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I. PROFESSIONAL BACKGROUND

A. Education

- May 1997* **Ph.D.**, Electrical Engineering: Systems
The University of Michigan, Ann Arbor, Michigan
Dissertation: *Reliable Signal Detection of Ventricular Fibrillation in Intracardiac Electrograms for Precision of Therapeutic Choice*
Advisor: Prof. Janice M. Jenkins
Major: Signal Processing
Minor: Biosystems
- May 1994* **M.S.E.**, Electrical Engineering and Computer Science
The University of Michigan, Ann Arbor, MI
- May 1992* **B.S.E.**, Electrical Engineering (Honors)
The University of Iowa, Iowa City, Iowa

B. Professional Experience

- 2004-pres* **Associate Professor**, *Electrical and Computer Engineering*
Clarkson University, Potsdam, NY. (04-07 part time ~50%, 07/08 100%)
- 2007* **Sabbatical**, University of Cagliari, Italy, Feb-June, 2007
- 2004-2006* **Interim Director of Rehabilitation Engineering**, *Coulter College of Engineering*
Clarkson University, Potsdam, NY. (part time included in above)
- 2004* **Consultant**, *Biometric Fusion Center, Department of Defense, Bridgeport, WV*
Developed biometric testing framework for sensors and algorithms. (part-time ~10%)
- 2002-2004* **Research Associate Professor**, *Electrical and Computer Engineering*
Clarkson University, Potsdam, NY. (part-time ~20%)
- 2002-pres* **Research Assistant Professor**, *Computer Science and Electrical Engineering*
West Virginia University, Morgantown, WV. (part-time ~10%)
- 1997-2002* **Assistant Professor**, *Computer Science and Electrical Engineering*
West Virginia University, Morgantown, WV. (2001-2002 part-time 25%)
- 1995-1997* **Consultant**, *Ann Arbor Biomedical*, Ann Arbor, MI
Assisted in grant preparation, tested software to simulate arrhythmias.
- 1994-1997* **Consultant**, *Ann Arbor Electrogram Libraries*, Ann Arbor, MI
Developed software for digitized multi-channel electrocardiograms.
- 1995* **Teaching Assistant**, *Digital Signal Processing*, The University of Michigan
- 1993-1994* **Consultant**, *EP Systems*, Ann Arbor, MI
Performed computer for an arrhythmia monitoring system.
- 1992* **Research Assistant**, *Prof. Milan Sonka*, The University of Iowa
Genetic algorithm for recognition of object boundaries in an image.
- 1990-1992* **Teaching Assistant**, *Introduction to Circuits*, The University of Iowa

1991 **Manufacturing Engineering Intern**, *Motorola, Inc.*, Arlington Heights, IL
Performed software troubleshooting as a test engineer for a cell phone assembly line.

1988-1990 **Lab Technician**, *Archer Daniel Midland*, Clinton, IA
Managed experiments testing optimal media for lysine production. Summers.

Table of Employment

Year	Title	WVU	Clarkson	Research	Total	Notes
97-98	Assistant Prof	100%			100%	Taught two courses, research
98-99	Assistant Prof	100%			100%	Taught five courses, research
99-00	Assistant Prof	100%			100%	Taught four courses, research
00-01	Assistant Prof	25%			25%	Research only
01-02	Assistant Prof	25%			25%	Research only
02-03	Research Assoc Prof	5%		20%	25%	Research only
03-04	Research Assoc Prof	5%		20%	25%	Research only
04-05	Assoc Prof (untenured)		25%	25%	50%	Interim Rehab Director
05-06	Assoc Prof (untenured)		25%	25%	50%	Research only, Bio seminar
06-07	Assoc Prof (untenured)		100% (fall)	25% (wint)	~62%	Taught one course, research
07-08	Assoc Prof (untenured)		100%		100%	Taught two courses, research

C. Honors and Awards

International

- 2003 **Invitee**, NSF Workshop for a Biometric Research Agenda, by invitation only
(unable to attend due to medical reasons)
- 1997 **Finalist**, International Society of Computerized Electrophysiology Young Investigator Competition
- 1996 **Winner**, Rosanna Degani Computers in Cardiology Young Investigator Paper/Presentation Competition
- 1993-1997 **Fellow**, Whitaker Foundation

Clarkson University

- 2008 **Alexander Graham Award**, Clarkson University
Honors one untenured faculty member per year for efforts in research
- 2007 **Teaching Excellence**, Coulter School of Engineering

West Virginia University

- 2000 *Nominated for* **Harriet B. Rigas Award**, IEEE Education Society
- 1999 **Young Researcher of the Year**, College of Engineering and Mineral Resources
- 1998 **Young Researcher of the Year**, College of Engineering and Mineral Resources

The University of Michigan

- 1996 **Distinguished Leader Award**, College of Engineering
Marion Sarah Parker Prize, College of Engineering
Outstanding Graduate Student Award, Society of Women Engineers
Improvement to the SWE Chapter Award, Society of Women Engineers
Best Overall Poster, Graduate SWE Poster Exhibition
- 1995 **Student Achievement Award**, University of Michigan

University of Iowa

- 1992 **Collegiate Scholar**, University of Iowa
Outstanding Senior Award, College of Engineering
- 1989-1991 **Merit Scholarship**, College of Engineering

II. INSTRUCTION

A. Courses Taught

Course #	Title	Semester	# of Students
<i>Clarkson University</i>			
EE321	Systems and Signal Processing	Fall 2008	~50
EE522	Advanced Signal Processing Biomedical and Other Applications	Spring 2008	12
EE321	Systems and Signal Processing	Fall 2007	50
EE321	Systems and Signal Processing	Fall 2006	67
BR100	Biomedical and Rehabilitation Seminar	Spring 2005	3
<i>West Virginia University</i>			
EE126	Signals and Systems II	Spring 2000	60
EE291E	Bioengineering (Team taught: Schuckers-organizer and 1/3 lectures)	Spring 2000	12
EE 124	Signals and Systems I	Fall 1999	69
EE127	Signals and Systems Lab	Fall 1999	69
EE 291C/391F	Biomedical Instrumentation	Fall 1999	14
EE391J	Advanced Signal Processing	Spring 1999	10
EE126	Signals and Systems II	Spring 1999	45
EE291E	Bioengineering (Team taught: Schuckers-organizer and 1/5 lectures)	Spring 1999	27
EE 124	Signals and Systems I	Fall 1998	58
EE127	Signals and Systems Lab	Fall 1998	58
EE 126	Signals and Systems II	Spring 1998	48
EE 291C/391F	Biomedical Instrumentation (Team taught: Schuckers 1/3)	Spring 1998	20

B. Instructional Activities

- 2007 **EE 321 Signals and Systems**, For required course for EE and CompE majors, created eight 'computer lecture' Matlab labs which use audio signals to provide hands-on-experience for students to illustrate signal and systems.
- 2007 **Short Course on Biometrics**, Introduction on biometrics, University of Cagliari, Italy, 5 day, May, 2007.
- 2006 **EE 321 Signals and Systems**, Added Matlab group laboratories on electronic music and group project component with reports and presentation with creation of electronic music.
- 2006-pres **Chair**, development of minors in Biomedical Engineering and Biomedical Science, & Technology (approved Sp 2008). Maintenance of Concentration in Biomedical and Rehabilitation Engineering.
- 2004-5 **Interim Director of Rehabilitation Engineering**, director of developing rehabilitation and bioengineering research and educational program, funded in part by \$6.5M gift from the Coulter Foundation.
- 2000 **Bioengineering Certificate Program**, Approved April 2000 (Tim Norman, chair).
- 2000 **EE 291E: Bioengineering**, *Redesigned* fundamentals of biomedical engineering course with other bioengineering faculty across the college—from engineering physiology biological systems-based course to bioengineering fundamentals-oriented course. Changed textbook.
- 1999 **Curriculum Revision**, Developed new signals and systems course series, reduced from three semesters to two, redesigned lab, added discrete components, submitted courses for approval at dept, college, and university levels.

