

SUMMARY

Broad background in intelligent robotics, AI, embedded systems, and software development. Extensive experience in:

- AI / machine learning / deep learning / TensorFlow
- Robotics / sensor fusion / actuator control / algorithms / ROS
- Embedded systems / electronics design / firmware / PCB layout / wiring / reverse engineering
- Computer vision / OpenCV / object detection / instance segmentation / perception / stereo
- C / C++ / Python / Linux / ROS

EDUCATION

Ph.D., Vanderbilt University, Physics, May 2011

Dissertation: *Electron field emission in nanostructures: A first-principles study*

M.S., Vanderbilt University, Physics, May 2008

Ph.D., Vanderbilt University, Electrical Engineering, December 2000

Dissertation: *A comparative analysis of model parameters in evolutionary robotics*

M.S., Vanderbilt University, Electrical Engineering, May 1998

Thesis: *Direction of attention using a model of human visual selection*

B.E., Vanderbilt University, Electrical Engineering, May 1996, *magna cum laude*

EXPERIENCE

Principal AI and Embedded Engineer, AutonomouStuff, Morton, IL, *February 2019 – Present*

Develop machine learning products for autonomous vehicle systems. Developed simulator to provide software-in-the-loop simulation for autonomy stack as well as synthetic data for training models. Supervise and train others to assist in deep learning workflow. Current projects include object detection and instance segmentation in diverse domains, stereo applications, and real-time perception for autonomous vehicles. Provide technical leadership to embedded systems development group (firmware, PCB design, etc.). Development in a Linux / ROS environment using C++ and Python. Main frameworks include TensorFlow, Darknet, Unreal engine and OpenCV.

Lead Embedded Systems Engineer, AutonomouStuff, Morton, IL, *March 2018 – February 2019*

In addition to the duties of the Senior Embedded Systems Engineer position below, in this role I also lead a team of embedded systems engineers developing products for the autonomous vehicle industry. Provide overall technical leadership, project responsibility, and coordination with other teams.

Senior Embedded Systems Engineer, AutonomouStuff, Morton, IL, *March 2017 – March 2018*

Designed, prototyped, and managed production of various embedded systems for autonomous vehicles. Low-level interfacing with automotive electronics, including analog signals and vehicle communications protocols (CAN, LIN, etc.). Reverse engineering. Software development using C++ and ROS. PCB design, prototyping, and managing outsourced production. Firmware, analog/digital circuit design, and wiring harness design. Troubleshooting and customer support.

Software Application Engineer, AutonomouStuff, Morton, IL, *August 2016 – March 2017*

Used C++ and ROS to develop drivers for various sensors and actuators used in autonomous systems. This role transitioned into embedded hardware development, and I led the development of a major new company initiative. Established company's formal EE R&D capabilities by designing lab and helping to hire other EE personnel.

Manager of Electrical and Software Projects, INTEGRIS Engineering, East Peoria, IL, *May 2015 – August 2016*

Lead product engineering company's electrical engineering and software development activities. Designed embedded systems, analog/digital circuits, PCBs, and software/firmware (C/C++/Python/Perl on Linux) for a variety of projects for industrial, academic, and government clients. Developed training materials. Projects include a medical simulation device, automotive sensor integration, and improvement of an electromagnetic clutch. Experience with EMI issues and UL certification process. Worked closely with other departments on interdisciplinary projects.

Assistant Professor, Bradley University, Dept. of Electrical and Computer Engineering, Peoria, IL, *Aug. 2013 - May 2015*

Taught 3 courses per semester. Developed robotics laboratory course. Research in robotics, high-performance computing, and nanoscale simulations. Supervised multiple-semester senior project teams in robotics projects including an autonomous quadcopter with human tracking and gesture recognition, multi-limbed walking robots, and autonomous underwater robotics. Application development for Linux using C++ and Python, interfacing with libraries such as OpenCV. Most projects involved custom electronics development using embedded processing and integration with sensors and actuators. Won 2014 college award for faculty research excellence.

Assistant Professor, Bradley University, Division of Engineering Physics, Peoria, IL. *August 2011 - August 2013*

Taught 2-3 courses per semester. Created course on high-performance computing. Created simulations of MEMS and nanoscale systems using time-dependent density functional theory and reactive molecular dynamics. Code developed using C++, CUDA, and Perl. Built Linux computing cluster for research and education.

Research Assistant, Vanderbilt University, Dept. of Physics and Astronomy, Nashville, TN, *Dec. 2006 - August 2011*

Conducted research in computational condensed matter physics. Work included software development for time-dependent density functional theory calculations. Built and administrated a high-performance computing cluster. Extensive software development using high-performance numerical methods. Development in C, C++, Fortran, and Perl in a Linux environment. Co-organizer/instructor for a summer school on computational nanoscience.

Assistant Professor, Middle TN State University, Dept. of Computer Science, Murfreesboro, TN, *Aug. 2002 - Aug. 2005*

Taught 2-3 courses per semester, including computer architecture and artificial intelligence. Created courses in artificial life and evolutionary algorithms. Research activities included genetic algorithms, mobile robotics, and bioinformatics. Robotics projects included teams of small mobile robots self-programmed using genetic algorithms. Code development in C, C++, Perl, and Python for Windows and Linux environments.

Software Developer, Genetics Squared, Inc., Milan, MI, *June 2001 - August 2002*

Developed bioinformatics software for analysis of functional genomics data. Used neural networks, statistical methods, evolutionary algorithms, and other machine learning techniques to analyze high-dimensionality data sets. Used C++, Perl, and PVM. Used computer cluster for high-performance computing.

Software Developer, Widevine Technologies, Inc., Advanced Technology Group, Seattle, WA, *Sept. 2000 - May 2001*

Developed software (C++/Perl) to gather and analyze Internet routing data. Evaluated software packages for network monitoring. Created neural network and location-based approaches for optimal delivery of Internet content.

TECHNICAL SKILLS

- Strong background in artificial intelligence, robotics, neural networks, genetic algorithms, numerical methods, image processing, and computer vision. Control algorithm development for position, speed, and torque controlled systems. Real-time perception systems for autonomous vehicles.
- Strong electrical hardware design background including robotics, embedded microcontrollers, analog/digital circuit design, power systems, sensor/actuator interfacing, etc. Multilayer PCB design using EAGLE. Some FPGA design with VHDL. Experience with low-level protocols (I2C, SPI, SSI, etc.) and CAN.
- Developed by-wire systems (hardware, firmware, and software) for self-driving vehicles (cars, large semi trucks, and off-road vehicles)
- Extensive software development skills using a variety of languages and frameworks, including C++, Python, ROS, TensorFlow, Keras, and OpenCV. Development on Linux and Windows. Experienced with collaborative tools such as git, Jira, Confluence, etc. Experience with MATLAB.
- Strong background in high-performance computing including GPU processing. Parallel software development. Linux computer cluster design and administration.

Other

- Licensed Professional Engineer in Illinois
- Senior Member of IEEE