

REZA DERAKHSHANI, PH.D.

CURRICULUM VITAE

CONTACT INFORMATION

Department of Computer Science and Electrical Engineering
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RESEARCH INTERESTS

Computational Intelligence with Biomedical and Biometrics applications

EDUCATION

August 2004

Ph.D. in Computer Engineering, West Virginia University, Morgantown, WV.
Dissertation topic: "Biologically Inspired Temporal Evolutionary Neural Circuits."
Advisor: Dr. Stephanie A.C. Schuckers

December 1999

M.S. in Electrical Engineering (Major: Digital Systems, Minor: Software Engineering)
West Virginia University, Morgantown, WV

January 1994

B.S. in Electrical and Electronics Engineering, Iran University of Science and
Technology, Tehran, Iran

PROFESSIONAL EXPERIENCE

A. Teaching

August 2004 – Present

Assistant Professor, Computer Science and Electrical Engineering Department, School of Computing and Engineering, University of Missouri at Kansas City

- Teaching ECE 276: Circuit Theory
- Teaching ECE480/481: Digital Signal Processing/DSP Lab
- Teaching ECE416/5590NN: Neural and Adaptive Systems (undergraduate/graduate, new course)
- Teaching ECE 5590BB: Machine Learning with Biomedical and Biometrics Applications (new graduate course)
- Teaching ECE 5590BP: Advanced Biomedical Signal Analysis (new graduate course)

January 2003 – May 2004

Adjunct Faculty, Computer Science Department, Georgetown University

- Taught COSC 127/COSC 506: Mathematical Methods for Computer Science/Concrete Mathematics and Complexity
- Taught COSC 251 Computer Systems Fundamentals II

B. Academic Research

August 2004 – Present

Assistant Professor, Computer Science and Electrical Engineering Department, School of Computing and Engineering, University of Missouri at Kansas City.

- Conducting research on computational intelligence with applications in biomedical signal analysis and biometrics, focusing on ocular biometrics and psychometrics, and EEG-based brain computer interfacing
- Facilitating the above by founding and supervising Computational Intelligence and Bio-Identification Technologies (CIBIT) lab

October 1998 – May 2004

Research Assistant, Biomedical Signal Analysis Lab (BioSAL), and NSF IUCRC Center for Identification Technology Research (CITeR), Lane Department of Computer Science and Electrical Engineering, West Virginia University.

- Research on biometric systems and their vulnerabilities, including design of a novel perspiration-based liveness detection algorithm for spoof-proofing fingerprint scanners
- Research on evolutionary temporal neural networks and their applications

C. Industry

May 1996 - October 1997

Data Communication Engineer, R&D Department, Kish Communications Industries (KCI), Tehran, Iran

- Enhanced PBX telephony data capabilities
- Advised KCI in adoption of new data communication hardware
- Designed fax/voice/data switches

April 1994 - May 1996

Electronic Circuit Designer, Atbin Co. Tehran, Iran

- Designed and constructed several economical internal and external EPROM and/or micro-controller programmers

PATENTS

1. *Derakhshani R*, Ross A, "Conjunctival Scans for Personal Identification." US Patent number 7,327,860; issued on 2/5/2008.
2. Schuckers SAC, *Derakhshani R*, Hornak L, "Liveness Detection Technique for Multi-Technology Fingerprint Sensors," Disclosure filed on January 4, 2003; full application was not pursued.

PUBLICATIONS

A. Journal Papers and Book Chapter

1. Schuckers SAC, *Derakhshani R*, Parthasaradhi S, Hornak, LA, "Liveness Detection in Biometric Devices," in *Electrical Engineering Handbook*, 3rd edition, CRC Press, 2005.
2. Parthasaradhi S, *Derakhshani R*, Hornak L, Schuckers SAC, "Time-Series Detection of Perspiration as a Liveness Test in Fingerprint Devices." *IEEE Transactions on Systems, Man, and Cybernetics, Part C: Applications and Reviews*, Vol. 35, No. 3, pp. 335-343, 2005.
3. *Derakhshani R*, Schuckers SAC, Hornak L, O'Gorman L, "Determination of Vitality from A Non-Invasive Biomedical Measurement for Use in Fingerprint Scanners." *Pattern Recognition Journal*, Vol. 36, No.2, pp. 383-396, 2003.