- 1999 **Bioengineering Certificate Program**, Developed and submitted proposal for graduate program to college curriculum committee, with numerous bioengineering faculty (Tim Norman, chair).
- 1999 **EE391J: Adv. Signal Processing**, Designed graduate level course on advanced signal processing topics featuring biomedical applications. Included strong application component where each group had a specific application which they studied throughout the semester for each theoretical technique.
- 1999 **EE 291F: Bioengineering**, Designed fundamentals of biomedical engineering course with other bioengineering faculty across the college.
- 1999 **Whitaker Foundation Proposal**, *Biometric Systems Engineering: A Unique and Innovative Graduate Degree Program in Biomedical Engineering at West Virginia University*, Collaboration with Tim Norman (PI) and Lawrence Hornak for a Whitaker Special Opportunity Award, Submitted February 1999, \$990,781 (not funded). To be resubmitted February 2000.
- 1998 **EE 124: Signals and Systems I**, Developed course, Passed out notes to class, maintained webpage and email alias, did group work in class, added creative project component with class presentations and reports where the students developed electronic music using Matlab and files from the internet and presented it in class. Includes evaluations between teams of practice presentations/draft reports, development of webpages for each project, and requirement of report revisions.
- 1998 **EE 127: Signals and Systems Lab**, Added new labs using a book, *Labs for Signals and Systems Using Matlab*. These labs featured using exponentials, sinusoids, and Fourier series to create music. Improved communication with lab teaching assistants through extensive weekly meetings, evaluations of instruction, and use of lab to facilitate project.
- 1998 **NSF Engineering Educator Scholars Workshop**, Participated in one week workshop focusing on research, teaching, and mentoring for new faculty, July 1998.
- 1998 **EE 291C and 391F: Biomedical Instrumentation** Designed new course.
- 1998 **EE 126: Signals and Systems II**, Developed course, passed out notes to class, maintained webpage and email alias, did group work in class, added two project components with report exploring correlation receivers and amplitude modulation.

C. Graduate Students

Major Professor

Completed Ph.D.

- May 2008 **Umasankar Kandaswamy**, *World Of Color-Texture: Unified Solution For Enhancement, Invariance, And Recognition*, Ph.D. Thesis, Clarkson.
- Jan 2006 **Aditya Abhyankar**, *Wavelet Integration for Iris and Fingerprint Liveness Biometric Applications*, Ph.D Thesis, Clarkson.
- Dec 2005 **Aaron Lewicke**, *Prediction of Life-Threatening Events in Infants*, Ph.D Thesis, Clarkson.
- Aug 2004 **Reza Derakhshani**, *Biologically-Inspired Evolutionary Temporal Neural Circuits*, Ph.D Thesis, WVU.
- May 2002 **Xu Xueyan**, *Prediction of Life-Threatening Event in Infants Using Heart Rate Variability Measurements*, Ph.D. Thesis, West Virginia University. (Winner of the International Society of Computerized Electrocardiology Jos Willems Young Investigator Competition)

Completed Master's

- Aug 2008 **Katherine Bellor**, *Exploring QT Interval Changes as a Precursor to the Onset of Ventricular Fibrillation/Tachycardia*, Master's Thesis, Clarkson.
- Aug 2008 **Brian DeCann**, *A New Region Based Liveness Detection Algorithm for Biometric Fingerprint Scanners*, Master's Thesis, Clarkson.
- May 2008 **Dave Donegan**, *Integration of Audio and Visual Speech Recognition for Liveness Detection in a Biometric Verification System*, Master's Thesis, Clarkson.
- Dec 2006 **Amith Vijayat**, *Vulnerability Assessment for a Secure On-line Biometric Authentication System Based on Dynamic Representations*, Master's Thesis, Clarkson.
- May 2006 **Nilesh Kulkarni**, *A Comparative Study of Fingerprint Image Quality and its Correlation with Matching Performance*, Master's Thesis, Clarkson.
- Aug 2004 **Dave Sonner**, *A Preliminary Investigation into the Addition of Speech Recognition to a Multi-Modal Biometric System*, Master's Thesis, Clarkson.
- Dec 2003 **Aditya Abhyankar**, *A Wavelet-Based Approach to Detecting Liveness in Fingerprint Scanners*, Master's thesis, Clarkson.
- Dec 2003 **Sujan Parthasardhi**, *Comparison of Classification Methods for Perspiration-Based Liveness Algorithm*, Master's thesis, West Virginia University.
- Dec 2002 **Tieling Yan**, *Visualization of long-term time series Electrocardiographic data*, Master's Problem Report, West Virginia University.
- Dec 2000 **Simona Crihalmeanu**, *Representative Ways to Analyze and Survey Changes in Long-Term Electrocardiographic Recordings*, Master's Thesis, West Virginia University.
- Dec 2000 **Sherry Kratsas**, *Parallelization of ECG Template-Based Abnormality Detection*, Master's Thesis, co-chair with Bojan Cukic, West Virginia University.
- Dec 2000 **Lan Guo**, *Development of a Web-based Multimedia Database for Collection, Organization, and Analysis of Biomedical Signals*, Master's Problem Report, West Virginia University.
- May 2000 **Meiyan Zeng**, *Web-based JAVA ECG Viewer For An Oracle Biomedical Signal Database*, Master's Problem Report, West Virginia University
- Dec 1999 **Amit Diggikar**, *Development of a Method for Calculation of Cardiac Output using Doppler Ultrasound*, Master's Thesis, West Virginia University.
- Dec 1999 **Reza Derakhshani**, *Determination of Vitality from a Non-Invasive Biomedical Measurement for Use in Integrated Biometric Devices*, Master's Thesis, West Virginia University.
- Dec 1999 **Pisut Raphisak**, *Study of the Kalman Filter for Arrhythmia Detection with Intracardiac Electrograms*, Master's Thesis, West Virginia University.
- Dec 1999 **Chuayin Dong**, *Building an Electrocardiogram Signal Database with Oracle 8*, Master's Problem Report, West Virginia University.
- Dec 1999 **Zhenhuan (Jane) Chi**, *Building a Web-Based Oracle Front-End Application for a Biomedical Signal Database*, Master's Problem Report, West Virginia University.
- Aug 1999 **Limin Wang**, *ECG Signal Processing by DSP-21062 Digital Signal Processor*, Master's Thesis, West Virginia University.
- Dec 1998 **Wei Huang**, *Building a Signal Database with Oracle 8*, Master's Problem Report, West Virginia University.

In Progress

Pisut Raphisak, *Analysis of Large Biomedical Time-Series Datasets*, Ph.D. Thesis, WVU, expected Dec 2008.

Daniel Rissacher, *Estimation of Pain from the EEG*, Ph.D. Thesis, Clarkson, off-campus, expected Dec 2008.

Bozhao Tan, *Lipreading as part of a multibiometric system*, Ph.D. Thesis, Clarkson, expected December 2008.

