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A. SUMMARY OF CREDENTIALS

- **Director, University-Industry Engineering Research Center (UIERC)**
- **Full Professor, Electrical & Computer Engineering, Computer Science, Bioengineering, University of Illinois at Chicago**
- **Consulting and Technical Services, Over 30 Companies**
- **Deputy Editor-in-Chief, IEEE Transactions on Circuits and Systems for Video Technology**
- **Area Editor, Special Issues, IEEE Signal Processing Magazine**
- **Guest Editor, 3 Special Issues (2 IEEE Transactions)**
- **Associate Editor, 4 IEEE Transactions**
- **Editorial Board, 4 Journals (1 IEEE Magazine)**
- **Member, 4 IEEE Technical Committees**
- **Member, ANSI/UL Standards Technical Panel**
- **Chair, 3 International Conferences (2 IEEE Conferences)**
- **Organizing Committee, 7 Conferences (5 IEEE Conferences)**
- **Presenter, 3 Plenary Talks at International Conferences (1 IEEE Conference)**
- **Author, Over 170 Technical Papers**
- **Co-Author and Advisor, 3 Best Student Paper Awards**
- **Advisor, 7 Doctoral and 8 Masters Thesis Students Graduated**
- **Inventor, 4 Patents (2 Issued)**
- **Funding, Over \$2 Million in Research Grants**
- **Instructor, Over 20 Different Undergraduate and Graduate Courses**

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C. RESEARCH INTERESTS

Multi-Dimensional Signal Processing; Image and Video Analysis; Computer Vision; and Genomic Signal Processing.

D. SIGNIFICANT RESEARCH ACCOMPLISHMENTS

D.1. Morphological Image Analysis

We have been working in the area of mathematical morphology since the mid-1980s. In the course of our work, we have solved several fundamental problems in morphological image analysis. Our initial work was devoted to image restoration using morphological filters. We proved that the alternating sequential filter is the optimal morphological filter for image restoration. The proof introduced a new approach to optimization of nonlinear filters and solved a fundamental problem which had been posed several decades earlier. We later provided an analytical solution to the fundamental open problem of characterization of the optimal structuring element (window) in morphological image analysis.

We have also addressed the problem of morphological representation and skeletonization. We presented a unified approach to image representation and demonstrated its relation to the medial axis transform which is used for pattern recognition and image coding. We also established necessary and sufficient conditions for the invertibility of image representations and determined the optimal skeleton for image coding. We finally investigated the robustness of the skeleton to noise degradation and used random set theory and stochastic geometry to prove that redundancy in skeleton representations is beneficial in low-noise environments, whereas sparsity provides superior performance in high-noise systems.

More recently, we have focused on the topic of spatially-variant and adaptive morphological image analysis. We demonstrated a dramatic improvement in the performance of skeletons for pattern recognition and image coding as well as image restoration by using an adaptive structuring element (window). We later introduced a theoretical foundation for a new approach to morphological image analysis based on spatially-varying structuring elements (windows) and illustrated the enormous improvement of this theory over classical methods in image analysis.

We have also presented several important practical solutions to various image processing applications. For instance, we have developed an algorithm for the implementation of morphological operations represented as thresholded linear convolution based on FFTs (Image Processing Toolbox of MATLAB, The MathWorks).

D.2. Video Tracking

In the late-1990s, we started to work in the area of video tracking. Our initial focus was on tracking in the compressed domain. We showed that we can exploit the structure of coded video sequences – motion vectors in MPEG-2 (HDTV) – to provide efficient target tracking in the compressed domain and thus improve the computational speed more than 4,000 times. We later extended the approach to an adaptive block matching algorithm for real-time video tracking. The proposed approach to video tracking on raw image sequences provides speed that is more than 10 times faster than previous methods for video tracking. The algorithm has been presented in consumer shows and incorporated into the software suite of the MiMagic Associate Processor Array (APA) by NeoMagic Corporation (two patents have been filed and issued on the adaptive block matching algorithm).

In the past few years, we have concentrated on the use of particle filtering for video tracking. We showed both theoretically and experimentally that we can achieve a dramatic improvement in the computational speed by using motion-based particle filters to reduce the number of particles required for efficient tracking from 1,000-4,000 down to 30-50 particles. We proposed techniques to improve the efficiency and accuracy of particle filters by adaptively determining the mean and covariance of the proposal (importance) density function. We finally derived a closed-form solution based on rate-distortion theory for particle allocation among multiple frames and objects for video tracking.

Our main focus on video tracking has been devoted to distributed tracking. We proposed a method for decomposition of graphical models used for the representation of the interaction among multiple objects and cameras in image sequences. We then derived a distributed particle filter for multiple object tracking based on statistical collaboration among interactive particle filters. The proposed approach can be used track occluded objects while its complexity grows linearly with the number of targets (compared to the exponential growth in computational complexity of methods that rely on joint representations). We have extended the approach to distributed particle filtering to tracking using multiple networked cameras as well as articulated object tracking by collaboration within units (e.g. hand and forearm) and among units (e.g. arm and leg) (two patents have been filed on the distributed particle filter algorithm).

D.3. Video Search and Retrieval

In the early 2000s, we began to work on retrieval and recognition in video databases. One of the key problems in video analysis is segmentation of image sequences into coherent visual scenes. We introduced statistical change detection theory to solve the classical problem of scene change detection in video sequences. This approach has been shown to yield far superior results for this fundamental problem for videos with both special effects and abrupt changes alike. It provides a single algorithm for scene change detection and avoids the need to use different methods for distinct special effects.

Since 2003, we focused on retrieval and recognition based on motion trajectories in video and sensor databases. We first proposed a framework based on principal component analysis for indexing and retrieval of segmented motion trajectories in video databases. We then extended the use of hidden Markov models from speech recognition to address the problem of motion trajectory classification in video sequences. We later adapted tools from shape analysis to address the problem of view-invariance of motion trajectories for unknown and moving cameras. We finally proposed a new approach to view-invariance based on a null-space representation of motion trajectory information.

In the past few years, we have focused primarily on retrieval and recognition of motion events in video and sensor databases characterized by multiple interactive motion trajectories. We first presented an approach to multiple motion trajectory indexing and retrieval based on tensor decomposition. We later provided an efficient method for extraction and insertion of partial information in video database used for multiple motion trajectory representation based on high-order singular value decomposition of

tensors. We also extended the null-space representation to tensors for view-invariant indexing and retrieval of multiple motion trajectories from unknown and moving cameras.

We finally provided a solution to classification and recognition of multiple interactive motion trajectories by deriving an extension of hidden Markov models to multiple dimensions. We provided a closed-form solution for the training and classification – general forward-backward, expectation-maximization, and Viterbi algorithms – for multiple dimensions in a causal system. We then presented an approach to multiple motion trajectory classification based on distributed multi-dimensional hidden Markov models for non-causal systems.

D.4. Genomic Signal Processing

Over the past few years, we have begun to work in the area of genomic and proteomic signal processing. Our aim thus far has been to address fundamental problems in system biology by using tools from signal processing and communications. We proposed a model of protein evolution as a communication system represented by a Markov chain and proved that it will converge to a probability distribution of amino acids that matches nearly perfectly the natural abundance of amino acids in nature. We further investigated the capacity and rate-distortion bounds of the protein communication model and showed it is consistent with an evolutionary pattern whereby the size of introns increases through time.

We also addressed the rationale for the presence of introns (junk DNA) in the genomic sequence by hypothesizing that introns serve as decoys that reduce the effect of mutations in gene expression. We showed that the exon length distribution that minimizes the probability of error due to mutations yields a long-tail density that is nearly identical to the histogram of exon lengths among eukaryotes. We finally investigated the statistical structure of genomic sequences and showed that coding and non-coding segments of the DNA can be distinguished by a measure of randomness defined based on tools from non-stationary analysis.

E. HONORS AND AWARDS

Senior Member

IEEE
2005

Best Student Paper Award

J. Yang, D. Schonfeld and M. Mohamed
“Robust Focused Image Estimation from Multiple Images in Video Sequences”
IEEE International Conference on Image Processing
2007

Best Student Paper Award

W. Qu and D. Schonfeld
“Robust Kernel-Based Tracking Using Optimal Control”
IEEE International Conference on Image Processing
2006

Best Student Paper Award

N. Bouaynaya and D. Schonfeld

“Spatially-variant morphological image processing: Theory and applications”
SPIE Conference on Visual Communications and Image Processing
2006

Outstanding Associate Editor Award – IEEE Circuits and Systems Society
IEEE Transactions on Circuits and Systems for Video Technology
2009

Most Active Chapter Award – IEEE Signal Processing Chicago Chapter Chair
IEEE – Region 4
2008

Service Award – IEEE Signal Processing Chicago Chapter Chair
IEEE – Chicago Section
2007

Certificate of Appreciation – IEEE Circuits and Systems Society
IEEE Transactions on Circuits and Systems for Video Technology
2008 – 2009

Certificate of Appreciation – IEEE Signal Processing Chicago Chapter Chair
IEEE – Chicago Section
2006

Who’s Who in America (WWA)
2010 Edition

Who’s Who in Engineering Education (WWEE)
2002 Edition

University Fellowship
The Johns Hopkins University
1986—1990

F. EDUCATION

Ph.D. July 1990
The Johns Hopkins University
Department of Electrical & Computer Engineering
Concentration: Nonlinear Signal Processing / Image Analysis
Thesis Title: “Optimal Morphological Representation and Restoration of Binary Images:
Theory and Applications”
Thesis Advisor (First Reader): Prof. John Goutsias; Co-Advisor (Second Reader): Prof. Victor Solo

