Berkan Solmaz

Postdoctoral Researcher, University of Pennsylvania

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EDUCATION

Ph.D. in Electrical Engineering,
University of Central Florida, Orlando, FL, USA — Aug 2013
Thesis: Holistic Representations for Activities and Crowd Behaviors
Advisor: Prof. Mubarak Shah
Area: Computer Vision, Image/Video Analysis.

M.S. in Electrical and Electronics Engineering,
Middle East Technical University (METU), Ankara, Turkey — Jul 2008
Thesis: Hardware implementation of an active feature tracker for surveillance applications
Advisor: Prof. Gözde Bozdağı Akar
Area: Image/Video Analysis.

B.S. in Electrical and Electronics Engineering,
Middle East Technical University (METU), Ankara, Turkey — Aug 2005

PROFESSIONAL EXPERIENCE

Postdoctoral Researcher at **University of Pennsylvania**, Philadelphia, PA
Center for Biomedical Image Computing and Analytics (CBICA) — Aug 2013 – Present
Explore research directions in automated analysis of facial expressions,
emotions, and functional connectivity analysis of brains for clinical studies.
Supervisor: Assoc.Prof. Ragini Verma

Research Assistant at **University of Central Florida**, Orlando, FL
Center for Research in Computer Vision (CRCV) — Sep 2008 – Jul 2013
Done diverse research in computer vision, medical imaging, and
proposed novel approaches for the challenging research problems.
Supervisor: Prof. Mubarak Shah
Research areas: Crowd video analysis, event classification, human action recognition,
human/object detection, aerial imagery, biomedical image analysis.

Intern at **Texas Instruments**, Dallas, TX
Vision R&D Labs — May 2012 – Aug 2012
Proposed and evaluated stereo vision algorithms in Matlab/C++ for embedded
surveillance applications, collected data, achieved higher accuracies.
Supervisor: Dr. Goksel Dedeoglu, Dr. Darnell Moore

Research Assistant at **Middle East Technical University (METU)**, Ankara, Turkey
Multimedia Research Laboratory — Jan 2007 – Jan 2008
Designed a stand-alone system for the application of object tracking on a TI DM642
DSP platform. The system performed real-time background modeling, object detection,
tracking, and pan-tilt-zoom camera control.
Supervisor: Prof. Gözde Bozdağı Akar

R&D Engineer at **Karel Electronics**, Ankara, Turkey
Telecommunications Technologies Section — Jul 2005 – Dec 2006
Designed and developed embedded hardware and software of featured phones and
pbx peripherals, explored all stages of commercial product development.
Supervisor: Dr. Alper Sarikan

Intern at **Tubitak-SAGE**, Ankara, Turkey
Guidance and Control Laboratory, Electronics Design Group — Jul 2003 – Aug 2003
Designed a programmable control unit for a laser power supply.
Supervisor: Dr. Yuksel Subasi

RESEARCH PROJECTS

Video Categorization (sponsored by IARPA Aladdin Program)
Explored research directions in video event classification for Trecvid Challange.
Proposed a novel global motion and scene descriptor, GIST3D, for classifying realistic videos of different actions.
Obtained state-of-the-art performance on challenging datasets involving human actions.
Delivered well documented source codes in Matlab and C++.

Crowd Scene Analysis (sponsored by Army Research Office)
Utilized the theory of linearization of dynamical systems and Lagrangian particle dynamics in crowd surveillance.
Proposed a novel optical flow based framework for identifying bottlenecks, lanes, departures, arches, blockings.
Made the first attempt in automatical identification of specific crowd behaviors without the need of object detection, tracking, or training.

Human/Vehicle Detection in UAV Images (sponsored by Harris Corporation and DARPA)
Proposed a geometry-based detector, reveals the possible human and shadow blobs, and verifies their relation as a cue for detection.
Avoided the search across entire image for detecting humans and vehicles.
Achieved state-of-the-art results on the VIVID dataset.
Delivered source codes in Matlab.

