

**George Bebis**  
Professor & Chair  
Director of Computer Vision Laboratory (CVL)  
Department of Computer Science and Engineering  
University of Nevada, Reno (UNR)

## Research Interests

Computer Vision  
Pattern Recognition  
Machine Learning  
Genetic Algorithms  
Bioinformatics

## Education

**Ph.D. in Electrical & Computer Engineering**  
University of Central Florida, Orlando, FL 32816  
Dissertation Topic: *Indexing-Based Object Recognition.*  
Graduation: August 1996

**Master of Science in Computer Science**  
University of Crete, Heraklion, Crete, Greece  
Thesis topic: *Model Based Object Recognition using  
Multi-resolution Segmentation and Neural Network Models.*  
Graduation: July 1991

**Bachelor of Science in Mathematics**  
University of Crete, Heraklion, Crete, Greece  
Major Areas: *Numerical Analysis, Probability Theory and Statistics*  
Graduation: September 1987

## Academic Experience and Appointments

**July 2013 - present, Professor and Chair**  
Department of Computer Science and Engineering, UNR

**July 2008 - June 2013, Professor**  
Department of Computer Science and Engineering, UNR

**July 2013 – June 2016, Director**  
Cybersecurity Center, UNR

**July 2002 - June 2008**, *Associate Professor*  
Department of Computer Science and Engineering, UNR

**January 1998 - June 2002**, *Assistant Professor*  
Department of Computer Science and Engineering, UNR

**July 1998 - August 1998**, *Summer Faculty*  
Center for Applied Scientific Computing (CASC), Lawrence Livermore National Laboratory

**January 1998 - present**, *Founder and Director*  
Computer Vision Laboratory (CVL), UNR

**August 1996 - August 1997**, *Visiting Assistant Professor*  
Department of Mathematics and Computer Science, University of Missouri-St. Louis (UMSL)

## Teaching

CS 135 Computer Science I

CS 302 Data Structures

CS 365 Mathematics of Computer Science

CS 474/674 Image Processing

CS 477/677 Analysis of Algorithms

CS 479/679 Pattern Recognition

CS 480/680 Computer Graphics

CS 485/685 Computer Vision

CS 791Y Mathematical Methods for Computer Vision

CS 491/691 Topics in Computer Vision

CS 491/691 Topics in Machine Learning

CS 773C Machine Intelligence

CS 791S Neural Networks

## **Departmental and College Committee Services**

*2013 - Present, Differential Fees Committee (Chair)*

*2005 - 2012, Graduate Director*

*2008 - 2013, Assessment Committee (Member)*

*2002 - 2003, Strategic Planning Committee (Chair)*

*2003 - 2004, Evaluation Committee (Member)*

*2012 - 2013, Evaluation Committee (Chair)*

*2003-2005, 2006-2007, Search Committee (Member)*

*2006 - 2008, College Personnel Committee (Member)*

*2007 - 2008, College Dean Search Committee (Member)*

*2009 - 2012, College FACE Committee (Member)*

*2009 - 2012, College Graduate Directors Committee (Member)*

## **National, and International Committee Services**

*2002 - 2006, IAPR Education Committee (international)*

*2001 - Present, Nevada NASA Space Grant Consortium*

## **Ph.D. Dissertations**

*Machine Learning based Mountainous Skyline Detection and Visual Geo-Localization, Touqeer Ahmad, December 2017.*

*Network Security Monitoring and Analysis based on Big Data Technologies, Bingdong Li, December 2013 (co-advised with Mehmet Gunes).*

*Hand-Based Biometrics, Gholmareza Amayeh, May 2010.*

*Perceptual Grouping Using Tensor Voting, Leandro Loss, May 2009.*

*On-Road Vehicle Detection, Zehang Sun, Fall 2003.*

## Master Thesis

*Automated detection of dune crest-lines in planetary satellite images*, David LeBlanc, February 2017.

*Retinal Vessel Segmentation using Tensor Voting*, Dan Farmer, May 2015 (co-advised with Mircea Nicolescu).

*Horizon Line Detection: Edge-less and Edge-based Methods*, Touqeer Ahmad, December 2014.

*Non-intrusive physical activity prediction for exergames*, Miran Kim, May 2013 (co-advised with Eelke Folmer).

*Feature Selection Using Genetic Algorithms for Human Gait Recognition*, Faezeh Tafazzoli, May 2012.

*Accurate and Robust Localization of Duplicated Region in Copy-Move Image Forgery*, Maryam Jaber, August 2012.

*Computational Models for Regional and Mesoscale Air Quality Modeling in the United States*, Julide Koracin, Spring 2009.

*Gender Classification*, Zhiming Liu, Spring 2007.

*Fingerprint Template Synthesis*, Tamer Uz, Spring 2006.

*Improving the Performance of Fingerprint Classification*, Uday Rajanna, Spring 2006.

*Shape Metamorphism Using  $p$ -Laplacian Equation*, Mehmet Eser, Spring 2005.

*Geometric Approach to Segmentation and Protein Localization in Cell Cultured Assays*, Sreevatsan Raman, Fall 2005.

*Automatic Recognition of a Baby Gesture*, Jigna Bhatt, Spring 2005.

*Global Hand Pose Estimation by Multiple Camera Ellipse Tracking*, Jorge Usabiaga, Spring 2005.

*Rendering Optimizations Guided by Head-Pose Estimates and their Uncertainty*, Javier Martinez, Summer 2005.

*Face Recognition Experiments Using Random Projection*, Navin Goel, Spring 2004.

*Infrared and Visible Image Fusion for Face Recognition*, Saurabh Singh, Spring 2004.

*Heliothis-Zea Classification Using Image Analysis*, Tom Patten, Spring 2004.

*Face Detection Using Multi-Band Fusion*, Jonathan Dowdall, Spring 2003.

*Multiresolution Image Retrieval through Fusion*, Vladimir Nikulin, Fall 2003.

*Face Recognition Using Image Fusion*, Aglika Gyaourova, Spring 2003.

*Fingerprint Minutiae Extraction*, Chris Smith, Fall 2002.

*Computational Analysis of Functionally Unknown Proteins from Expressed Sequence Tags (EST) Datasets*, Elham Alavi, Fall 2002.

*Improving Fingerprint Recognition*, Xiaosheng Tu, Summer 2000.

*Genetic Search for Face Recognition*, Satish Uthiram, Summer 1999.

*Face Detection using Convex Grouping*, Alexey Kryuchkov, Fall 1998.

*Fingerprint Recognition using Delaunay Triangulation*, Taisa Deaconu, Fall 1998.

## Editorials

[1] N. Bourbakis and G. Bebis, "Digital Multimedia on Demand", **IEEE Multimedia**, January-March 2004.

## Books Edited

[12] G. Bebis et. al (eds) *Advances in Visual Computing*, Lecture Notes in Computer Science (LNCS), Vols. 10072, 10073, 12th International Symposium, **ISVC 2016**, Las Vegas, Nevada, USA, Dec 12-14, 2016.

[11] G. Bebis et. al (eds) *Advances in Visual Computing*, Lecture Notes in Computer Science (LNCS), Vols. 9474, 9475, 11th International Symposium, **ISVC 2015**, Las Vegas, Nevada, USA, Dec 14-16, 2015.

[10] G. Bebis et. al (eds) *Advances in Visual Computing*, Lecture Notes in Computer Science (LNCS), Vols. 8887, 8888, 10th International Symposium, **ISVC 2014**, Las Vegas, Nevada, USA, Dec 8-10, 2014.

- [9] G. Bebis et. al (eds) *Advances in Visual Computing*, Lecture Notes in Computer Science (LNCS), Vols 8033, 8034, 9th International Symposium, **ISVC 2013**, Crete, Greece, July 29-31, 2013.
- [8] G. Bebis et. al (eds) *Advances in Visual Computing*, Lecture Notes in Computer Science (LNCS), Vols 7430, 7431, 8th International Symposium, **ISVC 2012**, Crete, Greece, July 16-18, 2012.
- [7] G. Bebis et. al (eds) *Advances in Visual Computing*, Lecture Notes in Computer Science (LNCS), Vols 6938, 6939, 7th International Symposium, **ISVC 2011**, Las Vegas, NV, USA, September 26-28, 2011.
- [6] G. Bebis et. al (eds) *Advances in Visual Computing*, Lecture Notes in Computer Science (LNCS), Vols 6453, 6454, 6455, 6th International Symposium, **ISVC 2010**, Las Vegas, NV, USA, November 29 - December 1, 2010.
- [5] G. Bebis et. al (eds) *Advances in Visual Computing*, Lecture Notes in Computer Science (LNCS), Vols 5875, 5876, 5th International Symposium, **ISVC 2009**, Las Vegas, NV, USA, November 30 - December 2, 2009.
- [4] G. Bebis et. al (eds) *Advances in Visual Computing*, Lecture Notes in Computer Science (LNCS), Vols 5358, 5359, 4th International Symposium, **ISVC 2008**, Las Vegas, NV, USA, December 1-3, 2008.
- [3] G. Bebis et. al (eds) *Advances in Visual Computing*, Lecture Notes in Computer Science (LNCS), Vols 4841, 4842, 3rd International Symposium, **ISVC 2007**, Lake Tahoe, NV, USA, November 26-28, 2007.
- [2] G. Bebis et. al (eds) *Advances in Visual Computing*, Lecture Notes in Computer Science (LNCS), Vols 4291, 4292, 2nd International Symposium, **ISVC 2006**, Lake Tahoe, NV, USA, November 6-8, 2006.
- [1] G. Bebis et. al (eds) *Advances in Visual Computing*, Lecture Notes in Computer Science (LNCS), Vol. 3804, 1st International Symposium, **ISVC 2005**, Lake Tahoe, NV, USA, December 5-7, 2005.

## Book Chapters

- [4] Bouwmans, T., Tavakkoli, A., Nicolescu, M., Bebis, G., Wang, J., Statistical Models for Background Subtraction: Support Vector Machines. In **Background Subtraction for Moving Object Detection: Theory and Practices**. CRC Press, Taylor and Francis, (in press).
- [3] Tavakkoli, M. Nicolescu, J. Wang, and G. Bebis, "Background Learning with Support Vectors: Efficient Foreground Detection and Tracking for Automated Visual Surveillance", In Thierry Bouwmans, Fatih Porikli, Benjamin Hörlin, Antoine Vacavant (Ed.), **Background**

**Learning with Support Vectors: Efficient Foreground Detection and Tracking for Automated Visual Surveillance.** CRC Press, Taylor and Francis, pages 11.1-11.23, June 2014.