M.S. May 1988
The Johns Hopkins University
Department of Electrical & Computer Engineering
Concentration: Speech Processing / Biomedical Signal Processing
Advisor: Prof. Moise H. Goldstein

B.S. May 1986
University of California at Berkeley
Department of Electrical Engineering & Computer Science
Concentration: Computer Engineering / Systems Engineering
Advisor: Prof. Michael J. Sabin

G. WORK EXPERIENCE

Director

University-Industry Engineering Research Center (UIERC)
College of Engineering
University of Illinois at Chicago
Chicago, Illinois
2008—Present

Professor with Tenure

Department of Electrical & Computer Engineering
University of Illinois at Chicago
Chicago, Illinois
2007—Present

Professor (Courtesy Appointment)

Department of Computer Science
University of Illinois at Chicago
Chicago, Illinois
2007— Present

Professor

Department of Bioengineering
University of Illinois at Chicago
Chicago, Illinois
2007— Present

Associate Professor with Tenure

Department of Electrical & Computer Engineering
University of Illinois at Chicago
Chicago, Illinois
2001—2007

Associate Professor (Courtesy Appointment)

Department of Computer Science
University of Illinois at Chicago
Chicago, Illinois
2001—2007

Associate Professor

Department of Bioengineering
University of Illinois at Chicago

Chicago, Illinois
1998—2007

Associate Professor with Tenure

Department of Electrical Engineering & Computer Science
University of Illinois at Chicago
Chicago, Illinois
1996—2001

Co-Director

Multimedia Communications Laboratory (MCL)
Department of Electrical & Computer Engineering
University of Illinois at Chicago
Chicago, Illinois
1997—Present

Assistant Professor

Department of Electrical Engineering & Computer Science
University of Illinois at Chicago
Chicago, Illinois
1990—1996

Visiting Professor

Department of Electrical Engineering—Systems
Tel-Aviv University
Tel-Aviv, Israel
Winter 1996—1997

Member

Signal and Image Research Laboratory (SIRL)
Department of Electrical & Computer Engineering
University of Illinois at Chicago
Chicago, Illinois
1990—2002

Instructor

Department of Electrical and Computer Engineering
The Johns Hopkins University
Baltimore, Maryland
1987—1990

Teaching Assistant

Department of Electrical and Computer Engineering
The Johns Hopkins University
Baltimore, Maryland
1986—1990

Software Engineer

Computer Aided Design
Teledyne Systems
Northridge, California

H. INTERDISCIPLINARY PROGRAMS

Clinical and Translational Science (CCTS)

Biomedical Informatics Core Consult Group
University of Illinois at Chicago
2009—Present

Graduate Program in Neuroscience

University of Illinois at Chicago
2001—Present

Bioinformatics Program

Department of Bioengineering
University of Illinois at Chicago
2000—Present

I. CONSULTING AND TECHNICAL SERVICES

Arris Group, Inc.
AOL Time Warner, Inc.
Broadcom Corp.
C-Cor
Charter Communications, Inc.
Chicago Merchantile Exchange
Choate, Hall, Stewart, LLP
Collaboration Properties, Inc.
Dell Computer Corp.
Getco Corp.
EarthLink, Inc.
Fish & Richardson, P.C.
Fitch, Even, Tabin & Flannery
Hewlett-Packard Co.
Humax USA, Inc.
IBM
Irell & Manella, LLP
Jones Day
Latham & Watkins, LLP
Lear Group, Ltd.
Marshall, Gerstein & Borun, LLP

McAndrews, Held & Malloy, Ltd.
**Mintz, Levin, Cohn, Ferris, Glovsky,
and Popeo, P.C.**
Mirror Image Internet, Inc.
Motorola, Inc.
Multimedia Systems Corp. (MSC)
nCUBE Corp.
NeoMagic Corp.
Nixon & Vanderhye, P.C.
Nixon Peabody, LLP
Picel Technologies Ltd
PrairieComm Corp.
Simpson, Thacher & Bartlett, LLP
SmartSignal Corp.
Teledyne Systems Corp.
TiVo Inc.
Touchtunes Music Corp.
Winston & Strawn, LLP
Xcelera, Inc.
24/7 Media, Inc.

J. PROFESSIONAL ACTIVITIES

J.1. Committees

Steering Committee

SPIE and IEEE Circuits and Systems Society
Conference on Visual Communications and Image Processing
2008—Present

Technical Committee

IEEE Communications Society
IEEE Multimedia Communications Technical Committee (MMTC)
2009— Present

Technical Committee

IEEE Signal Processing Society
Image, Video, and Multidimensional Signal Processing (IVMSP)
2009— Present

Technical Committee

IEEE Signal Processing Society
Image and Multidimensional Signal Processing (IMDSP)
2007—2008

Technical Committee

IEEE Circuits and Systems Society
Signal and Image Processing in Medicine
1990—1996

Technical Sub-Committee

IEEE Communications Society
Multimedia Communications Technical Committee
P2P Communication and Networking
2006—Present

Representative

Regions 1-6
Chapters Committee
IEEE Signal Processing Society
2006—Present

Chairman

Chicago IEEE Signal Processing Chapter
2006—Present

Member

ANSI Standards Technical Panel (STP)
UL 0469: Musical Instruments and Accessories
UL 0813: Commercial Audio Equipment
UL 1492: Audio/Video Products and Accessories
UL 6500: Audio/Video and Musical Instrument Apparatus for Household, Commercial, and Similar General Use
UL 60065: Audio, Video and Similar Electronic Apparatus – Safety Requirements
2002—Present

J.2. Editorships

Editor

Video Search and Mining
Studies in Computational Intelligence Series
Springer-Verlag
2009

Deputy Editor-in-Chief (DEIC)

IEEE Transactions on Circuits and Systems for Video Technology
2010—Present

Area Editor, Special Sections

Special Issues
IEEE Signal Processing Magazine
2009—Present

Guest Editor

EURASIP Journal on Image and Video Processing
Special Issue on Advanced Video-Based Surveillance
2010—Present

Guest Editor

IEEE Journal of Special Topics in Signal Processing
Special Issue on Recent Advances in Video Processing for Consumer Displays
2009—Present

Guest Editor

IEEE Transactions on Circuits and Systems for Video Technology
Special Issue on Event Analysis in Videos
2008

Lead Guest Editor

IEEE Journal of Special Topics in Signal Processing
Special Issue on Genomic and Proteomic Signal Processing
2007—2008

Guest Editor

Journal of Advances in Multimedia
Special Issue on Plenoptic Signal and Image Processing
2007—2008

Associate Editor

IEEE Transactions on Image Processing
Image and Video Storage, Retrieval and Analysis
2007—Present

Associate Editor

IEEE Transactions on Circuits and Systems for Video Technology
Video Analysis
2006—Present

Associate Editor

IEEE Transactions on Signal Processing
Multidimensional Signal Processing &
Multimedia Signal Processing
1999—2000

Associate Editor

IEEE Transactions on Image Processing
Filtering and Enhancement
1994—1996

Editorial Board

IEEE Signal Processing Magazine
2008—Present

Editorial Board

Research Letters in Signal Processing
Hindawi Publishing Corporation
2007—Present

Editorial Board

Recent Patents on Computer Science
Bentham Science Publishers, Ltd.
2007—Present

Editorial Board

Recent Patents on Electrical Engineering
Bentham Science Publishers, Ltd.
2007—Present

Contributor

Science and Technology: SPIE Newsroom
Electronic Imaging and Signal Processing
2005—2008

J.3. Review Panels

Member

Paper Award Committee
IEEE International Conference on Advanced Video and Signal-Based Surveillance (AVSS)
Genoa, Italy
2009

Member

Technical Jury
NTT DoCoMo USA Labs Most Innovative Paper Awards
IEEE International Conference on Image Processing
San Diego, California
2008

Member

Technical Jury
NTT DoCoMo USA Labs Most Innovative Paper Awards
IEEE International Conference on Image Processing
San Antonio, Texas
2007

Member

Technical Jury
NTT DoCoMo USA Labs Most Innovative Paper Awards
IEEE International Conference on Image Processing
Atlanta, Georgia
2006

Member

NSF Review Panel
Computer & Information Science & Engineering (CISE)
Information & Intelligent Systems (IIS)
Databases and Data Mining (DB/DM)
2007

Member

NSF Review Panel
Small Business Innovation Research (SBIR) Program
Robotics II
Phase II
2007

Member

NSF Review Panel
Computer & Information Science & Engineering (CISE)
Information & Intelligent Systems (IIS)
Information Management (IM)
2006

Member

NSF Review Panel
Computer & Information Science & Engineering (CISE)
Information & Intelligent Systems (IIS)
Information & Knowledge Management (IKM)
2005

Member

NSF Review Panel
Small Business Innovation Research (SBIR) Program
Robotics II
Phase I
2005

Member

NSF Review Panel
Computer & Information Science & Engineering (CISE)
Advanced Networking Infrastructure and Research (ANIR)
Information Technology Research (ITR)
Networking Research
Small Grants
2002

Member

NSF Review Panel
Small Business Innovation Research (SBIR) Program
Diagnostic Systems and Signal Processing
Phase I
2002

Member

NSF Review Panel
Computer & Information Science & Engineering (CISE)
Information Technology Research (ITR)
Biology & Information Technology
Computational Biology / Biocomputation
Medium Grants
2003

J.4. Organizing Committees

Plenary Chair

IEEE International Conference on Image Processing
Plenary Chair
Orlando, Florida
2012

General Chair

IEEE International Workshop on Genomic Signal Processing and Statistics
Chicago, Illinois
2011

Publicity Co-Chair

IEEE/SPIE International Conference on Visual Communications and Image Processing
Publicity Co-Chair
Huang Shan, An Hui, China
2010