Member of Committee

Completed

- May 2008 **Asghar Goli**, *Multi-component Non-stationary Signal Processing*, Ph.D. Thesis, Clarkson.
- May 2006 **Tim McAuley**, *Heart Rate Variability In Adolescents Exposed To Ultrafine Particles Downwind Of A Major Trade Bridge In Buffalo*, Ph.D. Thesis, Clarkson University.
- Jan 2006 **Liyang Xu**, *Error Resilient and Scalable Video Coding Technique*, Ph.D. Thesis, Clarkson University.
- Nov 2005 **Jonathan P. Majo**, *Blood-flow measurement by Doppler Effect utilizing a non-stationary signal processing technique*, Master's Thesis, Clarkson University.
- Dec 2004 **Mark Fitzpatrick**, *Real-Time Implementation of a Hearing Testing Technique*, Master's Thesis, Clarkson University.
- Aug 2004 **Rohin Govindarajan**, *Feature Level Fusion In Multimodal Biometrics*, Master's Thesis, WVU.
- May 2002 **Lisa Lowell**, *Signal Processing of Bird Calls*, Master's Problem Report, WVU.
- May 2001 **Xiaoqiang Si**, *Porting a CORBA Component to EJB*, Master's Problem Report, WVU.
- May 2001 **Diaa Eldin Nassar**, *A Prototype Automatic Dental Identification System (ADIS)*, Master's Thesis, WVU.
- Dec, 2000 **Praveen Soora**, *CMOS Fingerprint Sensor Electrostatic Modeling*, Master's Thesis, WVU.
- May, 2000 **Qiang Zheng**, *Web Based Distributed System Application*, Master's Problem Report, WVU.
- Dec, 1999 **Brian Taylor**, *Regressive Model Approach to the Generation of Test Trajectories*, Master's Thesis, WVU.
- Dec, 1999 **Xuhui Zhen**, *The Development of a Web-Based Test Bed for Fingerprint Image Comparison*, Master's Problem Report, WVU.
- Dec, 1999 **Yongyi Tao**, *Fingerprint Registration Using Genetic Algorithms*, Master's Problem Report, WVU.
- Dec, 1999 **Lixin Wu**, *XML Representation of EKG*, Master's Problem Report, WVU.
- Aug, 1998 **Xuemin Wang**, *Evaluation of Impact of Cooperative Medical Informatics Laboratory on the Performance of the Data Network of R. C. Byrd Health Sciences Center*, Master's Thesis, WVU.

In Progress

David McNamara, *Audio Signal Processing*, Ph.D. Thesis, Clarkson, Expected May 2009.

Rakesh Pilkar, *Posture and Balance*, Ph.D. Thesis, Clarkson, Expected May 2010.

Viprali Bhakar, *Posture and Balance*, Ph.D. Thesis, Clarkson, Expected May 2010.

Paulo Lopez, *REcogn*, Ph.D. Thesis, Clarkson, Expected May 2010.

D. Undergraduate Students (& Other)

2008-pres **David Yambay**, *Analysis of Multibiometric Data*, C-STEP Scholar.

- 2008-pres **Anthony Bishop**, *Electronic Tongue for differentiation of serotonin & dopamine*, McNair Scholar.
- 2008-pres **Stanley Onyewuchi**, *Environmental changes of liveness measures in fingerprint*, Honors.
- 2008-pres **Andrew Nadeau**, *Development of data collection setup for distance iris and face recognition*, Honors.
- 2008-pres **Corey VanWoert**, *Multi-biometric fusion for face, voice, & lip*, Honors Thesis.
- 2007-pres **David Illig**, *Respiration Changes during exposure to diesel exhaust in children*, Honors Thesis, 2007-pres.
- 2006-07 **John Bartholomay**, *Vulnerability Assessment of Biometric Fingerprint Liveness*, McNair Scholar, 2006-2007.
- 2006-07 **Kate Bellor**, *Analysis of Respiration in CHIME Infant Data*, Honors Thesis, 2006-2007.
- 2004-06 **Joshua Smith**, *Liveness Detection in Biometric Devices*, Honors Thesis, 2004-06.
- 2004-06 **Piyushee Jha**, *Combination of lip reading with face and voice recognition for biometric authentication*, Research Experience for Undergraduates (NSF REU), June 04-June 06.
- 2000-01 **Steve Hudson**, *Automatic Calculation of the QT interval*, Research Experience for Undergraduates (NSF REU), May 2000-Dec 2001.
- 2000-01 **Eric Olness**, *Biology Honors Project*, Project Reader, May 2000-May 2001.
- 2000 **Janet Klinkhachorn**, *Separation of Ventricular Tachycardia and Fibrillation*, High School Research Assistant, May - August 2000.
- 2000 **Jason Stanley**, *Development of a Web-Based Front-End for Data Insertion in an Oracle Database*, Research Experience for Undergraduates (NSF REU), May 2000-Dec 2000.
- 1999-01 **William Gerken**, *Separation of Ventricular Tachycardia and Fibrillation*, Research Experience for Undergraduates (NSF REU), September 1999-May 2001. Now in graduate school at Georgia Tech.
- 1999 **Vebjorn Kristensen**, *Sensing and Recognition of Finger Vitality Using the Veridicom CMOS Fingerprint Sensor*, Undergraduate Research Assistant (unfunded), January 99 - May 99. Now in graduate school at Stanford.
- 1999 **John Nozum**, *Musical ECG*, Undergraduate Independent Project, January 99 - December 99, Finalist for EMBS/BMES Student Project Contest.
- 1999 **Senior Design Group: Paul Kritschgau, Alan Orbeta, Robert Berry, John Grilli**, *Stay-Awake Drowsy Driver*, Sponsor, January 99 - December 99.
- 1998-9 **Senior Design Group: Dwayne Bender, Carlos Iga, Kim Stalnaker, Erin Hogbin**, *Sensing and Recognition of Finger Vitality Using the Veridicom CMOS Fingerprint Sensor*, Sponsor, August 98 - May 99.
- 1998-9 **Senior Design Group: Sherry Poe, Eric Bolton, Jason Lehosit**, *Data Storage and Signal Processing of Electrocardiograms in Laboratory Animals*, Sponsor, August 98 - May 99.
- 1998-9 **Erin Hogbin**, *Sensing and Recognition of Finger Vitality Using the Veridicom CMOS Fingerprint Sensor*, Undergraduate Research Experience through EG&G scholarship and GE Faculty of the Future Award, Summer 1998-May 1999.
- 1997-8 **Senior Design Group: Pete Fritsch, Darin Markus, Todd Welch, Matt Wolfe**, *Development of an Implantable Cardioverter Defibrillator Research Development Tool*, Sponsor, Aug 97 - May 98.

II. RESEARCH

- Statistical signal processing, pattern recognition, algorithm development and evaluation, data mining, and image processing
- Biomedical signals: electrocardiogram, respiration, and electroencephalograms
- Biometrics: fingerprint, iris, voice, face, fingerprint liveness

A. Publications (italics for students)

1. Journal Papers

Under Review

1. *Umasankar Kandaswamy, **Schuckers S**, Don Adjeroh, Comparison of Texture Analysis Schemes Under Non-ideal Conditions, *IEEE Transactions on Image Processing*, submitted 2007.*
2. *Aditya Abhyankar, **Stephanie Schuckers** Combining level-3 features with perspiration pattern for robust fingerprint recognition, *IEEE Signal Processing Letters*, submitted 2007.*
3. *Umasankar Kandaswamy, **Schuckers S**, Don Adjeroh, The Minvariance Model: Illumination-Invariant Analysis of Color Texture, *IEEE Transactions on Image Processing*, submitted 2008.*
4. *Tan B, **Schuckers S**, Spoof Protection for Fingerprint Scanner Using Wavelet Ridge and Valley Noise Analysis, *IEEE Transactions on Forensics and Information Security*, submitted 2007.*
5. *Tan B, **Schuckers S**, Anti-spoofing Protection for Fingerprint Scanner Using Intensity Analysis Based On A Single Image, *Pattern Recognition Letters*, submitted 2008.*
6. *Aditya Abhyankar, **Stephanie Schuckers** , Iris Quality Assessment and Bi-orthogonal Wavelet Based Encoding for Recognition, *IEEE SMC*, submitted 2007.*

Published or Accepted

1. *Aditya Abhyankar, **Stephanie Schuckers** Integrating a wavelet based perspiration liveness check with fingerprint recognition, *Pattern Recognition*, in press, 2008.*
2. *Sazanov E, **Schuckers S**, Lopez-Meyer P, Makeyev O, Sazonova N, Melanson EL, Neuman M, Non-invasive monitoring of chewing and swallowing for objective quantification of ingestive behavior, *Physiologic Measurements*, vol. 20, pp. 525-541, 2008.*
3. *Robert Dowman, Daniel Rissacher, **Stephanie Schuckers**, EEG indices of tonic pain-related activity in the somatosensory cortices, *Clinical Neurophysiology*, vol. 119, pp. 1201-1212, 2008.*
4. *Tan B, **Schuckers S** A New Approach for Liveness Detection in Fingerprint Scanners Based on Valley Noise Analysis, *Journal of Electronic Imaging*, Vol. 17, No. 1, pp. 011009-1 to 011009-9, 2008.*
5. *Aaron Lewicke, Edward Sazonov, **Stephanie Schuckers**, Sleep Versus Wake Classification from Heart Rate Variability Using Computational Intelligence: Consideration of Rejection in Classification Models, *IEEE Transactions on Biomedical Engineering*, vol. 55, pp. 108-118, 2008.*
6. ***Stephanie Schuckers**, Natalia A. Schmid, Aditya Abhyankar, Vivekanand Dorairaj, Chris Boyce, Lawrence A. Hornak, On Techniques for Angle Compensation in Non-Ideal Iris Recognition, *IEEE Transactions of Systems, Man, and Cybernetics*, Volume 37, Issue 5, Page(s):1176 – 1190, Oct. 2007.*
7. *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, pp. 335- 343, 2005.*