[2] G. Bebis, "Fingerprint Indexing", **Biometrics Encyclopedia**, Springer-Verlag, 2009.

[1] G. Bebis, "Face Recognition in the Thermal Spectrum", **Biometrics Encyclopedia**, Springer-Verlag, 2009.

## **Journal Publications (peer reviewed)**

[66] Yongjie Chu, Touqeer Ahmad, George Bebis, Lindu Zhao, "Low-resolution face recognition with single sample per person", **Signal Processing**, vol. 141, pp. 144-157, 2017.

[65] A. Yazdanpanah, E. Regentova and G. Bebis, "Algebraic Iterative Reconstruction-Reprojection (AIRR) Method for High Performance Sparse-View CT Reconstruction", **Applied Mathematics and Information Sciences**, vol. 10, no. 6, pp. 1-8, 2016.

[64] S. Khana, M. Hussain, H. Aboalsamhb, H. Mathkourb, G. Bebis, and M. Zakariahd, "Optimized Gabor features for mass classification in mammography", **Applied Soft Computing**, vol. 44, pp. 267-280, 2016.

[63] A. Alahmadi, M. Hussain, H. Aboalsamh, G. Muhammad, G. Bebis, and H. Mathkour, "Passive Detection of Image Forgery using DCT and Local Binary Pattern", **Signal, Image and Video Processing**, 2016 (accepted).

[62] C. Moujahdi, G. Bebis, S. Ghouzali, M. Mikram and M. Rziza, "Biometric Template Protection Using Spiral Cube: Performance and Security Analysis", **International Journal on Artificial Intelligence Tools**, vol. 25, no. 1, 2016.

[61] Shicai Yang, George Bebis, Yongjie Chua and Lindu Zhaoa "Effective Face Recognition Using Bag of Features with Additive Kernels", **Journal of Electronic Imaging**, (accepted) 2016.

[60] Salabat Khan, Muhammad Hussain, Hatim Aboalsamh and George Bebis, "A comparison of different Gabor feature extraction approaches for mass classification in mammography", **Multimedia Tools and Applications**, pp. 1-25, 2015.

[59] Touqeer Ahmad, George Bebis, Emma Regentova, Ara Nefian, and T. Fong, "Coupling Dynamic Programming with Machine Learning for Horizon Line Detection", **International Journal on Artificial Intelligence Tools**, vol. 24, no. 4, pp. 1-19, 2015.

[58] M. Jiang, J. Kong, G. Bebis, and H. Huo, "Informative joints based human action recognition using skeleton contexts", **Signal Processing: Image Communication**, vol. 33, pp. 29-40, 2015.

- [57] Q. Tao, Z. Liu, G. Bebis, and M. Hussain, "Face Recognition Using a Novel Image Representation Scheme and Multi-Scale Local Features", **International Journal of Biometrics**, vol. 7, no. 3, pp. 191-212, 2015.
- [56] F. Tafazzoli, G. Bebis, S. Louis, and M. Hussain, "Genetic Feature Selection for Gait Recognition", **Journal of Electronic Imaging**, vol. 24, no. 1, pp. 1-14, 2015.
- [55] M. Hussain, S. Qasem, G. Bebis, G. Muhammad, H. Aboalsahm, and H. Mathkour, "Evaluation of Image Forgery Detection Using Multi-Scale Weber Local Descriptors", **International Journal on Artificial Intelligence Tools**, vol. 24, no. 4, pp. 1-28, 2015.
- [54] A. Ambardekar, Mircea Nicolescu, G. Bebis, and Monica Nicolescu, "Vehicle Classification Framework: A Comparative Study", **EURASIP Journal on Image and Video Processing**, vol. 29, pp. 1-13, 2014.
- [53] C. Moujahdi, G. Bebis, S. Ghouzali, and M. Rziza, "Fingerprint Shell: Secure Representation of Fingerprint Template", **Pattern Recognition Letters**, vol. 45, pp. 189-196, 2014.
- [52] G. Muhammad, M. Al-Hammadi, M. Hussain, G. Bebis, "Image Forgery Detection Using Steerable Pyramid Transform and Local Binary Pattern", **Machine Vision and Applications**, vol 25, no 4, pp. 985-995, 2014.
- [51] A. Ambardekar, Mircea Nicolescu, G. Bebis, and Monica Nicolescu, "A Visual Traffic Surveillance Framework: Classification to Event Detection", **Journal of Electronic Imaging**, Special Issue on "Video Surveillance and Transportation Imaging Applications", vol. 22, no. 4, 2014.
- [50] A. K. Mandava, E. E. Regentova, G. Bebis, "LFAD- Locally and Feature-Adaptive Diffusion Based Image Denoising", **Applied Mathematics and Information Sciences**, vol. 8, no. 1, pp. 1-12, 2014.
- [49] M. Jaber, G. Bebis, M. Hussain, and G. Muhammad, "Accurate and Robust Localization of Duplicated Region in Copy-Move Image Forgery", **Machine Vision and Applications**, vol. 25, pp. 451-475, 2014.
- [48] M. Hussain, S. Khan, G. Muhammad, and G. Bebis, "Effective Extraction of Gabor features for False Positive Reduction and Mass classification in Mammography", **Applied Mathematics and Information Sciences**, vol. 8, no. 1L, pp. 397-412, 2014.
- [47] A. Mazoul, M. El Ansari, K. Zebbara and G. Bebis, "Fast spatio-temporal stereo for intelligent transportation systems", **Pattern Analysis and Applications**, vol. 17, no. 1, 2014.
- [46] Ihsan Ullah, Aboalsamh, H., Hussain, M., Muhammad, G., Mirza, A. M., Bebis, G., "Gender Classification using Texture Descriptor", **Journal of Internet Technology**, vol. 15(5), pp.801-812, Sept, 2014.



- [45] Amol Ambardekar, Mircea Nicolescu, George Bebis, and Monica Nicolescu, "A Visual Traffic Surveillance Framework: Classification to Event Detection", **Journal of Electronic Imaging**, Special Issue on "Video Surveillance and Transportation Imaging Applications", vol. 22, no. 4, pp. 1-17, 2013.
- [44] B. Li, E. Erdin, M. Gunes, G. Bebis, and T. Shipley, "An Overview of Anonymity Technology Usage", **Computer Communications**, vol 36, no. 12, pp. 1269-1283. 2013
- [43] B. Li, J. Springer, G. Bebis, and M. Gunes, "A Survey Of Network Flow Applications", **Journal of Networks and Computer Applications**, vol. 36, pp. 567-581, 2013.
- [42] S. Yang, G. Bebis, M. Hussain, G. Muhammad, and A. Mirza, "Unsupervised Discovery of Visual Face Categories", **International Journal of Artificial Intelligence Tools**, vol. 22, no. 1, 2013.
- [41] G. Muhammad, M. Hussain, F. Alenezy, G. Bebis, A. Mirza, and H. Aboalsamh, "Race Classification from Face Images Using Local Descriptors", **International Journal of Artificial Intelligence Tools**, vol. 21, no. 5, 2012.
- [40] G. Muhammad, M. Hussain and G. Bebis, "Passive copy move image forgery detection using undecimated dyadic wavelet transform", **Digital Investigation**, vol. 9, pp. 49-57, 2012.
- [39] L. Loss, G. Bebis, and B. Parvin, "Iterative Tensor Voting for Perceptual Grouping of Ill-Defined Curvilinear Structures", **IEEE Transactions on Medical Imaging**, vol. 30, no. 8, pp. 1503-1513, 2011.
- [38] Tom Patten, Wenjing Li, George Bebis, and Muhammad Hussain, "Assessing Insect Growth Using Image Analysis", **International Journal of Artificial Intelligence Tools**, vol. 20, no. 3, pp. 511-530, 2011.
- [37] U. Rajanna, A. Erol, and G. Bebis, "A Comparative Study on Feature Extraction for Fingerprint Classification and Performance Improvements Using Rank-Level Fusion", **Pattern Analysis and Applications**, vol. 13, no. 3, pp. 263-272, 2010.
- [36] J. Wang, G. Bebis, Mircea Nicolescu, Monica Nicolescu, and R. Miller, "Improving Target Detection by Coupling It with Tracking", **Machine Vision and Applications**, vol. 20, no. 4, pp. 205-223, 2009.
- [35] T. Uz, G. Bebis, A. Erol, and S. Prabhakar, "Minutiae-Based Template Synthesis and Matching for Fingerprint Authentication", **Computer Vision and Image Understanding (CVIU)**, vol 113, pp. 979-992, 2009.
- [34] A. Amayeh, G. Bebis, and M. Nicolescu, "Hand-based Verification and Identification Using Palm-Finger Segmentation and Fusion", **Computer Vision and Image Understanding Journal (CVIU)**, vol 113, pp. 477-501, 2009.

