have co-authored more than 70 research papers (in reputed journals like PAMI, PR, CVGIP, and conferences like ICCV, CVPR, ICPR).
- Approximately half of these participants have gone to graduate schools, fourteen students have written Honors in the Major Theses, six participants are now faculty members at different Universities, and five participants have started their own companies.

- One student, Paul Smith, received **Barry Goldwater fellowship**, the first ever for UCF, on his REU project.
- I was the organizer of two CISE REU PI meetings (Orlando, Florida, 2002; Monterey, California, 2004).
- Below are some examples. Please visit (<http://www.cs.ucf.edu/~vision/reu-web/REU.html>) for more examples.
 - 2007-2008 Participant Andrew Miller published papers in ICME 2007, AAAI 2007, and ICRA 2008. In addition, Andrew was the only undergraduate member of the UCF team that entered a robotic car in the DARPA Urban Challenge, in which the UCF team reached the finals. Andrew also led UCF team for CLEAR and ETISEO evaluation, and published two summary papers in Springer LNCS. Currently he is working on Honors in the Major thesis at UCF.
 - 2005-2006 Vladimir Reilly participant, worked on human detection for his REU project. He completed his BS Honors in The Major thesis in 2006. He was admitted to Ph.D. at UCF with a fellowship. He published his first paper at CVPR 2007. He passed his Ph.D. qualifying exam in Spring 2008.
 - J. Prokaj, participated in 2005-06, published one paper in the LNCS series, and is now a PhD student at University of Southern California.
 - C. Schwarz, participated in 2004-05, published two papers, is now a PhD student at UC-Davis in medical imaging.
 - Michael Wells, a participant in the 2003-04 REU, worked on “Visual Analysis of Lifting”, and published a paper at the Irish Machine Vision and Image Processing conference in 2004. Micheal’s work drew the attention of the industrial engineering community, and his paper was also an invited paper published by the Society of Manufacturing Engineers as SME Technical Paper TP05PUB80. Michael completed his undergrad degree from University of St. Thomas (Texas), and is now a graduate student on Fellowship at the Colorado School of Mines.
 - David and Michael Batz, participants in the 2003-04 REU (and twins), worked together on “Monitoring Medication Intake by Senior Citizens”, and published in the IEEE Canadian Robotics and Vision Conference 2005. Their project was the basis of a collaborative grant proposal with the Faculty of Nursing, sent to the NIH, and they completed the M.Engg. degree at UCF.
 - Ankur Datta was in the 2001-02 REU; he worked on “Person-on-Person Violence Detection in Video Data”, got a publication in International Conference on Pattern Recognition, in 2002, and then got further publications in IEEE ICME, and IASTED Graphics and Image Processing in 2003. He completed his Honors in the Major Thesis on his REU project in 2004, and received the NSF graduate fellowship (\$30,000 per year for three years plus tuition). During the summer of 2003, he was selected to participate in a summer program organized by JPL and Caltech. He obtained an honorable mention for the Barry Goldwater scholarship in 2003, he was the CRA (Computer Research Association) Outstanding Undergraduate Award Finalist in 2004. He was offered admission

with fellowships at Columbia, Washington, and CMU. He is currently a Ph.D. student under Takeo Kanade at CMU.

- David Diel worked on tracking and registration for robotic motion in the 2001-02 REU. Based on his REU work, he wrote his graduate research application essay to MIT and was accepted to the graduate program with a fellowship at the Draper Lab. At MIT, he has completed his M.S. and is now in their Ph.D. program preparing for his qualifiers.
- Jigna Bhatt worked on “Detecting Babies’ Hand Gestures” in the 2001-02 REU. She was published in the Intl. Conf. on Tools with Artificial Intelligence, and is now a graduate student at the University of Nevada-Reno.
- Michael Wells, a participant in the 2003-04 REU, worked on “Visual Analysis of Lifting”, and published a paper at the Irish Machine Vision and Image Processing conference in 2004. Micheal’s work drew the attention of the industrial engineering community, and his paper was also an invited paper published by the Society of Manufacturing Engineers as SME Technical Paper TP05PUB80. Michael completed his undergrad degree from University of St. Thomas (Texas), and is now a graduate student on Fellowship at the Colorado School of Mines.
- David and Michael Batz, participants in the 2003-04 REU (and twins), worked together on “Monitoring Medication Intake by Senior Citizens”, and published in the IEEE Canadian Robotics and Vision Conference 2005. They are now in the graduate program at UCF, and their project is the basis of a collaborative grant proposal with the Faculty of Nursing, that is to be sent to the NIH.
- A 2000-01 participant, Ashish Myles, worked on “Wheelchair Detection using Vision”, and published his research in the Asian Conference on Computer Vision in 2002. He is now on full fellowship in the Ph.D. program at the University of Florida.
- A 1999-00 participant, Rusty Philips from UCF, worked on “Detecting Fire From Video”. His paper was accepted for oral presentation in IEEE Workshop on Applications of Computer Vision in 2000, and he also published a paper in the journal, Pattern Recognition. He has since then gone to the graduate program at Purdue.
- Another 1999-00 participant, Andrew Wu, a 19 year old freshman from University of Illinois, worked on “Virtual 3-D blackboard” project, and came up with very novel method for generating 3-D trajectories using a single camera. He summarized his work in a research paper, which was accepted in the International Conference on Face and Gesture Recognition, held in France in March 2000. The acceptance rate for this conference was less than 50%. Not bad for a 19 year old student, who competed with very senior researchers in the field. Andrew presented this project in Engineering Open House, the largest engineering open house in the country, at University of Illinois at Urbana-Champaign, and won first place under the Original Undergraduate Research category. He was selected to participate in the IBM Deep Computing project during Summer 2000. He also won a UIUC College of Engineering Honeywell Award, given to a single junior in the college showing excellence in academics, leadership and professional interest. Andrew in now a Ph.D. student at UIUC.
- Another 1999-00 participant from UCF, Paul Smith, worked on “Detecting Driver Alertness”. His paper was accepted in Intl. Conf. on Pattern Recognition, 2000. Paul

received the Barry M. Goldwater Scholarship, a first for UCF, on his REU project. Paul is finishing his Ph.D. at UCF next month.

- A 1998-99 participant, Michael Wallick from UCF, worked on “A Computer Vision Framework for Recognizing Text from Video of Lectures”. His paper was accepted in Intl. Conference for Intelligent Systems, Louisville, KY June 2000. He was also invited to submit an extended version of this paper for a journal by Intl. Society for Computers and Their Applications. Michael is now in the last year of his Ph.D. at U. Wisconsin-Madison.
- A 1993/94 REU participant, Jim Davis from UCF, worked on gesture recognition for his REU project. A short version of the paper about Jim’s work was accepted in 1994 European Conf. on Computer Vision (acceptance rate 18%), and a long version appeared in a journal. He completed his Honors in The Major thesis in 1994. Jim was admitted to the graduate program at MIT with full fellowship. He completed his Ph.D. in 2000. Currently, he is an associate professor in Computer and Information Science at Ohio State University.
- A 1991/92 REU participant from USF, Adam Hoover, worked on “A methodology for evaluating range image segmentation techniques”. His paper appeared in 1994 IEEE Workshop on Applications of Computer Vision. Adam received his Ph.D. in 1996, and he is currently an assistant professor in Electrical and Computer Engineering Department at Clemson University.
- A 1989/90 REU participant, a USF student, Maha Sallam, had a paper describing her REU work accepted by the Pattern Recognition Letters journal and then had a paper describing her continued work accepted as a “long paper” at the 1990 International Conference on Computer Vision (ICCV) (acceptance rate 5%). She completed her Ph.D. at USF and is one of the founders of a medical imaging start-up company in the Tampa Bay area (see www.ismd.inc for more information on this company). Her company recently won an SBIR grant for approximately one million dollars.
- A 1989/90 REU participant from UCF, Robert Franceschini, worked on “Crystal Growth” project. He completed his Ph.D. in 1999, and he is currently at SAIC.

4.2.8 Computational Science Training for Undergraduates in the Mathematical Sciences (CSUMS)

(<http://www.math.ucf.edu/csums/index.htm>)

- In 2008, I received \$980,324 grants from NSF for training undergraduates in Mathematical Sciences. GAUSS, a new program in Computational Science Training for Undergraduates in Mathematical Sciences (CSUMS) funded by the National Science Foundation. GAUSS will highlight the exciting applications in Computer Vision and Image Sciences as motivations for the study of advanced mathematical theory in computation. GAUSS is a yearlong program, each student selected to participate will be paid \$10,000 in stipend plus room and board in the summer. The participants will be required not to take any other part time employment during the GAUSS year. The Goals are to:

- Enhance computational aspects of education and training of undergraduates by emphasizing both mathematical theory and computational skills
- Better prepare students to pursue careers and graduate study in fields that require integrated strengths in computation and the mathematical sciences

4.2.9 Research Experience for High School Students and Teachers

- In 2007, I received as co-PI a \$1,200,000 NSF grant for inspiring High School teachers and students in technology. The PROFIT project (<http://profit.eecs.ucf.edu/>) is centered on the idea of introducing computer vision and imaging experience into the core curriculum of mathematics. It was designed as a novel model for training mathematics teachers to use pictorial IT, for transferring exciting, appealing modules into core curricula, and as a model for mentoring students through the last of their pre-collegiate years and attract them into IT-STEM careers.
- In Summer 2007, two High School Teachers: Paul Ackerman of Edgewater High School and David Pollock of Oak Ridge High School were participants in an 8-week summer program consisting of a short course in Computer Vision, involvement in research, ideas for integrating their research experiences into classroom curriculum. This was funded under NSF supplemental grant Research Experience for Teachers. I was the PI, and Ali Orooji and Niels Lobo were co-PIs.
- In summer of 2006, two high school teachers: Charles Percival of Pine View School in Sarasota, FL and Timothy Gallagher of Winter Springs High School in Winter Springs, FL were participants in an 8-week summer program consisting of a short course in Computer Vision, involvement in research, ideas for integrating their research experiences into classroom curriculum. This was funded under NSF supplemental grant Research Experience for Teachers.
- I have served as a mentor for a number of local High School students.
 - In 2005-2006, myself and my Ph.D. student Arslan Basharat, helped mentor two High School students Chris Bethel, Elizabeth A. Ennis from Lake Brantley High School in Altamonte Springs, FL. The students worked on software for automated detection of abandoned luggage in surveillance videos. The two students participated in the County Science Fair where they won first place. From there, they advanced to the Florida State Science & Engineering Fair where they were awarded 3rd place in the senior team category. The pair then made it to the 2006 Intel International Science and Engineering Fair (ISEF) presented by Agilent Technologies in Indianapolis in May of 2006.
 - Another student from Lake Brantley High School, Joey Wilson, worked with me on “Detecting Logos in TV Commercials” project. Joey, who had the highest GPA in his School, and graduated as valedictorian, and won a first prize in Computer Science in the 47th Annual Florida State Science and Engineering Fair 2002, he also received Intel Excellence in Computing award, and was invited to 2003 Taiwan International Science Fair, where he won the second prize. Joey, got admitted to all Schools he applied including UC Berkeley, and accepted Lombardi Scholar offer from the University of Florida. In 2007, he graduated summa cum laude with my B.S. in Electrical Engineering

at University of Florida. He was also selected as the UF College of Engineering's Four Year Male Scholar a distinction given to only one male, graduating engineering student based on academics and commitment to service. He was accepted at Berkeley for his PhD in Bioengineering. However, he is deferring my enrollment at Berkeley for two years to do the Teach For America Program.

- In 1997-98 I mentored a bright High School student, Jed Rose, from Lake Brantley High School, Longwood, Florida. In the 48th International Science and Engineering competition Jed received the “Air Force First Place Award”; “Kodak First Place Award”; “IEEE Computer Society third place award”; and “NASA award” for all paid trip to space camp. Jed was accepted in Brown, Yale, and Stanford.

4.2.10 Collaborative Research Work With Industry

Harris Corporation

- In 2008, Harris awarded me research contract of \$130,000 on UAV video analysis. In 2009, Harris awarded me another research contract of \$150,000 for video analysis.
- I spent my sabbatical at **Harris corporation** during 1998-99, where I taught a 15-week course on video computing to Harris engineers, contributed to **DARPA AVS** program in Precision Video Registration, and started a colloquium series.
- As an outgrowth of my work with Harris on video registration, I organized the first ever IEEE Workshop on Video Registration, 2001, and published a book on **Video Registration, Kluwer Academic Publishers, 2003**.
- Harris awarded me Engineering achievement award in 1999, and two research grants in 2000 and 2001.

