

# michael garbus

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## Summary

- Background & Interests: audio and speech analysis, machine learning, intelligent usage of sensory data, embedded systems, human interaction with machines, human language acquisition, algorithm development, signal processing, art and engineering.
- R&D to Product: demonstrated ability to generate, research, and develop ideas from conception to final product.
- Intellectual Property: two patents and two patents-pending related to modeling the human perception of color in low-end microcontrollers and general embedded systems.

## Education

Carnegie Mellon • Pittsburgh, PA • Status: Current Masters Student

Pursuing a MS Language Technologies with an emphasis on Audio and Speech Analysis

Virginia Tech • Blacksburg, VA • Graduated: May 2003

BS Electrical Engineering with Minor in Mathematics

## Professional Experience

Carnegie Mellon University • Pittsburgh, PA • August 2010 to Current

Graduate Research Assistant

- Performed Arabic-specific data normalization for ASR built using RADC's Pan-Arabic Corpus.
- Developed a method to create new pronunciations for dialects of Arabic that are underrepresented in training data.
- Built audio scene analysis classifiers for IARPA TRECVID Aladdin project.
- Performed sociolinguistic speech analysis on MapTask Corpus.

Applications Technology Inc. • McLean, VA • September 2008 to March 2010

Natural Language Senior Software Engineer

- Developed statistical machine translation models with customizable pre- and post-processing for Farsi to English, Farsi to Arabic, Hebrew to Arabic, Urdu to English, and English to Farsi.
- Integrated statistical models for French to English, Spanish to English, German to English, Italian to English, and Russian to English into custom Linux translation engine.
- Demonstrated automatic statistical Farsi punctuation generator for output of ASR.
- Produced software for reordering of Farsi verb and noun phrases for better statistical correlation with target language.
- Performed custom pruning of translation and language models.
- Produced statistical part-of-speech tagger for Farsi.
- Performed parameter optimization using the Downhill Simplex algorithm.
- Designed and wrote address identification program given spoken addresses and USPS

database.

- Created system for acquisition of semi-aligned parallel data by crawling bilingual websites.
- Performed machine translation bootstrapping with low quantities of data.

### Renaissance Lighting • Herndon, VA • March 2006 to September 2008

#### Principal Engineer

- Provided technical guidance to senior management of the company.
- Authored over 20 internal white papers describing intellectual property, technical solutions to persistent problems, and technical guidance to senior management.
- Wrote all firmware and algorithms for embedded microcontrollers of various devices in ANSI C.
- Developed and implemented automated color calibration process for production lighting fixtures in Linux and LabVIEW.
- Developed system-wide controls architecture for networked lighting systems with high-precision color consistency using sophisticated RS-485 serial protocol.
- Co-developed and implemented algorithms and methods for color management system within a PIC 16F678A and PIC 18F2525.
- Created custom ergonomic color palette and developed mathematics to map to a standard coordinate space (CIE 1931).
- Developed and implemented PID closed loop control system for color stability, along with other advanced 32-bit floating point mathematical functions, using 8-bit microcontrollers
- Developed advanced custom color algorithms for white correction.
- Specified and designed an advanced control system using PDA and PC with intuitive and ergonomic GUI.
- Produced several Linux and LabVIEW simulators and emulators of internal controls projects.
- Developed 18-month high-level schedule and roadmap for course of future technology development and feature integration into product line.
- Managed team of three engineers to produce scalable, networked Bluetooth control system along with intuitive color sequencer software for advanced color shows.

### Electronic Warfare Associates • Herndon, VA • June 2005 to March 2006

#### Electrical Engineer

- Designed system level architecture for device that passively intercepts, logs, and analyzes wireless communications.
- IEEE 802.11 a, b, & g wireless traffic for military and intelligence applications.
- Provided senior management with a plan to complete all technical aspects of 802.11 project along with descriptions of appropriate personnel and their necessary skill sets.
- Built proof-of-concept of portions of system using several open source networking and hacking tools.
- Advised senior management of the benefits of developing a relationship with 802.11 hardware manufacturer Atheros Communications which was successfully pursued.
- Demonstrated proof-of-concept for inexpensive inter-device compression algorithm for project involving passively locating the point of origin of an FM signal.