- [33] J. Martinez, A. Erol, G. Bebis, R. Boyle, and X. Twombly, "Integrating Perceptual Level of Detail with Head Pose Estimates and their Uncertainty", **Machine Vision and Applications**, vol 21, no. 1, pp. 69-83, 2009.
- [32] L. Loss, G. Bebis, M. Nicolescu, and A. Skurikhin, "An Iterative Multi-Scale Tensor Voting Scheme for Perceptual Grouping of Natural Shapes in Cluttered Backgrounds" **Computer Vision and Image Understanding (CVIU)**, vol. 113, no. 1, pp. 126-149, 2009.
- [31] J. Usabiaga, A. Erol, G. Bebis, R. Boyle, and X. Towmbly, "Global Hand-Pose Estimation by Multiple Camera Ellipse Tracking", **Machine Vision and Applications**, vol 21, no. 1, pp. 1-15, 2009.
- [30] A. Tavakkoli, Mircea Nicolescu, G. Bebis, and Monica Nicolescu, "Non-parametric Statistical Background Modeling for Efficient Foreground Region Detection", **Machine Vision and Applications**, vol 20, no 6, pp. 395-409, 2009.
- [29] U. Rajanna, A. Erol, and G. Bebis, "A Comparative Study on Feature Extraction for Fingerprint Classification and Performance Improvements Using Rank-Level Fusion", **Pattern Analysis and Applications**, vol. 13, no. 3, pp. 263-272, 2010.
- [28] R. Kelley, C. King, A. Tavakkoli, Mircea Nicolescu, Monica Nicolescu, and G. Bebis, "An architecture for understanding intent using novel hidden Markov formulation" **International Journal of Humanoid Robotics**, (special issue on "Cognitive Humanoid Robots"), vol. 5, no. 2, pp. 243-264, 2008.
- [27] W. Li, G. Bebis, and N. Bourbakis, "3D Object Recognition Using 2D Views", **IEEE Transactions on Image Processing**, vol. 17, no. 11, pp. 2236-2255, 2008.
- [26] A. Tavakkoli, Mircea Nicolescu, G. Bebis, and Monica Nicolescu, "A Support Vector Data Description Approach for Background Modeling in Videos with Quasi-Stationary Backgrounds", **International Journal of Artificial Intelligence Tools**, vol. 17, no. 4, pp. 635-658, 2008.
- [25] A. Erol, G. Bebis, M. Nicolescu, R. Boyle, X. Twombly, "Vision-Based Hand Pose Estimation: A Review", **Computer Vision and Image Understanding** (special issue on Vision for Human-Computer Interaction), October/November 2007.
- [24] G. Bebis, A. Gyaourova, S. Singh, and I. Pavlidis, "Face Recognition by Fusing Thermal Infrared and Visible Imagery", **Image and Vision Computing**, vol. 24, no. 7, pp. 727-742, 2006.
- [23] Z. Sun, G. Bebis, and R. Miller, "On-road Vehicle Detection: A review", **IEEE Transactions on Pattern Analysis and Machine Intelligence**, vol. 28, no. 5, pp. 694-711, 2006.

- [22] Z. Sun, G. Bebis, and R. Miller, "Monocular Pre-crash Vehicle Detection: Features and Classifiers", **IEEE Transactions on Image Processing**, vol. 15, no. 7, pp. 2019-2034, July 2006.
- [21] Z. Sun, G. Bebis, and R. Miller, "On-Road Vehicle Detection Using Evolutionary Gabor Filter Optimization", **IEEE Transactions on Intelligent Transportation Systems**, vol. 6, no. 2, pp. 125-137, 2005.
- [20] Z. Sun, G. Bebis, and R. Miller, "Boosting Object Detection Using Feature Selection", **Pattern Recognition**, vol. 37, pp. 2165-2176, 2004.
- [19] N. Bourbakis, J. Gattiker, and G. Bebis "A Synergistic Model for Interpreting Human Activities and Events from Video", **International Journal on Artificial Intelligence Tools**, vol. 12, no. 1, 2003.
- [18] J. Dowdall, I. Pavlidis, and G. Bebis, "Face Detection Using Multi-Band Fusion", **Image and Vision Computing**, vol 21, no. 7, pp. 565-578, 2003.
- [17] G. Bebis, D. Egbert, and M. Shah, "Review of Computer Vision Education", **IEEE Transactions on Education**, vol. 46, no. 1, pp. 2-21, 2003.
- [16] G. Bebis, S. Louis, Y. Varol, and A. Yfantis, "Genetic Object Recognition Using Combinations of Views", **IEEE Transactions on Evolutionary Computing**, vol 6, no. 2, pp. 132-146, April 2002.
- [15] G. Bebis, S. Uthiram, and M. Georgiopoulos, "Face Detection and Verification Using Genetic Search", **International Journal on Artificial Intelligence Tools**, vol 9, no 2, pp. 225-246, 2000.
- [14] E. Yfantis, T. Lazarakis, G. Bebis, and M. Gallitano, "An Algorithm for Cancer Recognition of Ultrasound Images", **International Journal on Artificial Intelligence Tools**, vol 9, no 2, pp. 265-276, 2000.
- [13] M. Georgiopoulos, I. Dagher, G. Heilman, and G. Bebis, "Properties of Learning of a Fuzzy ART Variant", **Neural Networks**, vol. 12, No. 6, pp. 837-850, 1999.
- [12] G. Bebis, M. Georgiopoulos, N. La Vitoria Lobo, and M. Shah, "Recognition by Learning Affine Transformations", **Pattern Recognition**, Vol. 32, No. 10, pp. 1783-1799, 1999.
- [11] G. Bebis, G. Papadourakis and S. Orphanoudakis, "Curvature Scale Space Driven Object Recognition with an Indexing Scheme based on Artificial Neural Networks", **Pattern Recognition**, Vol. 32, No. 7, pp. 1175-1201, 1999.
- [10] I. Dagher, M. Georgiopoulos, G. Heilman, and G. Bebis, "An Ordering Algorithm for Pattern Presentation in Fuzzy ARTMAP That Tends to Improve Generalization Performance", **IEEE Transactions on Neural Networks**, Vol. 10, No. 4, pp. 768-778, 1999.

- [9] G. Bebis, M. Georgiopoulos, M. Shah, and N. La Vitoria Lobo, "Indexing based on algebraic functions of views", **Computer Vision and Image Understanding**, vol. 72, no. 3, pp. 360-378, 1998.
- [8] G. Bebis, M. Georgiopoulos and N. La Vitoria Lobo, "Using Self-Organizing Maps to Learn Geometric Hashing Functions for Model-Based Object Recognition", **IEEE Transactions on Neural Networks**, Vol 9, No. 3, pp. 560-570, 1998.
- [7] G. Bebis, M. Georgiopoulos, and T. Kasparis "Coupling weight elimination with genetic algorithms to reduce network size and preserve generalization" **Neurocomputing**, Vol. 17, No. 3&4, pp. 167-194, 1997.
- [6] M. Georgiopoulos, H. Fernlund, G. Bebis, and G. Heileman, "Order of Search in Fuzzy ART and Fuzzy ARTMAP: Effect of the Choice Parameter", **Neural Networks**, vol. 9, no. 9, pp. 1541-1559, 1996.
- [5] G. Bebis and M. Georgiopoulos, "Feed-forward neural networks: why network size is so important", **IEEE Potentials**, pp. 27-31, October/November 1994.
- [4] G. Bebis and G. Papadourakis, "Object Recognition Using Invariant Object Boundary Contour Representations and Neural Network Models", **Pattern Recognition**, Vol. 25, No. 1, pp. 25-44, January 1992.
- [3] G. Papadourakis and G. Bebis, "Artificial Neural Networks I", **Scientific Journal of the Technical Chamber of Greece**, Vol. 11, No. 3, pp. 57-73, 1991.
- [2] G. Papadourakis and G. Bebis, "Artificial Neural Networks II", **Scientific Journal of the Technical Chamber of Greece**, Vol. 12, No. 1, pp. 107-131, 1992.
- [1] G. Bebis, G. Papadourakis and M. Georgiopoulos, "Back Propagation: Increasing Rate of Convergence by Predictable Pattern Loading", **Intelligent Systems Review**, Vol. 1, No. 3, pp. 14-30, 1989.

## **Conference Publications (peer reviewed)**

- [139] Touqeer Ahmad, Pavel Campr, Martin Cadik, and George Bebis "Comparison of Semantic Segmentation Approaches for Horizon/Sky Line Detection", **International Joint Conference on Neural Networks (IJCNN'17)**, Anchorage, Alaska, May 14-19, 2017.
- [138] Touqeer Ahmad, David Ilstrup, Ebrahim Emami, and George Bebis, "Symbolic Road Marking Recognition Using Convolutional Neural Networks", **IEEE Intelligent Vehicles Symposium (IV'17)**, Redondo Beach, CA, June 11-14, 2017.

- [137] Ebrahim Emami, George Bebis, Ara Nefian, and Terry Fong, "On Crater Verification Using Mislocalized Crater Regions", **IEEE Workshop on Applications in Computer Vision (WACV'17)**, Santa Rosa, CA, March 27-30, 2017.
- [136] Luke Fraser, Banafsheh Rekabdar, Monica Nicolescu, Mircea Nicolescu, David Feil-Seifer and George Bebis, "A Compact Task Representation for Hierarchical Robot Control", **IEEE-RAS International Conference on Humanoid Robots**, Cancun, Mexico, 2016.
- [135] Yu Ding, Mircea Nicolescu, Dan Farmer, Yao Wang, George Bebis, and Fabien Scalzo, "Tensor Voting Extraction of Vessel Centerlines from Cerebral Angiograms", **12th International Symposium on Visual Computing (ISVC'16)**, Las Vegas, NV, 2016.
- [134] Raqinah Alrabiah, Muhammad Hussain, Hatim A. Aboalsamh, Mansour Zuair, and George Bebis, "PH-BRINT: Pooled Homomorphic Binary Rotation Invariant and Noise Tolerant Representation for Face Recognition under Illumination Variations", **12th International Symposium on Visual Computing (ISVC'16)**, Las Vegas, NV, 2016.
- [133] Mariam Busaleh, Muhammad Hussain, Hatim A. Aboalsamh, Mansour Zuair, and George Bebis, "False Positive Reduction in Breast Mass Detection using the Fusion of Texture and Gradient Orientation Features", **12th International Symposium on Visual Computing (ISVC'16)**, Las Vegas, NV, 2016.
- [132] Muhammad Hussain, Awabed Jibreen, Hatim Aboalsmah, Hassan Madkour, George Bebis and Gholamreza Amayeh, "Feature Selection for Hand-Shape Based Identification", **International Joint Conference, Advances in Intelligent Systems and Computing**, 2015.
- [131] Ebrahim Emami, George Bebis, Ara Nefian, and T. Fong, "Automatic Crater Detection Using Convex Grouping and Convolutional Neural Networks", **11th International Symposium on Visual Computing (ISVC'15)**, Las Vegas, Nevada, December 14-16, 2015.
- [130] Touqeer Ahmad, George Bebis, Monica Nicolescu, Ara Nefian, and T. Fong, "An Edge-less Approach to Horizon Line Detection", **IEEE International Conference on Machine Learning and Applications (ICMLA'15)**, Miami, Florida, December 9-11, 2015.
- [129] Touqeer Ahmad, George Bebis, Monica Nicolescu, Ara Nefian, and T. Fong, "Fusion of Edge-less and Edge-based Approaches for Horizon Line Detection", **International Conference on Information, Intelligence, Systems and Applications (IISA'15)**, Corfu, Greece, July 6-8, 2015.
- [128] Touqeer Ahmad, George Bebis, Emma Regentova, Ara Nefian, and T. Fong, "An Experimental Evaluation of Different Features and Nodal Costs for Horizon Line Detection", **10th International Symposium on Visual Computing (ISVC'14)**, Las Vegas, Nevada, USA, December 8-10, 2014.
- [127] Faezeh Tafazzoli, George Bebis, Sushil Louis and Muhammad Hussain, "Improving Human Gait Recognition Using Feature Selection", **10th International Symposium on Visual Computing (ISVC'14)**, Las Vegas, Nevada, USA, December 8-10, 2014.