Lockheed Martin

- In 2008, received a sub-contract of \$807,000 from Lockheed Martin for DARPA VIART program.
- In 2005, I received Army's FCS (Future Combat Systems) grant with Lockheed, which is a \$30,000,000 project, UCF part was of \$400,000. My group was the only University group among 360 companies covering 150 congressional districts in 35 states receiving a grant under US Army's Future Combat Systems program.
- Received three grants (2004-2007) \$100,000 each from Lockheed Martin Integrated Systems & Solutions, Gaithersburg, Maryland.
- Received three grants (2003-2005) from Lockheed-Martin Fire & Missile Systems on Multiple Camera tracking and ATR.
- Received two corporate grants(2001-2002) from Lockheed-Martin on Tracking in FLIR Imagery.
- I have co-authored several papers with Lockheed researchers.

Other Companies

- Have received two contracts (2007, 2008) \$50,000 each from Eastman Kodak for consumer video indexing.
- Have received two grants from Boeing corporation, and one from startup Teranex.
- Have received DARPA STTR Phase I and II grants with a start up company, Perceptek.
- Have received two millions dollar joint grant with TASC (Northrop Gruman) from ARDA.

4.3 Publications

Summary

- Have published **three** books, **eleven** book chapters, more than **seventy five** journal and more than **one hundred seventy five** conference papers.

4.3.1 Books

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2. “Video Registration”, Editors: Mubarak Shah and Rakesh Kumar, Kluwer Academic Publishers, 2003.
3. “Motion-Based Recognition”, Editors: Mubarak Shah and Ramesh Jain, Kluwer Academic Publishers, 1997.

4.3.2 Book Chapters

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2. Abhijit Mahalanobis, Mubarak Shah, Alan van Nevel, “Information Processing across Distributed and Netted Systems for Security and Surveillance”, Optical Imaging, Photonics, Sensors, and Systems for Homeland Security edited by Bahram Javidi, Springer, 2004.
3. Yaser Sheikh, Sohaib Khan, and Mubarak Shah, “Feature-based Georegistration of Aerial Images”, GeoSensor Networks, Anthony Stefanidis and Silvia Nittel (editors): CRC Press, 2004.
4. Zeeshan Rasheed and Mubarak Shah, “Video Categorization using Semantics and Semiotics”, Video Mining Techniques, Editors: Azriel Rosenfeld, Daniel DeMenthon, and David Doermann, Kluwer Academic Publishers, 2003.
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10. Kristine Gould, Krishnan Rangarajan, and Mubarak Shah, “Detection and Representation of Events in Motion Trajectories ”, chapter in **Advances in Image Analysis**, editors: Y. Mahdavih, and Gonzalez, R., SIPE Optical Engineering Press, 1992.
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4.3.3 Journal Papers

Accepted

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2. Saad Ali and Mubarak Shah, ”Human Action Recognition in Videos Using Kinematic Features and Multiple Instance Learning”, IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI). (accepted)
3. Jun Xie, Shahid Khan, and Mubarak Shah, “Automatic Tracking of Escherichia Coli In Phase-Contrast Microscopy Video”, IEEE Trans. on Biomedical Engineering. (accepted)
4. Imran Saleemi, Khurram Shafique, and Mubarak Shah “Probabilistic Modeling of Scene Dynamics for Applications in Visual Surveillance”, IEEE Transactions on PAMI. (accepted)
5. Jun Xie, Pheng-Ann Heng, and Mubarak Shah, “A Shape Matching Approach Using Skeletal Features and Context Descriptor”, Pattern Recognition. (accepted)

In Print

6. Pingkun Yan, Ashraf A. Kassim, Weijia Shen, and Mubarak Shah, “Modeling Interaction for Segmentation of Neighboring Structures”, IEEE Trans. Information Technology in Bio Medicine, Volume 13, Number 2, pp 252-262, March 2009.
7. Saad Masood Khan and Mubarak Shah, “Tracking Multiple Occluding People by Localizing on Multiple Scene Planes”, IEEE Transactions on PAMI, Volume 31, Number 3, pp 505-519, March 2009.

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10. Yaser Sheikh, and Mubarak Shah, "Trajectory Association Across Multiple Airborne Cameras", IEEE Transactions on PAMI, Volume 30, No 2, pp 361-367, February 2008.
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15. Javed Ahmed, M. N. Jafri, Muhammad Akbar and Mubarak Shah, "Real-Time Edge-Enhanced Dynamic Correlation and Predictive Open-Loop Car-Following Control for Robust Tracking", Machine Vision and Applications Journal, Volume 19 Number 1, pp 1-26, January 2008
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25. Orkun Alatas, Omar Javed and Mubarak Shah, "Video Compression Using Spatiotemporal Regularity Flow", IEEE Transactions on Image Processing, Vol. 15, No. 12, pp. 3812-3823, December 2006.
26. Lisa Spencer and Mubarak Shah, "Determining Scale and Sea State from Water Video", IEEE Transactions on Image Processing, Vol. 15, No. 6, 2006.
27. Paul Smith; Mubarak Shah; Niels Lobo, "Integrating Multiple Levels of Zoom to Enable Activity Recognition", Computer Vision and Image Understanding, Vol. 103, Issue 1 (July 2006), pp.33-51.
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4.3.4 Conference Papers

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3. Arslan Basharat and Mubarak Shah, "Time Series Prediction by Chaotic Modeling of Non-linear Dynamical Systems", International Conference on Computer Vision (ICCV), 2009.
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5. Jingen Liu, Yang Yang, and Mubarak Shah, "Learning Semantic Visual Vocabularies Using Diffusion Distance", CVPR 2009, June 2009.
6. Ramin Mehran and Mubarak Shah, "Abnormal Crowd Behavior Detection using Social Force Model", CVPR 2009, June 2009.
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8. Arslan Basharat, Alexi Grati and Mubarak Shah, "Geometric Constraints on 2D Action Models for Tracking Human Body", International Conference on Pattern Recognition, December 2008. (**Oral, Acceptance rate 18%**)
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16. Jingen Liu, Saad Ali and Mubarak Shah, "Recognizing human action using multiple features", CVPR 2008.
17. Mikel Rodriguez, Javed Ahmed, Mubarak Shah, "Action MACH: A Spatio-temporal Maximum Average Correlation Height Filter for Action Recognition", CVPR 2008.
18. Yusuf Aytar, Mubarak Shah, Jiebo Luo, "Utilizing Semantic Word Similarity Measures for Video Retrieval", CVPR 2008.
19. Saad M. Khan and Mubarak Shah, "Reconstructing Non-stationary Articulated Objects in Monocular Video using Silhouette Information", CVPR 2008.
20. Pingkun Yan, Saad M. Khan and Mubarak Shah, "Learning 4D Action Feature Models for Arbitrary View Action Recognition", CVPR 2008.
21. Andrew Miller, Mubarak Shah, and Don Harper, "Landing a UAV on a Runway Using Image Registration, International Conference on Robotics & Automation, 2008.
22. Taylor Goodhart, Pingkun Yan, Mubarak Shah, "Action recognition using spatio-temporal regularity based features", International Conference on Acoustics, Speech and Signal Processing, March 28-April 4, 2008, Las Vegas.
23. Martin Schiavenato, Jacqueline Byers, Paul Scovanner, Piotr Windyga, and Mubarak Shah, "Is there a Primal Face of Pain? A methodology answer", Proceedings of the 29th Annual International Conference of the IEEE EMBS, Cit Internationale, Lyon, France, August 23-26, 2007.
24. Saad Ali, Arslan Basharat, and Mubarak Shah, "Chaotic Invariants for Human Action Recognition", International Conference on Computer Vision, October, 2007, Rio de Janeiro, Brazil.
25. Pingkun Yan, Saad M. Khan, and Mubarak Shah, "3D Model based Object Class Recognition in Arbitrary Views, IEEE International Conference on Computer Vision, October, 2007, Rio de Janeiro, Brazil.

26. Jingen Liu, “Scene Modelling Using Co-Clustering”, IEEE International Conference on Computer Vision, October, 2007, Rio de Janeiro, Brazil.
27. Saad Masood Khan, Pingkun Yan, and Mubarak Shah, “A Homographic Framework for the Fusion of Multi-view Silhouettes”, IEEE International Conference on Computer Vision, October, 2007, Rio de Janeiro, Brazil.
28. Paul Scovanner, Saad Ali, and Mubarak Shah, “A 3-Dimensional SIFT Descriptor and its Application to Action Recognition”, ACM MM 2007, Augsburg, Germany.
29. Mikel D. Rodriguez, and Mubarak Shah, “Detecting and Segmenting Humans in Crowded Scenes”, ACM MM 2007, Augsburg, Germany.
30. Javed Ahmed, Mubarak Shah, Andrew Miller, Don Harper, and M.N. Jafri, “A Vision-Based System for a UGV to Handle a Road Intersection”, AAAI Twenty-Second Conference on Artificial Intelligence, Vancouver, British Columbia, 22-26 July 2007.
31. Vladimir Reilly, Saad Ali, and Mubarak Shah, “Motion and Appearance Contexts for Tracking and Re-Acquiring Targets in Aerial Video”, IEEE Conference on Computer Vision and Pattern Recognition, June 2007.
32. Andrew Miller and Mubarak Shah “Foreground Segmentation in Surveillance Scenes Containing a Door”, IEEE International Conference on Multimedia & Expo, Beijing, China 2007.
33. Brandyn White and Mubarak Shah “Automatically Tuning Background Subtraction Parameters Using Particle Swarm Optimization”, IEEE International Conference on Multimedia & Expo, Beijing, China 2007.
34. Yusuf Aytar, Omer Bilal Orhan and Mubarak Shah “Improving Semantic Concept Detection and Retrieval Using Contextual Estimates”, IEEE International Conference on Multimedia & Expo, Beijing, China 2007.
35. Yaser Sheikh, Xin Li, and Mubarak Shah, “Trajectory Association across Non-overlapping Moving Cameras in Planar Scenes”, IEEE Conference on Computer Vision and Pattern Recognition, June 2007.
36. Alexi Grati, Yaser Sheikh, and Mubarak Shah, “On the Spacetime Geometry of Galilean Cameras”, IEEE Conference on Computer Vision and Pattern Recognition, June 2007.
37. Asad Hakeem, Yaser Sheikh, and Mubarak Shah, “On the Direct Estimation of the Fundamental Matrix”, IEEE Conference on Computer Vision and Pattern Recognition, June 2007.
38. Saad Ali, and Mubarak Shah, “A Lagrangian Particle Dynamics Approach for Crowd Flow Segmentation and Stability Analysis”, IEEE Conference on Computer Vision and Pattern Recognition, June 2007.
39. Yun Zhai and Mubarak Shah, “Visual Attention Detection in Video Sequences Using Spatiotemporal Cues”, ACM MM 2006, Santa Barbara, CA, USA.
(**Acceptance rate 16%.**)

40. Humera Noor, Shahid H. Mirza, Yaser Sheikh, Amit Jain, "Mubarak Shah, Model Generation for Video based Object Recognition", ACM MM 2006, Santa Barbara, CA, USA.
41. Jun Xie, Pheng-Ann Heng, Simon S. M. Ho, Mubarak Shah, "Image Diffusion using Saliency Bilateral Filter", 9th MICCAI Conference, October 1-6, 2006, Copenhagen.
42. Asaad Hakeem, Roberto Vezzani, Rita Cucchiera, Mubarak Shah "Estimating Geospatial Trajectory of a Moving Camera", International Conference on Pattern Recognition", Hong Kong, August 23, 2006.
(**Acceptance rate 15%.**)
43. Pingkun Yan and Mubarak Shah, "Segmentation of Neighboring Structures by Modeling Their Interaction," IEEE Computer Society Workshop on Mathematical Methods in Biomedical Image Analysis (MMBIA), New York, June 2006.
44. Yaser Sheikh, Niels Haering, and Mubarak Shah, "Shape from Dynamic Texture for Planes", IEEE Conference on Computer Vision and Pattern Recognition, New York, USA 2006.
(**Acceptance rate 20%.**)
45. Jingen Liu, Yun Zhai, Mubarak Shah, "PEGASUS: An Information Mining System for TV News Videos", SPIE's Defense and Security Symposium 2006, 17 -21 April 2006.
46. Saad Ali and Mubarak Shah, "COCOA - Tracking in Aerial Imagery", SPIE Airborne Intelligence, Surveillance, Reconnaissance (ISR) Systems and Applications, Orlando, 2006.
47. Fahd Rafi, Saad M. Khan, Khurram Shafiq, Mubarak Shah, "Autonomous Target Following by Unmanned Aerial Vehicles", SPIE Defence and Security Symposium 2006, Orlando FL.
48. Alexei Gritai and Mubarak Shah, "Tracking of Human Body Joints Using Anthropometry", International Conference of Multimedia and Expo, Toronto, Canada, 2006.
49. Yun Zhai, Jingen Liu, Mubarak Shah, "Automatic Query Expansion In News Video Retrieval", International Conference of Multimedia and Expo, Toronto, Canada, 2006.
50. Saad M. Khan, Fahd Rafi, Mubarak Shah, "Where was the picture taken: Image Localization in Route Panoramas using Epipolar Geometry", International Conference of Multimedia and Expo, Toronto, Canada, 2006.
51. Saad M. Khan, Mubarak Shah, "A Multiview Approach to Tracking People in Crowded Scenes using a Planar Homography Constraint", European Conference of Computer Vision 2006.
52. Asaad Hakeem, Khurram Shafique, and Mubarak Shah "An Object based Video Coding Framework for Video Sequences Obtained From Static Cameras", ACM Multimedia 2005, Singapore, November 6-12.
(**Acceptance rate 16%, nominated for Best Paper Award.**)
53. Yun Zhai, and Mubarak Shah, "Tracking News Stories Across Different Sources", ACM Multimedia 2005, Singapore, November 6-12.
(**Acceptance rate 16%.**)