NLX Corporation / Rockwell Collins • Sterling, VA • April 2004 to June 2005

Software Engineer

- Modeled functionality of classified radio equipment for a B-52 flight simulator in ANSI C.
- Developed software interface for DSP audio generation hardware.
- Conducted spectral analysis on audio information to correctly model the sounds of a B-52.
- Produced specification and managed work by a third-party to produce appropriate audio hardware.

Naval Surface Warfare Center Carderock Division • Bethesda, MD • June 2003 to April 2004

Electrical Engineer/Computer Engineer

- Independently created, modeled, and presented phase alignment algorithm in MATLAB that could greatly improve performance of certain systems used during war games with 688 fast attack submarines.
- Designed several digital LP filter circuit boards used in phase alignment of motion equipment.
- Generally increased performance of motion controller by conducting analysis of algorithms used in DSP and increasing SNR of analog and digital input signals.
- Wrote LabVIEW programs to interface and control high speed data recorders.
- Installed and aided in debugging of sonar latency test equipment on 688 fast attack submarine.

General Electric • Greenville, SC • January 2001 to August 2002

Co-op/Systems Engineer

- Wrote all controls and data acquisition software for high-profile experiment to stall turbine engine under fuel injection failure modes.
- Performed spectral analysis on bearing vibration data to aid in diagnosis of problems.
- Designed and built 4th order Butterworth LP filter for custom GE data acquisition system.
- Debugged and corrected binary machine code for persistent problem with older turbines in the field.
- Designed and tested controls for pyrometer sensor system for various gas turbine experiments.
- Provided general support of quality testing of turbines.

Hampton University • Hampton, VA

Assistant Physicist • May 2000 to August 2000

Work performed at the NSF's Center for Ultrafast Optical Science • Ann Arbor, MI

- Setup and calibrated custom data acquisition system for experimental technology to generate and control a beam of free electrons.
- Wrote LabVIEW interface for nuclear and particle physics equipment.
- Built (by-hand), calibrated, and installed several scintillating particle detectors.

Intern • May 1999 to August 1999

Hampton University's Graduate Nuclear and High Energy Physics Department • Hampton, VA

- Developed and implemented automated system for simultaneously testing and calibrating several scintillating particle detectors by integrating oscilloscopes and custom equipment using LabVIEW.

Thomas Jefferson National Accelerator Facility • Newport News, VA • Sept 1996 to May 1998  
High School Intern

- Wrote ANSI C and FORTRAN simulation of interactions between an electron beam and a beam position measurement system.
- Aided in experiment involving electroproduction of kaons with a polarized electron beam.
- Aided in development of GUI's for real-time data collection in accelerator control room.

### **Publications & Patents**

- Mayfield, Garbus, Adamson, and Rose, "Data-Driven Interaction Patterns: Authority and Information Sharing in Dialogue", AAAI Symposium 2011.
- Nallasamy, Garbus, Metze, Jin, Schaaf, and Schultz, "Analysis of Dialectal Influence in Pan-Arabic ASR", INTERSPEECH-2011.
- Garbus, M., 7478922, "Set-Point Validation for Color/Intensity Settings of Light Fixture"
- Lyons, S., Garbus, M., Aldrich, M., 7560677, "Step-Wise Intensity Control of a Solid State Lighting System"

### **Patents Pending**

- Aldrich, M., Garbus, M., 20080103714, "Calibration Method and Apparatus for Lighting Fixtures using Multiple Spectrum Light Sources and Light Mixing"
- Lyons, S., Garbus, M., Aldrich, M., Geishecker, A., 20080228508, "Monitoring Connect Time and Time of Operation of a Solid State Lighting Device"