Technical Program Chair

IEEE International Workshop on Genomic Signal Processing and Statistics
Minneapolis, Minnesota
2009

Organizer

IEEE International Conference on Acoustics, Speech, and Signal Processing

Thematic Symposium on Multimedia Search and Retrieval
Taipei, Taiwan
2009

Chair

Workshop on Video Mining
Held in conjunction with the IEEE International Conference on Data Mining (ICDM)
Pisa, Italy
2008

Chair

SPIE International Conference on Visual Communications and Image Processing
San Jose, California
2007

Technical Organizing Committee

IS&T/SPIE Annual Symposium on Electronic Imaging: Science and Technology
San Jose, California
2007

Publications Chair

IEEE International Conference on Image Processing
Chicago, Illinois
1998

Plenary Talks and Special Session Chair

IEEE/EURASIP Workshop on Nonlinear Signal and Image Processing
Mackinac Island, Michigan
1997

J.5. Program Chair

Technical Program Chair

IEEE International Workshop on Genomic Signal Processing and Statistics
Minneapolis, Minnesota
2009

Chair

Workshop on Video Mining
IEEE International Conference on Data Mining
Held in conjunction with the IEEE International Conference on Data Mining (ICDM)
Pisa, Italy
2008

Chair

SPIE International Conference on Visual Communications and Image Processing
San Jose, California
2007

Multimedia Content Analysis Track Chair

IEEE International Conference on Multimedia and Expo
New York, New York
2009

Technical Program Committee / Area Chair
IEEE International Conference on Image Processing
San Diego, California
2008

Technical Program Committee / Area Chair
IEEE International Conference on Acoustics, Speech, and Signal Processing
Las Vegas, Nevada
2008

Technical Program Committee / Area Chair
IEEE International Conference on Image Processing
San Antonio, Texas
2007

Associate Program Chair
ACM Multimedia
Juan Les Pins, France
2002

J.6. Technical Program Committees

Technical Program Committee
IEEE/SPIE International Conference on Visual Communications and Image Processing
Huang Shan, An Hui, China
2010

Technical Program Committee
ICST International Conference on
Wireless Mobile Communication and Healthcare (MobiHealth 2010)
Ayia Napa, Cyprus
2010

Technical Program Committee
SPIE International Conference on Visual Information Processing and Communications
San Jose, California
2010

Program Committee
International Workshop on Video Event Categorization, Tagging and Retrieval (VECTaR)
Held in conjunction with the Asian Conference on Computer Vision
Xi'an, China
2009

Program Committee
IEEE International Workshop on Video-Oriented Object and Event Classification (VOEC)

Held in conjunction with the International Conference on Computer Vision (ICCV)
Kyoto, Japan
2009

Program Committee / Reviewer
IEEE International Conference on Computer Vision
Kyoto, Japan
2009

Technical Program Committee
IEEE International Conference on Advanced Video and Signal-Based Surveillance (AVSS)
Genoa, Italy
2009

Technical Program Committee
IEEE Workshop on Multimedia Computing and Communications (MCC)
Held in conjunction with the International Conference on Computer Communications and Networks (ICCCN)
San Francisco, California
2009

Technical Program Committee
International Conference on Image and Graphics
Xi'an, China
2009

Program Committee
International Conference on Advances in Multimedia (MMEDIA)
Colmar, France
2009

Technical Program Committee
IEEE International Workshop on Computational Advances
in Multi-Sensor Adaptive Processing (CAMSAP)
Dominican Republic
2009

Technical Program Committee
SPIE International Conference on Visual Communications and Image Processing
San Jose, California
2009

Technical Program Committee / Reviewer
IEEE International Conference on Image Processing
San Diego, California
2008

Program Committee
IEEE Conference on Computer Vision and Pattern Recognition
Anchorage, Alaska
2008

Technical Program Committee / Reviewer

IEEE International Conference on Acoustics, Speech, and Signal Processing
Las Vegas, Nevada
2008

Technical Program Committee

IEEE International Workshop on Genomic Signal Processing and Statistics
Phoenix, Arizona
2008

Technical Program Committee

International Workshop on Multimedia Analysis & Processing (IMAP)
U.S. Virgin Islands
2008

Technical Program Committee

SPIE International Conference on Visual Communications and Image Processing
San Jose, California
2008

Program Committee

IEEE International Conference on Computer Vision
Rio de Janeiro, Brazil
2007

Technical Program Committee / Reviewer

IEEE International Conference on Image Processing
San Antonio, Texas
2007

Technical Program Committee

IEEE International Workshop on Genomic Signal Processing and Statistics
Tuusula, Finland
2007

Technical Program Committee

SPIE International Conference on Visual Communications and Image Processing
San Jose, California
2007

Technical Program Committee

IEEE International Conference on Image Processing
Atlanta, Georgia
2006

Technical Program Committee

IEEE International Workshop on Genomic Signal Processing and Statistics
College Station, Texas
2006

Technical Program Committee

SPIE International Conference on Visual Communications and Image Processing
San Jose, California
2006

Technical Program Committee / Reviewer

IEEE International Conference on Acoustics, Speech, and Signal Processing
Toulouse, France
2006

Technical Program Committee

IEEE International Conference on Image Processing
Genova, Italy
2005

Technical Program Committee / Reviewer

IEEE International Conference on Acoustics, Speech, and Signal Processing
Philadelphia, Pennsylvania
2005

Technical Program Committee

IEEE International Conference on Image Processing
Singapore
2004

Technical Program Committee

IEEE International Conference on Image Processing
Barcelona, Spain
2003

Technical Program Committee

IEEE International Conference on Image Processing
Rochester, New York
2002

Technical Program Committee

IEEE International Conference on Image Processing
Thessaloniki, Greece
2001

Technical Program Committee

IEEE International Conference on Image Processing
Vancouver, Canada
2000

Technical Program Committee

IEEE International Conference on Image Processing
Kobe, Japan
1999

Technical Program Committee

IEEE International Conference on Image Processing
Chicago, Illinois
1998

Technical Program Committee
International Symposium on Mathematical Morphology
Amsterdam, The Netherlands
1998

Technical Program Committee
SPIE International Conference on Visual Communications and Image Processing
San Jose, California
1998

Technical Program Committee
SPIE International Conference on Visual Communications and Image Processing
San Jose, California
1997

Technical Program Committee
SPIE International Conference on Visual Communications and Image Processing
Orlando, Florida
1996

Technical Program Committee
IEEE International Conference on Image Processing
Austin, Texas
1994

Technical Program Committee
IEEE International Symposium on Circuits and Systems
Chicago, Illinois
1993

J.7. Session Organizer

Organizer and Chair
IEEE International Conference on Acoustics, Speech, and Signal Processing
Special Session on Video Search and Event Analysis
Taipei, Taiwan
2009

Organizer
Workshop on Global Multimedia Mobile Communications
University of Illinois at Chicago
Chicago, Illinois
2005

Organizer and Chair
IEEE International Conference on Image Processing

Special Session on Nonlinear Filtering
Austin, Texas
1994

Organizer and Chair

IEEE International Symposium on Circuits and Systems
Special Session on Medical Image and Signal Processing
Singapore
1991

Organizer and Chair

Conference on Information Sciences and Systems
Session on Nonlinear Image and Signal Processing I
Baltimore, Maryland
1991

J.8. Session Chair

Chair

IEEE International Conference on Advanced Video and Signal-Based Surveillance (AVSS)
Session on Trajectory Analysis and Learning
Genoa, Italy
2009

Chair

IEEE International Conference on Multimedia and Expo
Session on Multimedia Content Analysis and Synthesis IV
New York, New York
2009

Chair

IEEE International Conference on Acoustics, Speech, and Signal Processing
Session on Stereoscopic and 3-D Processing
Taipei, Taiwan
2009

Chair

IEEE International Conference on Image Processing
Session on Enhancement and Denoising II
San Diego, California
2008

Chair

IEEE International Conference on Acoustics, Speech, and Signal Processing
Session on Restoration and Enhancement
Las Vegas, Nevada
2008

Chair

SPIE Electronic Imaging Conference on Visual Communications and Image Processing

Session on Image Processing
San Jose, California
2008

Chair

IEEE International Conference on Image Processing
Session on Image and Video Restoration and Enhancement I
San Antonio, Texas
2007

Chair

IEEE International Conference on Image Processing
Session on Image and Video Filtering
Atlanta, Georgia
2006

Chair

IEEE International Conference on Multimedia and Expo
Session on Media Signal Processing
Toronto, Canada
2006

Chair

IEEE International Conference on Multimedia and Expo
Session on Multimedia Database Applications
Toronto, Canada
2006

Chair

IEEE International Conference on Multimedia and Expo
Session on Peer-to-Peer Multimedia Streaming
Toronto, Canada
2006

Chair

SPIE Electronic Imaging Conference on Visual Communications and Image Processing
Session on Computer Vision
San Jose, California
2006

Chair

IEEE International Conference on Acoustics, Speech, and Signal Processing
Session on Video Segmentation and Tracking
Philadelphia, Pennsylvania
2005

Chair

SPIE Electronic Imaging Conference on Image and Video Communications and Processing
Session on Selective Encryption for Image/Video
San Jose, California
2005

Chair

SPIE Electronic Imaging Conference on Image and Video Communications and Processing
Session on Object Tracking
San Jose, California
2005

Chair

INPT/ASME International Conference on Communications, Signals and Systems
Session on Signals and Data
Rabat, Morocco
2001

Chair

SPIE Conference on Multimedia Storage and Archiving Systems III
Session on Video Segmentation
Boston, Massachusetts
1998

Chair

IEEE International Conference on Image Processing
Session on Image Sequence Segmentation
Chicago, Illinois
1998

