

George Bebis

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Research Interests

Computer Vision
Image Processing
Pattern Recognition
Machine Learning

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

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

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

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

August 1997 - December 1997, *Visiting 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

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

Ph.D. Dissertations

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

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

Hand-Based Biometrics, Gholmareza Amayeh, May 2010.

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

Master Theses

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.

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", filed in June 2007.

"Hand-Based Gender Classification", filed in June 2010.

"Minutiae-based Template Synthesis and Matching", filed in August 2010.

Departmental and College Committee Services

2013 - present, College Chairs Committee (Member)

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 - present, College FACE Committee (Member)

2009 - 2012, College Graduate Directors Committee (Member)

State, National, and International Committee Services

2002 - 2006, IAPR Education Committee (international)

2001 - present, Nevada NASA Space Grant Consortium

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 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).

Reviewer

Computer Vision and Image Understanding (CVIU)

Pattern Recognition (PR)

Image and Vision Computing (IVC)

IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI)

Machine Vision and Applications (MVA)

International Conference on Computer Vision (ICCV)

Computer Vision and Pattern Recognition Conference (CVPR)

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.

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.

Organizer/co-Organizer

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

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

Program Committee Member

IEEE International Conference on Image Processing, Paris, France, October 27-30, 2014.

19th International Conference on Digital Signal Processing, Hong Kong, August 20-23, 2014.

International Conference on Image and Signal Processing (ICISP'14), Cherbourg, Normandy, France, June 30 - July 2, 2014.

International Conference on Cyberwolds, Royal Palace of La Magdalena, Santander, Spain, October 6-8, 2014.

Computational Modeling of Objects Represented in Images: Fundamentals, Methods and Applications (CompIMAGE'2014), Pittsburgh, September 3-5, 2014.

International Joint Conference on Biometrics (IJCB 2014), Clearwater, Florida, 29 September - 2 October 2014.

2nd Activity Monitoring by Multiple Distributed Systems (AMMDS), in conjunction with the "22nd International Conference on Pattern Recognition (ICPR'14)", Stockholm, Sweden, August 24-28, 2014.

International Workshop on Combinatorial Image Analysis (IWCA14), Brno, Czech Republic, May 28-30, 2014.

VipIMAGE, Madeira Island, Portugal, October 14-16, 2013.

IEEE International Conference on Biometrics: Theory, Applications and Systems, Washington DC, Sept 29 - October 2, 2013.

International Conference on Cyberwolds, Yokohama, Japan, October 21-23, 2013.

IEEE Workshop on Activity Monitoring by Multiple Distributed Sensing, Krakow, Poland, August 27, 2013 (in conjunction with AVSS 2013).

IEEE Workshop on Object Tracking and Classification in and Beyond the Visible Spectrum, Portland, Oregon (in conjunction with CVPR 2013).

18th International Conference on Digital Signal Processing, Santorini, Greece, July 1-3, 2013.

International Conference on New Horizons in Industry, Business and Education [1], Chania, Crete, Greece, August 29-30, 2013.

3rd Sensor Signal Processing for Defence Conference, London, UK, September 25-27, 2012.

International Workshop on Combinatorial Image Analysis (IWCA11), Austin, Texas, USA, November 28-30, 2012.

IEEE International Conference on Biometrics: Theory, Applications and Systems (BTAS 2012), Washington DC, Sept 23 - 27, 2012.

IET Image Processing Conference, London, UK, July 3-4, 2012.

IEEE International Conference on Advanced Video and Signal Based Surveillance, Beijing, China, September 19-21, 2012.

5th IAPR/IEEE International Conference on Biometrics, New Delhi, India, March 30 - April 1, 2012.

International Conference on Image and Signal Processing (ICISP'12), Agadir, Morocco, June, 2012.

Computational Modeling of Objects Presented in Images: Fundamentals, Methods and Applications, Rome, Italy, September 6-7, 2012.

Computational Modeling of Objects Presented in Images: Fundamentals, Methods and Applications, Rome, Italy, September 6-7, 2012.

International Conference on Cyberworlds, Banff, AB, Canada, October 4-6, 2011.

International Workshop on Combinatorial Image Analysis (IWCA11), Madrid, Spain, May 23-25, 2011.

7th International Conference on New Horizons in Industry, Business and Education, Chios island, Greece, August 25-26, 2011.

IEEE International Conference on Advanced Video and Signal Based Surveillance, Klagenfurt University, Austria, August 30 - September 2, 2011.

17th International Conference on Digital Signal Processing, Corfu, Greece, July 6-8, 2011.

SPIE Defense, Security and Sensing Symposium (Biometric Technology for Human Identification VII), April 25-29, 2011, Orlando, Florida.

IEEE Symposium on Computational Intelligence in Vehicles and Transportation Systems (CIVTS), Paris, France, April 11-15, 2011.

17th International Conference on Digital Signal Processing, Corfu, Greece, July 6-8, 2011.

SPIE Defense, Security and Sensing Symposium (Biometric Technology for Human Identification VII), April 25-29, 2011, Orlando, Florida.