8. Sazonov E, Sazonova, N, **Schuckers SAC**, Neuman M, and CHIME Study Group, Activity-based sleep-wake identification in infants, *Physiol. Meas*, vol. 25 pp. 1291-1304, 2004. Chosen by editors as “IoP Select” article.
9. *Derakhshani R*, **Schuckers SAC**, Determination of Vitality From A Non-Invasive Biomedical Measurement for Use in Fingerprint Scanners, *Pattern Recognition*, No.2 pp. 383-396, 2003.
10. **Schuckers SAC**, Spoofing and Anti-Spoofing Measures, *Information Security Technical Report*, Vol. 7, No. 4, pages 56 – 62, 2002.
11. *Xu X*, **Stephanie Schuckers**, Artifact Detection in Heart Period Data, *Journal of Electrocardiology* 2001;34(suppl):101-105.
12. **Schuckers SAC**, Approximate entropy applied to arrhythmia detection, *Journal of Electrocardiology* 1998;31(suppl):101-105.
13. **Caswell SA**, Jenkins JM, DiCarlo LA. Comprehensive ventricular fibrillation detection scheme for ICDs. *Journal of Electrocardiology* 1997;30 (suppl):148-153.
14. Jenkins JM, **Caswell SA**. Detection algorithms in implantable cardioverter defibrillators. *Proceedings of the IEEE* 1996;84:428-445.
15. Chiang CM, Jenkins JM, **Caswell SA**, Stevenson SA, DiCarlo LA, Augmented two-channel arrhythmia detection: an efficient diagnostic method for implantable devices. *PACE* 1996;19:1-9.
16. DiCarlo LA, Jenkins JM, **Caswell SA**, Morris M, Pariseau B. Tachycardia detection by antitachycardia devices: present limitations and future strategies. *Journal of Interventional Cardiology* 1994;7:459-471.
17. **Caswell SA**, DiCarlo LA, Chiang CJ, Jenkins JM. Automated analysis of spontaneously occurring arrhythmias by implantable devices: limitation of using rate and timing features alone. *J of Electrocardiology* 1994;27:151-156.

Citations (by others) from Google Scholar and ISI Web of Knowledge

Author	Journal	Year	Google	Science
R Derakhshani, LA Hornak, SAC Schuckers	IEEE T SYST MAN CY C	2005	12	3
E Sazonov, N Sazonova, S Schuckers, M Neuman, CS	PHYSIOL MEAS	2004	5	4
R Derakhshani, SAC Schuckers, LA Hornak, LO'Gorman	PATTERN RECOGN	2003	36	11
SAC Schuckers	INFORMATION SECURITY	2002	29	5
X Xu, S Schuckers	J ELECTROCARDIOL	2001	3	1
SA Schuckers	J ELECTROCARDIOL S	1998	7	3
SA Caswell, JM Jenkins, LA DiCarlo	J ELECTROCARDIOL	1998	2	1
JM Jenkins, SA Caswell	P IEEE	1996	48	18
SA Caswell, LA DiCarlo, CM Chiang, JM Jenkins	J ELECTROCARDIOL	1994	1	4
Chiang, JM Jenkins, SA Caswell, SA Stevenson, La	PACE	1996	2	1
L Dicarlo, JM Jenkins, S Caswell, M Morris, B	J INTERV CARDIOL	1994	2	1
TOTAL			147	52

2. Book Chapters

1. **Schuckers SAC**, Automated Arrhythmia Detection, in *Encyclopedia of Medical Devices*, Wiley-Interscience, 2 edition, ISBN: 0471263583, 2006.
2. **Schuckers SAC**, *Derakhshani R*, *Parthasardhi S*, Hornak, LA, Liveness Detection in Biometric Devices, in *Electrical Engineering Handbook*, 3rd edition, CRC Press, Chapter 26, ISBN: 084932274X, 2006.

Book Chapters Under Review

1. Andy Adler, **Stephanie Schuckers**, Security and Liveness: Overview, in *Encyclopedia of Biometrics*, to be published.

2. Andy Adler, **Stephanie Schuckers**, Biometric Vulnerabilities: Overview, in *Encyclopedia of Biometrics*, to be published.
3. **Stephanie Schuckers**, Liveness: Fingerprint, in *Encyclopedia of Biometrics*, to be published.

3a. Conference Papers

1. *Oleksandr Makeyev*, Edward Sazonov, Stephanie Schuckers, *Paulo Lopez-Meyer*, Ed Melanson, Michael Neuman, Limited Receptive Area Neural Classifier for Recognition of Swallowing Sounds Using Continuous Wavelet Transform, *29th IEEE EMBS Annual International Conference*, 2007.
2. *Umasankar Kandaswamy*, Donald Adjeroh, Natalia Schmid, **Stephanie Schuckers**, Error Encoded Pde-Textons For Face Recognition, *Automatic Identification and Advanced Technologies, IEEE Workshop on*, June 10-11, 2007.
3. *D. Rissacher*, R. Dowman, **S.A.C. Schuckers**, Identifying Frequency-Domain Features for an EEG-Based Pain Measurement System *33rd Annual Northeast Bioengineering Conference Stony Brook University, NY*, pp. 114-115, March 10-11 2007.
4. Peter Jaques, *Timothy R. McAuley, Xing Sheng, Huang Zheng, Anirban Ghosh, Stephanie Schuckers*, Andrea R. Ferro (2006). Heart Rate Variability (Hrv) Responses And Particulate Exposures For Individuals Who Live Near A Major United States-Canada Trade Bridge In Buffalo. *International Aerosol Conference*, Sept. 10-15, St Paul, MN, USA (Poster 8H13, p.854).
5. *N. Sazonova*, Sazonov Edward, **Stephanie Schuckers**, *Bozhao Tan*, Sleep State Scoring in Infants from Respiratory and Activity Measurements, *Engineering in Medicine and Biology Society, 2006. EMBS '06. 28th Annual International Conference of the IEEE*, Page(s):2462 – 2465, Aug, 2006.
6. *Abhyankar A*, **Schuckers SAC**, Fingerprint Liveness Detection using Local Ridge Frequencies and Multiresolution Texture Analysis Techniques, *Image Processing, 2006 IEEE International Conference on*, Page(s):321 – 324, 8-11 Oct. 2006.
7. *Aditya Abhyankar*, **Stephanie Schuckers**, Active Shape Models for Effective Iris Segmentation, *Proceedings of SPIE*, Orlando, FL March 2006.
8. *Bozhao Tan*, **Stephanie Schuckers**, Comparison of ridge- and intensity-based perspiration liveness detection methods in fingerprint scanners, *Proceedings of SPIE*, Orlando, FL March 2006.
9. *Bozhao Tan*, **Stephanie Schuckers**, Liveness Detection for Fingerprint Scanners Based on the Statistics of Wavelet Signal Processing, *Computer Vision and Pattern Recognition Workshop, 2006 Conference on*, Page(s):26 – 26, 17-22 June 2006.
10. *Aditya Abhyankar*, **Stephanie Schuckers**, Empirical Mode Decomposition Liveness Check in Fingerprint Time Series Captures, *Computer Vision and Pattern Recognition Workshop, 2006 Conference on*, Page(s):28 – 28, 17-22 June 2006.
11. *Abhyankar A*, Hornak LA, **Schuckers SACS**, Off-angle iris recognition using bi-orthogonal wavelet network system, in *Automatic Identification Advanced Technologies, 2005. Fourth IEEE Workshop on*, Page(s):239 – 244, 17-18 Oct. 2005.
12. *Aaron Lewicke*, Edward Sazonov, Michael Corwin and **Stephanie Schuckers**, Reliable Determination of Sleep versus Wake from Heart Rate Variability, *Neural Networks, 2005. IJCNN '05. Proceedings. 2005 IEEE International Joint Conference on Volume 4*, Page(s):2394 - 2399 vol. 4, 31 July-4 Aug. 2005. (Best Student Poster Paper in Applications)
13. ^B*Abhyankar A*, **Schuckers SAC**, Characterization, similarity score, and uniqueness of fingerprint perspiration patterns, *Proceedings of Audio- and Video-Based Biometric*