Chair

International Symposium on Mathematical Morphology
Session on Theory
Atlanta, Georgia
1996

Chair

INPT/ASME International Conference on Communications, Signals and Systems
Session on Signals and Data
Rabat, Morocco
1995

Chair

IEEE Workshop on Nonlinear Signal and Image Processing
Session on Mathematical Morphology and Fuzzy DSP
Neos Marmaras, Halkidiki, Greece
1995

Chair

IEEE International Conference on Image Processing
Session on Shape Representation and Image Modeling
Austin, Texas
1994

Chair

SPIE Conference on Visual Communications and Image Processing

Session on Mathematical Morphology
Boston, Massachusetts
1992

Chair

Conference on Information Sciences and Systems
Session on Signal Representation, Modeling, and Analysis
Baltimore, Maryland
1991

J.9. Panelist and Participant

Panelist

DOD Tri-Service Workshop on Stochastic Methods in Image Analysis
Session on Mathematical Morphology
U.S. Army Harry Diamond Laboratories
Adelphi, Maryland
1992

Participant

NSF Workshop on Improving Domestic Student Participation
in Electrical and Computer Engineering Graduate Programs
University of Tennessee
Knoxville, Tennessee
2009

Participant

Workshop on Global Multimedia Mobile Communications
University of Illinois at Chicago
Chicago, Illinois
2005

Participant

Workshop on Extraction of Visual Information by Biological and Non-Biological Systems
University of Illinois at Chicago
Chicago, Illinois
2002

Participant

Workshop on Multimedia Information Systems
Capri, Italy
2001

Participant

NSF Advanced Networking Infrastructure Support
National Workshop on Developing Guidance
Research Competitiveness Program
Washington, D.C.
1999

Participant

IMA Workshop on Applications and Theory of Random Sets
Session on Mathematical Morphology
Minneapolis, Minnesota
1996

K. PUBLICATIONS

K.1. Thesis

- [1] D. Schonfeld, *Optimal Morphological Representation and Restoration of Binary Images: Theory and Applications*. Department of Electrical and Computer Engineering, The Johns Hopkins University, Baltimore, Maryland, 1990.

K.2. Books

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- [2] D. Schonfeld, C. Shan, D. Tao, and L. Wang, (Eds.), *Video Search and Mining*. Studies in Computational Intelligence Series, Springer-Verlag, 2009, in preparation.

K.3. Book Chapters

- [1] M. Charif-Chefchaoui and D. Schonfeld, "Spatially-Variant Mathematical Morphology: Minimal Basis Representation," *Mathematical Morphology and Its Applications to Image and Signal Processing*. P. Maragos, R.W. Schafer, and M.K. Butt, (ed.), pp. 49-56, Kluwer Academic Publishers: Boston, Massachusetts, 1996.
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- [3] D. Schonfeld, "Image and Video Communication Networks," (**Invited Chapter**). *Handbook of Image and Video Processing*. A. Bovik (ed.), Academic Press: San Diego, California, Chapter 9.3, pp. 717-732, 2000.
- [4] D. Lelescu and D. Schonfeld, "Video skimming and summarization based on principal component analysis," *Management of Multimedia on the Internet*, Lecture Notes in Computer Science, E.S. Al-Shaer and G. Pacifici (Eds.), Springer-Verlag, pp. 128-141, 2001.
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- [6] S. Khanvilkar, F. Bashir, D. Schonfeld, and A. Khokhar, "Multimedia networks and communication," (**Invited Chapter**). *Electrical Engineering Handbook*. W-K. Chen (ed.), Academic Press: San Diego, California, pp. 401-425, 2004.
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- [9] X. Chen, X. Ma, A. Khokhar, and D. Schonfeld, "Motion trajectory-based video retrieval, classification, and summarization," *Video Search and Mining*. Springer-Verlag, to appear.

K.4. Journal Editorials

- [1] D. Schonfeld, J. Goutsias, I. Shmulevich, I. Tabus, and A.H. Tewfik, "Introduction to the issue on genomic and proteomic signal processing," *IEEE Journal of Selected Topics in Signal Processing*, Special Issue on Genomic and Proteomic Signal Processing, vol. 2, pp. 257-260, 2008.
- [2] S.-F. Chang, J. Luo, S. Maybank, D. Schonfeld, and D. Xu, "An Introduction to the special issue on event analysis in videos," *IEEE Transactions on Circuits and Systems for Video Technology*, vol. 18, pp. 1469-1472, 2008.
- [3] D. Schonfeld, "Perspectives on special issues," *IEEE Signal Processing Magazine*, vol. 26, issue 5, September 2009, to appear.

K.5. Refereed Journal Papers

- [1] D. Schonfeld and J. Goutsias, "Optimal morphological pattern restoration from noisy binary images," *IEEE Transactions on Pattern Analysis and Machine Intelligence*, vol. 13, pp. 14-29, 1991.
- [2] D. Schonfeld and J. Goutsias, "On the morphological representation of binary images in a noisy environment," *Journal of Visual Communication and Image Representation*, vol. 2, pp. 17-30, 1991.
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- [7] B. Kisacanin and D. Schonfeld, "A fast thresholded linear convolution representation of morphological operations," *IEEE Transactions on Image Processing*, vol. 3, pp. 455-457, 1994.
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- [34] P. Pan and D. Schonfeld, "Image reconstruction and multi-dimensional field estimation from randomly scattered sensors," *IEEE Transactions on Image Processing*, vol. 17, pp. 94-99, 2008.
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- [43] J. Yang, D. Schonfeld, and M. Mohamed, "Robust video stabilization based on particle filtering tracking of projected camera motion," *IEEE Transactions on Circuits and Systems for Video Technology*, accepted.
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- [45] X. Ma, D. Schonfeld, and A. Khokhar, "Video event classification and image segmentation based on non-causal multi-dimensional hidden Markov models," *IEEE Transactions on Image Processing*, accepted.
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- [47] X. Chen, D. Schonfeld, and A. Khokhar, "Localization and trajectory estimation of mobile objects using minimum samples," *IEEE Transactions on Vehicular Technology*, accepted.

- [48] L. Wang and D. Schonfeld, "Mapping equivalence for symbolic sequences: Theory and applications," *IEEE Transactions on Signal Processing*, accepted.
- [49] H. Hong and D. Schonfeld, "Attractive-repulsive expectation-maximization algorithm for density estimation," *IEEE Transactions on Image Processing*, accepted.
- [50] J. Yang and D. Schonfeld, "Virtual focus and depth estimation from defocused video sequences," *IEEE Transactions on Image Processing*, accepted.
- [51] X. Chen, D. Schonfeld, and A. Khokhar, "Robust closed-form tracking of moving targets using a single sensor with arbitrary noise degradation," *IEEE Transactions on Vehicular Technology*, submitted.
- [52] S. Zhao, D. Tuninetti, R. Ansari, and D. Schonfeld, "Multiple description coding over multiple erasure channels," *IEEE Transactions on Communications*, submitted.
- [53] C. Chen and D. Schonfeld, "A particle filtering framework for joint video tracking and pose estimation," *IEEE Transactions on Image Processing*, submitted.
- [54] C. Chen and D. Schonfeld, "Pose estimation from multiple cameras based on Sylvester's equation," Special Issue on Multi-Camera and Multi-Modal Sensor Fusion, *Journal of Computer Vision and Image Understanding*, submitted.
- [55] X. Ma, D. Schonfeld, and A. Khokhar, "Dynamic updating and downdating matrix SVD and tensor HOSVD for adaptive indexing and retrieval of motion trajectories," *IEEE Transactions on Image Processing*, submitted.
- [56] X. Chen, D. Schonfeld, and A. Khokhar, "Robust view-invariant null-space representation and sampling for classification and retrieval of video sequences," *IEEE Transactions on Pattern Analysis and Machine Intelligence*, submitted.
- [57] X. Chen, D. Schonfeld, and A. Khokhar, "View-invariant tensor null space representation for classification and retrieval of multi-dimensional motion events," *IEEE Transactions on Multimedia*, submitted.
- [58] X. Chen, D. Schonfeld, and A. Khokhar, "Robust localized null space representation for view invariant dynamic video classification and retrieval," *IEEE Transactions on Image Processing*, submitted.
- [59] P. Pan and D. Schonfeld, "Sequential particle filtering for conditional density propagation on graphs," *IEEE Transactions on Image Processing*, submitted.
- [60] P. Pan, F. Porikli, and D. Schonfeld, "Tracking performance evaluation and recurrent tracking using multifold consistency," *IEEE Transactions on Circuits and Systems for Video Technology*, submitted.
- [61] G. Friedman, D. Schonfeld, and N. Bouaynaya, "The impact of action costs on dynamic systems: Why is hysteresis ubiquitous in nature and technology?" *Proceedings of the IEEE*, submitted.

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- [63] X. Shi and D. Schonfeld, "Fast statistical methods for cross-correlation analysis in video classification and mining," *IEEE Transactions on Image Processing*, submitted.
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K.6. Refereed Conference Papers

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K.7. Presentations

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- [3] M. Dutta, D. Schonfeld, S. Liao, and M. Stroschio, "Quantum Dot Blinking: Physical Limit for Nanoscale Optoelectronic Device," *International Workshop of Computational Electronics*, Amherst, Massachusetts, 2007.
- [4] C. Chen and D. Schonfeld, "Spectral analysis of unstructured plenoptic sampling," *Illinois Computer Vision Workshop*, Toyota Technological Institute at Chicago, Chicago, Illinois, 2009.

K.8. Patents

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- [7] C. Chen, D. Schonfeld, and M. Mohamed, "Distributed Pose Estimation from Multiple Views," Invention Disclosure, November 20, 2007.