- [126] Ali Pour Yazdanpanah, Ajay K.Mandava, Emma E. Regentova, Venkatesan Muthukumar, and George Bebis, "A CUDA based Implementation of Locally- and Feature-Adaptive Diffusion based Image Denoising Algorithm", **International Conference on Information Technology: New Generations**, 2014.
- [125] Muhammad Hussain, Sahar Q. Saleh, Hatim Aboalsamh, Ghulam Muhammad, and George Bebis "Comparison between WLD and LBP Descriptors for Non-intrusive Image Forgery Detection ", **IEEE International Symposium on Innovations in Intelligent Systems and Applications (INISTA)**, 2014.
- [124] Muhammad Hussain, Sarah Al-Otaibi, Hatim Aboalsamh, George Bebis, and Ghulam Muhammad "Nonsampled Contourlet Transform Based Descriptors for Gender Recognition", **11th International Conference on Computer Graphics, Imaging and Visualization**, 2014.
- [123] A. Nefian, X. Boyssounousse, L. Edwards, T. Kim, E. Hand, J. Rhizor, M. Deans, G. Bebis, and T. Fong, "Planetary Rover Localization within Orbital Maps", **International Conference on Image Processing**, Paris, France, October 27-30, 2014.
- [122] A. Nefian, X. Boyssounousse, L. Edwards, T. Kim, E. Hand, J. Rhizor, M. Deans, G. Bebis, and T. Fong, "Infrastructure free rover localization ", **International Symposium on Artificial Intelligence, Robotics and Automation in Space (i-SAIRAS)**, Montreal, Canada, June 17-19, 2014.
- [121]Alomar, F.A. ; Muhammad, G. ; Aboalsamh, H. ; Hussain, M. ; Mirza, A.M. ; Bebis, G., "Gender recognition from faces using bandlet and local binary patterns ", **International Conference on Systems, Signals and Image Processing (IWSSIP)**, Bucharest, Romania, July 7-9, 2013.
- [120] M. Kim, J. Angermann, G. Bebis and E. Folmer, "ViziCal: Accurate Energy Expenditure Prediction for Playing Exergames", **ACM Symposium on User Interface Software and Technology (UIST'13)**, St Andrews, UK, Oct. 8-11, 2013.
- [119] Alamri, T. ; Hussain, M. ; Aboalsamh, H. ; Muhammad, G. ; Bebis, G. ; Mirza, A.M., "Category Specific Face Recognition Based on Gender\_", **International Conference on Information Science and Applications (ICISA)**, Pattaya, Thailandm June 24-26, 2013.
- [118] M. Jaber, G. Bebis, M. Hussain, and G. Muhammad, "Improving the Detection and Localization of Duplicated Regions in Copy-Move Image Forgery", **18th International Conference on Digital Signal Processing**, Santorini, Greece, July 1-3 2013.
- [117] M. Hussain, S. Al-Otaibi, G. Muhammad, A. Mirza, H. Aboalsamh and G. Bebis "Gender Recognition using Non-sampled Contourlet Transform and WLD Descriptor", **18th Scandinavian Conference on Image Analysis**, Espoo, Finland, June 17-20, 2013.

- [116] T. Ahmad, G. Bebis, E. Regentova, and A. Nefian, "A Machine Learning Approach to Horizon Line Detection Using Local Features", **9th International Symposium on Visual Computing (ISVC'13)**, Crete, Greece, July 29-31, 2013.
- [115] I. Apostolopoulos, E. Folmer, and G. Bebis, "Improving Accessibility of Virtual Worlds by Automatic Object Labeling", **9th International Symposium on Visual Computing (ISVC'13)**, Crete, Greece, July 29-31, 2013.
- [114] M. Hussain, G. Muhammad, S. Saleh, A. Mirza, and G. Bebis, "Image forgery detection using multi-resolution Weber local descriptors ", **IEEE EUROCON**, Zagreb, Croatia, July 1-4, 2013.
- [113] M. Hussain, G. Muhammad, and G. Bebis, "Face Recognition using Multiscale and Spatially Enhanced Weber Law Descriptor", **8th International Conference on Signal Image Technology and Internet Based Systems**, Nov. 25-29, 2012, Naples, Italy.
- [112] M. Hussain, G. Muhammad, Q. Sahar, G. Bebis, and A. Mirza, "Copy-move Image Forgery Detection using Multi-resolution Weber Descriptors", **8th International Conference on Signal Image Technology and Internet Based Systems**, Nov. 25-29, 2012, Naples, Italy.
- [111] M. Hussain, S. Khan, G. Muhammad, and G. Bebis, "A Comparison of Different Gabor features for Mass Classification in Mammography", **8th International Conference on Signal Image Technology and Internet Based Systems**, Nov. 25-29, 2012, Naples, Italy.
- [110] G. Muhammad, M. Hussain, F. Alenezy, A. Mirza, G. Bebis, and H. Aboalsamh, "Race recognition using local descriptors", **IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)**, pp. 1525-1528, 2012.
- [109] G. Muhammad, M. Hussain, A. Mirza, and G. Bebis, "Dyadic wavelets and DCT based blind copy-move image forgery detection", **IET Conference on Image Processing**, 2012.
- [109] M. Hussain, S. Khan, G. Muhammad, M. Berbar, and G. Bebis, "Mass detection in digital mammograms using Gabor filter bank", **IET Conference on Image Processing**, 2012.
- [108] L. Loss, G. Bebis, H. Chang, M. Auer, P. Sarkar, and B. Parvin, "Automatic Segmentation and Quantification of Filamentous Structures in Electron Tomography", **ACM Conference on Bioinformatics, Computational Biology and Biomedicine**, Orlando, Florida, October 7-10, 2012.
- [107] G. Muhammad, M. Hussain, F. Alenezy, G. Bebis, and A. Mirza, "Race Recognition From Face Images Using Weber Local Descriptor", **International Conference on Systems, Signals, and Image Processing**, Vienna, Austria, April 11-13, 2012.
- [106] I. Ullah, M. Hussain, G. Muhammad, H. Aboalsamh, G. Bebis, and A. Mirza, "Gender Recognition from Face Images with Local WLD Descriptor", **International Conference on Systems, Signals, and Image Processing**, Vienna, Austria, April 11-13, 2012.

- [105] I. Ullah, M. Hussain, G. Muhammad, H. Aboalsamh, G. Bebis, and A. Mirza, "Gender Recognition from Face Images with Dyadic Wavelet Transform and Local Binary Pattern", **International Symposium on Visual Computing**, Rethymnon, Crete, Greece, July, 2012.
- [104] C. Moujahdi, S. Ghouzali, M. Mikram, M. Riza, and G. Bebis, "Spiral Cube for Biometric Template Protection", **International Conference on Image and Signal Processing**, Agadir, Morocco, June, 2012.
- [103] N. Muhammad, M. Hussain, G. Muhamad, and G. Bebis, "Copy-Move Forgery Detection Using Dyadic Wavelet Transform ", **IEEE International Conference on Computer Graphics, Imaging and Visualization (CGIV'11)**, Singapore, August 17-19, 2011.
- [102] BingDong Li, Esra Erdin, Mehmet H. Gunes, George Bebis and Todd Shipley, "An Analysis of Anonymity Technology Usage", **3rd COST TMA International Workshop on Traffic Monitoring and Analysis**, Vienna, Austria, April 27, 2011.
- [101] Joshua Gleason, Ara V. Nefian, Xavier Bouysounousse, Terry Fong and George Bebis, "Vehicle Detection from Aerial Imagery", **IEEE International Conference on Robotics and Automation (ICRA11)**, Shanghai, China, May 9-13, 2011.
- [100] A. Tavakkoli, M. Nicolescu, and G. Bebis, "A Spatio-Spectral Algorithm for Robust and Scalable Object Tracking in Videos", **6th International Symposium on Visual Computing**, Las Vegas, Nevada, Nov 29 - Dec 1, 2010.
- [99] G. Amayeh, G. Bebis, and M. Hussain, "A Comparative Study of Hand Recognition Systems", **Workshop on Emerging Techniques and Challenges for Hand-based Biometrics (in conjunction with ICPR 2010)**, Istanbul, Turkey, August 22, 2010.
- [98] M. El Ansari, S. Mousset, A. Bensrhair, and G. Bebis, "Temporal Consistent Fast Stereo Matching for Advanced Driver Assistance Systems (ADAS)", **IEEE Intelligent Vehicles Symposium (IV10)**, San Diego, CA, June 21-24, 2010.
- [97] G. Amayeh, A. Tavakkoli, and G. Bebis, "Accurate and Efficient Computation of Gabor Features in Real-Time Applications", **5th International Symposium on Visual Computing (ISVC09)**, Las Vegas, Nevada, USA, November 30 - December 2, 2009.
- [96] G. Amayeh, G. Bebis, and M. Nicolescu, "Improving Hand-Based Verification Through Online Finger Template Update Based on Fused Confidences", **IEEE International Conference on Biometrics: Theory, Applications and Systems (BTAS09)**, September 28-30, 2009, Washington DC.
- [95] L. Loss, G. Bebis, and B. Parvin, "Tunable Tensor Voting Improves Grouping of Membrane- Bound Macromolecules", **IEEE Workshop on Mathematical Methods in Biomedical Image Analysis**, (in conjunction with CVPR09), Miami, USA, June 20, 2009.