54. Saad M. Khan and Mubarak Shah, “Detecting Group Activities Using Rigidity of Formation”, ACM Multimedia 2005, Singapore, November 6-12.
55. Yun Zhai, and Mubarak Shah, “Determining Structure in Continuously Recorded Videos”, ACM Multimedia 2005, Singapore, November 6-12.
56. Yun Zhai and Mubarak Shah, “A General Framework for Temporal Video Scene Segmentation”, IEEE International Conference on Computer Vision, 2005, Beijing, China, October 15-21.
(**Acceptance Rate 20%**)
57. Paul Smith, Niels da Vitoria Lobo and Mubarak Shah, “Temporal Boost for Event Recognition”, IEEE International Conference on Computer Vision, 2005, Beijing, China, October 15-21.
(**Acceptance Rate 20%**)
58. Alper Yilmaz and Mubarak Shah, “Recognizing Human Actions in Videos Acquired by Uncalibrated Moving Cameras”, IEEE International Conference on Computer Vision, 2005, Beijing, China, October 15-21.
(**Acceptance Rate 20%**)
59. Saad Ali and Mubarak Shah, “A Supervised Learning Framework for Generic Object Detection in Images”, IEEE International Conference on Computer Vision, 2005, Beijing, China, October 15-21. (**Acceptance Rate 20%**)
60. Yaser Sheikh and Mubarak Shah, “Object Tracking Across Multiple Independently Moving Cameras”, IEEE International Conference on Computer Vision, 2005, Beijing, China, October 15-21.
(**Acceptance Rate 20%**)
61. Yaser Sheikh and Mubarak Shah, “Exploring the Space of an Action for Human Action Recognition”, IEEE International Conference on Computer Vision, 2005, Beijing, China, October 15-21.
(**Acceptance Rate 20%**)
62. Orkun Alatas and Mubarak Shah, “Video Compression Using Structural Flow”, International Conference on Image Processing, Genova, Italy, September 11-14, 2005.
63. Yun Zhai, Alper Yilmaz, and Mubarak Shah, “Story Segmentation in News Videos Using Visual and Text Cues”, International Conference on Image and Video Retrieval 2005, CIVR2005, July 20–22, 2005, Singapore.
64. Asad Hakeem and Mubarak Shah, “Multiple Agent Event Detection and Representation in Videos”, The Twentieth National Conference on Artificial Intelligence (AAAI), 2005.
(**Acceptance Rate 18%**)
65. Saad Ali and Mubarak Shah, “Kernel PCA and Boosting: An Integrated Approach to Generic Object Detection”, IEEE International Conference on Multimedia & Expo July 6-8, 2005, Amsterdam, The Netherlands.

66. Yun Zhai and Mubarak Shah, "Automatic Segmentation of Home Videos", IEEE International Conference on Multimedia & Expo July 6-8, 2005, Amsterdam, The Netherlands.
(**Acceptance Rate 22%**)
67. Yaser Sheikh and Mubarak Shah, "Bayesian Object Detection in Dynamic Scenes", IEEE CVPR 2005, San Diego, June 20-26.
(**Acceptance rate 6%**)
68. Omar Javed, Khurram Shafique and Mubarak Shah, "Appearance Modeling for Tracking in Multiple Non-overlapping Cameras", IEEE CVPR 2005, San Diego, June 20-26.
(**Acceptance rate 6%**)
69. Alper Yilmaz and Mubarak Shah, "Actions As Objects: A Novel Action Representation", IEEE CVPR 2005, San Diego, June 20-26. (**acceptance rate 20%**)
70. Omar Javed, Saad Ali and Mubarak Shah, "Online Detection and Classification of Moving Objects Using Progressively Improving Detectors", IEEE CVPR 2005, San Diego, June 20-26.
(**Acceptance rate 20%**)
71. Jiangjian Xiao and Mubarak Shah, "Accurate Motion Layer Segmentation and Matting", IEEE CVPR 2005, San Diego, June 20-26.
(**Acceptance rate 20%**)
72. Xiaochun Cao and Mubarak Shah, "Camera Calibration and Light Source Orientation Estimation from Images with Shadows", IEEE CVPR 2005, San Diego, June 20-26.
(**Acceptance rate 20%**)
73. D. Batz, M. Batz, N. Da Vitoria Lobo, M. Shah, "Visual System for Monitoring Medication Intake", in Procs. Canadian Conference on Computer and Robot Vision, May 2005, Victoria.
74. J. Garcia, N. Da Vitoria Lobo, M. Shah, J. Feinstein, "Finding Heads in Single Images", in Procs. Canadian Conference on Computer and Robot Vision, May 2005, Victoria.
75. Arslan Basharat, Necati Catbas and Mubarak Shah, "A Framework for Intelligent Sensor Network with Video Camera for Structural Health Monitoring of Bridges", PerCom 2005, Third International Conference on Pervasive Computing, Kauai Island, Hawaii, March 8-12, 2005.
76. Yunjun Zhang, Jiangjian Xiao and Mubarak Shah, "Motion Layer Based Object Removal", IEEE Workshop on Application of Computer Vision, 2005.
77. Jiangjian Xiao, Yunjun Zhang, and Mubarak Shah "Adaptive Region-Based Video Registration", IEEE Workshop on Motion and Video Computing, 2005
78. Xiaochun Cao and Mubarak Shah, "Shadow Construction in Object Transfer", IEEE Workshop on Application of Computer Vision, 2005.
79. Michael Wells, Niels da Vitoria Lobo, Mubarak Shah, "Automatic Visual Tracking for Analysis of Lifting", Irish Machine Vision and Image Processing Conference, Dublin, Ireland, Sept 1-3, 2004.

80. Alfred K. Levy III, Niels Da Vitoria Lobo, Mubarak Shah, "Object Tracking in Low Frame-Rate Video", Irish Machine Vision and Image Processing Conference, Dublin, Ireland, Sept 1-3, 2004.
81. Khurram Shafique and Mubarak Shah, "Estimation of the Radiometric Response Functions of a Color Camera from Differently Illuminated Image", IEEE International Conference on Image Processing, October 24-26, 2004, Singapore.
82. Lisa Spencer Mubarak Shah, "Water Video Analysis", IEEE International Conference on Image Processing, October 24-26, 2004, Singapore.
83. Omar Javed Mubarak Shah Dorin Comaniciu, "A Probabilistic Framework for Object Recognition in Video", IEEE International Conference on Image Processing, October 24-26, 2004, Singapore.
84. Yun Zhai, Zeeshan Rasheed, Mubarak Shah "Conversation Detection in Feature Film Using Finite State Machines", International Conference on Pattern Recognition, August 2004, Cambridge, England.
85. Alexei Gritai, Yaser Ajmal, Mubarak Shah, "On the use of Anthropometry in the Invariant Analysis of Human Action", International Conference on Pattern Recognition, August 2004, Cambridge, England.
86. Orkun Alatas, Omar Javed and Mubarak Shah, "Compressed Spatio-temporal Descriptors for Video Matching and Retrieval", International Conference on Pattern Recognition, August 2004, Cambridge, England.
87. Imran N. Junejo, Omar Javed, Mubarak Shah, "Multi Feature Path Modeling for Video Surveillance", International Conference on Pattern Recognition, August 2004, Cambridge, England.
88. Asaad Hakeem, Yaser Sheikh, and Mubarak Shah, "Ontology and Taxonomy Collaborated Framework for Meeting Classification", International Conference on Pattern Recognition, August 2004, Cambridge, England.
89. Yunjun Zhang, Jiangjian Xiao, Mubarak Shah, "Object Removal in Single Image", Proceedings of EUROGRAPHICS, August 30 - September 3, Grenoble, France, 2004.
90. Asaad Hakeem, Yaser Sheikh, and Mubarak Shah, "CASEE: A Hierarchical Event Representation for the Analysis of Videos", The Nineteenth National Conference on Artificial Intelligence (AAAI), July 25-29, 2004.
(**Acceptance Rate 25%**)
91. Yun Zhai, Zeeshan Rasheed, Mubarak Shah "Conversation and Explosion Detection in Feature Film", CIVR2004 International Conference on Image and Video Retrieval, Dublin, July 21-23, 2004

92. Jiangjian Xiao, Mubarak Shah, “Motion Layer Extraction in the Presence of Occlusion using Graph Cut”, Oral presentation, Proceedings of Computer Vision and Pattern Recognition, June 2004.
(**Acceptance rate 6.5%**)
93. Paul Smith, Mubarak Shah, and Niels da Vitoria Lobo, “Integrating and Employing Multiple Levels of Zoom for Activity Recognition”, Proceedings of Computer Vision and Pattern Recognition, June 2004.
(**Acceptance rate 20%**)
94. F. N. Catbas, M. Shah, J. Burkett and A. Bashart, “Challenges in Structural Health Monitoring’, 14th Int Workshop on Structural Control, Columbia University, New York, June 10-11, 2004.
95. Abhijit Mahalanobis, Jamie Cannon, S. Robert Stanfill, Robert Muise and Mubarak SHah, “Network Video Image Processing for Security, Surveillance, and Situational Awareness”, SPIE sensors, command, control, communications, and intelligence (c3i) technologies for homeland security and homeland defense Conference 12-16 April 2004.
96. Yaser Sheikh, Khurram Shafique and Yun and Mubarak Shah, Zhai, “Visual Monitoring of Railroad Grade Crossing”, SPIE sensors, command, control, communications, and intelligence (c3i) technologies for homeland security and homeland defense Conference 12-16 April 2004.
97. J. Xiao and M. Shah, “Automatic target recognition using multiview morphing”, SPIE Automatic Target Recognition XIV Conference, 12-16 April 2004.
98. Yaser Sheikh and Mubarak Shah, “Aligning Dissimilar Images Directly”, Asian Conference on Computer Vision, January, 2004.
99. Alper Yilmaz, Xin Li, and Mubarak Shah, “Object Contour Tracking”, Asian Conference on Computer Vision, January, 2004.
100. Lisa Spencer and Mubarak Shah, “Recovering Temporal Synchronization Between Non-Overlapping”, Asian Conference on Computer Vision, January, 2004.
101. Yaser Sheikh and Mubarak Shah, “An Accumulative Framework For The Alignment Of An Image Sequence”, Asian Conference on Computer Vision, January, 2004.
102. Jiangjian Xiao and Mubarak Shah, “From Images to Video: View Morphing of Three Images Vision”, Modeling, and Visualization 2003 (VMV2003), November 19-21, Munich, Germany, 2003.
103. Cen Rao, Mubarak Shah and Tanveer Syeda-Mahmood, “Invariance in Motion Analysis of Videos”, ACM Multimedia 2003, Nov 2-8, Berkeley, CA, USA.
(**Acceptance rate 20%**)
104. Yaser Sheikh and Mubarak Shah, “Aligning dissimilar images directly”, GeoSensor Networks (GSN03) Portland, Maine; October 9-11, 2003. (invited)