L. PLENARY TALKS

Stochastic noise process enhancement of nonlinear filtering

INPT/ASME International Conference on Communications, Signals and Systems

Rabat, Morocco

1995

VORTEX: Video Retrieval and Tracking from Compressed Multimedia Databases

INPT/ASME International Conference on Communications, Signals and Systems

Rabat, Morocco

2001

MotionSearch: Content-Based Video Retrieval and Activity Recognition in Video Surveillance
IEEE International Conference on Advanced Video and Signal Based Surveillance
Genoa, Italy
2009

M. INVITED SEMINARS

Optimal morphological representation and detection of binary images

Department of Electrical Engineering and Computer Science
Northeastern University
Boston, Massachusetts
1990

Optimal morphological representation and detection of binary images

The Johns Hopkins University
Applied Physics Laboratory
Laural, Maryland
1990

Optimal morphological representation and detection of binary images

Center for Automation Research
University of Maryland
College Park, Maryland
1990

Optimal morphological representation and restoration of binary images: Theory and applications

Department of Electrical and Computer Engineering
Illinois Institute of Technology
Chicago, Illinois
1990

Optimal morphological representation and restoration of binary images: Theory and applications

Department of Electrical and Computer Engineering
University of California
Santa Barbara, California
1990

Optimal morphological representation and restoration of binary images: Theory and applications

Department of Electrical Engineering and Computer Science
Northwestern University
Evanston, Illinois
1991

Morphological image processing and analysis: Theory and applications

Department of Electrical and Computer Engineering

University of Illinois
Urbana-Champaign, Illinois
1992

Morphological image representation: Theory and applications
DOD Tri-Service Workshop on Stochastic Methods in Image Analysis
U.S. Army Harry Diamond Laboratories
Adelphi, Maryland
1992

Morphological representation of nonlinear filters: Theory and applications
Department of Electrical and Computer Engineering
Illinois Institute of Technology
Chicago, Illinois
1993

Morphological image representation: Theory and applications
ONR Workshop on Vision and Optical Information Processing
Arlington, Virginia
1994

Nonlinear Signal and Image Processing
Department of Electrical Engineering and Computer Science
University of Illinois
Chicago, Illinois
1996

Nonlinear Operators: Theory and Application to Image Processing and Communications
School of Electrical and Computer Engineering
Technion – Israel Institute of Technology
Haifa, Israel
1996

Stochastic Noise Process Enhancement of Nonlinear Filtering
Department of Electrical Engineering
Northern Illinois University
DeKalb, Illinois
1996

Morphological Signal and Image Processing: Theory and Applications
Department of Electrical Engineering—Systems
University of Tel-Aviv
Tel-Aviv, Israel
1997

VORTEX: Video Retrieval and Tracking from Compressed Multimedia Databases
Department of Electrical and Computer Engineering
Illinois Institute of Technology
Chicago, Illinois
2001

Mathematical Morphology and Computer Vision

University of Illinois at Chicago
Chicago, Illinois
2002

VORTEX: Video Retrieval and Tracking from Compressed Multimedia Databases

Department of Electrical and Computer Engineering
Drexel University
Philadelphia, Pennsylvania
2002

Time-Series Analysis Based on Statistical Signal Processing:

Segmentation, Prediction, and Tracking

Global Electronic Trading Company (Getco)
Chicago, Illinois
2004

Particle Filtering for Head Tracking in Wireless Communications

Motorola Research Labs
Schaumburg, Illinois
2004

Real-Time Video Communications: Compression, Tracking, Retrieval, and Networking

University of Illinois
Chicago, Illinois
2005

Real-Time Video Tracking and Retrieval from Multimedia Databases

Motorola Research Labs
Schaumburg, Illinois
2005

**Real-Time Multiple Object Tracking and Motion Trajectory-Based Video Databases:
Indexing, Retrieval, and Activity Recognition**

Hewlett-Packard Research Labs
Haifa, Israel
2005

Real-Time Video Tracking Based on Particle Filtering

University of Illinois
Chicago, Illinois
2005

**Real-Time Collaborative Distributed Tracking and Trajectory Analysis from Multiple
Camera and Sensor Networks**

School of Electrical and Computer Engineering
Purdue University
West Lafayette, Indiana
2005

A New Method for Multidimensional Optimization and Its Application in Image and Video Processing

Department of Electrical Engineering and Computer Science
Northwestern University
Evanston, Illinois
2006

Protein Communication System: Evolution and Genomic Structure

Department of Electrical and Computer Engineering
University of Illinois at Urbana-Champaign
Urbana-Champaign, Illinois
2006

Protein Communication System: Evolution and Genomic Structure

Bioinformatics Group
Mathematics and Computer Science Division
Argonne National Laboratory
Argonne, Illinois
2006

**Distributed Image and Video Processing:
Directed Graphs, Bayesian Estimation, and Hidden Markov Models**

College of Information Science and Engineering
Graduate School
Chinese Academy of Science
Beijing, P.R. China
2007

**Distributed Image and Video Processing:
Directed Graphs, Bayesian Estimation, and Hidden Markov Models**

Visual Computing Group
Microsoft Research Asia
Beijing, P.R. China
2007

**Distributed Image and Video Processing:
Directed Graphs, Bayesian Estimation, and Hidden Markov Models**

School of Electronic and Information Institute
Tongji University
Shanghai, P.R. China
2007

**Distributed Image and Video Processing:
Directed Graphs, Bayesian Estimation, and Hidden Markov Models**

School of Automation
Institute of Automation
Hangzhou Dianzi University
Hangzhou, P.R. China
2007

Distributed Image and Video Processing:

Directed Graphs, Bayesian Estimation, and Hidden Markov Models

Department of Information Science and Electronic Engineering
Institute of Information and Communication Systems
Zhejiang University
Hangzhou, P.R. China
2007

Interactive Vision: Distributed Image and Video Processing

Intellectual Property Technical Lecture Series
McAndrews, Held & Malloy, Ltd.
Chicago, Illinois
2007

Distributed Image and Video Processing:

Directed Graphs, Bayesian Estimation, and Hidden Markov Models

Departments of Computer Science and Electrical & Computer Engineering
Technion, Israel Institute of Technology
Haifa, Israel
2007

MotionSearch: Content-Based Video Retrieval and Classification

Joint Chapters of the IEEE
Rochester, New York
2008

Evolution and Genomic Structure: A Signal Processing Perspective

Bioinformatics Cluster
University of Rochester
Rochester, New York
2008

Evolution and Genomic Structure: A Signal Processing Perspective

Department of Electrical Engineering
Columbia University
New York, New York
2008

Evolution and Genomic Structure: A Signal Processing Perspective

Department of Electrical Engineering and Computer Science
Northwestern University
Evanston, Illinois
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MotionSearch: Content-Based Video Retrieval and Classification

Distinguished Speaker in the Joint College Colloquium Series
College of Engineering and Information Technology and College of Science and Mathematics
Department of Applied Science
University of Arkansas at Little Rock
Little Rock, Arkansas
2008

Evolution and Genomic Structure: A Signal Processing Perspective

Department of Electrical and Computer Engineering
University of Wisconsin – Madison
Madison, Wisconsin
2008

MotionSearch: Content-Based Video Retrieval and Classification

Department of Electrical & Computer Engineering
Tufts University
Medford, Massachusetts
2009

MotionSearch: Content-Based Video Retrieval and Classification

Department of Electrical & Microelectronics Engineering
Rochester Institute of Technology
Rochester, New York
2009

MotionSearch: Content-Based Video Retrieval and Classification

School of Computer Engineering
Nanyang Technological University
Singapore
2009

N. GRADUATE STUDENTS AND VISTING SCHOLARS

N.1. Visiting Scholars

Mohammed Charif-Chefchaoui

Department of Electrical Engineering and Computer Science
University of Illinois at Chicago
Chicago, Illinois
1995

Position: Director and Professor, National Institute of Postes and Telecommunications, Morocco.

Yuesong Lin

Department of Electrical and Computer Engineering
University of Illinois at Chicago
Chicago, Illinois
2007

Position: Professor, Institute of Information and Control, Hangzhou Dianzi University, Hangzhou, P.R. China.

N.2. Postdoctoral Fellows

Mohammed Charif-Chefchaoui

Department of Electrical Engineering and Computer Science
University of Illinois at Chicago

Chicago, Illinois

1994

Position: Director and Professor, National Institute of Postes and Telecommunications, Morocco.

N.3. Visiting Students

Alessio Dore

Department of Electrical and Computer Engineering

University of Illinois at Chicago

Chicago, Illinois

2008

Current Position: Doctoral Candidate, DIBE - Department of Biophysical and Electronic Engineering, University of Genova, Genoa, Italy.

Yunmei Gong

Department of Electrical and Computer Engineering

University of Illinois at Chicago

Chicago, Illinois

2008-09

Current Position: Doctoral Candidate, Information and Communication Engineering, College of Electronics and Information Engineering, Tongji University, Shanghai, P.R. China.

N.4. Doctoral Students

Mohammed Charif-Chefchaoui

“Morphological Representation of Nonlinear Filters: Theory and Applications”

Department of Electrical Engineering and Computer Science

University of Illinois at Chicago

Chicago, Illinois

1993

Starting Position: Professor, National Institute of Postes and Telecommunications, Rabat, Morocco.

Current Position: Director, National Institute of Postes and Telecommunications, Rabat, Morocco.

Dan Lelescu

“VORTEX: Video Retrieval and Tracking from Compressed Multimedia Databases”

Department of Electrical Engineering and Computer Science

University of Illinois at Chicago

Chicago, Illinois

2000

Starting Position: Senior Research Scientist, Lead of Algorithms Group, Compression Sciences, Campbell, California, USA.

