

Rick Archibald

Computer Science and Mathematics Division
Oak Ridge National Laboratory
P.O. Box 2008 MS 6367
Oak Ridge, TN
Telephone: (865) 576- 5761 **Fax:** (865) 574-0680
Electronic Mail: archibaldrk@ornl.gov

Education

Arizona State University

Tempe, AZ.

Thesis Advisor: Anne Gelb. Thesis title: *Boundary Detection and Reconstruction in Magnetic Resonance Imaging*. Focus of study: spectral methods, partial differential equations, statistics, computational biology, and medical image analysis.

Ph.D. in Mathematics

August 1998– May 2002

University Of Alberta

Edmonton, AB.

Thesis Advisor: Abel Cadenillas. Focus of study: stochastic partial differential equations, numerical computation, and mathematical finance.

M.Sc. in Applied Mathematics

September 1996– April 1998

University Of Alberta

Edmonton, AB.

Focus of study: partial differential equations, computer programming, and biological physics.

B.Sc. in Honors Physics

September 1992– April 1996

Professional Experience

Computer Science and Mathematics Division

Oak Ridge National Laboratory

Supervisor: Ed D’Azevedo. Focus of study: hyperspectral imaging, nano-technology, parallel computing, and partial differential equations.

Householder Fellow

August 2005–August 2007

Department of Neuroscience

Brown University

Supervisor: Jerome Sanes. Focus of study: Data fusion and beamforming in Electroencephalography (EEG), Magnetoencephalography (MEG) and functional Magnetic Resonance Imaging (fMRI).

Post Doctorate

August 2004–July 2005

Center for System Science and Engineering Research

Arizona State University

Supervisor: Frank Hoppensteadt. Focus of study: Dynamical nano-systems and image analysis.

Post Doctorate

May 2002–August 2004

Alzheimer Disease Research Center

Good Samaritan Hospital, AZ.

Studied under the guidance of Kewei Chen in the areas of medical imaging methods and analysis.

Research Assistant

January 1999– May 2002

Publications

R. Archibald and G. Fann, "Feature Selection and Classification of Hyperspectral Images with Support Vector Machines." In press *IEEE Geoscience and Remote Sensing Letters*, **4**, 4, 674-678, 2007.

N. Lavrik, R. Archibald, D. Grbovic, and P. Datskos, "Uncooled MEMS IR Imagers with Optical Readout and Image Processing," *Proceedings of the SPIE*, **6542**, 2007.

P. Chapman, Z. Long, P. Datskos, R. Archibald, and M. Sepaniak, "Differentially Ligand-Functionalized Microcantilever Arrays for Metal Ion Identification and Sensing." *Analytical Chemistry*, **79**, 18, 7062-7068, 2007.

R. Archibald, P. Datskos, G. Devault, V. Lamberti, N. Lavrik, D. Noid, M. Sepaniak, and P. Dutta, "Independent Component Analysis of Nanomechanical Responses of Cantilever Arrays," *Analytica Chimica Acta*, **584**, 101-105, 2007.

R. Archibald, A. Gelb, and J. Yoon, "Determining the Locations of Discontinuities in the Derivatives of Functions." *Applied Numerical Mathematics*, 2007.

J. Sanes, T. OKeefe, R. Archibald, E. Bienenstock, "Single-Trial Prediction of Discrete Hand Movements with Electroencephalography," Abstract, Human Brain Mapping, 2006.

R. Archibald, A. Gelb, S. Gottlieb, and J. Ryan, "One-Sided Post-Processing for the Discontinuous Galerkin Method Using ENO Type Stencil Choosing and the Local Edge Detection Method." *Journal of Scientific Computing*, **28**, 2-3, 167-190, 2006.

R. Archibald, A. Gelb, and J. Yoon, "Polynomial Fitting for Edge Detection in Irregularly Sampled Signals and Images." *SIAM Journal on Numerical Analysis*, **43**, 259-279, 2005.

R. Archibald, J. Hu, A. Gelb, and G. Farin, "Improving the Accuracy of Volumetric Segmentation Using Pre-Processing Boundary Detection and Image Reconstruction." *IEEE Transactions on Image Processing*, **13**, No. 4, 2004.

R. Archibald, K. Chen, A. Gelb, and R. Renaut, "The Improvement of Human Brain Segmentation Through the use of the Gegenbauer Reconstruction Method as a Pre-Processing Step." *NeuroImage*, **20**, 489-502, 2003.

R. Archibald and A. Gelb, "Reducing the Effects of Noise in MRI Reconstruction." *Biomedical Imaging, Proceedings, 2002 IEEE International Symposium on*, 497-500, 2002.

A. Gelb and R. Archibald, "Reducing the Gibbs Ringing Artifact in MRI Scans While Maintaining Tissue Boundary Integrity." *Biomedical Imaging, Proceedings, 2002 IEEE International Symposium on*, 923-926, 2002.