Journal Papers Under Preparation:

1. "Automated Deception Detection from Startle Blinks Captured with High Speed Video," to be submitted to the *IEEE Transaction on Information Forensics and Security* (in September 2009, with Chris Lovelace, Judee Burgoon, and Diane Filion).
2. "Biometric Identification using Ocular Surface Vasculature," to be submitted to the *IEEE Transaction on Information Forensics and Security* (in August 2009, with Arun Ross, Pavan Tankasala, Simona Crihalmeanu, and Rohit Krishna)
3. "A Comparison of Short and Long Term Performance of Feature Extraction and Classification Methods with 3-D User Feedback for EEG-based Brain Computer Interfaces," to be submitted to *IEEE Transactions on Neural Systems and Rehabilitation Engineering*. (in September 2009, with Jesse Sherwood).
4. "A Comparative Study of Nonlinear Surrogate Models of Tibia-Femoral Joints" to be submitted to *IEEE Transactions on Biomedical Engineering* (in August 2009, with Trent Guess, Meenakshi Misra, and Gavin Paiva).

B. Peer-reviewed Conference Papers

1. Crihalmeanu S, Ross A, and *Derakhshani R*, "Enhancement and Registration Schemes for Matching Conjunctival Vasculature," *Proceedings of the 3rd IAPR/IEEE International Conference on Biometrics (ICB)*, Alghero, Italy, June 2009.
2. Sherwood J and *Derakhshani R*, "On Classifiability of Wavelet Features for EEG-Based Brain-Computer Interfaces," *Proceedings of the 2009 International Joint Conference on Neural Networks*, Atlanta, GA.

3. Lovelace C, *Derakhshani R*, Tankasala SP, and Fillion D, "Classification of Startle Eyeblink Metrics using Neural Networks" Proceedings of the 2009 International Joint Conference on Neural Networks, Atlanta, GA.
4. Doynov P, Sherwood J, and *Derakhshani R* "Classification of Imagined Motor Tasks for Brain-Computer-Interface." Proceedings of IEEE 2008 Region 5 Conference, Kansas City, MO.
5. Sherwood J, *Derakhshani R*, and Guess, T "A Comparative Study of Linear and Nonlinear Data-Driven Surrogate Models of Human Joints." Proceedings of IEEE 2008 Region 5 Conference, Kansas City, MO.
6. *Derakhshani R* and Ross A "A Texture-Based Neural Network Classifier for Biometric Identification using Ocular Surface Vasculature." Proceedings of 2007 International Joint Conference on Neural Networks, Orlando, FL.
7. *Derakhshani R*, Ross A, and Crihalmeanu S "A New Biometric Modality Based on Conjunctival Vasculature." Proceedings of ANNIE 2006 Conference, St. Louis, MO.
8. Fazel A and *Derakhshani R* "A Comparative Study of Time Delay Neural Networks and Hidden Markov Models for Electroencephalographic Signal Classification." Proceedings of ANNIE 2006 Conference, St. Louis, MO.
9. Fazel A, *Derakhshani R*, and Wang Y "Gaussian Mixture Model Classification of Multi-Color Fluorescence In Situ Hybridization Images." Proceedings of ANNIE 2006 Conference, St. Louis, MO.
10. *Derakhshani R*, "A Temporal Minimum Description Length Policy for Evolving Neural Networks." Proceedings of ANNIE 2005 Conference, St. Louis, MO.
11. *Derakhshani R*, "GETnet: A General Framework for Evolutionary Temporal Neural Networks." Proceedings of IEEE IJCNN 2005 Conference, Montreal, Canada.
12. *Derakhshani R*, "Spoof-proofing Fingerprint Systems using Evolutionary Time-Delay Neural Networks." Proceedings of IEEE CIHSPS 2005 Conference, Buena Vista, FL.
13. Rakendu R, *Derakhshani R*, "A Comparison of EEG Preprocessing Methods using Time Delay Neural Networks. 2nd International IEEE EMBS Special Topic Conference on Neural Engineering, Arlington, Virginia, 03-16-2005, 2005.
14. *Derakhshani R*, Schuckers SAC, "Continuous Time Delay Neural Networks for Detection of Temporal Patterns in Signals." Proceedings of 2004 IEEE International Joint Conference on Neural Networks, Budapest, Hungary.
15. Schuckers SAC, Parthasaradhi S, *Derakhshani R*, Hornak LA, "Comparison of Classification Methods for Time-Series Detection of Perspiration as a Liveness Test in Fingerprint Devices." Proceedings of the 2004 International Conference on Biometric Authentication, Hong Kong (Springer-Verlag LNCS series).
16. Schuckers SAC, *Derakhshani R*, Parthasaradhi S, Hornak LA, "Improvement of an Algorithm for Recognition of Liveness using Perspiration in Fingerprint Devices." Proceedings of SPIE Vol. #5404, 2004.
17. *Derakhshani R*, Schuckers SAC, "Biologically Inspired Evolutionary Temporal Neural Circuits." Proceedings of IEEE World Congress on Computational Intelligence, Honolulu, HI, 2002
18. *Derakhshani R*, Schuckers SAC, Hornak L, O'Gorman L, "Neural Network-Based Approach for Detection of Liveness in Fingerprint Scanners." Proceedings of the International Conference on Artificial Intelligence, Las Vegas, NV. CSREA Press, pp. 1099-1105, 2001.

