

Prof. Eli Saber

<http://people.rit.edu/essee>

RESEARCH INTERESTS

- Image and Video Processing for Multimedia, Military & Biomedical Applications.
- Computer Vision and Three Dimensional Scene Reconstruction.
- Color Image Processing for Printing and Multimedia Applications.

EDUCATION

Ph.D., Electrical Engineering, University of Rochester, Rochester, New York (*March 1996*).

Concentration: Signal/Image/Video Processing, Pattern Recognition, and Computer Vision.

Dissertation: Automatic image annotation and query-by-example using color, shape and texture information.

M.S., Electrical Engineering, University of Rochester, Rochester, New York (*May 1992*)

Concentration: Signal/Image/Video Processing, Pattern Recognition, Computer Vision, Communications.

B.S., Electrical and Computer Engineering, Summa Cum Laude, State University of New York at Buffalo, Buffalo, New York (*May 1988*)

Concentration: Computers, Microprocessors, Communications, Instrumentation.

A.S., Engineering Science, Mohawk Valley Community College, Utica, New York (*May 1986*)

CAREER MAJOR HIGHLIGHTS

- **Teaching**: Taught/continue to teach multiple courses in the Signal/Image/Video Processing, Engineering Analysis, Advanced Engineering Mathematics, Random Signal & Noise, Pattern Recognition with excellent feedback from Students from 1996-Present.
- **Research & Funding**: Acquired funding as PI in excess of \$3 Million and as PI/Co-PI in excess of \$5 Million over the period of September 2004 – Present.
- **Publications**: 1 Book, 2 Special Issues, 30 Journal, 97 Conference and 10 Patents/Patent Publications.
- **Service**: Worked on several department, college and university level committees/academic senate, served on several IEEE and SPIE conferences and chaired two conferences.
- **Honors & Awards**: RIT Trustees Award (2012), KGCOE Scholarship Award (2012), EME Gleason Professor (2011-2013), and PI Millionaire (2011).
- **Industry**: Worked for Xerox Corporation from 1988 until 2004 in a variety of engineering, managerial and scientific positions ending as Product Development Scientist and Manager at the Business Group Operations Unit.

3SHAPE EXHIBIT 2002

Exocad v. 3Shape

IDB2018-00788

ACADEMIC EXPERIENCE

Professor (Associate 2004 – 2010, Full 2010 – Present), Department of Electrical and Microelectronic Engineering (EME), Kate Gleason College of Engineering (KGCOE).

Extended Faculty, Center for Imaging Science, Rochester Institute of Technology. (8/04-Present)

Director of the Image, Video and Computer Vision Laboratory

Graduate Program Director (2010 – 2014)

- Responsible for teaching several undergraduate & graduate courses in Digital Signal Processing, Digital Image Processing, Digital Video Processing, Engineering Analysis, Advanced Engineering Mathematics, Random Signal & Noise, Pattern Recognition, Communications, Computer Vision, Modern Control Theory, Linear Systems.
- Acquired funding as PI in excess of \$3 Million and as PI/Co-PI in excess of \$5 Million over the period of September 2004 – Present. Note that the EME department at RIT does not currently have a PhD program. The College of Engineering established a PhD in Engineering Starting Fall 2014.
- Director of the Image, Video and Computer Vision Laboratory. Currently advising 5 Center for Imaging Science PhD and 2 MS students on image/video segmentation, hierarchical image decomposition, video mosaicking/3-dimensional scene reconstruction, image/video understanding, object tracking/recognition. All students are funded under various government or corporate grants.
- Advised/currently advising several undergraduate and graduate students on curriculum issues.
- Supervised multiple thesis and graduate papers in the areas of signal, image, video processing and computer vision.
- Awarded the Prestigious Trustees Scholarship award – the highest award at RIT with regards to research recognition
- Elected in 2011 as PI Millionaire.
- Awarded the EME Gleason Professor for 3 years (2011-2013).
- Elected as the Kate Gleason College of Engineering Scholarship award winner.
- Former Member (KGCOE representative) of the Academic Senate (2007 – 2013 and 2014-2017) and of the Academic Senate Executive Committee (2009-2010, 2016-2017)
- Served as Chair (along with Mr. Craig Smith) of the Vision 2025 committee per request from RIT President Dr Destler. Committee was commissioned, over the summer of 2009, to review 80+ ideas submitted from all colleges and provide a recommendation to upper administration.
- Member and Former Chair of KCGOE graduate committee.
- Former Member of Graduate Council.
- Former Member of the IEEE Industry Technical Committee on DSP.
- Former Member of the IEEE Image and Multidimensional Digital Signal Processing (IMDSP) technical Committee.
- Area Editor for the Journal of Electronic Imaging.
- Senior member of the Institute of Electrical and Electronic Engineers (IEEE) and the Imaging Science and technology (IS&T) societies.
- Member of SPIE.
- ICIP 2002 Finance Chair, ICIP 2007 and ICIP 2009 Tutorial Chair, ICIP 2012 General Chair, ICASSP 2017 Technical Program Chair.
- Co-founder and General Chair (along with Dr Robert Loe) of the Video Surveillance and Transportation Imaging Conference within the Electronic Imaging Symposium.
- Served on several committees for curriculum development, recognition, and faculty search.