105. Rasheed, Z. and Shah M. "A Graph Theoretic Approach for Scene Detection in Produced Videos", Multimedia Information Retrieval Workshop 2003, in conjunction with the 26th annual ACM SIGIR conference on Information Retrieval, 1 Aug 2003, Toronto, Canada.
106. Javed O, Rasheed Z, Shafique K and Shah M, "Tracking Across Multiple Cameras With Disjoint Views", The Ninth IEEE International Conference on Computer Vision, Nice, France, October 2003.
(**Acceptance rate 20%**)
107. Khurram Shafique and Mubarak Shah, "A Non-Iterative Greedy Algorithm for Multi-frame Point Correspondence", The Ninth IEEE International Conference on Computer Vision, Nice, France, October 2003.
(**Acceptance rate 20%**)
108. Jiangjian Xiao and Mubarak Shah, "Two-FrameWide Baseline Matching", The Ninth IEEE International Conference on Computer Vision, Nice, France, October 2003.
(**Acceptance rate 20%**)
109. Cen Rao, Alexei Gritai, Mubarak Shah, "View-invariant Alignment and Matching of Video Sequences", The Ninth IEEE International Conference on Computer Vision, Nice, France, October 2003.
(**Acceptance rate 20%**)
110. Omar Javed and Mubarak Shah, "KNIGHTM: A Multi-Camera Surveillance System", ONDCP International Technology Symposium, 2003, July 7 to 12, Sand Diego. (invited)
111. Zeeshan Rasheed and Mubarak Shah, "Scene Detection In Hollywood Movies and TV Shows", IEEE Computer Vision and Pattern Recognition Conference, CVPR 2003, Madison, Wisconsin June 16-22, 2003.
(**Acceptance rate 6%**)
112. Omar Javed, Zeeshan Rasheed, Orkun Alatas and Mubarak Shah, "M-Knight: A Real Time Surveillance System for Multiple Overlapping and Non-Overlapping Cameras", Invited paper in IEEE conference on Multimedia and Expo, Special Session on Multi-Camera Surveillance Systems, Baltimore, July 6-9, 2003.
113. Omar Javed, Khurram Shafique, and Mubarak Shah, "A Hierarchical Approach to Robust Background Subtraction using Color and Gradient Information", IEEE Workshop on Motion and Video Computing, December, 2002.
114. Jiang Jian Xiao, Cen Rao and Mubarak Shah, "View Interpolation for Dynamic Scenes", EUROGRAPHICS 2002, Saarbrcken, Germany, September 6-9, 2002.
115. A. Yilmaz and M. Shah, "Estimation of Arbitrary Albedo and Shape from Shading for Symmetric Objects", BMVC2002 - British Machine Vision Conference 2002, Cardiff, UK, 2-5 Sept 2002.

116. Zeeshan Rasheed and Mubarak Shah, "Movie Genre Classification By Exploiting Audio-Visual Features Of Previews", International Conference on Pattern Recognition, August 11-15 2002 - Qubec City, Canada.
117. Jaime Dever, Niels da Vitoria Lobo, and Mubarak Shah, "Automatic Visual Recognition of Armed Robbery", International Conference on Pattern Recognition, August 11-15 2002 - Qubec City, Canada.
118. Alper Yilmaz, Khurram Shafique, Mubarak Shah, "Estimation of rigid and nonrigid motion using anatomical face model", International Conference on Pattern Recognition, August 11-15 2002 - Qubec City, Canada.
119. Ankur Datta, Mubarak Shah and Niels Da Vitoria Lobo, "Person-on-Person Violence Detection in Video Data", International Conference on Pattern Recognition, August 11-15 2002 - Qubec City, Canada.
120. Omar Javed and Mubarak Shah "Tracking And Object Classification For Automated Surveillance", European Conference on Computer Vision, Copenhagen, Denmark, May 28-31, 2002.
121. Sohaib Khan, Omar Javed, and Mubarak Shah, "Tracking in Uncalibrated Cameras with Overlapping Field of View", Second IEEE International Workshop on Performance Evaluation of Tracking and Surveillance, December 9, 2001 (in conjunction with IEEE CVPR'2001) Kauai, Hawaii, USA.
122. Ashish Myles, Niels da Vitoria Lobo, Mubarak Shah, "Wheelchair Detection in a Calibarated Environment", Asian Conference on Computer Vision, ACCV 2002, Melborne, Australia, Jan 2002.pp 706-712.
123. Richard Russo, Niels da Vitoria Lobo, Mubarak Shah, "A Computer Vision System for Monitoring Production of Fast Food", Asian Conference on Computer Vision, ACCV 2002, Melborne, Australia, Jan 2002.
124. Alper Yilmaz, Mubarak Shah, "Automatic Feature Detection and Pose Recovery for Faces", Asian Conference on Computer Vision, ACCV 2002, Melborne, Australia, Jan 2002.
125. Cen Rao, Mubarak Shah, "View Invariance in Action Recognition", IEEE Computer Vision and Pattern Recognition Conference, CVPR 2001, Kauai, Hawaii, Dec 11-13, 2001.
126. Sohaib Khan, Mubarak Shah, "Object Based Segmentation of Video Using Color, Motion and Spatial Information", IEEE Computer Vision and Pattern Recognition Conference, CVPR 2001, Kauai, Hawaii, Dec 11-13, 2001.
127. Sohaib Khan, Omar Javed, Zeeshan Rashedd, Mubarak Shah, "Human Tracking in Multiple Cameras", International Conference on Computer Vision, Vancouver, Canada, July 9-12, 2001.
128. Omar Javed, Zeeshan Rashedd, Mubarak Shah, "A Framework for Segmentation of Talk & Game Shows", International Conference on Computer Vision, Vancouver, Canada, July 9-12, 2001.

129. Alper Yilmaz, Khurram Hassan-Shafique, Mubarak Shah, Niels da Vitoria Lobo, "Target-Tracking in FLIR Imagery Using Mean-Shift and Global Motion Compensation" Workshop on Computer Vision Beyond the Visible Spectrum, with CVPR 2001, Kauai, Hawaii, Dec 14, 2001.
130. Wallick, M. N.; Lobo, N. d. V.; Shah, M. "A System for Placing Videotaped and Digital Lectures Online" To appear at IEEE 2001 International Symposium on Intelligent Multimedia, Video & Speech Processing (ISIMP). Hong Kong, May 2001.
131. Bracewell D.B., da Vitoria Lobo N., and Shah M, "Human identification through body measurements", *Proceedings of Computers and Their Applications, ISCA*, Seattle, WA, March 28-30, 2001, pp.383-386.
132. Omar Javed, Sohaib Khan, Zeeshan Rasheed, Mubarak Shah, "Camera Handoff: Tracking in Multiple Uncalibrated Stationary Cameras", IEEE Workshop on Human Motion, HUMO-2000, Austin, TX, Dec 7-8, 2000.
133. Cen Rao, Mubarak Shah, "A View-Invariant Representation of Human Action", International Conference on Control, Automation, Robotics and Vision, ICARCV 2000, Singapore, Dec 5th-8th, 2000.
134. Walter Phillips III, Mubarak Shah, Niels da Vitoria Lobo, "Flame Detection in Video", Workshop on Applications of Computer Vision, Plam Springs, CA, Dec 4th-6th, 2000
135. Alper Yilmaz, Mubarak Shah, "Shot Detection using Principle Coordinate System", IASTED Int'l Conf, Internet and Multimedia Systems and Applications, IMSA 2000, Las Vegas, Nov 20-23, 2000.
136. Omar Javed, Sohaib Khan, Zeeshan Rasheed, Mubarak Shah, "A Framework for Segmentation of Interview Videos", IASTED Int'l Conf, Internet and Multimedia Systems and Applications, IMSA 2000, Las Vegas, Nov 20-23, 2000.
137. Richard W. Cannata, Mubarak Shah, Steven G. Blask, John A. Van Workum, "Autonomous Video Registration Using Sensor Model Parameter Adjustments", Applied Imagery Pattern Recognition Workshop (AIPR) 2000, Cosmos Club, Washington D.C., Oct 16-18, 2000.
138. Mubarak Shah, "Understanding Video Sequences", 14th International Symposium on Computer and Information Sciences, ICSCIS XIV, October, 18-20, 1999, Kusdasi, Turkey.
139. Paul Smith, Mubarak Shah, and Niels da Vitoria Lobo, "Monitoring Head Eye Motion for Driver Alertness with One Camera", ICPR'2000 Fifteenth International Conference on Pattern Recognition, September 3-8, 2000, Barcelona, Spain.
140. Wallick M. N., Lobo N. d. V., Shah M., "Computer Vision Framework for Analyzing Projections from Video of Lectures", ISCA 9th International Conference for Intelligent Systems Louisville, KY, June 2000.
141. Andrew Wu, Mubarak Shah and Niels da Vitoria Lobo, "Virtual Blackboard", International Conference on Face and Gesture Recognition", France, March 2000.

142. Sohaib Khan and Mubarak Shah, "Tracking People in Presence of Occlusion", Asian Conference on Computer Vision, Taipei, Taiwan, January 2000.
143. Piotr Windyga, Chris Ingrassia and Mubarak Shah, "A non-linear filter for impulsive noise reduction", Proceedings of Joint Conference of Information Sciences, Durham, October, 1998.
144. Piotr Windyga and Mubarak Shah, "Multi-Profile Analyzer for Coronograms Segmentation", IEEE Medical Imaging Conference, Toronto, Canada, November 8-14, 1998.
145. Piotr Windyga and Mubarak Shah, "Automatic Profile-Based Border Detector for Coronograms", Proceedings of IASTED International Conference, Signal and Image Processing (SIP98), Oct 1998, pp 763-766.
146. Doug Ayers and Mubarak Shah, "Recognizing Human Actions in a Static Room", *4th IEEE Workshop on Applications of Computer Vision (WACV'98)*, October 19-21, 1998, Princeton, NJ.
147. Doug Ayers and Mubarak Shah, "Monitoring Human Behavior in An Office Environment", Interpretation of Visual Motion Workshop, CVPR-98, June 1998.
148. Jed Rose and Mubarak Shah, "Content-Based Image Retrieval Using Projections of Gradients", IEEE South East Conference, Orlando April 1998.
149. Shawn Dettmer, Avinash Seetharamaiah, Lin Wang and Mubarak Shah, "Model-Based Approach for Recognizing Human Activities From Video Sequences", Workshop on Recent Advances in Computer Vision, Karachi, Pakistan, January 1-2, 1998.
150. G. Bebis, M. Gerogiopoulos, N. Lobo and M. Shah, "Using Algebraic Functions of Views for Indexing-Based Object Recognition", International Conference on Computer Vision, Bombay, India, January 4-8, 1998.
151. Paul Prestopnik and Mubarak Shah, "Manipulating MR/CT Data With Hand Gestures", Sixth International Conference on Intelligent Systems, Boston, June 1997.
152. G. Bebis, M. Gerogiopoulos, N. Lobo and M. Shah, "Learning Affine Transformations of the Plane for Model-Based Object Recognition", International Conference on Pattern Recognition, Vienna, Austria August 25 - 30, 1996.
153. Li Nan, Shawn Dettmer, and Mubarak Shah, "Visual Lipreading Using Eigensequences", *International Workshop on Automatic Face and Gesture Recognition*, pp 30-34, Zurich, June 1995.
154. Yu Tian and Mubarak Shah, "Recovering 3D Motion and Structure of Multiple Objects Using Adaptive Hough Transform", *Proceedings of International Conference on Computer Vision*, pp 284-289, Boston, Ma, June 20-23, 1995.
(**Acceptance rate 26%**)
155. Ruo Zhang, Ping-Sing Tsai, and Mubarak Shah, "Shape from Intensity", *Workshop on Computer Vision*, Islamabad, Pakistan, January 2-5, 1995.