Former Position: Senior Researcher, NTT DoCoMo Communications Laboratories USA, San Jose, California, USA.

Current Position: Principal Scientist, Advanced Imaging Research & Development Laboratory, Micron Technology, California, USA.

Bulent Cavusoglu

“Real-Time Content-Based Video Communications over Heterogeneous Networks”

(Jointly Supervised with Prof. Rashid Ansari)

Department of Electrical & Computer Engineering
University of Illinois at Chicago
Chicago, Illinois
2005

Current Position: Assistant Professor, Ataturk University, Erzurum, Turkey.

Faisal Bashir

“MotionSearch: Object Motion Trajectory-Based Video Search and Classification System”

(Jointly Supervised with Prof. Ashfaq Khokhar)
Department of Electrical & Computer Engineering
University of Illinois at Chicago
Chicago, Illinois
2006

Internship: Mitsubishi Electric Research Laboratory (MERL), USA.

Starting Position: Intern, Mitsubishi Electric Research Laboratory (MERL), Cambridge, Massachusetts, USA.

Current Position: Senior Imaging Scientist, Retica Systems, Inc., Waltham, Massachusetts, USA.

Wei Qu

“Real-Time Distributed Video Tracking of Multiple Objects from Single and Multiple Cameras”

Department of Electrical & Computer Engineering
University of Illinois at Chicago
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2006

Internship: Mitsubishi Electric Research Laboratory (MERL), USA; Siemens Medical Systems, USA.

Starting Position: Senior Research Scientist, Motorola Research Labs, Schaumburg, Illinois, USA.

Former Position: Senior Scientist, Siemens Medical Solutions USA, Hoffman Estates, Illinois, USA.

Current Position: Associate Professor, Graduate University of Chinese Academy of Sciences, Beijing, China.

Nidhal Bouaynaya

“Analysis of Proteomics and Genomics Based on Signal Processing and Communication Theory”

Department of Electrical & Computer Engineering
University of Illinois at Chicago
Chicago, Illinois
2007

Current Position: Assistant Professor, Department of Systems Engineering, University of Arkansas at Little Rock, Little Rock, Arkansas, USA.

Hunsop Hong

Constrained and Hierarchical Density Estimation for Image Reconstruction and Sensor Networks

Department of Electrical & Computer Engineering
University of Illinois at Chicago
Chicago, Illinois
2008

Current Position: Senior Research Engineer, Samsung Information Systems America, Irvine, California, USA.

Pan Pan

Video Tracking Based on Particle Filters: Particle Allocation, Graphical Models, and Performance Evaluation

Department of Electrical & Computer Engineering
University of Illinois at Chicago
Chicago, Illinois
2009

Internship: NTT Research Laboratory, Japan; Mitsubishi Electric Research Laboratory (MERL), USA.
Current Position: Research Scientist, Fujitsu Research and Development, Beijing, China.

Xiang Ma

Motion Trajectory-Based Video Retrieval and Recognition: Tensor Analysis and Multi-Dimensional Hidden Markov Models

(Jointly Supervised with Prof. Ashfaq Khokhar)
Department of Electrical & Computer Engineering
University of Illinois at Chicago
Chicago, Illinois
2009

Internship: Knowledge Media Institute, Open University, United Kingdom; Siemens Medical Solutions USA, Hoffman Estates, Illinois, USA.

Current Position: Computer Vision Research Engineer, IntuVision, Inc., Woburn, Massachusetts, USA.

Chong Chen

Multi-Camera Vision Systems: Distributed Pose Estimation and Plenoptic Imaging

Department of Electrical & Computer Engineering
University of Illinois at Chicago
Chicago, Illinois
2009 (exp.)

Internship: Siemens Research Laboratory, USA; FX Palo Alto Laboratory (FXPAL), USA.

Junlan Yang

Virtual Video Enhancement for Handheld Mobile Cameras: Stabilization, Auto-Focus, and Super-Resolution

Department of Electrical & Computer Engineering
University of Illinois at Chicago
Chicago, Illinois
2009 (exp.)

Internship: Ricoh Research Laboratory, USA; Sharp Laboratories of America, USA.

Current Position: Senior Engineer, iKoa Corporation, Menlo Park, California, USA.

Songqing Zhao

Multiple Description Coding

(Ex-Officio; Jointly Supervised by Profs. Rashid Ansari and Daniela Tuninetti)

Department of Electrical & Computer Engineering
University of Illinois at Chicago
Chicago, Illinois
2009 (exp.)

Internship: Mitsubishi Electric Research Laboratory (MERL), USA.

Xu Chen

Localization and Trajectory Estimation of Mobile Objects from a Single Sensor

(Jointly Supervised with Prof. Ashfaq Khokhar)
Department of Electrical & Computer Engineering
University of Illinois at Chicago

Chicago, Illinois

2010 (exp.)

Internship: Institute of Electrical Engineering, Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland; Kodak Research Laboratories, USA.

Current Position: Postdoctoral Fellow, Department of Electrical Engineering and Computer Science, University of Michigan, Ann Arbor, Michigan, USA.

Lei Gao

Compiler Optimization for FPGA Design

(Jointly Supervised with Prof. Prith Banerjee)

Department of Electrical & Computer Engineering

University of Illinois at Chicago

Chicago, Illinois

2010 (exp.)

Liuling Gong

Machine Learning for Biological Systems

Department of Electrical & Computer Engineering

University of Illinois at Chicago

Chicago, Illinois

2010 (exp.)

Internship: eBay Research Labs, USA.

Xiangqiong Shi

Video Mining

Department of Electrical & Computer Engineering

University of Illinois at Chicago

Chicago, Illinois

2010 (exp.)

Internship: Motorola Research Labs, USA.

Liming Wang

Genomic Signal Processing

Department of Electrical & Computer Engineering

University of Illinois at Chicago

Chicago, Illinois

2011 (exp.)

Yanying Chen

Video Retrieval and Classification

Department of Electrical & Computer Engineering

University of Illinois at Chicago

Chicago, Illinois

2013 (exp.)

Johnson Jonaris Gad Elkarim

Genomic Signal Processing

Department of Electrical & Computer Engineering

University of Illinois at Chicago

Chicago, Illinois

2013 (exp.)

Jing Huang

Distributed Video Processing
Department of Electrical & Computer Engineering
University of Illinois at Chicago
Chicago, Illinois
2013 (exp.)

Qun Li

Distributed Video Processing
Department of Electrical & Computer Engineering
University of Illinois at Chicago
Chicago, Illinois
2013 (exp.)

N.5. Masters Thesis Students

Vladimir Pavlovic

“Stochastic Noise Process Enhancement of Hopfield Neural Networks”
(Jointly Supervised with Prof. Gary Friedman)
Department of Electrical Engineering and Computer Science
University of Illinois at Chicago
Chicago, Illinois
1993
Position: Associate Professor, Department of Computer Science, Rutgers University, New Jersey, USA.

Deepak K. Bal

“Transmission of Real-Time MPEG-2 Video Over Differentiated Services Networks”
(Jointly Supervised with Prof. Rashid Ansari)
Department of Electrical & Computer Engineering
University of Illinois at Chicago
Chicago, Illinois
2003
Position: Takata, Inc., Michigan, USA.

Karthik Hariharakrishnan

“Visual Tracking: New Methods Using Adaptive Block Matching and Particle Filters”
Department of Electrical & Computer Engineering
University of Illinois at Chicago
Chicago, Illinois
2003
Internship: NeoMagic Corp., USA.
Previous Position: Motorola Research Laboratories, India.
Current Position: ARM Embedded Technologies, Ltd., India.

Subhash Yadhav

“Associative Processors for Video Coding”
Department of Electrical & Computer Engineering
University of Illinois at Chicago

Chicago, Illinois
2004
Position: Qualcomm Corp., California, USA.

Emir Mulabegovic

“Lightweight Streaming Protocol for Real-Time Video Communications”
(Jointly Supervised with Prof. Rashid Ansari)
Department of Electrical & Computer Engineering
University of Illinois at Chicago
Chicago, Illinois
2005
Position: PCTEL, Illinois, USA.

Andrea De Mauro

“A Peer-to-Peer Network for Real-Time Multiple-Description Video Communications
Using Multiple Paths”
Department of Electrical & Computer Engineering
University of Illinois at Chicago
Chicago, Illinois
2006
Position: Financial Solutions Systems Analyst, Procter & Gamble, Newcastle, United Kingdom.

Claudio Rossi

“A Partially-Reliable Multihomed Transport Protocol for Real-Time Multiple-Description
Multimedia Traffic”
Department of Electrical & Computer Engineering
University of Illinois at Chicago
Chicago, Illinois
2006
Position: Area Manager, IBM, Milan, Italy.

Amita Jain

Design and Evaluation of Data Compression and Decompression Applications on Field Programmable
Gate Arrays
(Jointly Supervised with Prof. Prith Banerjee)
Department of Electrical & Computer Engineering
University of Illinois at Chicago
Chicago, Illinois
2008
Position: Newark Technology, Cleveland, Ohio, USA.

Chetana Makarla Suresh

Biometric Analysis for Fingerprint Identification
Department of Electrical & Computer Engineering
University of Illinois at Chicago
Chicago, Illinois
2010 (exp.)

Carlo Giulietti

Video Communication Networks
Department of Electrical & Computer Engineering

University of Illinois at Chicago
Chicago, Illinois
2010 (exp.)