Person Authentication: 5th International Conference, Lecture Notes in Computer Science, Kanade et al (eds.) Springer Verlag GmbH, 3546: 860-868, 2005

14. A. S. *Abhyankar*, L. A. *Hornak*, **S. C. Schuckers**, Biorthogonal wavelet-based iris recognition, *Biometric Technology For Human Identification II, Proceedings of SPIE* Vol. #5779, Orlando, FL March 2005.
15. *Derakhshani R*, **Schuckers SAC**, "Continuous Time Delay Neural Networks for Detection of Temporal Patterns in Signals." *Neural Networks, 2004. Proceedings. 2004 IEEE International Joint Conference on*, Volume 4, Page(s):2723 - 2728 vol.4, 25-29 July 2004.
16. *Lewicke A*, *Sazonov E*, **Schuckers SAC**, CHIME study group, Sleep-wake identification in infants: heart rate variability compared to actigraphy, *Engineering in Medicine and Biology Society, 2004. EMBC 2004. Conference Proceedings. 26th Annual International Conference of the*, Volume 1, Page(s):442 - 445 Vol.1, 2004.
17. *Raphisak P*, **Schuckers SAC**, AD Curry, An algorithm for EMG noise detection in large ECG data, *Computers in Cardiology, 2004*, Page(s):369 – 372, 19-22 Sept. 2004.
18. **Schuckers SAC**, *Parthasaradhi S*, *Derakhshani R*, *Hornak L*, Comparison of classification methods for time-series detection of perspiration as a liveness test in fingerprint devices, *Biometric Authentication: First International Conference (ICBA)*, LNCS 3072, Springer, Hong Kong, July 2004, pp. 256-263.
19. **Schuckers SAC**, *Abhyankar A*, A Wavelet Based Approach to Detecting Liveness in Fingerprint Scanners, *Proceedings of the Biometric Authentication Workshop, LNCS 3087*, Springer, ECCV, Prague, May, 2004, pp. 100-110.
20. **Schuckers SAC**, *Derakhshani R*, *Parthasaradhi S*, *Hornak L*, Improvement of an algorithm for recognition of liveness using perspiration in fingerprint devices, *Proceedings of the SPIE Defense and Security Symposium, Biometric Technology for Human Identification*, Orlando, April, 2004.
21. **Schuckers SA**, *Abhyankar A*, Wavelet-based approach to detecting liveness in fingerprint scanners, *Proceedings of the SPIE Defense and Security Symposium, Biometric Technology for Human Identification*, Orlando, April, 2004.
22. *Raphisak P*, *Curry AD*, *Malkin RA*, **Schuckers SAC**, Heart Rate Variability in Rats with Aldosterone-Induced Chronic Heart Failure, *Engineering in Medicine and Biology Society, 2003. Proceedings of the 25th Annual International Conference of the IEEE Volume 1*, 17-21 Page(s):228 - 231 Vol.1, Sept. 2003.
23. *Raphisak P*, **Schuckers SAC**, Analysis of Heart Rate Variability in a Rabbit Model of Heart Failure Using Karhunen-Loeve Expansion, *Bioengineering Conference, 2003 IEEE 29th Annual, Proceedings of*, Page(s):242 – 243, 22-23 March 2003.
24. *Sazonova N*, *Sazonov E*, **Schuckers SAC**, Activity-Based Sleep-Wake Identification In Infants, *Proceedings of 2002 Computers in Cardiology*, IEEE Press 0276-6547/02, vol. 29, pp. 525-528.
25. *Raphisak P*, **Schuckers SAC**, Development Of An Experimental Method For Long-Term Electrocardiographic Recordings In A Heart Failure Rabbit Model, *Proceedings of 2002 Computers in Cardiology*, IEEE Press 0276-6547/02, vol. 29, pp. 333-336.
26. *Xu X*, **Schuckers SAC**, Comparison Of Heart Rate Variability Measurements In Infants, *Proceedings of 2002 Computers in Cardiology*, IEEE Press 0276-6547/02, vol. 29, pp. 585-588.
27. *Derakhshani R*, **Schuckers SAC**, "Biologically Inspired Evolutionary Temporal Neural Circuits." *Proceedings of IEEE World Congress on Computational Intelligence*, Honolulu, HI, 2002..

28. **Schuckers SAC**, *Crihalmeanu S, Raphisak P, Xu Xueyan*, Analysis of Long-Term Electrocardiographic Data in a Rabbit Model of Heart Failure, *IEEE Engineering Medicine and Biology Society Annual Conference Proceedings*, October 2001.
29. *Derakhshani R, Schuckers SAC*, Hornak L, O’Gorman L, Neural Network-Based Approach for Detection of Liveness in Fingerprint Scanners, *International Conference on Artificial Intelligence 2001 Proceedings*, Editor H.R.Arabnia, CSREA Press, pp. 1099-1105, 2001.
30. **Schuckers SAC**, *Pisut Raphisak*, Distinction of Arrhythmias with the Use of Approximate Entropy, *Computers in Cardiology 1999*, IEEE Press, pp. 347-350, 1999.
31. **Schuckers SAC**, Use of Approximate Entropy Measurements to Classify Atrial and Ventricular Tachycardia and Fibrillation, *Computers in Cardiology*, IEEE Press pp. 265-268, 1998.
32. **Schuckers SAC**, *Xu Xueyan*, Schuckers ME, Jenkins JM, Ventricular Arrhythmia Detection Using Time-Domain Template Algorithms, *Proceedings of the IEEE 24th Annual Northeast Bioengineering Conference 1998*, IEEE Press, pp. 21-23.
33. **Caswell SA**, Thompson JA, Jenkins JM, DiCarlo LA. Separation of ventricular tachycardia from ventricular fibrillation using paired unipolar electrodes. *Computers in Cardiology*, IEEE Press pp. 1-4, 1996.
34. Jenkins JM, **Caswell SA**, Yan MC, DiCarlo LA. Is waveform analysis a viable consideration for implantable devices given its computational demand? *Computers in Cardiology*, IEEE Press pp. 839-842, 1993.
35. **Caswell SA**, Kluge KS, Chiang CM, Jenkins JM, DiCarlo LA. Pattern recognition of cardiac arrhythmias using two intracardiac channels. *Computers in Cardiology*, IEEE Press pp. 181-184, 1993.