156. James Davis and Mubarak Shah, “Three-Dimensional Gesture Recognition”, *Asilomar Conference on Signals, Systems, And Computers* , Pacific Grove, California, October 31–November 2, 1994.
157. Yu Tian and Mubarak Shah, “Estimating 3D Motion and Shape of Multiple Objects Using Hough Transform”, *Proceedings of International Conference on Pattern Recognition* , Jerusalem, Israel, October 9–13, 1994.
158. Yu Tian and Mubarak Shah, “Motion Estimation and Segmentation”, *Proceedings International Conference on Image Processing*, Austin, Texas, November 13–16, 1994.
159. Yu Tian and Mubarak Shah, “A General Approach for Determining 3D Motion and Structure of Multiple Objects from Image Trajectories”, *Proceedings of IEEE Workshop on Motion of Nonrigid & Articulate Objects*, Austin, Texas, November 11–12, 1994.
160. Claudette Cédras and Mubarak Shah, “A Survey of Motion Analysis from Moving Light Displays”, *IEEE Conference on Computer Vision and Pattern Recognition*, Seattle, June 20–23, 1994.
(**Acceptance rate 17%**)
161. Ruo Zhang, Ping-Sing Tsai, James Cryer and Mubarak Shah, “Analysis of Shape from Shading Techniques”, *IEEE Conference on Computer Vision and Pattern Recognition*, Seattle, June 20–23, 1994.
(**Acceptance rate 17%**)
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(**Acceptance rate 17%**)
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(**Acceptance rate 18%**)
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171. Krishnan Rangarajan, and Mubarak Shah, "Motion Correspondence", *IEEE Conference on Computer Vision and Pattern Recognition*, pp 103–108, June 3–6, 1991, Maui, Hawaii.
(**Acceptance rate 18%**)
172. Donna Williams, and Mubarak Shah, "Greedy Algorithm for Active Contour ", *Proceedings of International Conference on Computer Vision* , pp 592–595, Osaka, Japan, December 1990.
(**Acceptance rate 29%**)
173. Jay Hackett, and Mubarak Shah, "Multi-sensor Fusion: A Survey", *Proceedings of IEEE Conference on Robotics and Automation, Cincinnati, Ohio, May 1990*, pp 1324–1330.
174. Donna Williams, and Mubarak Shah, "Edge Contours at Multiple Scales ", *Proc. First European Conference on Computer Vision*, France, April 1990.
(**Acceptance rate 12%**)
175. Donna Williams, and Mubarak Shah, "Normalized Edge Detection ", *Proceedings of International Conference on Pattern Recognition* , pp 942–946, Vol. 1, Atlantic City, June 1990.
176. Kristine Gould, and Mubarak Shah, "Trajectory Primal Sketch", *Proceedings of IEEE Conference on Computer Vision and Pattern Recognition*, pp 79–85, San Diego, June 1989.
177. Donna Williams, and Mubarak Shah, "Multiple Scale Edge Linking", *Proc. S.P.I.E. Technical Symposium on Optics, Electro Optics and Sensors*, Peabody Orlando, FL, March 1989.
178. Rangarajan, Mubarak Shah, and David Van Brackle, "Detecting Corners", *Proceedings of International Conference on Computer Vision*, pp 90–94, Tarpon Springs, Florida December 1988.
179. Ranganathan, N. and Shah, M.A., "Scale-Space Chip", *Proceedings of International Conference on Pattern Recognition*, Rome, Italy, November 1988.
180. Shah, M. and Sood, A.K. "Fitting primitives in the scale-space", *Proc. S.P.I.E. Technical Symposium on Optics, Electro Optics and Sensors*, Peabody Orlando, FL, May 1987.
181. Shah, M., Sood, A. and Jain, R., "Pulse and Staircase Models for Detecting Edges at Multiple Resolutions", *Proceedings of IEEE Workshop on Computer Vision: Representation and Control*, Bellaire, Michigan, October 1985.
182. Shah, M. and Jain, R., "Time Varying Corner Detector", *Proceedings of International Conference on Pattern Recognition*, pp 2-5, Montreal, Canada, August 1984.

4.4 Invited Talks, Colloquia, Tutorials and Workshops

Summary

- More than **one hundred** talks in **more than ten** countries
 - Tutorial/Short Courses at CVPR-99 and ACCV-200
 - Short courses in US, Italy, Mexico, Pakistan, Taiwan
 - Lecture series at UT Austin
1. “An Overview of Visual Tracking in EO and IR Imagery”, **keynote talk**, IEEE Workshop on Object Tracking & Classification in and Beyond the Visible Spectrum (OTCBVS), CVPR 2009, Miami Beach, FL, June 20, 2009.
 2. “Visual Analysis of Crowded Scenes, International Workshop on Video, Barcelona, Spain, May 27, 2009.
 3. “Taming Crowded Visual Scenes”, DARPA ISAT workshop, Berkeley, CA, May 6, 2009.
 4. “Taming Crowded Visual Scenes”, EECS department, University of Michigan Ann Arbor, MI, April 8, 2009.
 5. “Taming Crowded Visual Scenes”, ECE department, Wayne State University, Detroit, MI, April 7, 2009.
 6. “UCF VIRAT efforts”, Audacity/VIRAT workshop, Lockheed Martin, Herndon, VA, February 18, 2009.
 7. “Floor field Models for Tracking in High Density Crowds”, European Conference on Computer Vision, October 14, 2008, Marseille, France.
 8. “Tracking Across Multiple Moving Cameras”, Missouri University of Science and Technology, **ACM Distinguished Lecture**, Rolla, Missouri, October 10, 2008.
 9. “Video Surveillance and Monitoring”, Austrian Research Centers GmbH, Vienna, August 1, 2008.
 10. “Human Action Recognition Using Bag of Video Words”, Vienna University of Technology, Vienna, July 17, 2008.
 11. “Video Surveillance and Monitoring”, Klagenfurt University, Klagenfurt, Austria, July 15, 2008.
 12. “Visual Analysis of Crowded Scenes”, invited talk at DARPA Workshop on Cityscapes, Reno, Nevada, March 8-9, 2008.
 13. “Visual Analysis of Crowded Scenes”, Keynote talk at International Conference on Machine Vision, Islamabad, Pakistan December 28, 2007.

14. “Visual Analysis of Crowded Scenes”, **Keynote talk** at International Symposium on Visual Computing, Lake Tahoe, Nevada, November 26-28, 2007.
15. “Video Surveillance and Monitoring Using Distributed Cameras”, **Keynote talk** at ACM/IEEE International Conference on Distributed Smart Cameras (ICDSC-07), September 25-28, 2007, Vienna, Austria.
16. “Recognizing Actions, Objects and Actions as Objects”, **Keynote talk** at British Machine Vision Conference (BMVC), Warwick, Uk, September 12, 2007.
17. “Video Surveillance and Monitoring”, half day tutorial at ICIAP, Modena, Italy, September 10, 2007.
18. “Aerial and Video Surveillance and Monitoring”, Capstone talk at IEEE Workshop on Multimodal Sentient Computing: Sensors, Algorithms, and Systems, Minneapolis, Minnesota, USA, Friday, June 22, 2007.
19. “Visual Analysis of Crowded Scenes”, Computer Science, University of California Irvine, May 29.
20. “An Overview of Video Surveillance and Monitoring Research at UCF”, HRL Lab, Malibu California, June 1, 2007.
21. “Visual Analysis of Crowded Scenes”, Statistics Department, University of California, LA, May 29.
22. “The Fundamental Matrix in Human Action Recognition”, Honda Research, Mountain View, CA, April 25.
23. “Spatiotemporal Regularity Flow”, **plenarytalk** at Frontier of Information Technology (FIT2006), Islamabad, Pakistan, December 20, 2006.
24. “Video Understanding”, BCC Fast, Karachi, Pakistan December 18, 2007.
25. “Spatiotemporal Regularity Flow: (SPREF): Its Estimation and Applications”, Workshop on Computational/Compressed Imaging, Lockheed Martin, Orlando, FL, September 26, 2006.
26. “Object Tracking”, **Keynote talk** at Computer Vision, Graphics and Image Processing Conference, August 14, 2006, Ta Shi, Taiwan.
27. “Recognizing Human Actions From Video Sequences”, Asia University, Taichung, Taiwan, August 15, 2006.
28. “The Fundamental Matrix in Human Action Recognition, AIST, Tsukuba, Japan, Japan, August 17, 2006.
29. “The Fundamental Matrix in Human Action Recognition, University of Tsukuba, Tsukuba, Japan, August 18, 2006.

30. “Estimating Geospatial Trajectory of a Moving Camera”, International Conference on Pattern Recognition”, Hong Kong, August 23, 2006.
31. “The Fundamental Matrix in Human Action Recognition, Princeton University, April 10, 2006.
32. “Advances in Video Understanding Research”, **Weissberger/Williams Kodak** Lecture Series, Kodak Research April 12, 2006, Rochester, New York.
33. “The Fundamental Matrix in Human Action Recognition, **Azreil Rosenfeld Lecture**, University of Maryland, College Park, May 1, 2006.
34. “Tracking Across Multiple Moving Cameras”, **plenary** talk, ICIAR-2006, Povia de Varzim, Portugal, September 19, 2006.
35. “Recognizing Human Actions”, **plenary** talk at ELMAR-2006, Zadar, Croatia, June 7, 2006.
36. “Recognizing Human Actions”, Lahore University of Management Sciences, Lahore, Pakistan, January 5, 2006.
37. “Tracking Across Multiple Moving Cameras”, Military College of Signals, Islamabad, January 6, 2006.
38. “Recognizing Human Actions”, Electrical and Computer Engineering, University of Miami, Miami, November 16, 2005.
39. “Tracking Across Multiple Moving Cameras”, Istituto di Cibernetica ”E. Caianiello, Napoli, ITALY, September 15, 2005.
40. “Recognizing Human Actions”, IDIAP Research Institute Martigny, Switzerland, September 12, 2005.
41. “Automatic Segmentation of Home Videos”, IEEE International Conference on Multimedia & Expo July 6-8, 2005, Amsterdam, The Netherlands.
42. “Tracking Across Multiple Moving Cameras”, July 13, 2005, CMU.
43. “Tracking Across Multiple Moving Cameras”, Universit degli Studi di Firenze, Italy, May 13th 2005.
44. “Tracking Across Multiple Moving Cameras”, Responsable d’quipe - Vision et Imagerie Centre de Recherche Informatique de Montral (CRIM), Canada, April 5, 2005.
45. “Video Registration, Segmentation and Tracking”, invited talk, 2nd International Workshop on Frontiers of Information Technology, Islamabad, Pakistan, December 20-21, 2004.
46. “Emerging technologies, education and research and their impact”, invited talk NCET2004, Karachi, Pakistan, December 18-19, 2004.
47. **Keynote address**, 17th International Conference on Computer Applications in Industry and Engineering (CAINE-2004) November 18, 2004, Orlando, Florida U.S.A.

48. "Video Registration, Segmentation and Tracking", invited talk, 58th Automatic Target Recognition Working Group, Lockheed Martin Missiles and Fire Control, Orlando, Florida, November 16-18, 2004.
49. "Object Tracking", Ohio State University, Columbus, October 13, 2004.
50. "Layer-Based Video Registration", Air Force Lab, Dayton, Ohio, October 14, 2004.
51. "Layer-Based Motion Segmentation In Presence of Occlusion", City University of New York, New York, October 12, 2004.
52. "Object Tracking", Sarnoff Corporation, Princeton, NJ, October 8, 2004.
53. "Human Action Recognition", Columbia University, New York, October 7, 2004.
54. "Recognizing Human Actions", University of Dundee, Dundee, Scotland, July 26, 2004.
55. "Registration, Tracking and Segmentation", invited talk, IEEE Workshop on Video Registration, CVPR, July 2, 2004.
56. "Multimedia: Computer Vision View", IEEE Workshop MDDE, CVPR, July 2, 2004.
57. "Target Tracking", Lockheed Martin Aeronautics Company Advanced Development Programs Combat Air Systems Integration & Demonstrations, Fort Worth, TX, June 2, 2004.
58. "Layer-Based Motion Segmentation", University of Texas, Austin, June 1, 2004.
59. "Representations for Action Recognition", Computer Science University of Texas, Dallas, April 5, 2004.
60. "Representations for Action Recognition", Computer Science and Engineering department, Penn State University, January 19, 2004.
61. "From Images to Video", Lahore University of Management Sciences, Lahore, Pakistan, December 26, 2003.
62. "Computer Vision and Undergraduate Research", invited talk, NSF Workshop on Frontiers of Information Technology, Islamabad, Pakistan, December 23-24, 2003.
63. "Geo-registering Aerial Video Imagery", invited talk, GeoSensor Networks (GSN03) Portland, Maine; October 2003.
64. "Understanding Hollywood Movies", Cognitive Sciences Colloquium, UCF, September 26, 2003.
65. "Understanding Video", A. Louis Medin Modeling & Simulation Seminar, Institute of Simulation and Training, UCF, July 21, 2003.
66. "Ontology and Taxonomy of Meeting Videos", ARDA Workshop on Video Event Taxonomy, La Jolla, California, July 14, 2003.