C. Abstracts

1. Lovelace C, Elmore W, Duval E, *Derakhshani R*, and Filion D, "Whence the Eye Blinketh? Correspondence between Multiple Measures of Startle Eyeblink," Abstract in Proceedings of the 48th annual meeting of the Society for Psychophysiological Research (supplement to Journal of Psychophysiology), Austin, TX, October 2008.
2. *Derakhshani R*, Ross A, Anand A, Jung E.H., Hong K, and Krishna R. "A Vessel Tracing Algorithm for Human Conjunctival Vasculature," Abstract in Proceedings of the Kansas City Life Sciences Institute Research Day Conference, Kansas City Convention Center, March 2006.
3. Schuckers SAC, Hornak LA, *Derakhshani R*, Parthasaradhi S, "Initial Results of Spoofing and Liveness Detection in Fingerprint Scanners." Abstract in the Proceedings of Biometrics 2002, London, UK, November 2002.
4. Schuckers SAC, Hornak L, Norman T, *Derakhshani R*, Parthasaradhi S, "Issues for Liveness Detection in Biometrics." Abstract in the Proceedings of the Biometrics Consortium Conference, Arlington, VA, September 2002.
5. *Derakhshani R*, Schuckers SAC, "Determination of Vitality from A Non-Invasive Biomedical Measurement for Use in Fingerprint Scanners." Abstract in Proceedings of World Congress on Medical Physics and Biomedical Engineering, Chicago, IL, 2000.
6. *Derakhshani R*, Schuckers SAC, "Determination of Vitality from A Non-Invasive Biomedical Measurement for Use in Fingerprint Scanners." Abstract in Proceedings of International Association for Identification 85th International Educational Conference, Charleston, WV, 2000.