3b. Conference Abstracts and Presentations

1. *Xing Sheng, Sheela V Surisetty, Xiaodong Zhou, Bozhao Tan, Emily MacWilliams, Ryan LeBouf*, Stephanie Schuckers, Alan Rossner, Andrea R. Ferro, Peter A. Jaques. “Personal Exposures and Cardiopulmonary Responses of Children Riding Diesel Powered School Buses, A Pilot Study (Phase II)”. AAAR, 2007.
2. *Maxwell A. Martin, Xiaodong Zhou, Ryan LeBouf, Emily L. MacWilliams*, Alan Rossner, Peter A. Jaques, Stephanie Schuckers, Andrea R. Ferro Spatial and Temporal Variability of Particulate Pollutants in Diesel-Powered School Buses; AAAR 2007.
3. *Tan B, Schuckers S*, Liveness Detection Using an Intensity Based Approach in Fingerprint Scanners, *Proceedings of Biometric Consortium Research Symposium 2005*, Crystal City, VA, Sept 2005.
4. **Schuckers SAC**, Hornak LA, *Derakhshani R, Parthasaradhi S*, Time Series Detection of Perspiration as a Liveness Test in Fingerprint Devices, *Biometric Consortium Research Symposium 2003*, Crystal City, VA, Sept 2003.
5. *Abhyankar A, Hornak LA, Schuckers SAC*, Iris recognition using biorthogonal wavelets, *Biometric Consortium Research Symposium 2004*, Crystal City, VA, Sept 2004.
6. **Schuckers SAC**, Hornak LA, *Derakhshani R, Parthasaradhi S*, Initial results of Spoofing and Liveness Detection in Fingerprint Scanners, *Biometrics 2002*, London, UK, Nov 2002.
7. *Derakhshani R, Schuckers SAC*, Determination of Vitality From A Non-Invasive Biomedical Measurement for Use in Fingerprint Scanners, *Proceedings of World Congress on Medical Physics and Biomedical Engineering 2000*.

8. *Derakhshani R, Schuckers SAC*, Determination of Vitality From A Non-Invasive Biomedical Measurement for Use in Fingerprint Scanners, *Proceedings of International Association for Identification 85th International Educational Conference*, 2000.
9. *Raphisak P, Schuckers SAC*, Use of the Kalman Filter in Arrhythmia Detection. *J of Electrocardiology* 2000;30(suppl).
10. **Schuckers SAC, Raphisak P**. Evaluation of Approximate Entropy for Separation of Ventricular Tachycardia and Fibrillation. *Proceedings of First Joint Meeting of BMES and EMBS*, 1999.
11. **Caswell SA, Jenkins JM, DiCarlo LA**. Ventricular fibrillation classification scheme employing paired signal concordance. *PACE* 1997;30.
12. **Caswell SA, Jenkins JM, DiCarlo LA**, Discrimination of ventricular tachycardia and ventricular fibrillation for use in implantable cardioverter defibrillators. *Proceedings of the Whitaker Biomedical Engineering Research Conference* Snowbird, Utah, August 9-11, 1996.
13. **Caswell SA, Shiu JR, Pariseau B, DiCarlo LA, Jenkins JM**. Ventricular tachycardia discrimination by antitachycardia devices. *Eur.J.C.P.E.* 1996;6:777.
14. **Caswell SA, Shiu JR, Pariseau B, DiCarlo LA, Jenkins JM**, Ventricular tachycardia versus ventricular fibrillation: discrimination by current antitachycardia devices. *J of Electrocardiology* 1996;29.
15. **Caswell SA, Compos AT, Maldonado JM, Jenkins JM, DiCarlo LA**. Chronic bipolar electrograms are stable during changes in body position and activity: implications for antitachycardia devices. *PACE* 1995;18:302.
16. DiCarlo LA, **Caswell SA**, Chiang CJ, Yan MC, Jenkins JM. Statistical validation of time-domain features of sinus rhythm, ventricular tachycardia and ventricular fibrillation. *J of Electrocardiology* 1994;27:91.
17. DiCarlo LA, **Caswell SA**, Chiang CJ, Yan MC, Jenkins JM. Time-domain characteristics of intracavitary sinus rhythm, ventricular tachycardia, and ventricular fibrillation electrograms: results of a statistical analysis. *PACE* 1994;17:11.
18. Jenkins JM, **Caswell SA**, DiCarlo LA, Yan MC, Chiang CM. Four morphometric methods for rhythm classification in implantable antitachycardia devices: a comparative study. *Circulation* 1993(suppl) 88:I53.
19. **Caswell SA, Jenkins JM, DiCarlo LA, Yan MC, Chiang CM**. A comparison of four morphometric methods for waveform analysis of intracardiac electrograms. *J Electrocardiology* 1993(suppl) 26:40.

B. Presentations

1. Conferences (Invited Speaker)

1. **Schuckers SAC, Parthasaradhi S, Derakhshani R, Hornak L**, Comparison of classification methods for time-series detection of perspiration as a liveness test in fingerprint devices, *Biometric Authentication: First International Conference (ICBA)*, LNCS 3072, Springer, Hong Kong, July 2004.
2. **Schuckers SA**, Making Biometric Systems Spoof-Proof, *Biometrics 2002*, London, UK, Nov 2002.
3. **Caswell Schuckers SA**, Use of Approximate Entropy Measurements to Classify Atrial and Ventricular Tachycardia and Fibrillation, *International Society of Computerized Electrocardiology*, May 1998.

2. Seminars (Invited Speaker)

1. Schuckers SAC, Bio-Signal Processing: Sudden Cardiac Death, Sudden Infant Death Syndrome, and Biometrics, *Clarkson University*, seminar, Science and Technology at the Bio-Interface series, December 2004.
2. Schuckers SAC, Signal Processing for Detection and Prediction of Cardiac Disease, *University of Memphis*, seminar, February 11, 2000.
3. Schuckers SAC, Digital Signal Processing for Arrhythmia Detection, *University of Alabama-Birmingham*, seminar, December 16, 1999.
4. Schuckers SAC, Biomedical Signal Processing Used for Prediction and Detection of Disease, *The 13th JoAnne and Charles Dickinson Symposium in Women's Studies*, West Virginia University, April 13, 1999.
5. Schuckers SAC, Biomedical Signal Processing, *WVU HSC Research Day*, Health Science Center, West Virginia University, Mar. 19, 1999.
6. Schuckers SAC, Bioengineering, *Cardiology Grand Rounds*, Dept of Cardiology, West Virginia University, January 29, 1999.
7. Schuckers SAC, A Brief Review of the Use of Computer Algorithms in Medical Devices, *WVU Biomedical Engineering Society*, November 1998.
8. Caswell SA, Signal Processing Techniques to Improve Arrhythmia Detection in the Implantable Cardioverter Defibrillator, *Prucka Engineering*, Houston Texas, December 12, 1997.
9. Caswell SA, Signal Processing Techniques to Improve Arrhythmia Detection in the Implantable Cardioverter Defibrillator, *WVU Computer Science Seminar Series*, November 20, 1997.
10. Caswell SA, Morris MM, Jenkins JM. New research in arrhythmia detection, Department of Biomedical Engineering Seminar, *The University of Michigan*, October 16, 1996.
11. Caswell SA. Digital signal processing used to improve arrhythmia detection in implantable cardioverter defibrillators, Department of Electrical and Computer Engineering, *The University of Iowa*, August 28, 1996.
12. Caswell SA. Review of digital signal processing used in implantable cardioverter defibrillators. Nora Eccles Cardiovascular Research and Training Institute, *The University of Utah*, August 8, 1996.

C. Research Grants

1. *Research Grants In Progress*: funding level stated as: \$total (\$my part)
National Science Foundation I/UCRC Center for Identification Technology Phase 0—
Participation in The MultiBiometric Grand Challenge, Stephanie Schuckers (PI) with Natalia Schmidt, B. Abidi, 7/1/08-12/31/08, \$30,000 (my part: \$10,000).
National Science Foundation, STTR Phase I: Software-Based Liveness to Prevent Spoofing Fingerprint Biometric Scanners, Aaron Lewicke (PI, NexID Biometrics), Stephanie Schuckers (PI, Clarkson University), \$147,326 (CU subcontract--\$66,726), 1/1/08-12/31/08.
National Science Foundation, ITR Collaborative Research: Biometrics – Performance, Security, and Societal Impact, Two linked proposals, Hornak (lead PI), SAC Schuckers (PI-link), A Jain, M Schuckers, L Nelson, B Cukic, 2/1/04-1/31/09, \$3,079,550 (CU link: \$1,714,097, \$723,023 my part). Also received an NSF REU supplement.
Zoll Lifecor, Analysis and Prediction of Spontaneous Arrhythmias, Stephanie Schuckers (PI), 8/25/07-2/24/09, \$39,750 (\$39,750).
National Institute of Health, Detection of Chewing and Swallowing to Estimate Eating Patterns and Energy Intake, E. Sazonov (PI), Stephanie Schuckers, 9/1/05-8/31/08, \$217,756 (\$108,878).