67. "Wide Area Surveillance Using Advanced Computer Vision", 2003 ONDCP International Technology Symposium Counter drug C4I Research and Development July 8-11, 2003, San Diego, CA.
68. "Wide-baseline Matching", NAVAIR, China Lake, California, July 9, 2003.
69. "Video Understanding", University of Michigan, Dearborn, June 13, 2003.
70. "Representation and Recognition of Events", panel for Workshop on Event Mining: Detection and Recognition of Events in Video, IEEE CVPR, June 17, 2003.
71. "Visual Tracking and Action Recognition", Auburn University, June 10, 2003.
72. "The Changing Face of Computer Vision Research", Colorado School of Mines, March 14, 2003.
73. "Computer Vision Research at UCF", United Space Alliance, Kennedy Space Center, Florida, January 17, 2003.
74. "Research Experience for Undergraduates in Computer Vision", University of California Berkeley, January 10, 2003.
75. "The Changing Face of Computer Vision Research", IBM Almaden Research Center, California, January 13, 2003.
76. "Video Data Mining", University of Illinois, Chicago, January 6, 2003.
77. "KNIGHT: Realtime Video Surveillance System", LOCKHEED MARTIN M&DS, Gaithersburg, MD.
78. "Introduction of Panel On Motion and Video Computing", IEEE WMVC, January 5-6, 2003, Orlando, FL.
79. "Video Categorization using Semantics and Semiotics", Center for Discrete Mathematics & Theoretical Computer Science Workshop on Video Data Mining, Rutgers University, N Piscataway, New Jersey, November 6, 2002.
80. "Visual Tracking and View Invariant Representation and Recognition of Human Action", Sarnoff Corporation, Princeton, NJ-08543, USA, November 8, 2002.
81. "Tracking in Uncalibrated Multiple Cameras, and View Invariant Representation and Recognition of Human Action", University of Southern California, October 18, 2002.
82. "Multiple Cameras, and View Invariant Representation and Recognition of Human Action", University of California, Riverside, October 16, 2002.
83. "Target Detection and Tracking in EO and FLIR Imagery", Second Lockheed-Martin ATR Workshop, Orlando, FL, October 2, 2002.
84. "Computer Vision and Undergraduate Research", Burnet Honors College, UCF, October 14-15, 2002.

85. "Tracking in Uncalibrated Multiple Cameras, and View Invariant Representation and Recognition of Human Action", INRIA Sophia-Antipolis Cede, France, September 6, 2002.
86. "Video Understanding: Visual Tracking, Representation and Recognition", Electrical and Computer Engineering, University of Houston, Houston, June 10, 2002.
87. "Video Understanding Research at UCF", TASC, Boston, February 15, 2002.
88. "Automatic Feature Detection and Pose Recovery for Faces", Asian Conference on Computer Vision, Melbourne, Australia, January 24, 2002.
89. "Understanding Human Behavior from Video Sequences", Computer Science department, University of Dallas, Texas, January 3, 2002.
90. "Overview of Research Experience for Undergraduates in Computer Vision", invited talk IEEE Workshop on Combined Research-curriculum development in Computer Vision, December 10, 2001, Kuauai, Hawaii.
91. "Understanding Human Behavior Using Video Sequences", invited talk at NSF/NIMA Defining a Motion Imagery Research and Development Program Workshop", Nov 28-30, 2001, Washington, DC.
92. "Target Detection and Tracking in FLIR Imagery", U.S. Army AMCOM AMSAM-RD-MG-IP/ Redstone Arsenal, Alabama, October 15, 2001.
93. "Distinguished Visitor Lecture Series", University of Texas, Austin, March 5-8, 2001. Four Lectures: Video Understanding, Video Registration, Video Segmentation, Visual Tracking.
94. "Understanding Human Behavior: Progress and New Challenges", invited talk, IEEE Workshop on Human Motion, HUMO-2000, Austin, TX, Dec 7-8, 2000.
95. "Video Computing", one week concentrated course, University Grants Commission, Islamabad, Pakistan, December 15-22, 2000 (Funded by UNDP).
96. "A Framework for Visual Tracking and Object-based Segmentation of Video" Department of Mathematics, UCF, October 3, 2000.
97. "Inverse Hollywood Problem: Understanding Video Sequences", ACM Student chapter at UCF, October 4, 2000.
98. "Image Quality Metrics and the Role of Linear Features in Video Registration", Harris Corporation, November 1, 2000.
99. "Visual Tracking", Texas Instruments, Dallas, Texas, July 31, 2000.
100. "An Overview of Video Analysis Research at UCF", Lockheed-Martin, August 28, 2000.
101. "Tracking People in The Presence of Occlusion", invited talk in Asian Conference on Computer Vision", Taipei, Taiwan, January 11, 2000.

102. “Visual Tracking and Recognition”, National Taiwan University, Taipei, January 9, 2000.
103. “Video Computing”, a half day tutorial before Asian Conference on Computer Vision, Taipei, Taiwan, January 2000.
104. “Video Understanding”, Istanbul Technical University, Istanbul, October 1999.
105. A Tutorial on “Video Computing”, I Taller de Computacion Robotica y Vision, de Monterey Campus Morelos, Mexico, November 1999. (One Day)
106. “Video Computing”, a half day tutorial before IEEE CVPR, Fort Collins, Colorado, June 1999.
107. “Video Understanding”, Congreso Nacional De Sistemas Computacionales Y Electronicos, Cuernavaca, Mexico, October 29-31, 1998.
108. “Recognizing Human Activities”, Ghulam Ishaque Khan Institute of Technology, Topi, Pakistan, January 1999.
109. “Video Computing”, 15-week course, Information Systems Division, Harris Corporation, Melbourne, Fl, September 1998-March 1999.
110. “Motion-Based Recognition”, Information System Division, Harris Corporation, Melbourne, Florida, March 6, 1998.
111. “Model-Based Approach for Recognizing Human Activities From Video Sequences”, invited talk Workshop on Recent Advances in Computer Vision, Karachi, Pakistan, January 1-2, 1998.
112. “Short Course on Computer Vision”, December 15–31, 1997, Karachi, Pakistan. (funded by UNDP)
113. “Visually Recognizing Human Activities, Gestures, and Speech’, Computer Science department, University of Reno, Nevada, November 21, 1997.
114. “Mentoring Undergraduates In Computer Vision Research”, invited talk IEEE Workshop on Undergraduate Education & Image Computation El San Juan Hotel, Puerto Rico, June 20, 1997.
115. “Experience With NSF REU Program”, IEEE Workshop on Undergraduate Education & Image Computation El San Juan Hotel, Puerto Rico, June 20, 1997.
116. “Visually Recognizing Human Activities, Gestures, and Speech”, University of California Irvine, April 7, 1997.
117. “Detecting and Recognizing Human Activities from Video Sequences”, CREOL Industrial Partnership Day, January 10, 1997.
118. “Seven Years of NSF REU at UCF”, ACM University of Central Florida chapter, February 13, 1996.

119. "Short Course on Computer Vision", Computer Training Center, Atomic Energy Commission, Islamabad, Pakistan, December 19, 1995–January 5, 1996. (Funded by UNDP)
120. "Recent Advances in Computer Vision", Shaheed Zulfikar Ali Bhutto Institute, Karachi, Pakistan, December 31, 1995.
121. "Shape from Shading and Photomotion", University of Bern, Bern, Switzerland, June 30, 1995.
122. "Shape from Intensity", National University of Singapore, Singapore, December 29, 1994.
123. "Computer Vision: Theory and Practice", *Workshop on Computer Vision*, Islamabad, Pakistan, January 2-5, 1995.
124. "Shape from Intensity", *Workshop on Computer Vision*, Islamabad, Pakistan, January 2-5, 1995.
125. "Shape from Intensity", Tsing Hua University Hsin-Chu city, Taiwan, December 27, 1994.
126. "Visual Gesture Recognition and Lipreading", David Sarnoff Lab, Princeton, N. J., September 23, 1994.
127. "Visual Gesture Recognition and Lipreading", IBM T J Watson Lab, New York, September 26, 1994.
128. "A Survey of Motion Analysis from Moving Light Displays", *IEEE Conference on Computer Vision and Pattern Recognition*, Seattle, June 20–23, 1994.
129. "An Overview of Computer Vision", N. E. D. University, Karachi, Pakistan, May 14, 1994.
130. "Short Course on Computer Vision", Mehran University of Engineering and Technology, Jamshoro, Pakistan, December 1992. (Funded by NSF)
131. "Greedy Algorithm for Active Contour", International Conference on Computer Vision, Osaka, Japan, December 1990.
132. "Edge Contours at Multiple Scales", First European Conference on Computer Vision, Antibes France, April 1990.
133. "Multisensor Fusion: Object Recognition Using Feature Overlap", National Science Foundation, Washington, D.c, an invited talk for REU project, March 1990.
134. "Trajectory Primal Sketch", *IEEE Conference on Computer Vision and Pattern Recognition*, San Diego, June 1989.
135. "Trajectory Primal Sketch", Computer Science and Engineering, University of South Florida, May 1989.

4.5 Grants and Contracts

1. (PI) *A Functional Estimation Testbed for Robust Vision-Aided Navigation*, Scientific Systems, 7/2009-7/2011, \$244,000. (Credit 50%)
2. (PI) *Taming Crowded Visual Scenes*, Army Research Office, 05/12/09 - 05/11/12, \$365,469 . (Credit 100%)
3. (PI) Computer Assisted Identification and Volumetric Analysis of Enhancing Components, NIH, 05/01/09 - 04/31/11, \$400,000.(Credit 100%)
4. (PI) *Research Experience for Undergraduates in Computer Vision*, with Niels Lobo and Marshall Tappen, National Science Foundation (NSF), \$300,000, January 2009–January 212. (Credit 34%)
5. (PI) *Visual Inspection of Railroads: Supplement*, Florida Department of Transportation, \$234,000, November 2008–August, 2010. (Credit 100%)
6. (PI) “Video Image Retrieval and Analysis Tool (VIRAT)”, Lockheed Martin/DARPA, \$807,351, Phase I, September 2008-Feb 2010. (Credit 100%)
7. (PI) “FHTC match to Lockheed Video and Image Analysis and Retrieval (VIRAT)”, \$269,117, September 2008-Feb 2010. (Credit 100%)
8. (PI) “Data Collection for Activity Recognition from Video”, Lockheed Martin and I-4 Match, \$55,000, September 2008-March 2010. (Credit 100%)
9. (PI) “CSUMS: Computational Mathematics with an Emphasis on Computer Vision and Imaging Science (CMECVIS)”, National Science Foundation, \$980,324, September 2008-August, 2013. (Credit 25%)
10. (PI) “Consumer Video Indexing”, Eastman Kodak, September 2008–August 2009, \$50,000.
11. (PI) “Automated Video Processing Research”, \$170,000, July 2008-June 2010, Harris Corporation and I-4 Match. (Credit 100%)
12. (Co-PI) “PROFIT: Pictures Represent Opportunities For Inspiration in Technology”, National Science Foundation, \$1,200,000, 12/01/2007 to 11/30/2010. (Credit 30%)
13. (PI) “Advanced Video Analysis and Fusion”, Lockheed Martin, Gaithersburg, MD, \$100,000, March 2007–November 2007. (Credit 100%)
14. (PI) NSF Graduate Research Fellowship: Enrique Ortiz: Advanced Video Analysis and Fusion of UAV and Surveillance Videos, NSF, 09/01/2007 to 08/31/2010, \$120,000.
15. (co-PI) “DURIP: A Deployable Multi-Platform UAV Team for Visual-Sensing Purposes”, US Army, \$210,600, September 2006. (Credit 50%)
16. (PI) “Geo-registration”, SAIC, \$60,000, 2006. (Credit 100%)

17. (PI) *Content Extraction for Analysis of Ground Reconnaissance Videos-Tier I*, Disruptive Technology Office (DTO), \$999,998, October 2006–September 2009. (Credit 100%)
18. (PI) *Video Analysis and Content Extraction-Tier II* with Perceptek, Disruptive Technology Office (DTO), \$4,500,000, January 2007–December 2010. (UCF part \$750,000). (Credit 100%) (This contract was terminated, UCF received \$55,000.)
19. (PI) *Consumer Video Indexing*, Kodak, \$50,000, October 2005–September 2007. (Credit 100%)
20. (PI) *Research Experience for Undergraduates in Computer Vision*, with Niels Lobo and Takis Kasparis, National Science Foundation (NSF), \$300,000, February 2006–March 2009. (Credit 50%)
21. (PI) *UAV Video Indexing*, Lockheed Martin, Gaithersburg, MD, \$100,000, December 2005–November 2006. (Credit 100%)
22. (PI) *Human Detection and Tracking Algorithms*, Army’s Future Combat System (FCS), Lockheed-Martin/Boeing, \$400,000 (out of \$30,000,000), August 2005–November 2006. I-4 Corridor match \$200,000. (Credit 100%)
23. (Co-PI) *Video Event Recognition Algorithm Assessment Evaluation (VERAAE)*, ARDA/TASC, \$70,000, 06/01/2005 to 06/30/2006. (Credit 20%)
24. (PI) *Multi-Platform Motion Analysis and Tracking Study*, Lockheed Martin, Orlando and I-4 Corridor \$36,000, March 2005–April 2005. (Credit 100%)
25. (PI) *UAV Video Indexing*, Lockheed Martin, Gaithersburg, MD, \$100,000, December 2004–November 2005. (Credit 100%)
26. (PI) *ATR Using Multiview Morphing*, Army Research Office, \$360,000, March 2005–February 2008. (Credit 100%)
27. (PI) *Night Time Surveillance*, DARPA STTR/Perceptek, \$250,000, August 2005–November 2006. (Credit 100%)
28. (PI) *Visual Inspection of Railroads*, Florida Department of Transportation, \$430,000, December 2004–February 2008. (Credit 100%)
29. (PI) *Tracking in Multiple Overlapping Moving Cameras*, Lockheed Martin and I-4 Corridor, \$136,000, April 2004–March 2005. (Credit 100%)
30. (PI) *Contour-Based Object Tracking*, TASC/ARDA, VACE Phase II, \$600,000, June 2004, May 2006. (Credit 100%)
31. (PI) *Night-Time Surveillance*, Perceptek/DARPA STTR program, \$35,000, July 2003–June 2004. (Credit 100%)
32. (PI) *Visual Monitoring of Railroad Grade Crossing*, Florida Department of Transportation, \$229,790, March 2003–April 2005. (Credit 100%)

