Cranos M. Williams, Ph.D.

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EDUCATION

01/2003 – 08/2008   **Ph.D., Electrical Engineering**
North Carolina State University, Raleigh, NC
Advisor: Dr. Winser Alexander
Dissertation: *Engineering Methodologies and Design Concepts for Systems Biology*

08/2001 – 12/2002   **M.S., Electrical Engineering**
North Carolina State University, Raleigh, NC

01/1997 – 05/2001   **B.S., Electrical Engineering**
North Carolina A&T State University, Greensboro, NC

RESEARCH AND WORK EXPERIENCE

08/2008 – Present   **North Carolina State University**, Raleigh, NC
Assistant Professor: Research interests include the development, reformulation, and implementation of engineering-based tools that can model multiple scales and multiple levels of interacting cellular processes in a system of systems infrastructure.

01/2003 – 08/2008   **North Carolina State University**, Raleigh, NC
Research Assistant: (1) Implemented and compared projection approaches for deciphering underlying regulatory mechanisms involved in the genotypic stress response of *Bacillus subtilis*; (2) Compared global search and local search optimization algorithms for state estimation of biochemical pathways; (3) Constructed an optimal control formulation which addresses several issues inherent to state and parameters estimation of biochemical pathways.

05/2003 – 08/2003   **Eastman Kodak Company**, Rochester, NY
GEM Fellow – Summer Research Student: (1) Performed a literature survey of state-of-the-art techniques used for multi-modal image registration; (2) Implemented and tested image processing algorithms designed to perform 2-D rigid-body image registration using Mutual Information; (3) Researched and implemented new algorithms for multi-modal image registration (U.S. Patent 7,263,243).

05/2002 – 08/2002   **Brookhaven National Laboratory, National Synchrotron Light Source**, Upton, NY
GEM Fellow – Summer Research Student: (1) Developed a high-speed low-latency digital front-end for processing RF signals in an Accelerator RF system; (2) Created a testing scenario that estimated the effects of round-off error due to finite precision implementation; (3) Designed a minimum phase anti-aliasing decimation filter that incorporated the removal of DC offset within the input signal.

05/2001 – 08/2001   **Brookhaven National Laboratory, National Synchrotron Light Source**, Upton, NY
GEM Fellow – Summer Research Student: (1) Researched the effects of replacing an analog Accelerator RF system with a more flexible, versatile digital system; (2) Implemented an in-phase/quadrature-phase detector and a multiple input Infinite Impulse Response (IIR) filter using a complex programmable logic device; (3) Designed a digital converter interface to allow time critical data conversions and calculations.

12/2000 – 05/2001	**North Carolina A&T State University**, Greensboro, NC *Undergraduate Research Assistant*: (1) Researched the use of Electromagnetic Glottal Sensors to enhance Automatic Speech Recognition; (2) Designed and built a PC based radio-controlled car.
08/2000 – 05/2001 & 06/1997 – 12/1999	**General Electric Industrial Systems**, Mebane, NC *Systems Analyst*: (1) Developed an automated Bug Tracking database which tracks and maintains past and future bugs for an in-plant requisition engineering system using Microsoft Access; (2) Responsible for software and hardware upgrades for 300+ workstations.
05/2000 – 08/2000	**General Electric Medical Systems**, Waukesha, WI *Global X-ray Field Service Application Engineer*: (1) Converted DOS-based X-ray positioner debug tool to a 32-bit Windows based utility by analyzing existing code and implementing the new design.
01/2000 – 05/2000	**General Electric FANUC Automation**, Charlottesville, VA *Systems Test Engineer*: (1) Designed, developed, implemented, and debugged application-based test platforms for functional and system level verification of various Programmable Logic Controller products; (2) Led development of the 90-30 Power Supply Test which utilized Ethernet, serial, and various other communication methods to verify system specification compliance.