IEEE Symposium on Computational Intelligence in Vehicles and Transportation Systems (CIVTS), Paris, France, April 11-15, 2011.

International Conference on Cyberworlds, Singapore, October 20-22, 2010.

1st ACM International Workshop on Analysis and Retrieval of Tracked Events and Motion in Imagery Streams (ARTEMIS2010), Firenze, Italy, October 29 2010.

4th IEEE International Conference on Biometrics: Theory, Applications and Systems (BTAS 2010), Washington DC, Sept 27 - 29, 2010.

Computational Modeling of Objects Represented in Images: Fundamentals, Methods and Applications (CompIMAGE'2010), Buffalo, NY, May 5-7, 2010.

3rd IEEE International Conference on Biometrics: Theory, Applications and Systems, Washington DC, Sept 28 - 30, 2009.

6th IEEE Workshop on Object Tracking and Classification in and Beyond the Visible Spectrum, Miami, Florida, June 20, 2009

16th International Conference on Digital Signal Processing, Santorini, Greece, July 5-7, 2009.

International Conference on Imaging Theory and Applications, Lisboa, Portugal, February 5-8, 2009.

IEEE International Conference on Information Reuse and Integration, Las Vegas, August 10-12, 2009.

Joint IAPR International Workshops on Structural and Syntactic Pattern Recognition (SSPR 2008) and Statistical Techniques in Pattern Recognition (SPR 2008), Orlando, Florida, December 4-6, 2008.

SPIE Defense and Security Symposium (DS108: Biometric Technology for Human Identification VI), April 13-17, 2009, Orlando, Florida.

IEEE Symposium on Computational Intelligence in Vehicles and Vehicular Systems, Nashville, Tennessee, Mar 30-Apr 2, 2009.

IEEE/IAPR International Conference on Biometrics, Alghero in Sardinia Island, Italy, June 2-5, 2009.

International Conference on Pattern Recognition (ICPR08) (Biometrics), Tampa, FL, December 8-11, 2008.

16th European Signal Processing Conference (EUSIPCO 2008), Lausanne, Switzerland, August 25-29, 2008.

IEEE Workshop on Online Learning for Classification, Anchorage, Alaska, June 27, 2008

2nd IEEE International Conference on Biometrics: Theory, Applications and Systems, Washington DC, Sept 29 - Oct 1, 2008.

5th IEEE Workshop on Object Tracking and Classification in and Beyond the Visible Spectrum, Anchorage, Alaska, June 27, 2008

IEEE International Conference on Information Reuse and Integration, Las Vegas, July 13-15, 2008.

International Conference on Cyberworlds, Hangzhou, China, September 22-24 2008.

SPIE Defense and Security Symposium (DS26: Biometric Technology for Human Identification V), March 16-20, 2008, Orlando, Florida.

IEEE International Conference on Advanced Video and Signal Based Surveillance (AVSS07), September 5-7, 2007, London, UK.

International Workshop on Combinatorial Image Analysis (IWCA08), April 7-9, 2008, Buffalo, NY, USA.

International Conference on Signal-Image Technology and Internet-Based Systems (SITIS07), December 16-19, 2007, China.

IEEE International Conference on Information Reuse and Integration August 13-15, 2007, Las Vegas, Nevada.

4th IEEE Workshop on Object Tracking and Classification in and Beyond the Visible Spectrum, Minneapolis, MN, USA, Friday, June 22, 2007.

5th International Conference on New Horizons in Industry, Business and Education, August 30-31, 2007, Rhodes island, Greece.

International Conference on Cyberworlds, Hannover, Germany, Oct 24-26, 2007.

Visual Information Engineering, July 25-27, 2007, London, UK.

International Conference on Sciences of Electronic, Technology of Information and Telecommunications (SETIT07), March 25-29, 2007, Hammamet, Tunisia.

IEEE International Conference on Advanced Video and Signal Based Surveillance (AVSS06), November 22-24, 2006, Sydney, Australia.

International Conference on Cyberworlds, Ecole Polytechnique Fdrale de Lausanne (EPFL), Switzerland, Nov 28-30, 2006.

IEE Conference on Crime and Security: Imaging for Crime Detection and Prevention, London, UK, 13-15 June 2006.

18th IEEE International Conference on Tools with Artificial Intelligence, 2006.

Third IEEE Workshop on Object Tracking and Classification in and Beyond the Visible Spectrum, (in conjunction with CVPR06), New York, NY, June 22, 2006.

International Conference on Computer Games Development, Las Vegas, NV, June 26-29, 2006.

IEEE International Conference on Information Reuse and Integration, Sep 16-18, 2006, Waikoloa, Hawaii.

International Conference on Sciences of Electronic, Technology of Information and Telecommunications (SETIT 2007), March 25-29, 2007, Hammamet, Tunisia.

International Conference on Computer Vision Theory and Applications (VISAPP), February 22-25, 2006, Setubal, Portugal.

IEEE International Conference on Advanced Video and Signal Based Surveillance (AVSS05), September 15-16, 2005, Como, Italy.

IEEE International Conference on Image Processing (ICIP05), September 11-14, 2005, Genova, Italy.