- [94] L. Loss, G. Bebis, and B. Parvin, "Tunable Tensor Voting for Rregularizing Punctat Patterns of Membrane-Bound Protein Signals", **IEEE International Symposium on Biomedical Imaging**, Boston, USA, June 28 - July 1, 2009.
- [93] F. Scalzo, G. Bebis, Mircea Nicolescu, L. Loss, and A. Tavakkoli, "Feature Fusion Hierarchies for Gender Classification", **International Conference on Pattern Recognition (ICPR08)**, December 2008.
- [92] A. Tavakkoli, Mircea Nicolescu, G. Bebis and Monica Nicolescu, "Efficient Background Modeling through Incremental Support Vector Data Description", **International Conference on Pattern Recognition (ICPR08)**, December 2008.
- [91] L. Loss, G. Bebis, M. Nicolescu, and A. Skurikhin, "Investigating How and When Perceptual Organization Cues Improve Boundary Detection in Natural Images", **IEEE Workshop on Perceptual Organization in Computer Vision** (in conjunction with CVPR08), 2008.
- [90] G. Amayeh, G. Bebis and M. Nicolescu, "Gender Classification from Hand Shape", **IEEE Workshop on Biometrics** (in conjunction with CVPR08), 2008.
- [89] A. Tavakkoli, Mircea Nicolescu, Monica Nicolescu, and G. Bebis, "Incremental SVDD Training: Improving Efficiency of Background Modeling in Videos", **Signal and Image Processing (SIP08)**, Hawaii, August 2008.
- [88] A. Ambardekar, M. Nicolescu, and G. Bebis, "Efficient Vehicle Tracking and Classification for an Automated Traffic Surveillance System ", **Signal and Image Processing (SIP08)**, Hawaii, August 2008.
- [87] F. Scalzo, G. Bebis, M. Nicolescu, and L. Loss, "Multimodal Feature Fusion Hierarchies", **Benelearn**, Spa, Belgium, May 2008.
- [86] K. McDermott, I. Juricevic, G. Bebis, and M. Webster, "Adapting Images to Observers", **SPIE Electronic Imaging (Human Vision and Electronic Imaging XIII)**, vol. 6806, San Jose, CA, January 2008.
- [85] R. Kelley, A. Tavakkoli, C. King, Monica Nicolescu, Mircea Nicolescu, and George Bebis, "Understanding Human Intentions via Hidden Markov Models in Autonomous Mobile Robots", **ACM/IEEE International Conference on Human-Robot Interaction**, Amsterdam, Netherlands, March 2008.
- [84] A. Tavakkoli, R. Kelley, C. King, Mircea Nicolescu, Monica Nicolescu, and G. Bebis, "A Vision-based Architecture for Intent Recognition", **3rd International Symposium on Visual Computing (ISVC07)**, Lecture Notes of Computer Science (LNCS), vol. 4842, pp. 173-182, November 26-28, 2007, Lake Tahoe, NV.
- [83] M. Webster, K. McDermott, and G. Bebis, "Fitting the world to the mind: Transforming images to mimic perceptual adaptation", **3rd International Symposium on Visual**

**Computing (ISVC07)**, Lecture Notes of Computer Science (LNCS), vol. 4842, pp. 757-768, November 26-28, 2007, Lake Tahoe, NV.

[82] Z. Sun, G. Bebis, and N. Bourbakis, "Decision-Level Fusion for Vehicle Detection", **11<sup>th</sup> International Conference on Computers**, July 2007, Crete, Greece.

[81] G. Amayeh, G. Bebis, A. Erol, and M. Nicolescu, "A new approach to Hand-based Authentication", **SPIE Defense and Security Symposium (DS26: Biometric Technology for Human Identification V)**, April 2007, Orlando, Florida.

[80] G. Amayeh, G. Bebis, A. Erol, and M. Nicolescu, "A component-based Approach to Hand Verification", **IEEE Workshop on Biometrics (in conjunction with CVPR07)**, Minneapolis, MN, June 2007.

[79] T. Uz, G. Bebis, A. Erol, and S. Prabhakar, "Minutia-Based Template Synthesis and Matching Using Hierarchical Delaunay Triangulations", **IEEE International Conference on Biometrics: Theory, Applications and Systems (BTAS07)**, September 27-29, 2007, Washington DC.

[78] L. Loss, G. Bebis, M. Nicolescu, and A. Skurikhin, "An Automatic Framework for Figure-Ground Segmentation in Cluttered Backgrounds", **British Machine Vision Conference (BMVC 2007)**, University of Warwick, UK, September 10-13, 2007.

[77] G. Amayeh, S. Kasaei, G. Bebis, A. Tavakkoli, and K. Veropoulos, "Improvement of Zernike Moment Descriptors on Affine Transformed Shapes", **International Symposium on Signal Processing and its Applications (ISSPA07)**, United Arab Emirates, February 12-15, 2007.

[76] L. Loss, G. Bebis, M. Nicolescu, and A. Skourikhine, "Perceptual Grouping Based on Iterative Multi-Scale Tensor Voting", **2nd International Symposium on Visual Computing (ISVC06)**, Lake Tahoe, November 6-8, 2006.

[75] A. Tavakkoli, M. Nicolescu, and G. Bebis, "A Novelty Detection Approach for Foreground Region Detection in Videos with Quasi-stationary Backgrounds", **2nd International Symposium on Visual Computing (ISVC06)**, Lake Tahoe, November 6-8, 2006.

[74] J. Usabiaga, A. Erol, G. Bebis, R. Boyle, and X. Twombly, "Global Hand Pose Estimation by Multiple Camera Ellipse Tracking", **2nd International Symposium on Visual Computing (ISVC06)**, Lake Tahoe, November 6-8, 2006.

[73] N. Bourbakis and G. Bebis, "A Method for Associating Patterns of Motion in Events from Video: A Case Study", **IEEE International Conference on Tools with Artificial Intelligence (ICTAI06)**, Washington, DC, November 2006.

- [72] A. Tavakkoli, M. Nicolescu, G. Bebis, "Robust Recursive Learning for Foreground Region Detection in Videos with Quasi-Stationary Backgrounds", **International Conference on Pattern Recognition (ICPR06)**, Hong Kong, August 2006.
- [71] G. Amayeh, G. Bebis, A. Erol, and M. Nicolescu, "Peg-Free Hand Shape Verification Using High Order Zernike Moments", **IEEE Workshop on Biometrics** (in conjunction with CVPR06), New York, NY, June 2006.
- [70] J. Wang, G. Bebis, and R. Miller, "Robust Video-Based Surveillance by Integrating Target Detection with Tracking", **IEEE Workshop on Object Tracking and Classification Beyond the Visible Spectrum** (in conjunction with CVPR06), New York, NY, June 2006.
- [69] A. Tavakkoli, M. Nicolescu, and G. Bebis, "An Adaptive Recursive Learning Technique for Robust Foreground Object Detection", **Workshop on Statistical Methods in Multi-image and Video Processing** (in conjunction with ECCV06), Graz, Austria, May 2006.
- [68] A. Tavakkoli, M. Nicolescu, and G. Bebis, "Automatic Statistical Object Detection for Visual Surveillance", **IEEE Southwest Symposium on Image Analysis and Interpretation**, Denver, CO, March 2006.
- [67] K. McDermott, J. Mulligan, G. Bebis, and M. Webster, "Visual Search and Eye Movements in Novel and Familiar Contexts", **SPIE Electronic Imaging (Human Vision and Electronic Imaging XI)**, San Jose, January 2006.
- [66] K. Veropoulos, G. Bebis, and M. Webster, "Investigating the Impact of Face Categorization on Recognition Performance", **1st International Symposium on Visual Computing**, (LNCS, vol 3804), Lake Tahoe, NV, December 2005.
- [65] G. Amayeh, A. Erol, G. Bebis, and M. Nicolescu, "Accurate and Efficient Computation of High Order Zernike Moments", **1st International Symposium on Visual Computing**, (LNCS, vol 3804), Lake Tahoe, NV, December 2005.
- [64] J. Martinez, A. Erol, G. Bebis, R. Boyle, and X. Twombly, "Rendering Optimizations Guided by Head-Pose Estimates and their Uncertainty", **1st International Symposium on Visual Computing**, (LNCS, vol 3804), Lake Tahoe, NV, December 2005.
- [63] A. Tavakkoli, M. Nicolescu, and G. Bebis, "Automatic Robust Background Modeling Using Multivariate Non-Parametric Kernel Density estimation for Visual Surveillance", **1st International Symposium on Visual Computing**, (LNCS, vol 3804), Lake Tahoe, NV, December 2005.
- [62] A. Erol, G. Bebis, M. Nicolescu, R. Boyle and X. Twombly, "A Review on Vision-Based Full DOF Hand Motion Estimation", **IEEE Workshop on Vision for Human-Computer Interaction**, (in conjunction with CVPR 05), San Diego, CA, June 21, 2005.