AWARDED RESEARCH GRANTS

1. An Integrated Platform for a new Biometric Identification System based on Ocular Surface Vasculature (UM IP Fast track Initiative)
Role: PI
Project Duration (projected): 8/1/2009 to 7/31/2010
Total funding: \$49,800
Funding Agency: University of Missouri's Office of Research and Economic Development
2. Post-mortem Ocular Biometric Analysis
Role: PI
Project Duration (projected): 8/1/2009 to 12/31/2010
Total funding: \$76,000
Funding Agency: NSF Center for Identification Technology Research
3. Economical, unobtrusive measurement of postural correlates of deception
Role: co-PI
Project Duration (projected): 8/1/2009 to 4/1/2011
Total funding: \$30,000 (UMKC)
Funding Agency: NSF Center for Identification Technology Research
4. Computational Simulation of Canine Biomechanically Induced Unicompartamental Osteoarthritis: A Concurrent Multiscale Approach
Role: co-PI (PI: Guess T.)

Project Duration: 2/1/2009 to 2/1/2012

Total funding: \$556,957

Funding agency: Missouri Life Sciences Review Board

5. Course Development Grant: Advanced Signal Processing (Music Brain Interface)
Role: PI
Project Duration: 7/2008 to 6/2009
Total funding: \$1,000
Funding agency: UMKC Faculty Center for Excellence in Teaching
6. MRI: Acquisition of an Experimental Platform to Support Research and Educational Activities in Human Motion
Role: co-PI (PI: Guess T.)
Project Duration: 9/1/2008 to 8/31/2011
Total funding: \$376,693
Funding agency: NSF (and 30% institutional matching funds)
7. Enhancing Iris Systems Using Conjunctival Vascular Patterns – Phase II
Role: PI
Project Duration: 1/1/2008 to 5/31/2009
Total funding: \$60,000 (UMKC: \$30,000)
Funding Agency: NSF Center for Identification Technology Research
8. An Acquisition Platform for Non-Cooperative, Long Range Ocular Biometrics
Role: PI
Project Duration: 1/1/2008 to 5/31/2009
Total funding: \$60,000 (UMKC: \$32,592)
Funding Agency: NSF Center for Identification Technology Research
9. Psychophysiological Biometrics
Role: co-PI (PI: Burgoon, J.)
Project Duration: 1/1/2008 to 5/31/2009
Total funding: \$60,000 (UMKC: \$25,000)
Funding Agency: NSF Center for Identification Technology Research
10. A Multimodal Electroencephalographic Brain-Computer Interface
Role: PI
Project duration: 01/14/2007 to 10/31/2008
Total funding: \$5,990.40
Funding agency: UMKC Research Board, Faculty Research Grant
11. Bi-modal, Adaptive Thought Translation Device
Role: PI
Project duration: 7/13/2007 to 7/12/2009.
Total funding: \$26,797
Funding agency: University of Missouri Research Board
12. Enhancing Iris Systems using Conjunctival Vascular Patterns
Role: PI
Project duration: 12/01/2005 to 11/30/2006

Total funding: \$50,000 (UMKC: \$30,000)

Funding agency: NSF Center for Identification Technology Research

13. Dynamic Simulation of Joints Using Multi-Scale Modeling

Role: co-I (PI: Guess, T.)

Project duration: 09/01/2005 to 08/31/2008

Total funding: \$441,990

Funding agency: NSF

14. ARROWS: Achieving Recruitment, Retention and Outreach with STEP

Role: Senior Personnel (PI: Sohraby, K.)

Project duration: 09/01/2005 to 08/31/2010

Total funding: \$999,841

Funding agency: NSF

OTHER RECOGNITIONS

1. The 2009 Western Chapter of the Missouri Society of Professional Engineering Leadership Excellence Achievement Program (LEAP) award for “demonstrated mentoring abilities that encourage students to seek leadership excellence in the engineering profession.”
2. Media spotlights on research and teaching, including the first-page article on 12/22/2008 issue of the Kansas City Star, by Steve Paul: “Music is a new way to know the brain.”
3. The 2008 UMKC Trustees’ Faculty Scholar Fellowship Award, for distinguished research and creativity (Award Amount: \$5,000).
4. Good Teaching Award 2006, School of Computing and Engineering, University of Missouri at Kansas City.
5. January 2002 – January 2004. Lane Fellowship for the highest academic achievement in the field of study. Lane Department of Computer Science and Electrical Engineering, West Virginia University.
6. May 2002 - IEEE Travel Award for 2002 World Congress on Computational Intelligence, Honolulu, HI.