Second IEEE Workshop on Object Tracking and Classification in and Beyond the Visible Spectrum, (in conjunction with CVPR05), San Diego, CA, June 20, 2005.

IEEE Workshop on Machine Vision for Intelligent Vehicles, (in conjunction with CVPR05), San Diego, CA, June 21, 2005.

IEEE International Conference on Information Reuse and Integration, Las Vegas, August 15-17, 2005.

17th IEEE International Conference on Tools with Artificial Intelligence, 2005.

Genetic and Evolutionary Computing Conference (GECCO 2005), Washington, DC, June 25-29, 2005.

Fourth International Conference on New Horizons in Industry, Business and Education, 25-26 August 2005, Corfu, Greece.

Signal, Image Technology and Internet-Based Systems (SITIS2005), November 27 - December 2, 2005, Cameroon.

International Conference on Cyberworlds (CW2005), November 23-25, 2005, Singapore.

Third International Conference on Sciences of Electronic, Technology of Information and Telecommunications, March 27-31, 2005, Susa, Tunisia.

IEEE Workshop on Object Tracking and Classification Beyond the Visible Spectrum, (in conjunction with CVPR04), Washington, DC, June 28, 2004.

International Joint Conference on Neural Networks (IJCNN04), Budapest, Hungary, July 25-29, 2004.

15th IEEE International Conference on Tools with Artificial Intelligence, Sacramento, November 3-5, 2003.

IEEE International Symposium on Bio-Informatics and Biomedical Engineering, Bethesda, March 10-12, 2003.

IEEE International Conference on Advanced Video and Signal Based Surveillance, July 21-22, 2003 Miami, FL.

Third International Conference on New Horizons in Industry and Education, 28-29 August 2003, Santorini, Greece.

14th IEEE International Conference on Tools with Artificial Intelligence, November 4-6, 2002, Washington D.C.

INNS-IEEE International Joint Conference on Neural Networks (IJCNN02), Honolulu, Hawaii, May 12-17 2002.

IEEE International Symposium on Bio-Informatics and Biomedical Engineering, November 2001, Washington DC.

IEEE Workshop on Models versus Exemplars in Computer Vision, (in conjunction with CVPR01), Kauai, Hawaii, December 11-13, 2001.

IEEE Workshop on Computer Vision Beyond the Visible Spectrum: Methods and Applications, (in conjunction with CVPR01), Kauai, Hawaii, December 14, 2001.

INNS-IEEE International Joint Conference on Neural Networks (IJCNN01), Washington DC, July 14-19, 2001.

Neural Networks and Expert Systems in Medicine and Health Care, Milos Island, Greece, 20-22 June 2001.

IEEE Workshop on Computer Vision Beyond the Visible Spectrum: Methods and Applications (in conjunction with CVPR00), June 2000, Hilton Head Island, SC.

IEEE International Conference on Information, Intelligence, and Systems, November 1999, Maryland.

International Conference on Imaging Science, Systems, and Technology, July 6-9, 1998, Las Vegas, Nevada, USA.

11th International Conference on Computer Applications in Industry and Engineering, November 11-13, 1998, Las Vegas, Nevada, USA.

Session Chair

13th International Conference on Parallel and Distributed Computing Systems Las Vegas, August 8-10, 2000 (Digital Video II).

Signal and Image Processing Conference, Las Vegas, Nevada, October, 1998 (Object Recognition).

IEEE International Conference on Systems, Man, and Cybernetics, Orlando, Florida, October, 1997 (Applications of Neural Networks in Computer Vision).

Editorials

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

Books Edited

- [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

- [3] Tavakkoli, M. Nicolescu, G. Bebis, J. Wang, "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 (to appear in 2014).

- [2] G. Bebis, "Fingerprint Indexing", **Biometrics Encyclopedia**, Springer-Verlag, 2009 (ISBN: 978-0-387-73003-5).
- [1] G. Bebis, "Face Recognition in the Thermal Spectrum", **Biometrics Encyclopedia**, Springer-Verlag, 2009 (ISBN: 978-0-387-73003-5).

Journal Publications (peer reviewed)

- [49] M. Hussain, I. Ullah, H. Aboalsamh, G. Muhammad, G. Bebis, and A. Mirza, "Gender Recognition from Face Images with Dyadic Wavelet Transform and Local Binary Pattern", **International Journal on Artificial Intelligence Tools**, vol. 22, no. 5, pp. 2013.
- [48] 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.
- [47] 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**, accepted (to appear in 2014).
- [46] 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.
- [45] 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**, accepted (to appear in 2014).
- [44] 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.
- [43] A. Mazoul, M. El Ansari, K. Zebbara and G. Bebis, "Fast spatio-temporal stereo for intelligent transportation systems", **Pattern Analysis and Applications**, accepted (to appear in 2014).
- [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**, (to appear) 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.

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- [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 Back-propagation 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.
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- [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 as Principal Investigator (PI))

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 2014

Amount Granted : \$1,125,000 (UNR's portion: \$531,318)

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 AdaptiveWindow 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 as co Principal Investigator (co-PI))

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

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: \$25,000

Agency: 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: \$25,000