Adjunct Faculty Member, Dept. of Electrical & Computer Engineering, University of Rochester. (9/96-Present)

- Taught undergraduate & graduate courses in Digital Signal Processing, Digital Image Processing, Pattern Recognition/Advanced Image Processing, Detection/Estimation Theory, and Analog & Digital Communications.
- Advised and graduated 1 Ph.D. student in the areas of “Image Understanding” and “Database Content Indexing”.

- Co-advised 1 Ph.D. student in the areas of “Watermarking”.
- Advised and graduated 1 MS student in the area of “Color Rendering” and “Printer Characterization”.
- Served as a committee member on several doctoral dissertations.
- Served on PhD qualifying examinations for the Signal Processing and Communications Concentration.
- Sought and captured funding from the National Science Foundation for the development of an intelligent image database system. Proposal funded for 4 years under NSF Grant IIS – 9820721
- Sought and captured industrial funding from Xerox Corporation for Printer Color Characterization & Digital Front End Object Oriented Rendering.

Adjunct Faculty Member, Dept. of Electrical Engineering, Rochester Institute of Technology. (3/98-07/04)

- Taught undergraduate and graduate courses in Pattern Recognition, Digital Video Processing, Random Signal & Noise, Image and Video Compression, and Communications.
- Advised and graduated a master student in the area of “Texture Classification”.

INDUSTRIAL EXPERIENCE

Product Development Scientist & Manager, Print Engine Development Unit, Xerox Corporation. (10/98-08/04)

Major responsibilities included:

- Lead the Image Science, Analysis and Evaluation area (12-15 direct reports and ~\$2 Million budget).
- Lead the development of highlight color specifications for the Sorrento print engine.
- Lead the development of color characterization algorithms for the iGen3 print engine.
- Lead the image quality integration of two color front end for the iGen3 Product.
- Lead the development of ROS and LED based imaging systems and image path architectures for upcoming highlight & full color products.
- Lead the development of xerographic hardware/algorithms & imaging systems for the DP92C highlight color product. (Product launched 9/30/99 and follow-on launched 4/20/00)
- Lead the research and development of image quality metrics for various product platforms and their dissemination throughout the Print Engine Development Unit and Xerox Corporation.
- Collaborate with the Department of Electrical & Computer Engineering (Univ. of Rochester) & the Center for Electronic Imaging Systems.

Advanced Development Scientist and Manager, Print Cartridge Delivery Unit, Xerox Corporation. (2/97 – 9/98)

Major responsibilities included:

- Establish the Advanced Design Laboratory (an imaging/xerographics lab) and provide technical and managerial leadership for the Electrical, Imaging and Xerographics Dept.
- Perform image processing and xerographic hardware/software design and development for low/mid volume color copiers and printers for current and future programs.
- Perform technology development, modeling, and product design for upcoming Xerox color products, specifically image on paper and image on belt products..
- Lead the development of the xerographic module for a color intermediate belt transfer product with direct technical and management responsibilities.
- Collaborate with the Department of Electrical & Computer Engineering (Univ. of Rochester) & the Center for Electronic Imaging Systems.

Research and Development Scientist, Production Systems Group, Xerox Corporation. (1/96-1/97)

Major responsibilities included:

- Lead the design and development of color characterization/management and image quality algorithms and specifications for digital front ends destined to drive high quality, high speed color print engines.
- Integrate color management & image processing algorithms into the Raster Image Processing module.
- Participate in the design and development of a high speed raster image processing architecture.

- Benchmark developed algorithms against existing products & systems both internally and externally.
- Collaborate with the Department of Electrical & Computer Engineering of the University of Rochester and the Center for Electronic Imaging Systems.

Research and Development Engineer, Corporate Research & Technology, Xerox Corporation (8/93-12/95) & Department of Electrical & Computer Engineering, University of Rochester. (1/95-12/95)

Major responsibilities included:

- Design and develop query by image content and query by example image annotation algorithms utilizing color, shape, texture and motion cues. System is able to perform query by keywords, color, shape, texture, and/or a combination of the above cues.
- Design and develop intelligent image segmentation algorithms. These algorithms are currently utilized in the query by image content and query by example systems described above.
- Design and develop face detection and facial feature extraction approaches.
- Design and develop color characterization/calibration and image quality algorithms for Digital Front Ends aimed at driving high speed / high quality print engines.

(Note: Image annotation/content analysis research was done in conjunction with the Department of Electrical & Computer Engineering and Center for Electronic Imaging Systems leading to the Ph.D.)