- [61] J. Wang, G. Bebis, and R. Miller, "Overtaking Vehicle Detection Using Dynamic and Quasi-Static Background Modeling", **IEEE Workshop on Machine Vision for Intelligent Vehicles**, (in conjunction with CVPR 05), San Diego, CA, June 21, 2005.
- [60] N. Goel, G. Bebis, A. Nefian, "Face Recognition Experiments with Random Projection", **SPIE Defense and Security Symposium (Biometric Technology for Human Identification)**, Orlando, FL, March 28 - April 1, 2005.
- [59] A. Erol, G. Bebis, R. Boyle and M. Nicolescu, "Visual Hull Construction Using Adaptive Sampling", **IEEE Workshop on Applications of Computer Vision**, (WACC05) Breckenridge, CO, January 5-7, 2005.
- [58] T. Patten, W. Li, G. Bebis, and M. Freeman, "Automatic Heliopsis Zea Classification Using Image Analysis", **IEEE International Conference on Tools with Artificial Intelligence**, Boca Raton, FL, November 15-17, 2004.
- [57] K. She, G. Bebis, H. Gu, and R. Miller, "Vehicle Tracking Using On-Line Fusion of Color and Shape Features", **IEEE International Conference on Intelligent Transportation Systems**, Washington, DC, October 3-6, 2004.
- [56] Z. Sun, G. Bebis, and R. Miller, "On-road Vehicle Detection Using Optical Sensors: A Review", **IEEE International Conference on Intelligent Transportation Systems**, Washington, DC, October 3-6, 2004.
- [55] M. Eser, G. Cong, B. Parvin, and G. Bebis, "Shape Metamorphism Using p-Laplacian Equation", **International Conference on Pattern Recognition (ICPR04)**, Cambridge UK, 23-26 August 2004.
- [54] W. Li, G. Bebis, and N. Bourbakis, "Integrating Algebraic Functions of Views with Indexing and Learning for 3D Object Recognition", **IEEE Workshop on Learning in Computer Vision and Pattern Recognition**, Washington DC, June 28, 2004.
- [53] A. Sighn, A. Gyaourova, G. Bebis, and I. Pavlidis, "Infrared and Visible Image Fusion for Face Recognition", **SPIE Defense and Security Symposium (Biometric Technology for Human Identification)**, Orlando, 12-16 April, 2004.
- [52] A. Gyaourova, G. Bebis, and I. Pavlidis, "Infrared and Visible Image Fusion for Face Recognition", **European Conference on Computer Vision (ECCV)**, May 2004.
- [51] V. Nikulin and G. Bebis, "Multiresolution Image Retrieval Through Fusion", **SPIE Electronic Imaging (Storage and Retrieval Methods and Applications for Multimedia)**, San Jose, January 2004.
- [50] Z. Sun, G. Bebis, and R. Miller, "Evolutionary Gabor Filter Optimization with Application to Vehicle Detection", **IEEE International Conference on Data Mining**, pp. 307-314, Melbourne FL, November 2003.

- [49] J. Bhatt, N. Lobo, M. Shah, and G. Bebis "Automatic recognition of a baby gesture", **IEEE International Conference on Tools with Artificial Intelligence**, November 2003, Sacramento.
- [48] Z. Sun, G. Bebis, and R. Miller, "Boosting Object Detection Using Feature Selection", **IEEE International Conference on Advanced Video and Signal Based Surveillance**, pp. 290-296, Miami, July 2003.
- [47] Z. Sun, Z. Sun, Y. Varol and G. Bebis, "A distributed Visual Surveillance System", **IEEE International Conference on Advanced Video and Signal Based Surveillance**, Miami, July 2003.
- [46] J. Dowdall, I. Pavlidis, and G. Bebis "Face Detection in the Near-IR Spectrum", **AeroSense SPIE Conference**, April 2003, Orlando.
- [45] Dwight Egbert, George Bebis, and Dave Williams, "Computer Vision Research Teaching Modules for Community College Computer Science and Engineering Courses", **SEE Annual Conference & Exposition**, June 2003.
- [44] G. Bebis and D. Egbert, "Using Computer Vision to Improve Learning and Knowledge Acquisition", **4th International Conference on Information Communication Technologies in Education**, Samos, Greece, July 2003.
- [43] G. Bebis and D. Egbert, "Integrating Teaching with Research Using Computer Vision Examples", **International Conference on Computers and Advanced Technology in Education**, Rhodes, Greece, July 2003.
- [42] Z. Sun, G. Bebis, X. Yuan, and S. Louis, "Genetic Feature Subset Selection for Gender Classification: A Comparison Study", **IEEE Workshop on Applications of Computer Vision (WACV02)**, Orlando, December 2002.
- [41] Z. Sun, R. Miller, G. Bebis, and D. DiMeo, "A Real-time Pre-crash Vehicle Detection System", **IEEE Workshop on Applications of Computer Vision (WACV02)**, Orlando, December 2002.
- [40] Z. Sun, G. Bebis, and R. Miller, "On-Road Vehicle Detection Using Gabor Filters and Support Vector Machines", **IEEE International Conference on Digital Signal Processing**, Santorini, Greece, July 2002.
- [39] Z. Sun, G. Bebis, and R. Miller, "Improving the Performance of On-Road Vehicle Detection by Combining Gabor and Wavelet Features", **IEEE International Conference on Intelligent Transportation Systems**, Singapore, September 2002.
- [38] Z. Sun, G. Bebis, and R. Miller, "Quantized Wavelet Features and Support Vector Machines for On-Road Vehicle Detection", **IEEE International Conference on Control, Automation, Robotics and Vision**, Singapore, December 2002.

- [37] B. Carlson, G. Bebis, and C. Looney, "Minutiae Detection Through Classifier Fusion and Clustering", **International Conference on Imaging Science, Systems, and Technology**, Las Vegas, June 2002.
- [36] D. Egbert, G. Bebis, M. McIntosh, N. LaTourrette, and A. Mitra "Computer Vision Research as a Teaching Tool in CS1", **32nd ASEE/IEEE Frontiers in Education Conference**, Boston, November 2002.
- [35] J. Dowdall, I. Pavlidis, and G. Bebis, "A Face Detection Method Based on Multi-Band Feature Extraction in the Near-IR Spectrum", **IEEE Workshop on Computer Vision Beyond the Visible Spectrum**, (in conjunction with CVPR01), December 2001, Hawaii.
- [34] Z. Sun, X. Yuan, G. Bebis, and S. Louis, "Neural-Network-Based Gender Classification Using Genetic Eigen-Feature Extraction", **IEEE International Joint Conference on Neural Networks**, May 2002.
- [33] W. Abd-Almageed, S. Fadali, and G. Bebis "A Non-intrusive Kalman Filter-Based Tracker for Pursuit Eye Movement", **American Control Conference**, May 2002.
- [32] N. Bourbakis, G. Bebis, and J. Gattiker, "A Synergistic Model for Interpreting Human Activities and Events from Video: A Case Study", **IEEE International Conference on Tools with Artificial Intelligence (ICTAI00)**, pp. 132-139, Vancouver, 2000.
- [31] G. Bebis and K. Fujimura, "An Eigenspace Approach to Eye-Gaze Estimation", **13<sup>th</sup> International Conference on Parallel and Distributed Computing Systems (Special Session on Digital Video and Digital Audio)**, pp. 604-609, Las Vegas, 2000.
- [30] E. Yfantis, T. Lazarakis, A. Popovitch, A. Angelopoulos, and G. Bebis, "On Cancer Recognition of Ultrasound Images", **IEEE Workshop on Computer Vision Beyond the Visible Spectrum: Methods and Applications**, (in conjunction with CVPR00), pp 44-54, Hilton Head Island, 2000.
- [29] G. Bebis, T. Deaconu and M. Georgiopoulos, "Fingerprint Recognition Using Delaunay Triangulation", **IEEE International Conference on Information, Intelligence, and Systems**, pp. 452-459, Maryland, 1999.
- [28] E. Yfantis, T. Lazarakis, G. Bebis, and G. Gallitano "A Computer Algorithm for Cancer Recognition on Ultrasound Images of Prostate Tissue", **IEEE International Conference on Information, Intelligence, and Systems**, pp. 34-39, Maryland, 1999.
- [27] G. Bebis, S. Uthiram and M. Georgiopoulos, "Genetic Search for Face Detection and Verification", **IEEE International Conference on Intelligence, Information and Systems (ICIIS'99)**, pp. 360-368, Maryland, 1999.
- [26] Qiang Ji and George Bebis, Visual Cues Extraction for Monitoring Driver's Vigilance, **First Honda Initiation Grant Forum: The HIG Symposium**, pp. 48-55, 1999.

- [25] G. Bebis, M. Georgiopoulos, M. Shah, and N. da Vitoria Lobo, "Algebraic Functions of Views for Model-Based Object Recognition", **Sixth International Conference on Computer Vision (ICCV98)**, pp. 634-639, India, January 1998.
- [24] G. Bebis, S. Louis, and S. Fadali, "Using Genetic Algorithms for 3D Object Recognition", **11th International Conference on Computer Applications in Industry and Engineering**, pp. 13-16, Las Vegas, November 1998.
- [23] G. Bebis, George Papadourakis, and S. Orphanoudakis, "Recognition Using Curvature Scale Space and Artificial Neural Networks", **1998 Signal and Image Processing Conference**, pp. 613-618, Las Vegas, October 1998.
- [22] S. Louis, G. Bebis, S. Uthiram, and Y. Varol, "Genetic Object Recognition", **7th Annual Conference on Evolutionary Programming**, LNCS 1447, V. Porto et. al (Eds.), pp. 199-208, San Diego, March 1998.
- [21] S. Fadali and G. Bebis, "Control System Design for LTI Systems Using Interval Analysis", **13th International Conference on Computers and Their Applications**, Honolulu, Hawaii, March 1998.
- [20] G. Bebis, S. Louis, and Y. Varol, "Using Genetic Algorithms for Model-Based Object Recognition", **1998 International Conference on Imaging Science, Systems, and Technology**, pp. 1-6, Las Vegas, July 1998.
- [19] I. Dagher, M. Georgiopoulos, G. Heilman, and G. Bebis, "Fuzzy ARTVar: An Improved Fuzzy ARTMAP Algorithm", **1998 International Joint Conference on Neural Networks (IJCNN98)**, vol. 3, pp. 1688-1693, Alaska, May 4-9, 1998.
- [18] I. Dagher, M. Georgiopoulos, G. Heilman, and G. Bebis, "Ordered Fuzzy ARTMAP: A Fuzzy ARTMAP algorithm with a fixed order", accepted, **1998 International Joint Conference on Neural Networks (IJCNN98)**, Vol. 3, pp. 1717-1722, Alaska, May 1998.
- [17] G. Bebis, M. Georgiopoulos, and S. Bhatia, "Learning Orthographic Transformations for Object Recognition", **IEEE International Conference on Systems, Man, and Cybernetics**, vol. 4, pp. 3576-3581, Orlando, October 1997.
- [16] G. Anagnostopoulos, M. Georgiopoulos, D. Nickerson, and G. Bebis, "Extending the Power of Linear Hybrid Ensemble Methods", **IEEE International Conference on Systems, Man, and Cybernetics**, vol. 2, pp. 1350-1355, Orlando, October 1997.
- [15] M. Georgiopoulos, I. Dagher, G. Heilman, and G. Bebis, "Properties of Learning of a Fuzzy ART Variant", **International Conference on Neural Networks (ICNN97)**, vol. III, pp. 2012-2016, 1997.
- [14] G. Bebis, M. Georgiopoulos, N. da Vitoria Lobo and M. Shah, "Learning Affine Transformations of the Plane for Model-based Object Recognition", **13th International**

**Conference on Pattern Recognition (ICPR96)**, vol. IV, pp. 60-64, Vienna, Austria, August 1996.

[13] G. Bebis, M. Georgiopoulos, and T. Kasparis, "Coupling Weight Elimination and Genetic Algorithms", **International Conference on Neural Networks (ICNN96)**, vol. 2, pp. 1115-1120, Washington, DC, June 1996.

