James Smith

9402 Hartwick Circle | Huntsville, AL 35803 | (256) 714-7168 | jss0036@auburn.edu

EDUCATION

Master of Science in Electrical Engineering, Auburn University (May 2018) — GPA: 4.00/4.00
Thesis: *Deep Learning Methods Using Levenberg-Marquardt with Weight Compression and Discrete Cosine Transform Spectral Pooling*

Bachelor of Electrical Engineering, Auburn University (May 2017) — GPA: 3.93/4.00
Minors in Computer Science, Political Science

RESEARCH EXPERIENCE

Graduate Research Student, Auburn University — May 2017 – present
Neural Networks and Deep Learning

- Developed the Levenberg-Marquardt with Weight Compression (LMWC) algorithm to combat the flat spot problem in second-order neural network optimization (Advisor - Dr. Bogdan M. Wilamowski).
- Developed a new spectral pooling techniques for convolutional neural networks using discrete cosine transformations (Advisor - Dr. Bogdan M. Wilamowski).
- Leading a project to characterize the specificity of convolution layers in Generative Adversarial Networks (GANs) using transfer learning (Advisor - Dr. Anh Nguyen).

Undergraduate Research Fellow, Auburn University — August 2016 – May 2017
Multi-bend Antenna Optimization by Genetic Algorithms

- Used Genetic Algorithms and the Method of Moments (MoM) to explore arbitrarily branching antenna structures capable of producing complex radiation patterns that cannot be designed. This is an optimization problem with my work focusing on the antenna geometry and objective function (Advisor - Dr. Michael E. Baginski).

Animal Detection System, Auburn University — Fall 2016, Spring 2018

- Under the direction of Dr. Mark Nelms and Florida Power and Light, I led a project to detect small animals at power stations. Starting as a senior design project involving the amplification and filtering of radar signals, I continued the project during graduate school with a deep learning approach using OpenCV and a raspberry pi.

Research Internship, Naval Research Laboratories — May 2015 – August 2015

- Assisting Dr. Sadasiva M. Rao, my research optimized Method of Moments (MoM) Fortran code simulating current induction on large bodies to dramatically decrease run time and increase memory management. I acted as design architect to create a cluster architecture using Message Passing Interface (MPI).

PUBLICATIONS

Smith, J. S., Wu, B., & Wilamowski, B. M. (in press). Neural Network Training with Levenberg-Marquardt and Adaptable Weight Compression. *IEEE Transactions on Neural Networks and Learning Systems*

Smith, J. S., & Wilamowski, B. M. Discrete Cosine Transform Spectral Pooling Layers for Convolutional Neural Networks. (2018, June). *17th International Conference on Artificial Intelligence and Soft Computing, ICAISC 2018*. Zakopane, Poland.

Smith, J. S., & Baginski, M. E. (2018). *Thin wire antenna design using a novel branching scheme and genetic algorithm optimization*. Manuscript submitted for publication.

Wu, B., Smith, J. S., & Wilamowski, B. M. *DCMDS: Density-Concentrated Multi-Dimensional Scaling Algorithm for Data Visualization*. Manuscript submitted for publication.

PRESENTATIONS

Multi-Bend Antenna Optimization by Genetic Algorithms
2nd Place Oral Presentation, Undergraduate STEM
This is Research Student Symposium, Thursday, April 13, 2017, Auburn University, AL

Discrete Cosine Transform Spectral Pooling Layers for Convolutional Neural Networks
This is Research Student Symposium, Monday, March 26, 2018, Auburn University, AL

PRACTICAL EXPERIENCE

Radiance Technologies Machine Learning Engineer — May 2018 – August 2018
- Developing deep learning software for defensive system target classification.
- Project includes creating database (TFRecord) and selecting appropriate model architecture.

Dynetics Student Engineer — May 2016 – August 2016
- Used Matlab Simulink to model foreign weapon systems purposed for an integrated threat analysis simulation environment.
- Presented classified briefing of work to Dynetics employees and Department of Defense officials.

Troy7 Laser Safety Engineer — May 2014 – August 2014
- Used Microsoft Visual Studios and Apple Xcode to develop programs for both PC and iPhone that implemented calculations for High Energy Laser safety hazards and optical sensor properties
- Presented briefing of work to Troy7 employees and Department of Defense officials.

TEACHING EXPERIENCE

Graduate Teaching Assistant, Auburn University
- Led undergraduate students through electrical engineering fundamentals, including simulations, breadboarding, and technical writing.
- **ELEC 2210**: Digital Electronics (Fall 2017 – Spring 2018)
- **ENGR 1110**: Introduction to Electrical Engineering (Fall 2017)
- **ELEC 2110**: Electric Circuit Analysis (Summer 2017)

SKILLS

- Tensorflow
- OpenCV
- Python
- C/C++
- Matlab/Simulink
- Java

RELEVANT COURSES

- **COMP 6600** – Artificial Intelligence
- **ELEC 6240** – Neural Networks
- **ELEC 8900** – Advanced Intelligent Systems
- **ELEC 6410** – Digital Signal Processing
- **PSYC 7400** – Cognitive Neuroscience
- **COMP 7970** – Deep Learning (Spring 2018)
- **ELEC 7450 –** Digital Image Processing (Spring 2018)

HONORS/AWARDS

- Alton B. Zerby and Carl T. Koerner Outstanding Electrical and Computer Engineering Student Award, L.A. Alumni Chapter IEEE/HKN (2017)
- President's Award, Samuel Ginn College of Engineering (2016 – 2017)
- SGA Student of the Year, Auburn University Honors College (2016 – 2017)
- Electrical and Computer Engineering Outstanding Student of the Year, Auburn University (2016 – 2017)
- Auburn University Nominee for Rhodes and Marshall Scholarships (Fall 2016)
- Tau Beta Pi Scholar (2015 – 2016)
- Dean's List, 7 semesters (2013-2017)
- Phi Kappa Phi National Honor Society
- Tau Beta Pi National Engineering Honor Society
- Eta Kappa Nu National Electrical and Computer Engineering Honor Society
- Mortar Board National Honor Society for Scholarship, Leadership, and Service

CAMPUS POSITIONS

Auburn for Water
Cofounded and served as officer for philanthropic organization purposed to fund and deliver clean water filters in under-developed countries.

- President, Summer, 2015 – Spring 2016
- Vice President, Fall 2014 – Spring 2015
- Cofounder, Fall 2014

Spring Up Leadership Programs
Designed curriculum for 12-week leadership development program and led 45 member groups with the assistance of two assistant directors.

- Executive Director, Fall 2015 – Spring 2016

Eta Kappa Nu (Auburn University Chapter)
Served as officer for the Electrical and Computer Engineering Honor Society.

- Graduate Student Advisor, Summer 2017 – present
- Corresponding, Summer 2016 – Spring 2017
- President, Summer 2015 – Spring 2016
- Recording Secretary, Summer 2014 – Spring 2015

HOBBIES

Marathon and Ultra Running
Auburn University Triathletes, Fall 2016 – Spring 2018