Electronic, Computer and Instrumentation Engineer, New Toner/Developer Facility Engineering, Xerox Corporation. (6/88-7/93)

Major responsibilities included:

- Provide design, development, installation, startup, and training for multiple toner production facilities.
- Provide development and implementation of control system database, software and displays for several systems.
- Evaluate vendor supplied electrical specifications and drawings.
- Manage and coordinate the efforts of technicians, electrical support, construction crew, and industrial workforce during the design, construction, startup, and implementation phases.
- Supervise and complete a number of upgrade projects for toner & photoreceptor production including software development, preparation of electrical design, procurement of necessary equipment and parts, supervision of technicians, contractors and industrial workforce, and scheduling of construction.

During this time, I gained extensive experience in the following systems: Fisher distributive control, unit operation controller, Provue console, Acrison material handling, Werner and Pfleiderer extrusion, Alpine air grinding, Majac/Micropul centrifugal classifiers, dry/wet material screening, Waeschle and others bulk powder storage and pneumatic convey, Ingersoll Rand and Joy compressed air equipment, Statistical process control.

BOOKS

1. S. Dianat and E. Saber, “Advanced Linear Algebra for Engineers with MATLAB”, CRC press, February 2009.

SPECIAL ISSUES

1. H. J. Trussell, E. Saber and M. Vrhel, “Color Image Processing”, IEEE SP magazine, January 2005.
2. R. Loce and E. Saber, “Video Surveillance and Transportation Imaging”, Journal of Electronic Imaging, 22(4), Dec. 2013

PEER-REVIEWED JOURNAL PUBLICATIONS

1. S. Piramanayagam, E. Saber, W. Schwartzkopf, F.W. Koehler, “Supervised Classification of Multisensor Remote Sensed Images using Deep Learning Framework”, in preparation for submission to the Remote Sensing Journal
2. Y. Liang, P. Markopoulos and E. Saber, “Subpixel Target Detection in Spatial-Spectral Coherence Regions of Hyperspectral Images”, in preparation for submission in the Journal of Selected Topics in Applied Earth Observations and Remote Sensing.
3. S. Piramanayagam, S. R. Vantaram , E. Saber, N. D. Cahill, and D. Messinger, “Full Motion Video Segmentation by 3-D Volume Growing and Merging using Color-Texture-Gradient-Motion Attributes”, in preparation for submission to Journal of Electronic Imaging.
4. S. R. Vantaram, Y. Hu, E. Saber and S. Dianat, “Synthesis of Intensity Gradient and Texture Information for Efficient Three-Dimensional Segmentation of Medical Volumes”, Journal of Medical Imaging 2, no. 2 (2015): 024003-024003.
5. S. R. Vantaram, S. Piramanayagam, E. Saber and D. Messinger, “Automatic Spatial Segmentation of Multi/Hyperspectral Imagery by Fusion of Spectral-Gradient-Textural Attributes”, Journal of Applied and Remote Sensing, Vol. 9, No. 1, pp. 095086 (1-37), 2015.
6. S. R. Vantaram and E. Saber, “A Survey of Contemporary Trends in Color Image Segmentation”, Journal of Electronic Imaging, 21(4), 040901, Oct-Dec 2012.
7. M. S. Erkilinc, M. Jaber, E. Saber, “Text, Photo and Line Extraction in Scanned Documents”, Journal of Electronic Imaging, Vol. 21, 033006, July 2012.
8. T. Keane, E. Saber, H. Rhody, A. Savakis and J. Raj, “Practical Image Registration Concerns Overcome by the Weighted and Filtered Mutual Information Metric”, Journal of Electronic Imaging, Vol. 21(2), 023029, June 2012.
9. P. Gurrarn, E. Saber and H. Rhody, “Semi-automated System for three-dimensional Modeling of Buildings from Aerial Video”, Journal of Electronic Imaging, Vol. 21(1), 013007, Jan-Mar 2012.
10. M. Jaber and E. Saber, “Probabilistic Approach for Extracting Regions of Interest in Digital Images”, Journal of Electronic Imaging, Vol. 19, No. 2, April - June 2010.
11. X. Fan, H. Rhody and E. Saber, “A Spatial Feature Enhanced MMI Algorithm for Multimodal Airborne Image Registration”, IEEE Transaction on Geoscience and Remote Sensing, Vol. 48, Issue 6, pp. 2580 – 2589, 2010.
12. P. Gurrarn, E. Saber and H. Rhody, “A Segment-Based Mesh design for Building Parallel-Perspective Stereo Mosaic”, IEEE Transactions on Geoscience and Remote Sensing, Vol. 48, No. 3, March 2010.
13. S. Vantaram, E. Saber, S. Dianat, M. Shaw and R. Bashkar, “Multiresolution Adaptive and Progressive Gradient-based color image Segmentation”, Journal of Electronic Imaging, Volume 19, Number 1, pp. 1-21, January-March 2010.

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