N.6. Masters Project Students

Neil Zalut

“Linear Restoration of Medical Images: An Overview”
Department of Electrical Engineering and Computer Science
University of Illinois at Chicago
Chicago, Illinois
1993

Branislav Kisacanin

“A Fast Thresholded Linear Convolution Representation of Morphological Operations”
Department of Electrical Engineering and Computer Science
University of Illinois at Chicago
Chicago, Illinois
1993

Alan Baumgartner

“Morphological Segmentation of Computed Tomography Images”
Department of Electrical Engineering and Computer Science
University of Illinois at Chicago
Chicago, Illinois
1994

Alvin Ng

“Spatially-Variant Morphological Skeleton Representation”
Department of Electrical Engineering and Computer Science
University of Illinois at Chicago
Chicago, Illinois
1994

Smriti Anand

“Efficient Fast Reconstruction Algorithms in Computerized Tomography”
Department of Electrical Engineering and Computer Science
University of Illinois at Chicago
Chicago, Illinois, May 1995

Stephan W. Wegerich

“Subband Image Restoration and Blur Identification Using the EM Algorithm and Cross-Filtering”
Department of Electrical Engineering and Computer Science
University of Illinois at Chicago
Chicago, Illinois
1995

Robert Werckmeister

“Performance Analysis of Video Communications in Multimedia Networks”
(Jointly Supervised with Prof. Ouri Wolfson)

Department of Electrical Engineering and Computer Science
University of Illinois at Chicago
Chicago, Illinois
1996

Margaret Kelton

“A Fast Method for Transform Conversion for Use in Image Processing”
Department of Electrical Engineering and Computer Science
University of Illinois at Chicago
Chicago, Illinois
1998

Kailash Ravishankar

“Frequency Prediction of High-Order Autoregressive Moving Average Sequences”
Department of Electrical Engineering and Computer Science
University of Illinois at Chicago
Chicago, Illinois
1998

Amir Yafe

“Transmission of MPEG-2 Streams Over Packet-Switched Networks”
Department of Electrical Engineering and Computer Science
University of Illinois at Chicago
Chicago, Illinois
1998

Steven J. Doering

“Digital Modulation: Applications to CDMA Communication Systems (IS-95)”
Department of Electrical Engineering and Computer Science
University of Illinois at Chicago
Chicago, Illinois
1999

Abhijit Bhattacharya

“MPEG-1 and H.263 Video Decoding on Motorola GSM Cellular Phone”
Department of Electrical Engineering and Computer Science
University of Illinois at Chicago
Chicago, Illinois
1999

Qin Cai

“Differentiated Transmission of MPEG-2 Video Bitstream Over Communication Networks”
(Jointly Supervised with Prof. Rashid Ansari)
Department of Electrical Engineering and Computer Science
University of Illinois at Chicago
Chicago, Illinois
2000

O. RESEARCH GRANTS

D. Schonfeld (PI)

“Morphological image representation: Theory and applications”

Office of Naval Research (ONR)

\$150,000

1991-1995

S. Corson (PI) and D. Schonfeld (Co-PI)

“Parallel processing research”

University of Illinois

Campus Research Board (CRB)

\$14,995

1994-1995

R. Ansari (PI), P. Hesketh (Co-PI), and D. Schonfeld (Co-PI)

“One-step process for instant ticket validation”

GTECH Corporation

\$5,000

1997

D. Schonfeld (PI)

“National Communications Forum”

International Engineering Consortium (IEC)

\$500

2000

D. Schonfeld (PI)

“Real-Time Very-Low Bit-Rate MPEG-4 Video Compression for Wireless Communication Application”

Neomagic Corporation

\$69,553

2001-2003

A. Khokhar (PI), R. Ansari (Co-PI), R. Grossman (Co-PI), D. Schonfeld (Co-PI), and C. Yu (Co-PI)

“High-Speed Terabyte Storage Server Based on Intelligent Disk Technology”

Army Research Office (ARO)

DURIP Program

\$422,626

2002-2004

D. Schonfeld (PI)

“Computer Architectures for Real-Time Video Communications”

Neomagic Corporation

\$76,075

2002-2004

M. Dutta (PI) et al.

“Design of a Super-Biological Eye Sensor System”

Defense Advanced Research Projects Agency (DARPA)

Army Research Office (ARO)
\$200,000 (Seed Project)
2002-2003

D. Schonfeld (PI)
“OMAP Code Composure Studio Software for Real-Time Video Communications”
Texas Instruments, Inc.
DSP University Program
\$4,500
2003

D. Schonfeld (PI)
“Real-Time Object Tracking of Video Sequences on Associative Processor Arrays”
Neomagic Corporation
\$68,750
2003-2005

D. Schonfeld (PI)
“Real-Time Low-Power High-Quality Interactive Video Telephony
for Wireless Communication Applications”
Motorola, Inc.
\$19,331
2004-2005

D. Schonfeld (PI)
“Real-Time Low-Power High-Quality Interactive Video Communications
for Video Animation and Stereography”
Motorola, Inc.
\$22,000
2005-2006

D. Schonfeld (PI)
“Real-Time High-Quality Video Communications from Handheld Cameras
Using Video Stabilization and Auto-Focus”
Motorola, Inc.
\$75,000
2005-2008

D. Schonfeld (PI)
“Interactive Video Communications Based on Stereographic Imaging
From a Single Camera”
Motorola, Inc.
\$22,000
2006-2007

A. Khokhar (PI) and D. Schonfeld (Co-PI)
“MotionSearch: Motion Trajectory-Based Object Activity Retrieval and Recognition from Video
and Sensor Databases”
National Science Foundation (NSF)
\$410,000
2006-2009

D. Schonfeld (PI)
“Real-Time Financial Forecasting Based on Statistical Signal Processing:
Correlation Analysis and Fast Algorithms”
Gelber Group
\$66,522
2006-2007

D. Schonfeld (PI)
“Signal Communication and Processing in a RFID Sensor Network System”
Your Life Essentials
\$4,000
2006-2008

D. Schonfeld (PI)
“MobilePlenoptics: Panoramic Video Communications in Mobile Devices”
Motorola, Inc.
\$22,000
2007-2008

D. Schonfeld (PI)
“Machine Learning and Event Detection in Biological Systems”
VG Bioinformatics, Inc.
\$40,000
2007-2008

A. Khokhar (PI) and D. Schonfeld (Co-PI)
“International Supplement to MotionSearch: Motion Trajectory-Based Object Activity Retrieval and
Recognition from Video and Sensor Databases”
National Science Foundation (NSF)
\$37,468
2007-2008

D. Schonfeld (PI)
“InteractiveVision: Collaborative Multiple-Input-Multiple-Output Inverse Problems
with Application in Image and Video Processing”
National Science Foundation (NSF)
\$232,496
2007-2010

A. Khokhar (PI) and D. Schonfeld (Co-PI)
“Research Experiences for Undergraduates (REU) Supplement to MotionSearch: Motion Trajectory-
Based Object Activity Retrieval and Recognition from Video and Sensor Databases”
National Science Foundation (NSF)
\$12,000
2008-2009

D. Schonfeld (PI)
“Real-time Superresolution for Enhanced Video Streaming”
iKoa Corporation
\$25,000

2008-2009

D. Schonfeld (PI)

“Tracking Performance Evaluation based on a Reflective Model and Perturbation Analysis”

Mitsubishi Electric Research Laboratories (MERL)

\$1,228

2009

R. Magin (PI), M. Ragozzino (Co-PI), K. Rockne (Co-PI), T. Royston (Co-PI), and D. Schonfeld (Co-PI)

“Acquisition of a High Field Magnetic Resonance Imaging System for Science and Engineering Research”

National Science Foundation (NSF)

\$1,995,000

2009

P. ADMINISTRATIVE ACTIVITIES

P.1. Administrative Positions

Director of the University-Industry Engineering Research Center (UIERC)

College of Engineering

University of Illinois at Chicago

2008—Present

Supervisor of Web Development

Department of Electrical & Computer Engineering

University of Illinois at Chicago

2001—2002

Director of Departmental Timetable Schedule

Department of Electrical Engineering & Computer Science

University of Illinois at Chicago

1999—2000

P.2. University Committees

University All-Campus Promotion and Tenure Committee

University of Illinois at Chicago

2008—2011

University Campus Research Board Committee

University of Illinois at Chicago

2001—2004

University Awards Committee

University of Illinois at Chicago

1998—2001

Student Appeals Board

University of Illinois at Chicago
2004—2005

P.3. College Committees

College Executive Committee

College of Engineering
University of Illinois at Chicago
2009-Present

Dean of the College of Engineering Search Committee

College of Engineering
University of Illinois at Chicago
2007-2008

Wexler Chair in Information Technology Search Committee

College of Engineering
University of Illinois at Chicago
2006

Chair of the Networking Curriculum Subcommittee

College of Engineering
University of Illinois at Chicago
2005

Departmental Reorganization and Formation Committee

College of Engineering
Department of Electrical Engineering & Computer Science
University of Illinois at Chicago
1999—2000

P.4. Departmental Committees

Member of Advisory Committee for Bioinformatics Program in Bioengineering

University of Illinois at Chicago
2000—Present

Chair of Departmental Faculty Search Committee

Department of Electrical & Computer Engineering
University of Illinois at Chicago
2006—2008

Chair of Departmental Research & Colloquium Committee

Department of Electrical Engineering & Computer Science
University of Illinois at Chicago
1996—1998; 2003—2004

Chair of Departmental Seminar Committee

Department of Electrical & Computer Engineering
University of Illinois at Chicago
2008—Present

Chair of Departmental Web Committee

Department of Electrical & Computer Engineering
University of Illinois at Chicago
2001—2003

Departmental Advisory Committee

Department of Electrical & Computer Engineering
University of Illinois at Chicago
1995—1996; 1998—1999; 2000—2002; 2004—2005; 2007—Present

Departmental Computer Committee

Department of Electrical & Computer Engineering
University of Illinois at Chicago
1990—1992; 2001—2004