[12] M. Georgiopoulos, H. Fernlund, G. Bebis, and G. Heileman, "Order of Search in Fuzzy ART and Fuzzy ARTMAP: Effect of the Choice Parameter", **International Conference on Neural Networks (ICNN96), Plenary, Panel and Special Session**, (invited paper) pp. 215-220, Washington, DC, June 1996.

[11] G. Bebis and M. Georgiopoulos, "Improving Generalization by Using Genetic Algorithms to Determine the Neural Network Size", **Proceedings of the Southcon Conference**, pp. 592-595, Ft. Lauderdale, Florida, March 1995.

[10] G. Bebis, M. Georgiopoulos and N. La Vitoria Lobo, "Learning Geometric Hashing Functions for Model Based Object Recognition", **Fifth International Conference on Computer Vision (ICCV95)**, pp. 543-548, M.I.T., Cambridge, Massachusetts, June 1995.

[9] P. Karkhanis and G. Bebis, "A Performance Evaluation of Variations to the Standard Backpropagation Algorithm", **Proceedings of the Southcon/94 Conference**, pp. 71-76, Orlando, Florida, March 1994.

[8] G. Bebis, M. Georgiopoulos, G. Papadourakis and G. Heileman, "Increasing Classification Accuracy Using Multiple Neural Network Schemes", **Proceedings of the SPIE (Inter. Soc. for Opt. Eng.)**, Vol. 1709, pp. 221-231, Orlando, Florida, April 1992.

[7] G. Papadourakis, E. Gaga, G. Vareltzis and G. Bebis, "Use of ANN for Clinical Decision-Making (Maldescensus Testis)", **Proceedings of International Joint Conference on Neural Networks 92 (IJCNN92)**, Vol. III, pp. 159-164, Baltimore, Maryland, June 1992.

[6] G. Papadourakis and G. Bebis, "The Design of a Systolic Architecture to Implement Graphic Transformations", **Proceedings of the IEEE CompEuro '91 Conference**, pp. 170-175, Bologna, Italy, May 1991.

[5] G. Bebis and G. Papadourakis, "Model Based Object Recognition Using Artificial Neural Networks", **Artificial Neural Networks, ICANN-91, Vol. 2, Kohonen et. al. (eds.)**, pp. 1111-1115, North-Holland, 1991.

[4] G. Papadourakis and G. Bebis, "Artificial Neural Networks", (*tutorial presentation*), **Proceedings of the Third Panhellenic Conference on Information Sciences**, pp. 336-351, Athens, Greece, May 1991.

[3] G. Papadourakis, S. Micheloyannis, G. Bebis and M. Giaxnakis, "EEG Signal Classification Using Neural Networks", **Engineering Systems with Intelligence, EURISCON'91**, S. Tzafestas (ed.), Kluwer Academic, pp. 221-228, 1991.



[2] G. Papadourakis, G. Bebis and M. Georgiopoulos, "Machine Printed Character Recognition Using Artificial Neural Networks", **Proceedings of the International Neural Networks Conference (INNS-90)**, pp. 392, Paris, 1990.

[1] G. Bebis and G. Papadourakis, "Implementation of Character Recognition Using Neural Networks and Traditional Classifiers", **Proceedings of the NEURONET International Symposium on Neural Networks and Neural Computing**, pp. 33-36, Prague, September 1990.

## **Research Grants (serving/served as Principal Investigator)**

**Agency:** UNR - AIRE

**Investigators:** G. Bebis (PI)

**Title:** Nevada Unmanned Autonomous Systems (UAS) and Advanced Manufacturing (AM) Research Infrastructure

**Period of Proposed Funding:** 2014

**Amount Granted:** \$70,000

**Agency:** UNR - AIRE

**Investigators:** G. Bebis (PI)

**Title:** Sandbox – A cyber security instructional infrastructure

**Period of Proposed Funding:** 2014

**Amount Granted:** \$70,000

**Agency:** NASA EPSCoR

**Investigators:** G. Bebis (PI), Monica Nicolescu, Emma Regentova, and Tom Jackman

**Title:** Advanced Computer Vision, Robotics, and Visualization Algorithms for Improving Planetary Exploration and Understanding

**Period of Proposed Funding:** September 2011 - August 2015

**Amount Granted:** \$1,125,000

**Agency:** Nevada Space Grant Consortium

**Investigators:** G. Bebis (PI) and K. Bekris (co-PI)

**Title:** Workforce Training in Imaging and Robotics

**Period of Proposed Funding:** August 2009 - December 2011

**Amount Granted:** \$80,000

**Agency:** NASA EPSCoR

**Investigators:** G. Bebis (PI)

**Title:** High Resolution 3D Lunar Maps Using Subpixel Accuracy and Adaptive Window Search

**Period of Proposed Funding:** July 2009 - June 2010

**Amount Granted:** \$40,000

**Agency:** NSF EPSCoR  
**Investigators:** G. Bebis (PI)  
**Title:** Hand-Based Biometrics  
**Period of Proposed Funding:** July 2006 - December 2008  
**Amount Granted:** \$70,000

**Agency:** eTreppid Technologies, LLC  
**Investigators:** G. Bebis (PI)  
**Title:** Object Detection, Tracking, and Classification  
**Period of Proposed Funding:** June 2006 - December 2007  
**Amount Granted:** \$130,000

**Agency:** UtopiaCompression Inc.  
**Investigators:** G. Bebis (PI)  
**Title:** Visual Surveillance  
**Period of Proposed Funding:** May 2006 - December 2006  
**Amount Granted:** \$80,000

**Agency:** NASA  
**Investigators:** G. Bebis (PI), F. Harris, A. Yfantis, and M. Nicolescu  
**Title:** Computer Vision Technologies for Effective Human-Computer Interaction in Virtual Environments (2nd phase)  
**Period of Funding:** 1/2006 - 2/2008  
**Amount Granted:** \$780,000

**Agency:** NASA  
**Investigators:** G. Bebis (PI), F. Harris, A. Yfantis, and P. Stubberud  
**Title:** Computer Vision Technologies for Effective Human-Computer Interaction in Virtual Environments (1st phase)  
**Period of Funding:** 9/02 - 12/05  
**Amount Granted:** \$1,148,940

**Agency:** NSF  
**Investigators:** G. Bebis (PI), D. Egbert, E. Jacobson, and M. McIntosh  
**Title:** Combined Research-Curriculum Development in Computer Vision  
**Period of Funding:** 1/1/2001 - 8/31/2004  
**Amount Granted:** \$650,243

**Agency:** NSF  
**Investigators:** G. Bebis (PI)  
**Title:** Request for Travel Grant for Undergraduate and Graduate Students  
**Period of Funding:** 6/1/2001 - 12/31/2001  
**Amount Granted:** \$8,831

**Agency:** ONR  
**Investigators:** G. Bebis (PI) and G. Mauer  
**Title:** Automatic Target Recognition Using Algebraic Functions of Views

**Period of Funding:** 4/1/2001 - 3/31/2005

**Amount Granted:** \$587,887

**Agency:** Ford Motor Company

**Investigators:** G. Bebis (PI) and D. Egbert

**Title:** Vehicle Detection, Classification, Tracking, and Depth Estimation for Driver Assistance and Collision Avoidance as part of Vehicle Compatibility Big Bang

**Period of Funding:** 1/1/2003-8/31/2005

**Amount Granted:** \$80,000

**Agency:** University of Nevada (Applied Research Initiative)

**Investigators:** G. Bebis (PI) and D. Egbert

**Title:** Vehicle Detection, Classification, Tracking, and Depth Estimation

**Period of Funding:** 1/1/2003-8/31/2005

**Amount Granted:** \$80,000

**Agency:** UNR - Research Advisory Board

**Investigators:** G. Bebis (PI)

**Title:** Robotic Vision Systems

**Period of Funding:** 7/1/98 – 6/30/99

**Amount Granted:** \$8,000

## **Research Grants (serving/served as co-Principal Investigator)**

**Agency:** NSF

**Investigators:** Sengupta, Shamik (PI), Bebis, George (co-PI), Seltzer, Nicholas A (co-PI), LaTourrette, Nancy (co-PI), Gunes, Mehmet (co-PI).