PROFESSIONAL DEVELOPMENT

1. NFTS: University of Missouri New Faculty Teaching Scholars Program, 2005-2006.
2. UMKC Diversity Empowerment Workshop, December 2005.

SELECTED INVITED TALKS

1. *Derakhshani* “Biometrics, an Introduction.” 2nd Annual Convention of the Missouri Society of Professional Engineers in Branson, Missouri, June 2009.
2. *Derakhshani R* and Doynov P “Long-rang Ocular Biometrics.” CSEE Seminar Series, University of Missouri, Kansas City, November 2008.
3. *Derakhshani R* “Introduction to Biometrics,” Missouri Society of Professional Engineers meeting, Kansas City, MO, March 2008.
4. *Derakhshani R* “The Eyes Have It: New Directions in Ocular Biometrics.” CSEE Seminar Series, University of Missouri, Kansas City, February 2008.

5. *Derakhshani R* "Biometrics: An Introduction to Current Technologies and Future Trends," Kansas State University, KS, October 2007.
6. *Derakhshani R* "Biometric Personal Identification," IEEE-EMBS chapter meeting, Kansas City, MO, July 2007.
7. *Derakhshani R* "Biometrics: How does it affect ME?" UMKC Innovation Series, Stowers Institute, Kansas City, MO, November 2006.
8. *Derakhshani R* "Artificial Intelligence and its Applications," Saturday Science Pioneers Seminar Series, Extreme Theatre, Union Station, Kansas City, MO, March 2006.
9. *Derakhshani R* "Biometrics: What is it, and how is it changing our lives?" CSEE Seminar Series, University of Missouri, Kansas City, March 2006.
10. *Derakhshani R* "Fingerprint Authentication Using Neural Networks," Computer Science Department, Georgetown University, Washington D.C., January 2003.

MEMBERSHIPS

1. West Virginia Society of Professional Engineers (Engineer in Training)
2. IEEE Engineering in Medicine and Biology Society (Member)
3. IEEE Computational Intelligence Society (Member)
4. Eta Kappa Nu (Member)
5. Order of the Engineer (Member)

SERVICE

1. IEEE 2008 Region 5 Conference, Technical program co-Chair
2. Founding Officer and Program co-Chair for the Kansas City Chapter of IEEE Engineering in Medicine and Biology Society (2006-present)
3. UMKC Graduate Council, Member (campus-wide, 2004-2007)
4. UMKC Faculty Library Committee, Member (campus-wide, 2004-2006)
5. SCE New Biomedical Program Committee, Member (school-wide, 2009-present)
6. SCE Recruitment and Retention Committee, Member (school-wide, 2008-present)
7. ECE Curriculum Committee, Member (departmental, 2005-present)
8. Reviewer for various journals, conferences, and grant proposals (ongoing)

GRADUATE STUDENTS

1. Plamen Doynov, *PhD Advisor* (in progress)
2. Jesse Sherwood, *PhD Advisor* (in progress)
3. Sriram Pavan Kumar Tankasala, *PhD Advisor* (in progress)
4. Cecil Stuerke, PhD Committee Member (in progress)
5. Mohammad Kia, PhD Committee Member (in progress)
6. Michael Todd Gardner, PhD Committee Member (in progress)
7. Kevin Phillip Kirkpatrick, PhD Committee Member (in progress)
8. Anan Muhammad, PhD Committee Member (Graduated in Spring 2008)
9. Brian Hare, Masters Thesis Committee Member (Graduated in Fall 2004)
10. Brijraj Vaghani, Masters Thesis Committee Member (Graduated in Fall 2004)