Departmental Electronics Instructional Laboratory Committee

Department of Electrical Engineering & Computer Science
University of Illinois at Chicago
1997—1998

Departmental Faculty Search Committee

Department of Electrical Engineering & Computer Science
University of Illinois at Chicago
1994—1995; 1998—2001; 2006—2008

Departmental Graduate Committee

Department of Electrical Engineering & Computer Science
University of Illinois at Chicago
1995—2000

Departmental Promotion & Tenure Committee

Department of Electrical & Computer Engineering
University of Illinois at Chicago
1996—Present

Departmental Research & Colloquium Committee

Department of Electrical Engineering & Computer Science
University of Illinois at Chicago
1992—1998; 2001—2004

Departmental Scholarship Committee

Department of Electrical Engineering & Computer Science
University of Illinois at Chicago
1990—1996

Departmental Seminar Committee

Department of Electrical & Computer Engineering
University of Illinois at Chicago
2008—Present

Departmental Undergraduate Committee

Department of Electrical & Computer Engineering
University of Illinois at Chicago
1998—2003; 2005—Present

Departmental Web Committee

Department of Electrical & Computer Engineering
University of Illinois at Chicago
2000—Present

Chair of the Departmental Communications and Networks Curriculum Subcommittee

of the Undergraduate and Graduate Committee
Department of Electrical & Computer Engineering
University of Illinois at Chicago
2001—2002

Chair of the Departmental Communications and Networks Curriculum Subcommittee
of the Graduate Committee

Department of Electrical & Computer Engineering
University of Illinois at Chicago
2004

Departmental Communications and Networking Curriculum Subcommittee

of the Undergraduate and Graduate Committee
Department of Electrical & Computer Engineering
University of Illinois at Chicago
2001—2002; 2004

Departmental Computer Engineering Curriculum Subcommittee

of the Undergraduate and Graduate Committee
Department of Electrical Engineering & Computer Science
University of Illinois at Chicago
1998—2002

Departmental Electrical Engineering Curriculum Subcommittee

of the Undergraduate and Graduate Committee
Department of Electrical Engineering & Computer Science
University of Illinois at Chicago
1996—2000

Departmental Imaging Curriculum Subcommittee

of the Undergraduate and Graduate Committees
Department of Electrical Engineering & Computer Science
University of Illinois at Chicago
1993—1993

Departmental Masters of Engineering Program Subcommittee

of the Graduate Committee
Department of Electrical & Computer Engineering
University of Illinois at Chicago
2005

Departmental Multimedia Curriculum Subcommittee
of the Undergraduate and Graduate Committees
Department of Electrical Engineering & Computer Science
University of Illinois at Chicago
2005

Departmental Networking Curriculum Subcommittee
of the Undergraduate and Graduate Committees
Department of Electrical Engineering & Computer Science
University of Illinois at Chicago
1999—2000; 2005

Departmental Signal Processing and Communications Curriculum Subcommittee
of the Undergraduate and Graduate Committees
Department of Electrical Engineering & Computer Science
University of Illinois at Chicago
1991

Departmental Signals and Systems Curriculum Subcommittee
of the Graduate Committee
Department of Electrical & Computer Engineering
University of Illinois at Chicago
2004

Departmental Student Cheating Policy Subcommittee
of the Undergraduate Committee
Department of Electrical Engineering & Computer Science
University of Illinois at Chicago
1999—1999

Departmental Teaching Assistant Assignment Subcommittee
of the Undergraduate Committee
Department of Electrical Engineering & Computer Science
University of Illinois at Chicago
1996—1997

Departmental Teaching Assistant Award Subcommittee
of the Scholarship Committee
Department of Electrical Engineering & Computer Science
University of Illinois at Chicago
1994—1994

P.5. Qualifier Committees

Chair of Departmental Communication Qualifier Committee

Department of Electrical & Computer Engineering
University of Illinois at Chicago
2003—2004

Chair of Departmental Computer Communication Network Qualifier Committee

Department of Electrical & Computer Engineering
University of Illinois at Chicago
2002—2003; 2005

Chair of Departmental Signal Processing Qualifier Committee

Department of Electrical & Computer Engineering
University of Illinois at Chicago
1991—1995; 2001; 2002; 2009—Present

Departmental Communication Qualifier Committee

Department of Electrical & Computer Engineering
University of Illinois at Chicago
1997—2004

Departmental Computer Communication Networks Qualifier Committee

Department of Electrical & Computer Engineering
University of Illinois at Chicago
2002—2005

Departmental Computer Vision Qualifier Committee

Department of Electrical Engineering & Computer Science
University of Illinois at Chicago
1993—2001

Departmental Signal Processing Qualifier Committee

Department of Electrical & Computer Engineering
University of Illinois at Chicago
1991—2001; 2004—Present

P.6. Research Laboratories and Centers

Director of the University-Industry Engineering Research Center (UIERC)

College of Engineering
University of Illinois at Chicago
2008—Present

Co-Director of the Multimedia Communications Laboratory (MCL)

Department of Electrical & Computer Engineering
University of Illinois at Chicago
1997—Present

Departmental Signal and Image Research Laboratory (SIRL)

Department of Electrical & Computer Engineering
University of Illinois at Chicago
1991—2002

Q. TEACHING ACTIVITIES

Q.1. The Johns Hopkins University

ECE 137
Digital Signals and Systems
Fall 1987

ECE 137
Digital Signals and Systems
Fall 1988

ECE 137
Digital Signals and Systems
Fall 1989

Q.2. University of Illinois at Chicago

EECS 212
Signal Processing
Fall 1990

EECS 212
Signal Processing
Winter 1991

EECS 416
Advanced Topics in Digital Signal Processing
Spring 1991

EECS 417
Digital Signal Processing
Fall 1991

EECS 554
Estimation Theory
Fall 1991

EECS 311
Communication Engineering
Spring 1992

EECS 554
Estimation Theory
Fall 1992

EECS / BioE 479

Real-Time Data Processing
Spring 1993

EECS / BioE 479
Real-Time Data Processing
Fall 1993

EECS 516
Optimal and Adaptive Digital Filters
Fall 1993

EECS 517
Image Processing
Spring 1994

EECS / BioE 479
Real-Time Data Processing
Fall 1994

EECS 517
Image Processing
Spring 1995

EECS 531
Detection and Estimation Theory
Spring 1995

EECS / BioE 479
Real-Time Data Processing
Fall 1995

EECS 517
Image Processing
Spring 1996

EECS 531
Detection and Estimation Theory
Spring 1996

EECS 530
Statistical Communication Theory
Fall 1996

EECS 517
Image Processing
Spring 1997

EECS / BioE 407
Pattern Recognition
Fall 1997

EECS 530

Statistical Communication Theory
Fall 1997

EECS / BioE 407

Pattern Recognition
Spring 1998

EECS 517

Image Processing
Spring 1998

EECS 517

Image Processing
Motorola Campus
Spring 1998

EECS 171

Introduction to Programming
Summer 1998

EECS 516

Optimal and Adaptive Digital Filters
Fall 1998

EECS 530

Statistical Communication Theory
Motorola Campus
Fall 1998

EECS 418

Digital Signal Processing II
Spring 1999

EECS 517

Image Processing
Spring 1999

EECS 531

Detection and Estimation Theory
Motorola Campus
Spring 1999

EECS 171

Introduction to Programming
Summer 1999

EECS 417

Digital Signal Processing I
Fall 1999

EECS 491
Multimedia Communication Networks
Spring 2000

EECS 311
Communication Engineering
Summer 2000

EECS 491
Multimedia Communication Networks
Internet Course (Preparation)
Fall 2000

EECS 516
Optimal and Adaptive Digital Filters
Fall 2000

EECS 531
Detection and Estimation Theory
Fall 2000

EECS 491
Multimedia Communication Networks
Internet Course
Spring 2001

EECS 517
Image Processing
Spring 2001

EECS 171
Introduction to Programming
Summer 2001

ECE 516
Optimal and Adaptive Digital Filters
Fall 2001

ECE 531
Detection and Estimation Theory
Fall 2001

ECE 434
Multimedia Communication Networks
Internet Course
Spring 2002

ECE 517
Image Processing
Spring 2002

CS 102

Introduction to Programming
Summer 2002

ECE 433

Computer Communication Networks
Fall 2002

ECE 434

Multimedia Communication Networks
Fall 2002

ECE 333

Computer Communication Networks
Laboratory (Preparation)
Spring 2003

ECE 311

Communication Engineering
Fall 2003

ECE 434

Multimedia Communication Networks
Fall 2003

ECE 517

Image Processing
Spring 2004

ECE 434

Multimedia Communication Networks
Fall 2004

ECE 516

Optimal and Adaptive Digital Filters
Fall 2004

ECE 517

Image Processing
Spring 2005

ECE 311

Communication Engineering
Summer 2005

ECE 434

Multimedia Communication Systems
Fall 2005

ECE 516

Optimal and Adaptive Digital Filters

Fall 2005

ECE 517

Image Processing

Spring 2006

ECE 311

Communication Engineering

Summer 2006

ECE 434

Multimedia Communication Systems

Fall 2006

ECE 516

Optimal and Adaptive Digital Filters

Fall 2006

ECE 531

Detection and Estimation Theory

Spring 2007

ECE 311

Communication Engineering

Summer 2007

ECE 434

Multimedia Communication Systems

Fall 2007

ECE 516

Optimal and Adaptive Digital Filters

Fall 2007

ECE 531

Detection and Estimation Theory

Spring 2008

ECE 434

Multimedia Communication Systems

Fall 2008

ECE 516

Optimal and Adaptive Digital Filters

Fall 2008

ECE 530

Random Signal Analysis

Spring 2009

ECE 517

Image Processing
Fall 2009

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