

# Joseph G. McMichael

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## CONTACT INFORMATION

Digital Signal Processing Group  
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## RESEARCH INTERESTS

Digital signal processing, communications systems

## EDUCATION

**Massachusetts Institute of Technology**, Cambridge, Massachusetts USA

Graduate Student, Electrical Engineering

- Digital Signal Processing Group
- Advisor: Prof. Alan V. Oppenheim
- S.M. Thesis: *Timing Offset & Quantization Error Trade-off in Time-Interleaved ADCs*
- Irwin Mark Jacobs & Joan Klein Jacobs Presidential Fellowship
- TA for 6.003: Signals & Systems (taught weekly tutorials and 3 recitations)
- G.P.A. 4.70/5.00

Graduate Coursework	
6.341	Discrete-Time Signal Processing
6.450	Digital Communications
6.438	Algorithms for Inference
6.345	Automatic Speech Recognition
6.431	Applied Probability

**Seattle University**, Seattle, Washington USA

B.S., Electrical Engineering, June, 2009

- G.P.A. 3.92/4.00

**Valparaiso University**, Valparaiso, Indiana USA

Electrical Engineering, Christ Honors College

- G.P.A. 3.91/4.00

## PROFESSIONAL EXPERIENCE

**NASA Goddard Space Flight Center**, Greenbelt, Maryland USA

**Summer 2007**

*Research Intern, Microelectronics & Signal Processing Branch*

Programmed an adaptable engineering data system test that generates analog and digital stimuli and performs data collection and analysis using LabVIEW, Matlab, and Scilab for NASA's "Miniature Imager for Neutral Ionospheric Atoms and Magnetospheric Electrons." Helped design application-specific integrated circuit. Project to be launched aboard MidSTAR-2 satellite in 2011.

**Boeing Phantom Works**, Renton, Washington USA

**Summer 2008**

*Research Intern, Mathematics & Computing Technology*

Formally verified Boeing's "Secure Network Server," a highly-secure multi-level network guard for use in military aircraft. Created and proved formal mathematical model using Prototype Verification System (PVS) and Isabelle/HOL. Researched layers of abstraction (top-level and low-level theories) and intra-level theory mapping. Project undergoing NSA security evaluation as first-ever EAL7 device of its kind.

**Bose Advanced Development**, Stow, Massachusetts USA

**Summer 2010**

*Research Intern, Active Noise Cancellation*

Designed and implemented tuning simulation for Bose's automotive "Engine Harmonic Cancellation" system using C and Matlab. Required thorough understanding of adaptive filtering and active noise cancellation. Responsible for dynamometer acoustic recordings to verify accuracy of simulation.

## HONORS AND AWARDS

**First Place, IEEE Northwest Paper Competition** (Washington, Oregon, & Alaska)

**2009**

*Title: Centralized Tracking & Guidance of Multiple Robots*

**Barr Scholar** **2008-2009**

*Scottish Rite Scholarship Foundation of Washington*

Honored as top applicant in all of Washington State on a basis of academic achievement, career goals, community service, and field experience.

**Teaching Assistant, “ECE 320: Electronics I”** **2008**

*Professor Xusheng Chen, Ph.D.*

Grading and teaching support for junior-level course encompassing analysis and design of circuits with diodes and bipolar junction and field-effect transistors.

**Bannan Scholar** **2008-2009**

*Seattle University*

Outstanding students chosen on the basis of academic achievement and commitment to service to the campus and greater community.

**Honored as first student in Seattle University history to be challenged with two senior capstone engineering projects simultaneously.**

- **Centralized Tracking & Guidance of Multiple Robots:** Implemented a centralized method for simultaneously tracking and guiding 21 large robots which roam an indoor space. Employed MIT Cricket Indoor Location System to measure distance from transmitting reference beacons, and embedded wireless network to communicate with central laptop. Personally developed intelligent trilateration algorithm to calculate three-dimensional position, using Newton-Raphson Method.
- **Phasor Measurement Unit Simulator:** Served as engineering advisor for team designing a phasor measurement unit (PMU) simulator for French power distribution company Areva.