AWARDS AND/OR FELLOWSHIPS

- Faculty Research and Professional Development Award (2009)
- National Science Foundation Graduate Research Fellowship (2003)
- NASA Harriett G. Jenkins Predoctoral Fellowship (2003)
- National Consortium for Graduate Degrees for Minorities in Engineering and Science (GEM) Doctoral Fellowship (2003)
- Association for the Concerns of African American Graduate Students (ACAAGS) College of Engineering Academic Achievement & Leadership Award (2005)
- Association for the Concerns of African American Graduate Students (ACAAGS) College of Engineering Academic Achievement & Leadership Award (2003)
- Minority Graduate Education (MGE) Fellowship - North Carolina State University (2003)
- Dean's Fellowship – North Carolina State University (2001)
- National Consortium for Graduate Degrees for Minorities in Engineering and Science (GEM) Masters Fellowship (2001)
- All American Scholar Recipient (2001)
- Ford Scholarship Recipient (1999)

STATEMENT OF RESEARCH INTERESTS

My current research interests are in Systems Biology. Specifically, my research program focuses on the development, reformulation, and implementation of engineering-based tools that can model multiple scales and multiple levels of interacting cellular processes in a system of systems infrastructure. These tools are used to facilitate the development of comprehensive theoretical and experimental techniques for modeling, understanding, and eventually controlling the behavior of biological processes at the biochemical, cellular, and tissue levels. Specific interests in this field include: nonlinear systems analysis, nonlinear system identification, uncertainty analysis, parameter estimation, optimal experimental design, and biological signal and data processing.

PUBLICATIONS
- M. de Luis Balaguer and C. Williams, "An Interval Method for State Estimation in Biological Systems," submitted IEEE International Symposium on Circuits and Systems, October 2009.
- C. Williams, W. Alexander, and W. Edmonson, "Optimal Control Formulation of Constrained Least-Squares Estimation for Biochemical Pathway Estimation," in *Proceedings of the 8th International Conference on Systems Biology,* October 2007.
- W. Edmonson, S. Ocloo, C. Williams, and W. Alexander, "The Use of Interval Methods in Signal Processing and Control for Systems Biology," in *Proceedings of the 1st IEEE Symposium on Foundations of Computational Intelligence*, April 2007, pp. 136–142.
- C. Williams, W. Alexander, W. Edmonson, "Estimating the Unmeasured Dynamics of Biological Systems using a Constrained Real-Coded Genetic Algorithm," *in Proc. IEEE 40th ASILOMAR Conf. on Signals, Systems, and Computers*, 2006.
- N. Cahill, C. Williams, S. Chen, L. Ray, and M. Goodgame, "Incorporating Spatial Information into Entropy Estimates to Improve Multimodal Image Registration," *IEEE International Symposium on Biomedical Imaging,* April 2006.
- C. Williams, W. Alexander, and T. Pompey, "Independent and Principal Component Analyses of the Global Stress Response of *Bacillus subtilis,*" *IEEE International Workshop on Genomic Signal Processing and Statistics*, May 2005.
- T. Pompey, C. Williams, J. Kim, and W. Alexander, "Analyzing the Reliability of ICA Estimates of *Bacillus subtilis*," *IEEE International Workshop on Genomic Signal Processing and Statistics*, May 2005.
- C. Williams, W. Alexander, and T. Pompey, "Shock Response Analysis of *Bacillus subtilis* using Independent Component Analysis," Presented at *The Seventh Annual Conference on Computational Genomics*, October 2004.
- C. Williams, N. Towne, "A High-Speed Digital Front End for Accelerator RF Systems," *Brookhaven National Laboratory Technical Report*, 2002.

PATENTS
- S. Chen, L. Ray, N. Cahill, M. Goodgame, and C. Williams, "Method of Image Registration using Mutual Information," U.S. Patent 7,263,243, Aug. 28, 2007.

TEACHING ACTIVITIES

01/2009 – Present   **North Carolina State University**, Raleigh, NC
Fall 2009 – Instructor: Digital Signal Processing: Graduate course in digital signal processing. Presented fundamental and advanced topics in digital signal processing which included but was not limited to sampling theory, digital signal analysis, digital filter design, multirate digital signal processing, design of quadrature mirror filter banks, and discrete wavelet transforms.