2. Past Research Grants

Syracuse Center of Excellence in Environmental and Energy Systems CARTI, *Personal Exposures and Cardiopulmonary Responses of Children Riding Diesel Powered School Buses*, Peter Jaques (PI) with A. Ferro, A. Rossner, S. Schuckers, 8/1/06-11/30/07, \$100,000 (\$25,000).

National Science Foundation I/UCRC Center for Identification Technology *Quality Based Restitution of Iris Features in High Zoom Images for Less Constrained Iris Recognition System*, Stephanie Schuckers (PI) with Natalia Schmidt, L. Hornak, 1/1/07-6/30/08, \$90,000 (\$45,000).

Primonics, *Development of a Voice Recognition Algorithm for Vision R&D Fingerprint/Voice Scanner*, Stephanie Schuckers (PI), 12/22/07-2/22/08, \$25,000 (\$25,000).

National Science Foundation I/UCRC Center for Identification Technology *Encryption of Biometric Templates using Biometrics as the Key*, PI with Sunil Kumar, 1/1/06-6/30/07, \$81,000 (\$40,500).

National Science Foundation I/UCRC Center for Identification Technology *Non-Ideal Iris Recognition: Segmentation and Algorithms*, Natalia Schmidt (PI) with G. Fahmy, X. Li, L. Hornak, 7/1/05-12/31/06, \$95,000 (\$39,000).

National Science Foundation I/UCRC Center for Identification Technology Research Grant, *Interoperability, Performance, and Fusion Issues in Fingerprint Sensors*, PI with Sunil Kumar, Arun Ross, 1/1/05-6/30/06, \$105,000 (\$26,000).

National Science Foundation I/UCRC Center for Identification Technology Research Grant, *Acquisition and Understanding of Partial Iris Imagery*, With Lawrence Hornak (PI), X. Li, G. Fahmy, A. Realini N. Schmidt, 1/1/04-6/30/05, \$122,000 (\$34,500).

National Institute of Health, *Predicting Life-Threatening Events in CHIME Infant Data*, 7/1/02-6/30/05, \$157,000 (\$157,000).

National Science Foundation I/UCRC Center for Identification Technology Research Grant, *Solidifying CITeR's Liveness Testing Core Competency*, Principal Investigator with Lawrence Hornak, Tim Norman, 1/1/03-6/30/04, \$75,000 (\$37,500).

Cameron Health, *Analysis of Electrocardiogram*, 7/1/02-9/30/02, \$7,579 (\$7,579).

STS, International (prime for DOD), *Biometrics and IA Curriculum*, Co-PI with Larry Hornak, Bojan Cukic (PI), Michael Schuckers, 7/25/2001-7/24/2004, \$262,443 (\$65,610).

National Science Foundation I/UCRC Center for Identification Technology Research Grant, *Determination of Liveness in Biometric Devices*, Principal Investigator with Lawrence Hornak, Tim Norman, 8/16/01-12/31/02, \$105,000 (\$50,000).

National Science Foundation, REU Supplemental Funding: *Analysis of Spontaneous Arrhythmias in the Chronic Adriamycin Model of Heart Failure*, Principal Investigator, 7/1/00-12/31/02, \$10,000 (\$10,000).

National Science Foundation, POWRE: *Analysis of Spontaneous Arrhythmias in the Chronic Adriamycin Model of Heart Failure*, Principal Investigator, 7/1/99-12/31/02, \$75,000 (\$75,000).

National Science Foundation, REU Supplemental Funding: *Analysis of Spontaneous Arrhythmias in the Chronic Adriamycin Model of Heart Failure*, Principal Investigator, 7/1/99-12/31/02, \$10,000 (\$10,000).

American Heart Association, *Signal Processing for Prediction of Sudden Cardiac Death in Adriamycin Animal Model of Heart Failure*, Principal Investigator, 7/1/99-6/30/02, \$60,000 (\$60,000).

STS, International (prime for DOD), *West Virginia Army National Guard Quick Look Biometric Test and Evaluation of Biometric Systems*, Co-PI with Larry Hornak, Bojan Cukic, Michael Schuckers (PI), 1/801-8/17/01, \$19,250 (\$5,000).

West Virginia University Research Corporation, *Signal Processing in Biomedical Devices*, Principal Investigator, 7/1/98-6/30/01, \$30,000 (\$30,000).

NASA EPSCOR, *Exploration and Expansion of Identification Technologies Research*, Principal Investigator with Larry Hornak, 7/1/99-6/30/00, \$38,970 (\$20,000).

National Science Foundation I/UCRC Planning Grant, *Center for Identification Technology Research*, Participant with Lawrence Hornak (PI), 1/1/01-12/31/01, \$10,000 (N/A).

WVU-ARTS, *Detecting Physiological Change in Massive Temporal Datasets*, Co-PI with Michael Schuckers and Kris Krajnek, 7/1/00-6/30/01, \$33,000 (\$11,000).

ALCOA Faculty of the Future, *Research in Computers in Cardiology*, Principal Investigator, 8/1/99-12/31/99, \$3,289 (\$3,289).

West Virginia Space Grant Consortium Research Capability Enhancement Award, *Signal Processing for Prediction of Sudden Cardiac Death*, Principal Investigator, 3/31/99-8/1/99, \$1,000 (\$1,000).

University of Memphis, *Approximate Entropy and Other Analysis for CHIME*, Subcontract on NIH study, Principal Investigator, 9/8/98-8/15/99, \$21,754 (\$21,754).

Veridicom, Inc., *Sensing and Recognition of Finger Vitality Using the Veridicom CMOS Fingerprint Sensor*, Principal Investigator with Larry Hornak, Tim Norman, 9/17/98-8/15/99, \$16,425 (\$15,000).

Veridicom, Inc., *The Veridicom CMOS Fingerprint Sensor: Sensing Mechanisms Electrostatic Modeling*, Co-Investigator (unfunded) with Larry Hornak (PI), Tim Norman (unfunded), 9/17/98-8/15/99, \$16,608 (\$2,000).

West Virginia Space Grant Consortium, *Continuous-time analysis of pre- and post-flight physiological signals for determination of the mechanism of orthostatic intolerance*, Principal Investigator, 9/17/97-6/30/98, \$20,000 (\$20,000).

GE Faculty of the Future Program, West Virginia University, *Signal Processing in Modern Biomedical Devices*, Principal Investigator, 7/28/97-10/1/98, \$20,000 (\$20,000).

Association of Women in Science – WV chapter – Career Enhancement Award, *Collaboration with University of Memphis Researchers for Development of Animal Model of Sudden Death*, Principal Investigator, 5/1/98-8/30/98, \$1,700 (\$1,700).

WV-EPSCOR Mini-Grants, *Development of a Proposal to NSF-CAREER*, 4/1/98-8/30/98, Principal Investigator, \$3,000 (\$3,000, plus \$1,000 for two mentors).

3. Equipment grants or donations

Coulter Foundation (from gift to Clarkson University), *Development of the Biomedical Signal and Image Processing Group*, 1/1/03-12/31/04, with S. Kumar, E. Sazonov, A. Ziarani, \$110,000 (\$27,500).

NSF-EPSCoR, *West Virginia Blueprint for Science and Technology: Strengthening Statewide Multidisciplinary Academic Research Infrastructure*, Participant with Paul Hill (PI), Lawrence Hornak (co-PI), Laura Janski (co-PI), Frances Van Scoy (co-PI), 1/1/2002-12/31/2005, 8,937,895. ~\$550,000 for Statistical Biosignal and Image Processing Group (~\$100K shared equipment).

NSF EPSCOR Infrastructure, *Identification Technology*, 8/1/01-12/31/01, Participant, Included \$122,000 (\$60,000) equipment specifically for biomedical signal processing group.