**Title:** Capacity Building in Cybersecurity Literacy: An Inter-disciplinary Approach

**Period of Proposed Funding:** 2015-2017.

**Amount Granted:** \$262,534

**Agency:** NSF

**Investigators:** L. Kam (PI), G. Bebis (co-PI), Kent, Graham (co-PI), Murray, Colleen (co-PI), Yim, Woosoon (co-PI)

**Title:** Enhanced Situational Awareness using Unmanned Autonomous Systems for Disaster Remediation

**Period of Proposed Funding:** August 2014 - July 2018

**Amount Granted:** \$800,000

**Agency:** NSF

**Investigators:** Dohetry, Bill (PI), Bebis, George (co-PI), LaTourrette, Nancy (co-PI), Fredrickson, Judy (co-PI)

**Title:** Nevada University ICT Transfer Pathway Pilot Project

**Period of Proposed Funding:** January 2014 – December 2014.

**Amount Granted:** \$60,785

**Agency:** NIJ

**Investigators:** M. Gunes (PI), G. Bebis (co-PI)

**Title:** Forensic and Investigative tools and technologies to investigate criminal use of Internet Anonymizers

**Period of Proposed Funding:** September 2010 - January 2012

**Amount Granted:** \$107,792

**Agency:** NSF

**Investigators:** E. Folmer (PI), G. Bebis (co-PI)

**Title:** TextSL: A Virtual World Interface for the Visually Impaired

**Period of Proposed Funding:** August 2009 - July 2013

**Amount Granted:** \$500,000

**Agency:** Nevada Dept of Transportation (NDoT)

**Investigators:** T. Tan (PI), G. Bebis (PI)

**Title:** Evaluation of Video Detection Systems and Development of Application Guidelines at Signalized Intersections

**Period of Proposed Funding:** October 2007 - October 2009

**Amount Granted:** \$165,000

**Agency:** NSF

**Investigators:** S. Louis (PI), G. Bebis, et al.

**Title:** Cognitive Information Processing Systems (part of "Research Infrastructure for Nevada's Growth - Targeting Research with Uniqueness and Excellence")

**Period of Proposed Funding:** June 2005 - June 2008

**Amount Granted:** \$1,200,000

**Agency:** Sanford Center for Aging

**Investigators:** M. Webster (PI), G. Bebis, M. Wessinger, M. Crognale

**Title:** Adaptation and Aging in the Human Visual System

**Period of Proposed Funding:** 7/2005 - 12/2006

**Amount Granted:** \$20,000

**Agency:** NASA

**Investigators:** M. Webster (PI) and G. Bebis

**Title:** Adaptation and Visual Exploration

**Period of Proposed Funding:** 1/2005 - 12/2005

**Amount Granted:** \$39,619

**Agency:** NSF

**Investigators:** D. Koracin (PI), G. Bebis

**Title:** Development of an Air-Sea Interaction Model with the Parameterization of the Ocean Surface Gravity Waves

**Period of Proposed Funding:** 1/2006 - 12/2007

**Amount Granted:** \$70,000

**Agency:** UNR - Instructional Enhancement Grant  
**Investigators:** D. Egbert (PI) and G. Bebis  
**Title:** Teaching Modules for Computer Vision Research  
**Period of Funding:** 1/1/2001 - 6/31/2001  
**Amount Granted:** \$2,400

**Agency:** Honda & UNR - Applied Research Initiative  
**Investigators:** Q. Ji (PI) and G. Bebis  
**Title:** A Multi-Sensory Vision System for Monitoring Driver's Vigilance  
**Period of Funding:** 11/1/98 - 10/31/99  
**Amount Granted:** \$50,000

## Media Coverage

*Nevada Engineering*, "Hacked? New Cyber Security Center trains next generation cybersleuths", 2014.

*Reno Gazette Journal*, "New UNR center seeks to put Reno at cybersecurity forefront", February 2014.

*KTNV Channel 2*, interviewed on the subjects of unmanned autonomous systems and cybersecurity, 2014.

*Nevada Today*, "Nirvana' for Scientists... and Students", October 2010

*Nevada Today*, "NASA interns work on autonomous systems, computer vision projects", September 2014.

*Nevada Today*, "New Cyber Security Center to develop education, research, industry collaboration", January 2014.

*Nevada News*, "Computer Science students conduct real-life Computer Vision research", March 2002.

*Nevada News*, "Campus to become hotbed for computer vision", February 2001.

*Reno Gazette Journal*, "UNR included in smart computer research", February 2001.

## Professional Activities

### Panelist

NSF, 2002-2005, 2009-2011

*Nevada NSF-EPSCoR, 2007, 2009*

*Nevada NASA-EPSCoR, 2006-2011*

*Nevada DoD-EPSCoR, 2004-2006*

*Nevada Space Grant, 2005-2012*

### **Associate Editor**

*Machine Vision and Applications Journal (2003-present)*

### **Editorial Board Member**

*Computer Methods in Biomechanics and Biomedical Engineering: Imaging and Visualization (2013-present)*

*International Journal on Artificial Intelligence Tools (2003-present)*

*Pattern Analysis and Applications (2016-present)*

*Pattern Recognition Journal (2004-2007)*

### **Guest Editor**

*IEEE Multimedia Magazine (special issue on Digital Multimedia on Demand, January-March 2004).*

*International Journal on Artificial Intelligence Tools (special issue on Applications of Computer Vision, June 2000).*

### **Founder, Organizer and Steering Committee Chair**

*International Symposium on Visual Computing (2005 - present)*

### **Program Chair/co-Chair**

*First International Symposium on Visual Computing (ISVC05), December 5-7, 2005, Lake Tahoe, Nevada.*

*ACM SIG 2003 Multimedia Biometrics Methods and Applications Workshop, (in conjunction with ACM Multimedia 03), Berkeley, November 8, 2003.*

*IEEE Workshop on Combined Research-Curriculum Development in Computer Vision, (in conjunction with CVPR01), Kauai, Hawaii, December 11-13, 2001.*

*IEEE International Symposium on Bio-Informatics & Biomedical Engineering, November 2000, Washington DC.*

*IEEE Symposium on Image, Speech, and Natural Language Systems, November 1999, Maryland.*

## **Area Chair**

*Document Analysis, Biometrics and Pattern Recognition Applications, (part of ICPR 2014), Stockholm, Sweden, August 24-28, 2014.*

*9th SIAM International Conference on Data Mining, Reno, NV, April 30 - May 2, 2009.*

*IEEE International Conference on Advanced Video and Signal Based Surveillance (AVSS08), September 1-3, 2008, Santa Fe, New Mexico.*

*Visual Information Engineering, (N. America Area Chair) July 25-27, 2007, London, UK.*

## **Program Committee Member**

*ACM International Conference on Multimedia, 2014.*

*ACM International Workshop on Analysis and Retrieval of Tracked Events and Motion in Imagery Streams, 2010.*

*ACS/IEEE International Conference on Computer Systems and Applications, 2016.*

*Activity Monitoring by Multiple Distributed Systems (AMMDS), (in conjunction with ICPR), 2014, 2016.*

*Computational Modeling of Objects Presented in Images: Fundamentals, Methods and Applications (CompIMAGE), 2010, 2012, 2014, 2016.*

*ECCOMAS Thematic Conference on Computational Vision and Medical Image Processing (VipIMAGE), 2013, 2015, 2017.*

*European Signal Processing Conference (EUSIPCO), 2008.*

*Genetic and Evolutionary Computing Conference (GECCO), 2005.*

*IAPR International Workshops on Structural and Syntactic Pattern Recognition and Statistical Techniques in Pattern Recognition*, 2008.

*IAPR/IEEE International Conference on Biometrics*, 2012, 2016.

*IEE Conference on Crime and Security: Imaging for Crime Detection and Prevention*, 2006.

*IEEE International Conference on Advanced Video and Signal Based Surveillance (AVSS)*, 2003, 2005, 2006, 2007, 2011, 2012.

*IEEE International Conference on Biometrics: Theory, Applications and Systems (BTAS)*, 2008, 2009, 2010, 2012, 2013, 2015, 2016.

*IEEE International Conference on Digital Signal Processing (DSP)*, 2015.

*IEEE International Conference on Identity, Security and Behavior Analysis (ISBA)*, 2015, 2016.

*IEEE International Conference on Image Processing (ICIP)*, 2005, 2014, 2015, 2016.

*IEEE International Conference on Information Reuse and Integration*, 2005, 2006, 2007, 2008, 2009.

*IEEE International Conference on Information, Intelligence, and Systems*, 1999.

*IEEE International Conference on Tools with Artificial Intelligence*, 2002, 2003, 2005, 2006.

*IEEE International Symposium on Bio-Informatics and Biomedical Engineering*, 2001, 2003.

*IEEE Symposium on Computational Intelligence in Vehicles and Transportation Systems (CIVTS)*, 2010, 2011.

*IEEE Symposium on Computational Intelligence in Vehicles and Vehicular Systems*, 2009.

*IEEE Workshop on Activity Monitoring by Multiple Distributed Sensing*, 2013.

*IEEE Workshop on Computer Vision beyond the Visible Spectrum: Methods and Applications*, 2000, 2001.

*IEEE Workshop on Machine Vision for Intelligent Vehicles*, 2005.

*IEEE Workshop on Models versus Exemplars in Computer Vision*, 2001.



*IEEE Workshop on Object Tracking and Classification beyond the Visible Spectrum*, 2004, 2007, 2008, 2009, 2011, 2013, 2014, 2015

*IEEE Workshop on Online Learning for Classification*, 2008

*IEEE/IAPR International Conference on Biometrics*, 2009.

*IET Image Processing Conference*, 2012.

*INNS-IEEE International Joint Conference on Neural Networks (IJCNN)*, 2001, 2002, 2004.

*International Conference on Computer Applications in Industry and Engineering*, 1998.

*International Conference on Computer Games Development*, 2006.

*International Conference on Computer Vision Theory and Applications (VISAPP)*, 2006, 2017.

*International Conference on Cultural Heritage*, 2014.

*International Conference on Cyberworlds*, 2005, 2007, 2008, 2011, 2013, 2014.

*International Conference on Digital Signal Processing*, 2009, 2011, 2013, 2014.

*International Conference on Image and Signal Processing (ICISP)*, 2012, 2014, 2016.

*International Conference on Imaging Science, Systems, and Technology*, 1998.

*International Conference on Imaging Theory and Applications*, 2009.

*International Conference on Information, Intelligence, Systems and Applications (IISA)*, 2015, 2016.

*International Conference on New Horizons in Industry and Education*, 2003, 2005, 2007, 2011, 2013.

*International Conference on Pattern Recognition (ICPR)*, 2008, 2014.

*International Conference on Sciences of Electronic, Technology of Information and Telecommunications (SETIT)*, 2007.

*International Conference on Signal-Image Technology and Internet-Based Systems (SITIS)*, 2005, 2007.

*International Joint Conference on Biometrics (IJCB), 2014.*

*International Workshop on Combinatorial Image Analysis (IWCA), 2008, 2012, 2014, 2015.*

*Neural Networks and Expert Systems in Medicine and Health Care, 2001.*

*Sensor Signal Processing for Defense Conference, 2012.*

*SPIE Defense and Security Symposium (Biometric Technology for Human Identification VI), 2008, 2009, 2011.*

*Visual Information Engineering, 2007.*

## **Honors**

*Donald W. Reynolds Governor's Cup Award, May 2010 (2nd place)*

*Lemelson Award for Innovation and Entrepreneurship, May 2002*

## **Patents**

*Hand-based Verification Using Palm-Finger Segmentation, 2015.*

*Hand-Based Gender Classification, 2016.*