Spring 2009 – Instructor: Special Topics in ECE – Analysis of Nonlinear Complex Systems: Introduced course outlining the use of concepts from signal processing, linear algebra, control theory, and systems theory for analyzing the structural and dynamic characteristics of biochemical pathways.

08/2006 – 12/2006 &   **North Carolina State University**, Raleigh, NC
08/2005 – 12/2005   *Co-instructor: Digital Signal Processing*: Lectured on advanced topics in Digital Signal Processing which included multirate digital signal processing, design of quadrature mirror filter banks, time/frequency analysis of nonstationary signals, and power spectrum estimation.

01/2003 – 05/2003   **North Carolina State University**, Raleigh, NC
Teaching Assistantship – Digital Signal Processing Architecture

01/2003 – 05/2003   **Saint Augustine's College**, Raleigh, NC
                      Mathematics Tutor: Mentored and tutored at-risk minority student at the collegiate level.

08/2001 – 12/2001   **North Carolina State University**, Raleigh, NC
                      Distinguished Teaching Assistantship – Analytical Foundations of Electrical and Computer Engineering

ADVISEES/MENTEES
06/2009 – Present   **North Carolina State University,** Raleigh, NC
                      Dissertation Advisor: Maria Angels de Luis Balaguer, Ph.D. Student, Electrical Engineering
08/2008 – Present   **North Carolina State University**, Raleigh, NC
                      Dissertation Advisor: Jina Song, Ph.D. Student, Electrical Engineering
08/2008 – 5/2009   **North Carolina State University**, Raleigh, NC
                      Academic Advisor: Sonia Islam, M.S. Student, Electrical Engineering
01/2009 – 5/2009   **North Carolina State University**, Raleigh, NC
                      Mentor: Marsalis Smith, Undergraduate Student, Textile Engineering
08/2007 – 05/2008   **North Carolina State University**, Raleigh, NC
                      Tutor: Jasmine Jarvis, High School Student
05/2006 – 12/2007   **North Carolina State University**, Raleigh, NC
                      Mentor: Samuel Hume, Undergraduate Student, Electrical Engineering
05/2005 – 08/2005   **North Carolina State University**, Raleigh, NC
                      Mentor: Corey Peterson, Undergraduate Research Student, Electrical Engineering

PROFESSIONAL AND SCHOLARLY ACTIVITIES
- **Invited Talk** – *NC State University*: Initiative for Maximizing Student Diversity Seminar Speaker
- **Senior Personnel** – Proposal: Regulation and Modeling of Lignin Biosynthesis (funded)
- **Guest Lecturer** – *Botany 824N: Molecular Approaches to Plant Development*: Lecture Topic – Computational Tools for Estimating the Unknown or Unmeasured Characteristics of Biochemical Pathways (2008)
- **Primary Engineering Contributor** – *Proposal*: Predictive Model of Lignin Biosynthesis (submitted NSF Plant Genome Research Project 2008)
- **Invited Talk** – *Seminar Series on Plant Biology*: Presentation Title – Plant Systems Biology: Understanding the Complex Dynamics of Biochemical Networks (2008)
- **Invited Talk** – *Graduate School Fellowship Recognition Dinner* (2007)
- **Co- Investigator** – *Proposal*: Systems Biology Approach to the Analysis of Carotenoids in Tomato Fruits (submitted 2007)
- **Reviewer** – *IEEE Journal on Selected Topics in Signal Processing*: Special Issue on Genomic and Proteomic Signal Processing (2007)
- **Reviewer** – *IEEE Transactions on Signal Processing*: Special Issue on Genomics Signal Processing and Statistics (2006)
- **Reviewer** – *IEEE International Workshop on Genomic Signal Processing and Statistics* (2005)
- **Student Member** – IEEE (2005, 2006, 2007)
- **Volunteer** – Visit NC State Day, Program that encourages undergraduate students from underrepresented groups to pursue doctoral degrees (2002, 2003, 2004, 2005, 2006, and 2007)
- **Panelist** – NSF Fellowship Workshop (2005)
- **Coordinator** – Electrical & Computer Engineering Graduate Student Association (2003/2004)
- **President** – Electrical & Computer Engineering Graduate Student Association (2002/2003)