NSF EPSCOR Infrastructure, *Identification Technology*, 7/1/98-6/30/01, Participant, Included \$100,000 equipment specifically for biomedical signal processing (\$50,000)

Hewlett Packard, *Collaborative Medical Informatics Laboratory*, Technical participant, Co-Director of Technical Management Group, Donation of ~\$500,000 (shared) worth of equipment, 7/1/97-6/31/2000.

IV. SERVICE ACTIVITIES

A. Profession

National Offices Held

- 2006-pres **Webmaster**, *International Society of Computerized Electrocardiology*
- 2000 **Chair, Professional Activities and Continuing Education (PACE) Committee**, *IEEE Engineering Medicine and Biology Administrative Committee*
- 1999-00 **Region 2 Representative**, *IEEE Engineering Medicine and Biology Administrative Committee*
- 1999 **PACE Committee**, *IEEE Engineering Medicine and Biology Administrative Committee*

Regional Offices Held

- 2000-01 **Chair**, *IEEE Upper Monongahela Subsection*
- 1998-9 **Vice-Chair**, *IEEE Upper Monongahela Subsection*
- 1997-8 **Secretary/Treasurer**, *IEEE Upper Monongahela Subsection*

Offices Held in School

- 1994 **Graduate Committee Director**, *Society of Women Engineers*
Founded and directed a graduate group for women in engineering. (5th year Anniversary was held in November, 1999.)
- 1995 **Symposium Co-Organizer**, *Society of Women Engineers*
Organized the first-ever UM Women in Engineering Symposium, a one-day event which hosted over 45 speakers and 125 attendees.
- 1991 **Public Relations Director**, *Society of Women Engineers*
- 1991 **Community Service Chair**, *Tau Beta Pi*
- 1991 **Vice President**, *Eta Kappa Nu*
- 1991 **Chairman**, *University of Iowa Honors Seminar*
- 1990 **Public Relations Director**, *Alpha Phi International Fraternity*

Memberships

- Senior Member**, *Institute of Electrical and Electronics Engineers*, 2007
- Member**, *Institute of Electrical and Electronics Engineers*, 1996
- Member**, *Society of Women Engineers*
- Member**, *International Society for Computerized Electrocardiology*
- Member**, *Sigma Xi, The Scientific Research Society*
- Member**, *American Society for Engineering Education*
- Member**, *Tau Beta Pi*, 1990
- Member**, *Eta Kappa Nu*, 1990
- Member**, *Association for Women in Science*, 1998

B. Referee Activity

- 2008 **Co-Editor**, Special Issue on Biometrics, *EURASIP Journal of Applied Signal Processing*
- 2004-pres **Member**, Program Committee, *International Conference on Biometric Authentication*
- 2003-pres **Member**, Program Committee, *Biometric Symposium at Biometric Consortium Conference*

Reviewer

- Pattern Recognition
IEEE Transactions on Information Security and Forensics

IEEE Pattern Analysis and Machine Intelligence
 IEEE Transactions on Systems, Man, and Cybernetics
 EURASIP Journal of Applied Signal Processing
 John Wiley & Sons
 NIH SBIR.
 IEEE Engineering Medicine & Biology Magazine
 Physiological Measurement
 American Heart Association
 IEEE Transactions on Biomedical Engineering
 National Science Foundation
 Medical & Biological Engineering and Computing
 IEEE Transactions on Education
 IEEE Southeastern Symposium on System
 North American Society of Pacing and Electrophysiology

C. Service to University

Clarkson University

- 2005-pres **Chair**, *Biomedical and Rehabilitation Engineering and Science Curriculum Committee*
- 2007-pres **Co-advisor**, *Society of Women Engineers* student group
 -Organized panel discussion at Clarkson Alumni Reunion for 35th anniversary, July 08.
- 2007-pres **Presentation**, *Fingerprints, Iris Scans and Voice Recognition: The Real Threat of Spoofing*, Clarkson University Alumni Reunion, 2007, 2008.
- 2004-5 **Member**, *College Open Faculty Search Committee*
- 2004-5 **Member**, *Director of Bio/Rehabilitation Engineering Search Committee*
- 2004-pres **Mentor**, Assistant Professor, Alireza Ziarani, ECE

West Virginia University

- 2001 **Member**, *Search Committee for College of Engineering and Mineral Resources Associate Dean for Research*
- 2000 **Featured in President's State of the University Address and Report**, *WVU Research: Supporting Economic Transformation of our State and Nation*
- 1999-00 **Member**, *Departmental Promotion and Tenure Committee*
- 1998-pres **Member**, *Electrical Engineering Curriculum Committee*
- 1998-2002 **Faculty Advisor**, *West Virginia University Biomedical Engineering Society Student Chapter*
- 1997-2002 **Faculty Counselor**, *West Virginia University Society of Women Engineering Student Chapter*
- 1999-00 **Member**, *Dean of College of Engineering and Mineral Resources Five-Year Review Committee*
- 1998-2002 **Member**, *West Virginia University Bioengineering Executive Committee*
- 1998-2002 **Member**, *West Virginia University Biometric Curriculum Committee*
- Sp, 1998 **Workshop Coordinator**, *AWIS Science: It's a She Thing*, High School Girls Science One-Day Workshop

C. Featured in the following:

Media Coverage

- 2007 **Article**, "The Door Key That Can't Be Misplaced " *The New York Times*, June 10, 2007.
- 2007 **Article**, "Fingered" *Odyssey Magazine*, October, 2007.

- 2005 **Article**, "Is That a Finger or a Jell-O Mold? " *The New York Times*, Dec. 20, 2005
- 2005 **Article**, "Biometric expert shows an easy way to spoof fingerprint scanning devices", *Physorg.com*, Dec. 11, 2005
- 2005 **Video**, "Fooling the finger scanner", *Daily Planet* archives, Discovery Channel Canada, Dec. 13, 2005
- 2005 **Article and RealAudio**, "Fake Fingers and Computer Security" from Public Radio's *Future Tense*, Dec. 14, 2005
- 2003 **Article**, "Progress: Summaries of Research and Inventions from Science and Technology Journal," *IEEE Spectrum*, (for Pattern Recognition 2003 article), March, 2003
- University**
- 2007 **Web Video**, "Why I Defy", marketing feature on Clarkson website.
- 2006 **Article**, *Clarkson University Alumni Magazine*
- 2005 **Article**, *Clarkson University Alumni Magazine*
- 2004 **Article in Clarkson University Alumni Magazine**, Spring 2004, pg 5
- 2002 **Article in Clarkson University President's Report**, 2002, pg 12
- 2001 **Featured in West Virginia University Alumni Magazine**, Summer 2001, pg 21

V. OTHER

- 2007 **U.S. Patent Filed**, Aditya Abhyankar, Stephanie Schuckers, "*New Wavelet-Based Fingerprint Liveness Method.*" United States Provisional Patent Application number 60/919,043 dated March 20, 2007, full patent submission dated October 8, 2007
- 2007 **U.S. Patent Filed**, Aditya Abhyankar, Stephanie Schuckers, *Fingerprint Liveness Detection Using Local Ridge Frequencies And Multiresolution Texture Analysis Techniques*, United States Provisional Patent Application number 60/850,664, submitted 10/9/06, full patent submission dated October 8, 2007
- 2005 **Founded NexID Biometrics, LLC**, Co-owners, Lawrence Hornak, Bojan Cukic, Michael Schuckers, Morgantown, WV, December 2005
- 2004 **Secret Security Clearance**
- 2004 **U.S. Provisional Patent Pending**, *A wavelet-based approach to detecting liveness in fingerprint scanners*, Submitted April, 2004, not pursued to completion
- 1999 **U.S. Provisional Patent Pending**, *Method and Apparatus for Determining A Living Finger On A Fingerprint Sensor*, Submitted September, 1999, not pursued to completion
- 1999 **U.S. Patent Awarded**, *Method and Apparatus for Separation of Ventricular Tachycardia From Ventricular Fibrillation For Implantable Cardioverter Defibrillators #5,857,977*, Submitted August 1996, Awarded January 12, 1999