33. (PI) *Implementation of Multi-camera Tracking System*, Lockheed Martin and I-4 Corridor, \$83,000, December 2002–November 2003. (Credit 100%)
34. (PI) *Visual Tracking for Individual Combatant Simulation*, US Army STRICOM, \$126,000, May 2002–April 2003. (Credit 100%)
35. (PI) *Battlefield Simulation Using Dynamic View Morphing*, US Army STRICOM, \$126,000, May 2002–April 2003. (Credit 100%)
36. (PI) *Advanced Image-Based Target Tracking*, Lockheed-Martin and I-4 Corridor, \$106,000, April 2002–June 2003, with Niels Da Vitoria Lobo and Xin Li. (Credit 33%)
37. (Co-PI) *3D Site Modeling*, Boeing and UCF, with Niels da Vitoria Lobo, \$56,000, January 2002–December 2002. (Credit 50%)
38. (PI) *NSF REU PI meeting*, National Science Foundation (**NSF**), \$67,000, November 2001–October 2002. (Credit 100%)
39. (PI) *Research Experience for Undergraduates in Computer Vision*, with Niels Lobo and Takis Kasparis, National Science Foundation (**NSF**), \$350,000, May 2001–April 2006. (Credit 75%)
40. (PI) *Multi-resolution Video Tracking*, Lockheed-Martin and I-4 Corridor, \$90,000, January 2001–December 2001, with Niels Da Vitoria Lobo and Xin Li. (Credit 33%)
41. (PI) *Registration of Video Images Containing Linear Features*, Harris Corporation and I-4 Corridor, \$26,000, January 2001–December 2001. (Credit 100%)
42. (Co-PI) *Feature Recognition and Polygon Reduction Utility*, Boeing, \$84,000, September 2000 to February 2001, with Niels Da Vitoria Lobo and Ratan Guha.(Credit 33%)
43. (PI) *A Field Test of a Computer Vision Enhanced Crime Detection and Deterrence System for Downtown Orlando*, OPD and I-4 Corridor, \$40,000, May 2000 to December 2001, with Ray Surrette. (Credit 50%)
44. (PI) *Image Registration Prescreening Metric*, Harris Corporation and I-4 Corridor, \$52,000, January 2000–June 2000, with Erol Gelenbe, and Niels Da Vitoria Lobo. (Credit 33%)
45. (Co-PI) *CORVIAR*, Harris Corporation and I-4 Corridor, \$50,000, August 1999–June 2000, with Erol Gelenbe, Niels da Vitoria Lobo, and Fernando Gomez. (Credit 10%)
46. (PI) *Advanced Techniques for Motion Compensation*, TeraNex and I-4 Corridor, \$40,000, July 1999–June 2000. (Credit 100%)
47. (Co-PI) *Video Image Dissemination, Exploitation, And Organization (VIDEO)*, with Erol Gelenbe, Mostafa Bassiouni, Niels da Vitoria Lobo, William H. Eyster III, Narsingh Deo, Terry Frederick, Kien Hua and Richard P. Simonian, State of Florida, under I4 corridor program, \$250,000, July 1, 1998–June 30, 1999. (Credit 10%)
48. (PI) *Research Experience for Undergraduates in Computer Vision*, with Niels Lobo and Art Weeks, National Science Foundation (**NSF**), \$280,000, May 1998–April 2001. (Credit 75%)

49. (PI) *Workshop on Motion-Based Recognition in Pakistan*, National Science Foundation (**NSF**), \$9,500, August 1997–July 1998.(Credit 100%)
50. (PI) *Robust Registration of Multimodality Image Data*, with Alan Appley and David Rippe, Florida Hospital Gala Endowment Program, \$9,700, January 1997–December 1997. (Credit 100%)
51. (PI) *Visually Monitoring Dismounted Infantry*, with Niels Lobo, STRICOM & US Army, \$95,321, February 1996–January 1997. (Credit 50%)
52. (Co-PI) *CISE Instrumentation: Specialized Equipment for Vision and Image Processing*, with Niels Lobo, and Takis Kasparis, National Science Foundation (**NSF**), \$68,000, April 1995–March 1996. (Credit 33%)
53. (PI) *Research Experience for Undergraduates in Computer Vision*, with Kevin Bowyer, Niels Lobo and Louise Stark National Science Foundation (**NSF**), \$287,980, May 1995–April 1998.
54. (PI) *Workshop on Computer Vision in Pakistan*, (**NSF**), \$15,000, July 1994–June 1995.
55. (PI) *Movement Analysis*, National Science Foundation (**NSF**), \$229,245, May 1993–April 1996.
56. (Co-PI) *Equipment for Research in Special Purpose VLSI Architecture*, with Amar Mukherjee and Mostafa Bassiouni, National Science Foundation (**NSF**), \$52,000, January 1993–December 1993.
57. (PI) *Science in Developing Countries: Computer Vision Research Participation in Pakistan*, National Science Foundation (**NSF**), \$7,600, December 1992–December 1993.
58. (PI) *Equipment for Research in Image Understanding and Image Compression for Dynamic Scenes*, with Mostafa Bassiouni and Takis Kasparis, National Science Foundation (**NSF**), \$53,000, June 1992–May 1993.
59. (PI) *Research Experience for Undergraduates in Computer Vision*, with Kevin Bowyer, National Science Foundation (**NSF**), \$200,000, June 1992–May 1994.
60. (PI) *Research Experience for Undergraduates in Computer Vision*, with Kevin Bowyer, Krishnan Ganapathi, National Science Foundation (**NSF**), \$104,930, June 1991–May 1992.
61. (Co-PI) *Development of CAD Based Object Recognition System*, with Kevin Bowyer, January–December 1991, Florida HiTech Council, \$50,000.
62. (PI) *Recovery of 3-D information using stereo and shadows* with Kevin Bowyer, January 1990–December 1991, DoD/IST, \$100,000.
63. (PI) *Research Experience for Undergraduates in Computer Vision*, with Kevin Bowyer, Krishnan Ganapathi, National Science Foundation (**NSF**), \$105,000, June 1990–May 1991.
64. (PI) *Development of CAD Based Object Recognition System*, with Kevin Bowyer, January 1990–December 1990, Florida HiTech Council, \$58,000.

65. (PI) *Intelligent Crystal Growth* , with Silvio DiGregorio, DARPA, \$250,000, October 1989–Sept 1990.
66. (PI) *Research Experience for Undergraduates in Computer Vision*, with Kevin Bowyer, Krishnan Ganapathi, National Science Foundation (**NSF**), \$76,000, June 1989–May 1990.
67. (PI) *Intelligent Crystal Growth* , DARPA, \$100,000, October 1988–Sept 1989.
68. (PI) *Recovery of 3-D information from 2-D images*, PMTRADE/DOD, \$75,000, August 1988–July 1989.
69. (PI) *Research Experience for Undergraduates in Computer Vision*, National Science Foundation (**NSF**), \$44,000, June 1987–May 1988.
70. (PI) *Multisensor Fusion*, Center for Electro Optics and Laser (**CREOL**), \$21,000, January 1987–June 1987.

4.6 Patents & Copyrights

- Smith P., Shah M., da Vitoria Lobo N., “System for monitoring Driver Alertness”, U.S. Patent issued Spring 2005.
- Omar Javed, Khurram Shafique, Mubarak Shah, “Multi Camera Tracking”, pending.
- Paul Sconvaner, Vlad Riely, Mikel Rodriguez, Mubarak Shah, “Human Detection”, US copyrights, effective September 2006.
- Janaka Liyanage adn Mubarak Shah, “Homography-based passive vehicle speed measuring systems”, UCF#7654 / 0210652-USO (pending).

5 Professional Service

5.1 Participation in International Visiting Scholars and Joint Programs

5.1.1 Memorandums of Understandings

- MOU with Mehran University of Engineering and Technology, Jam Shoro, Sindh, Pakistan April 2006.
- MOU with National University of Science and Technology, Islamabad, Pakistan, August 2006.
- MOU with University of Modena, Italy, 2005.

5.1.2 Visitors

- Kittiya Khongkrapan, Prince of Songkla University Thailand, June 2008-December 2008.
- Kairoek Choeychuen, Prince of Songkla University Thailand, June 2008-May 2009.
- Marco Leo, Institute of Intelligent System for Automation in Bari, Italy, June 2007.
- Dr. Fangshi Wang, Beijing Jiatotong University, September 2007-August 2008.
- Professor Jianjun Huang, Fuzhou University, Peoples Republic of China, November 2006-April 2007.
- Javed Sheikh, NUST Islamabad, Pakistan, July 2006-February 2007.
- Sohail Sattar, NED University Karachi, Pakistan, November 2006-April 2007.
- Humera Noor, NED University Karachi, Pakistan, 2005 and 2006.
- Roberto Vezzani, University of Modena, Italy, 2005.
- Professor Jeff Boyd, University of Calgary, Canada, August 2004-May 2005.

5.2 Editorships and Services as a Reviewer

5.2.1 Editorship of Book Series

- Series Editor, *Video Computing*, International Book Series, Kluwer Academic Publishers, 2000-.
 - “Automated Multi-Camera Surveillance: Algorithms and Practice”, Omar Javed, and Shah, Mubarak, September 2008.
 - “Multimodal Video Characterization and Summarization”, Smith, Michael A., Kanade, Takeo, October, 2004.
 - 3D Face Processing: Modeling, Analysis and Synthesis Wen, Zhen, Huang, Thomas S. Huang, June 2004.
 - “Content-Based Image and Video Retrieval”, Xian Sean Zhu and Thomas Huang, August 2003.
 - “Video Mining Techniques”, Editors: Azriel Rosenfeld, Daniel DeMenthon, and David Doermann, July 2003.
 - “Mean Shift Analysis”, Dorin Comaniciu and Peter Meer, (under preparation).
 - “Video Registration”, Mubarak Shah, and Rakesh Kumar, May 2003.
 - “Media Computing: Computational Media Aesthetics”, Chitra Dorai, Svetha Venkatesh, April 2002.

- “Analyzing Video Sequences of Multiple Humans”, Jun Ohya, Akira Utsumi, and Junjo Yamato, March 2002.
- “Face Detection and Gesture Recognition for Human-Computer Interaction”, Ming-Hsuan Yang and Narendra Ahuja, August 2001.
- “Visual Event Detection”, Niels Haering, Niels da Vitoria Lobo, July 2001.

5.2.2 Editorships of Archival Journals

- Editor in Chief, *Machine Vision and Applications*, 2004-
- Associate Editor, *IEEE Transactions on PAMI*, 1998-2002.
- Associate Editor, *ACM Computing Surveys*, 2006-
- Associate Editor, *Pattern Recognition*, international journal, 1994-2006.
- Associate Editor, *Machine Vision and Applications*, international journal, 1999-.

5.2.3 Guest Editorship of Archival Journal

- Guest-Editor, *International Journal of Computer Vision*, Special Issue on Video Computing, November, 2002.

5.2.4 Editorships of Workshop Proceedings

- IEEE Workshop on Motion and Video Computing, 2002.
- “Recent Advances in Computer Vision”, Karachi, Pakistan, January 1-2, 1998.
- *Workshop on Computer Vision*, Islamabad, Pakistan, January 2-5, 1995.

5.3 Conference and Workshop Program Committee Memberships and Organization

- Tutorial Chair, International Conference on Pattern Recognition, Tampa, Fl, December 2008.
- Program co-chair, IEEE CVPR 2008.
- General Chair, 2007 International Conference on Machine Vision, Islamabad, Pakistan, December 28-29, 2007.
- Member Program Committee, Automatic Target Recognition XVIII, SPIE Defense and Security, 16 - 20 March 2008 Orlando World Center Marriott Resort and Convention Center Orlando, FL USA.
- Program co-chair IJCAI-2007 Workshop on Multimodal Information Retrieval Hyderabad, India - January 6, 2007.