R. Archibald and A. Gelb, "A Method to Reduce the Gibbs Ringing Artifact in MRI Scans While Keeping Tissue Boundary Integrity." *IEEE Transactions of Medical Imaging*, **21**, 305-319, 2002.

R. Archibald and A. Gelb, "Reducing The Effects of Noise in Boundary Detection." *Journal of Scientific Computing*, **17**, 167-180, 2002.

**Selected
Presentations &
Posters**

"Identification of Limiting Domains for Hyperbolic Dynamical Systems Through Multivariate Edge and Singularity Detection." *International Conference on Spectral and High Order Methods*, Chinese Academy of Sciences, Beijing, China, June 2007.

"Information Extraction and Classification of Signals from Nanomechanical Cantilever Arrays." *Pittsburgh Conference and Expo*, Chicago, IL, February 2007.

"Computation Using Rate Coupled Oscillators with Saddle Node Dynamics." *Functional Engineered Nano Architectonics (FENA) Review*, University of Los Angeles, CA, January 2005.

"Predicting Leftward and Rightward Hand Movements with EEG on Single Trials," *Society of Neuroscience Annual Meeting*, Washington, DC, November 2005.

"Applications of Multivariate Boundary Detection." *International Conference on Spectral and High Order Methods*, Brown University, RI, June 2004.

"Improving the Accuracy of Segmentation Algorithms for Magnetic Resonance Imaging." *Mathematical Modeling in Neuroscience, Biomedicine, Genetics, and Epidemiology – Special Session at the National AMS Meeting*, Phoenix, AZ, January 2004.

"Reducing the Effects of Noise in MRI Reconstruction." *IEEE International Symposium On*

Biomedical Imaging: Macro to Nano, Washington, D.C., July 2002.

“Reducing the Effects of Noise in Boundary Detection.” *International Conference on Spectral and High Order Methods*, Uppsala, Sweden, July 2001.

“The Path of Personal Academic Development.” *Preparing Future Faculty Conference* Arizona State University, AZ, May 2001.

“Validation Methods for Segmentation in Medical Imaging.” *SIAM Annual Meeting*, San Juan, Puerto Rico, July 2000.

“The Graduate Research Experience.” *Undergraduate Seminar*, NAU, AZ, June 2000.

**Invention
Disclosures**

R. Archibald, A. Rondinone, D. Noid, M. Garland, S. Mirzadeh, “Downward Scalable Power Source Fueled by Nuclear Action in Nano-particles,” January, 2007.

R. Archibald, P. Datskos, G. Devault, V. Lamberti, N. Lavrik, D. Noid, M. Sepaniak, and P. Dutta, “Nanomechanical Sensor Employing Independent Component Analysis and Neural Network Analysis,” May, 2006.

Current Support

Y-12 National Security Complex - Plant Directed Research and Development, “Microcantilever Transducers - the next generation of gas diagnostics,” 2006-2007, \$100,000/yr.

Pending Support

DARPA, “Blast-induced Traumatic Brain Injury: Defining the Problem, Discovering the Causes, Developing Solutions for Our Soldiers,” 2007-2009, \$150,000/yr.

DARPA, “Downward Scalable Power Source Fueled by Nuclear Action of Nanoparticles,” 2007-2010 (PI), \$300,000/yr.

**Teaching
Experience**

Maricopa Community College
Mesa, AZ.

Adjunct Faculty

January 2003–July 2004

Instructor for Basic Mathematics, Introductory Algebra, and Calculus. Additionally I maintain a course web site, which includes resources, syllabus, and class grades.

Arizona State University
Tempe, AZ.

Instructor

August 1998–May 2002

Instructed several College Algebra and Pre-Calculus courses. Additionally I maintained for each course a web site, which included resources, syllabus, and class grades. Substitute instructor on various occasions for the graduate Spectral Methods course. Guest lecturer for the graduate Computational Biology course.

Payne Academy for the Gifted
Mesa, AZ.

Instructor

August 2001–May 2002

Instructed Honors Calculus and Honors Geometry courses. Additionally I maintained for each course a web site, which included resources, syllabus, and class grades. Mentored several gifted students.

**Research
Experience**

**Southwest Small Animal Imaging
Resource**
Tucson, AZ.

Research Assistant

January 2001–May 2001

Developed imaging algorithms for high field magnetic resonance imaging.

Center Of Nuclear Medicine
Good Samaritan Hospital, AZ.

Research Assistant

January 1999–May 2000

Developed image segmentation algorithms for magnetic resonance imaging.

**Professional
Service**

Peer Review of Articles

ACM Transactions on Mathematical software.

Applied Numerical Mathematics.

Journal of Electronic Imaging.

Journal of Optimization and Engineering.

Journal of Scientific Computing

Mathematical Biosciences and Engineering.

Review of Research Proposals

Early Career Principal Investigator Program in Applied Mathematics, Computer Science, and High-Performance Networks, U.S. Department of Energy.