President’s List & Dean’s List, Seattle University, Every Quarter Attended

Tau Beta Pi - Engineering Honor Society

College of Engineering Representative to Valparaiso University Council, 2006-2007

Dean’s List, Valparaiso University College of Engineering, Every Semester Attended

Alpha Lambda Delta Honor Society, 2006-2007

Dean’s List, Valparaiso University Honors College

Presidential Scholarship Recipient, Valparaiso University

Voted Resident Assistant of the Year, Wehrenberg Hall, 2006-2007

Eagle Scout, Boy Scouts of America

Washington State Honors Award

Lynden High School Student of the Year, Physics & Spanish Departments

Presidential Classroom Graduate & Full Scholarship, Washington, D.C.

RESEARCH  
PRESENTATIONS

**“Miniature Imager for Neutral Ionospheric Atoms and Magnetospheric Electrons Engineering Data System Test”** **August 8, 2007**

*NASA Goddard Space Flight Center, Greenbelt, Maryland USA*

*Advisors: Duane Armstrong & George Suarez*

**“Formal Verification of Boeing’s Secure Network Server”** **August 6, 2008**

*Boeing Phantom Works Research Branch, Renton, Washington USA*

*Advisor: Hugh Taylor, Ph.D.*

**“Designing Arbitrary Voltage Signals in the Frequency Domain”** **May 14, 2008**

*Seattle University, Seattle, Washington USA*

*Advisor: Robert Heeren, Ph.D.*

TECHNICAL  
SKILLS

**Signal Processing**

- Digital Signal Processing & Lab
- Research: Time-Interleaved A/D Conversion
- Statistical Signal Processing
- Created detailed Matlab simulation of CDMA direct-sequence spread spectrum wireless network, using pseudo-noise (PN) codes.
- Discrete & Continuous Fourier Transform Theory (including FFT and IFFT)
- Z & Laplace Transforms
- Texas Instruments DSP Code Composer Studio
- Analog Devices DSP VisualDSP++
- Modern Digital & Analog Communication Systems
- Sampling Concepts used in Software-Defined Radio

**Machine Learning**

- Statistical Estimation
  - MAP estimation
  - ML estimation
- Clustering
  - Gaussian Mixture Models
  - Vector Quantization
- Principal Component Analysis
- Hidden Markov Models
  - Viterbi Decoding Algorithm
  - Baum-Welch Learning Algorithm
- Kalman Filters
- Probabilistic Graphical Models
  - Belief Propagation
  - Message Passing Algorithms
  - Junction Tree Algorithm

**Programming & Applications**

- Matlab, Simulink, LabVIEW, VHDL, PSpice, C++, Java, Python, Lisp, HTML, Javascript, Wireshark, TCP/IP Network Protocol

**Formal Methods**

- PVS, Isabelle/HOL,  $\lambda$ -calculus, Common Lisp
- Intra-Level Abstraction (Formal Top-Level & Low-Level Specifications)

**Hardware**

- Electrical Circuit Analysis and Design, Including RLC Circuits
- Advanced Digital Logic Design & VHDL
- Experience Programming FPGAs with Altera Quartus II
- Electronics
- SCPI Interfacing with Agilent & Keithley Lab Instruments
- CompTIA A+ Certified Professional (Computer Technician)

**Robotics**

- MIT Cricket Indoor Positioning System
- Development of Intelligent Trilateration Algorithms
- Development of Autonomous Robots with Collision Avoidance Algorithms
- Ultrasonic, Laser, and IR Sensors

**Math & Physics**

- Electromagnetic Field Theory
- Complex Analysis

- Differential Equations & Linear Algebra
- Statistics for Engineers & Scientists
- Calculus I-III
- Honors Physics: Mechanics and Heat
- Honors Physics: Electricity, Magnetism & Waves

**Publishing**

- $\LaTeX$ ,  $\TeX$ , Photoshop, Flash, Dreamweaver, HTML, Excel, Word, PowerPoint
- Created <http://www.joemcmichael.com> & <http://www.kmcmichael.com>

**Other**

- Extensive Experience Writing for School Newspaper and Honors Courses
- Strong Leadership & Problem-Solving Skills
- Methodical, Organized, and Detail-Orientated

**Operating Systems**

- Linux/Unix, Windows, Mac OS X, Solaris