- Chair, The Sixth IEEE International Workshop on Visual Surveillance, VS2006, May 13, 2006, Graz, Austria.
- Member Program Committee, IEEE Conference on Computer Vision and Pattern Recognition, CVPR-2005, 2006.
- Member Program Committee, European Conference on Computer Vision, ECCV-2006.
- Member Program Committee, International Conference on Pattern Recognition, ICPR-2006.
- Area Chair, Asian Conference on Computer Vision, ACCV-2006.
- Member Steering Committee, The 3rd International Workshop on Frontiers of Information Technology, Islamabad, Pakistan, December 2005.
- Member Program Committee, IEEE International Conference on Computer Vision, ICCV-2005.
- Member Program Committee, IEEE Workshop on Motion and Video Computing, January, 2005.
- Program Co-Chair, International Workshop on Semantic Knowledge in Computer Vision, ICCV, 2005, Beijing, China.
- Member Program Committee, ACM 2nd International Workshop on Video Surveillance and Sensor Networks, 2004.
- Session Chair, International Conference on Pattern Recognition, Cambridge, England, August 2004.
- Member Program Committee, IEEE Workshop on Video Registration, June 2004.
- Member Program Committee, IEEE Workshop on Computer Vision beyond the visible Spectrum June 2004.
- Member Program Committee, IEEE Workshop on Video Event Mining, June 2004.
- Member Program Committee International Conference on Pattern Recognition, 2004.
- Member Program Committee, IEEE Workshop MDDE 04, June 2004.
- Member Program Committee IEEE Conference on Computer Vision and Pattern Recognition, 2004.
- Program Chair, NSF REU Site PIs meeting, Monterey, California, February 23-24, 2004.
- Member Program Committee, European Conference on Computer Vision, 2004.
- Member Program Committee, Asian Conference on Computer Vision, January 28-30, 2004, Jeju Island, KOREA.

- Member Program Committee International Conference on Computer Vision, 2003.
- Member Program Committee, IEEE Workshop on Detection and Recognition of Events in Video, Madison, Wisconsin, June, 2003.
- Member Program Committee, MIRAGE-2003, Model-based Imaging, Rendering, image Analysis and Graphical special Effects, March, 10-11 2003, INRIA Rocquencourt, France.
- Member Program Committee, Conference on Computer Animation and Social Agents 2003, Rutgers the State University of New Jersey May 7-9, 2003.
- Member Program Committee, IASTED International Conference Computer Science and Technology CST 2003 May 19-21, 2003 Cancun, Mexico.
- Program Committee, IEEE CVPR-2003, Madison, Wisconsin, June 16-22, 2003.
- Organizer NSF REU PI meeting, Disney Cornando Springs Resort, January 2002.
- Co-chair IEEE Workshop on Motion and Video Computing, December 2002, Orlando, FL.
- Member Program Committee IEEE CVPR, December, 2001, Kuauai, Hawaii.
- Member Program Committee, International Conference on Pattern Recognition, Quebec City, Canada, August 11-15, 2002.
- Member Program Committee, Asian Conference on Computer Vision, Melbourne, Australia: January 23-25 2002.
- Member Program Committee, IEEE Workshop on Detection and Recognition of Events in Video, Vancouver, Canada, July 8, 2001.
- Co-Chair Program Committee, Workshop on Video Registration, Vancouver, Canada, July 13, 2001.
- Co-chair, IEEE Workshop on Combined Research-curriculum development in Computer Vision, December 10, 2001, Kuauai, Hawaii.
- Session Chair, ISCIS-99, Izmir, Turkey, October 1999.
- Member Program Committee, CVPR-99, IEEE Conference on Computer Vision and Pattern Recognition.
- Session Chair, IEEE South East Conference, April 1998, Orlando, Florida.
- Organizer, Workshop on Recent Advances in Computer Vision, Karachi, Pakistan, January 1998. (Funded by NSF).
- Member Program Committee, CVPR-98, IEEE Conference on Computer Vision and Pattern Recognition.
- Session Chair, IEEE CVPR-96, San Francisco, June 1996.

- Member Program Committee, IEEE CVPR-96, San Francisco, June 16-20, 1996.
- Member Program Committee, International Conference on Pattern Recognition, Vienna, Austria on August 25 - 30, 1996
- Organizer, Workshop on Computer Vision, Islamabad, Pakistan, January 1995. (Funded by NSF)
- Session Chair, Workshop on Computer Vision”, Islamabad, Pakistan, January 1995.
- Session Chair, IEEE CVPR-94, Seattle, June 1994.
- Panelist, Recent Advances, New Opportunities in Computer Vision, held during Southeastcon 94 in Miami, April 13, 1994.
- Session Chair, SPIE Applications of AI Conference, Orlando, April 1991.
- Session Chair, IEEE International Conference on Pattern Recognition, Atlantic City, June 1990.
- Member Program Committee, ACM Computer Science Conference, Washington, D.C., February 1989.
- Member Program Committee, Machine Vision and Robotics Conference, April 1991.

5.3.1 Publication Reviewer

- Computer Vision & Image Understanding
- International Journal of Computer Vision
- IEEE Transaction on Image Processing
- Pattern Recognition Letters
- IEEE Transactions on PAMI
- Machine Vision and Applications
- Optical Engineering
- IEEE Transactions on Systems, Man, and Cybernetics
- Pattern Recognition
- International Journal of Pattern Recognition and Artificial Intelligence
- IEEE Proceedings
- Image and Vision Computing

- IEE Vision, Image and Signal Processing
- Electronic Imaging

Conferences

- IEEE Conference Computer Vision and Pattern Recognition
- International Conference on Pattern Recognition
- IEEE Conference Robotics and Automation
- SPIE conference on Applications of Artificial Intelligence
- IEEE Workshop on Human Motion Analysis

5.4 Proposal Review

- Served on NSF CISE Computer Vision proposal panel, November 2008.
- Served on NSF DDDAS-AS2 Panel, August 1-2, 2005.
- Served on NSF Computer Vision Panel, June 2-3, 2005.
- Served on NSF panel Multimedia program, 2003
- Served on NSF review panel, Sensor networks, 2003.
- Served on NSF review panel on REU, 2002
- Served on NSF review panel on Information Technology Research, 2000
- Served on NSF review panel on Computer Vision research, 1992
- Served on NSF review panel on Computer Vision research, 1998
- Reviewer for proposals submitted to NSF International Programs, since 1993

5.5 Other Professional Service

- Member membership committee, International Association of Pattern Recognition, 2002-2004.
- Member Advisory Board, NSF Combined Research and Curriculum Development in Computer Vision project, University of Nevada, Reno, 2000-.
- Member Advisory Board, OPSTeC College of Computer Science, Pakistan, 2000-.
- Member Academic Committee, Shaheed Z. A. Bhutto Institute of Science and Technology (SZABIST), Pakistan, 1997-.
- Secretary IEEE Orlando chapter, August 1997-July 1998.

6 University Service

6.1 Computer Vision Distinguished Speaker Series

- Organized the highly acclaimed Computer Vision Distinguished Speaker series to attract top Computer Vision Researchers to UCF campus.

2007-2008

- Dr. Aaron Bobick, “Seeing Action”, Georgia Institute of Technology September 17, 2007.
- Dr. Demetri Terzopoulos, “Simulation of Humans and Lower Animals”, University of California Los Angeles, October 4, 2007.
- Dr. Larry Davis, “Event Recognition in Surveillance Video - The Challenge of Identity Maintenance”, University of Maryland November 5, 2007.
- Dr. Jan Olof Eklundh, “Detecting and Recognizing Objects in the Real World”, Royal Institute of Technology, January 10, 2008.
- Dr. David Fleet, “Model-Based Human Pose Tracking”, University of British Columbia, February 2008.
- Dr. Song-Chun Zhu, “Object Category Modeling, Learning, and Recognition by Stochastic Grammar”, University of California - Los Angeles, March 27, 2008.

2006-2007

- Dr. James Duncan, “Model-Based Recovery of Structure and Function from Medical Images”, Yale University, April, 2007.
- Gerard Medioni, “Tensor Voting: Overview and Applications to Vision and Learning”, University of Southern California, March, 2007.
- Dr. David Lowe, “Object and Place Recognition from Invariant Local Features”, University of British Columbia, February, 2007.
- Ted Adelson, “Image Statistics, Visual Perception and Visual Illusions”, Massachusetts Institute of Technology, January 18, 2007.
- Anil Jain, “Biometric Recognition: How Do I Know Who You Are?”, Michigan State University, November, 2006.
- Zhengyou Zhang, “Computer Vision for Real-Time Communication and Human-Computer Interaction, Microsoft Research, Redmond, October, 2006.
- Amnon Shashua, “The Role of multi-linear Factorization in Image Coding, Clustering and Visual Learning”, Hebrew University of Jerusalem, September, 2006.

2005-2006

- Allen Hanson, “Vision of Vision”, University of Massachusetts, Amherst, April 2006. Tom Huang, “Vision-Based Hand Gesture Tracking and Recognition”, University of Illinois at Urbana Champaign, March, 2006.
- Luc Van Gool, “Total Recall: A Plea for Realistic 3D Reconstruction of Cultural Heritage”, Swiss Federal Institute of Technology in Zurich (ETHZ), February 2006.
- Jitendra Malik, “Recognizing Objects and Actions in Images and Videos”, University of California at Berkeley, January 2006.
- Takeo Kanade, “Modeling and Reconstruction of Deformable Object Shapes from Video”, Carnegie Mellon University, November, 2005.
- Rama Chellapa, “Machine Perception of Humans and their Activities”, University of Maryland, October, 2005.
- Jake Aggarwal, “Understanding of Human Motions, Actions and Interactions”, University of Texas at Austin, May, 2005.

6.2 University, College and Department Committees

- Member Trustee Chairs Review Committee, Spring 2007.
- Group Coordinator, Computer Vision and Graphics, SEECS, 2006–.
- Member graduate committee, SEECS, 2006–.
- Member SEECS executive committee, 2006–.
- CECS, RIA selection committee, 2006.
- Chair, department Promotion and Tenure committee, 2004-05.
- Member, ECE chair search committee, 2003-04.
- Member CECS TIP committee, 2003-04.
- Member, University Undergraduate Research Council, 2003.
- Chair Faculty Search Committee, 2003.
- Member CS Promotion/Tenure Review Committee, 2003-04.
- Member, University Graduate Council, 2003-04, 2004-05.
- Member, Dean’s Research Committee, 2003.
- Member CS YAC (Committee for \$2.5 millions CS special), 2003.

- Member, Graduate Program Focus Group, UCF Strategic Planning Council, 2000-01.
- Served as a chair of the Graduate Committee, 1996-2001. Committee Duties/Accomplishments include (Please visit: <http://www.cs.ucf.edu/csdept/academics.html>):
 - Design of new Ph.D. qualifying exam.
 - Selection of new graduate students among a large number of applicants for GTA and other fellowship awards;
 - Assigning advisor to each supported graduate student;
 - Managing of Ph.D. qualifying exam twice a year;
 - Reviewing of graduate students every semester;
 - Other misc items related to graduate program.

As a result of these efforts:

- The Computer Science graduate program **grew 225%** in students credit hours from 1998 to 2001.
- Served as a member SCS Director Search Committee, 1997-98. Hired Erol Gelenbe as the first director of SCS, which became SEECs.
- Served as a member of the Dean’s “Computer Science Academic Excellence” committee, 1997. Accomplishments/Duties included:
 - Authoring of Top-50 proposal for Computer Science excellence to UCF president, which was funded at \$400,000 first year, with \$500,00 yearly, which has reached to \$2,500,000 this year.
- Served as a member of CAS (College of Arts and Sciences) In-House Awards Committee, 1995-1996.
- Served as a member of department Graduate Committee, 1993–present.
- Served as a member of department tenure and promotion committee, 1994.
- Served as a member of Computer Science department chair search committee, 1993.
- Served as a chair and a member of department colloquium committee, 1991-1992.
- Served as a member of College of Arts and Sciences tenure and promotion committee, 1992-1993.
- Served as a chair of department student complain committee, 1992-1993.
- Served as a chair of faculty screening committee, 1993.
- Served as a member of faculty screening committee, 1994.

- Served as member of technical report committee, 1991.
- Served as chair of publication committee, 1994.
- Served as a member of department computer interface committee, 1993.
- Served as a member of Ph.D. qualifying committee, 1993.
- Served as a member of Ad hoc Dept secretary committee, 1992.
- Served as a member of department committee for graduate program, 1988.