Tumor Detection/Segmentation (sponsored by NIH)
Investigated the problem of automatic brain tumor detection and segmentation within a multi-disciplinary team.
Proposed a discriminative approach which extracts multiple features from multi-modality MRI to train a classifier for guiding tumor detection and segmentation.
Improved the performance of segmentation algorithms such as region growing, level-sets and graph-cut.

ADHD Classification
Presented an approach for automatic classification and analysis of ADHD using f-MRI images.
Utilized a bag-of-features framework to represent each network by a histogram of network features.
Improved the performance of the baseline features.
Filed a joint patent application with IBM T. J. Watson Research Center.

Facial Expression Analysis for Schizophrenia (sponsored by NIH)
Focused on the automated analysis of facial expressions and emotion of individuals by the use of image/video data in neuropsychiatric disorders.
Quantified the facial expressions of people during the clinical sessions to aid in the diagnosis of schizophrenia.

Functional Connectivity Analysis of Brains for Autism (sponsored by NIH)
Analyzed the differences in the activity and connectivity of the brain lobes of healthy controls and patients in conjunction with the performance of certain tasks.
Extracted the functional connectivity profiles, described by magnetoencephalography (MEG) data, to reveal the disorders within the human brains.

PUBLICATIONS

B. Solmaz, B. Moore, and M. Shah, "Identifying Behaviors in Crowded Scenes Using Stability Analysis for Dynamical Systems," in *IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)*, 2012.

B. Solmaz, S. Assari, and M. Shah, "Classifying Web Videos using a Global Video Descriptor," in *Journal of Machine Vision and Applications (MVAP)*, 2012.

V. Reilly, B. Solmaz, and M. Shah, "Shadow Casting Out Of Plane Candidates for Human and Vehicle Detection in Aerial Imagery," in *International Journal of Computer Vision (IJCV)*, 2012.

K. Reddy, B. Solmaz, P. Yan, N. Avgeropoulos, D. Rippe, and M. Shah, "Confidence Guided Enhancing Brain Tumor Segmentation in Multi-parametric MRI," in *International Symposium on Biomedical Imaging (ISBI) (Oral)*, 2012.

B. Solmaz, S. Dey, R. Rao (IBM T. J. Watson Research Center) , and M. Shah, "ADHD Classification Using Bag of Words Approach on Network Features," in *SPIE Medical Imaging*, 2012.

V. Reilly, B. Solmaz, and M. Shah, "Geometric Constraints for Human Detection in Aerial Imagery," in *Proceedings of the European Conference on Computer Vision (ECCV)*, 2010.

PATENT

Method and system for modeling and processing f-MRI image data using a bag-of-words approach, Application No. US 13,757,102, Issued: Aug 2013

HONORS & GRANTS

Full-tuition Research Scholarship, Fall 2008 through Summer 2013, 2008 – 2013
Center for Research in Computer Vision, Orlando, FL

Provost's Graduate Fellowship, University of Central Florida, Orlando, FL 2008 – 2009
Offered to superior graduate students who are newly enrolling.

The Scientific and Technical Research Council of Turkey (TUBITAK) Research Scholarship 2007 – 2008

Ranked 275^{th} among 1,366,659 students in National University Entrance Exam, Turkey 2000

OTHER EXPERIENCE

Teaching Assistant, UCF CAP5415 Computer Vision 2011 – 2012
This course covers the fundamental topics of computer vision, and introduces approaches for computer vision research. Done tutoring, mentoring, preparing programming assignments, and evaluation.

Coordinator, Research Experience for Undergraduates (REU) Program at UCF 2011
The goal of this program is to encourage talented students to pursue graduate studies and realize their full potential in this regard.

RELATED SKILLS

Programming: MATLAB, C/C++

Platforms: Windows, GNU/Linux

Tools: OpenCV, LaTeX, Adobe Illustrator, Electronics Workbench, Orcad/Pcad schematic tools

Hardware: Motorola, Intel, PIC micro-controllers and Texas Instruments DM642 DSP

Research: Computer vision, biomedical image analysis, embedded software/hardware design