# James Smith

**jamessealesmith (at) gatech (dot) edu | [Webpage]**

---

**EDUCATION**

**PhD in Machine Learning**, Georgia Institute of Technology (current)

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

**Bachelor of Electrical Engineering**, Auburn University (May 2017)
Minors in Computer Science, Political Science

**FOCUS**

**Lifelong/Continual Learning; Knowledge Distillation; Limited Supervision**

**PUBLICATIONS**

Smith, J., Balloch, J., Hsu, Y., & Kira, Z. (2021). Memory-Efficient Semi-Supervised Continual Learning: The World is its Own Replay Buffer. *arXiv preprint arXiv: 2101.09536*. [Paper]

Smith, J., Baer, S., Taylor, C., & Dovrolis, C. (2020). Unsupervised Progressive Learning and the STAM Architecture. *arXiv preprint arXiv:1904.02021*. [Paper]

Smith, J.S., Wu, B., & Wilamowski, B.M. (2019). Neural Network Training with Levenberg–Marquardt and Adaptable Weight Compression. *IEEE Transactions on Neural Networks and Learning Systems, 30*, 580-587. [Paper]

Smith, J.S., Baginski, M.E. (2019). Thin-Wire Antenna Design Using a Novel Branching Scheme and Genetic Algorithm Optimization. *IEEE Transactions on Antennas and Propagation, 67*, 2934-2941. [Paper]

Wu, B., Smith, J.S., Wilamowski, B.M., & Nelms, R.M. (2019). DCMDS: Density-Concentrated Multi-Dimensional Scaling Algorithm for Data Visualization. *Journal of Visualization, 22*, 341-357. [Paper]

Smith, J.S., & Wilamowski, B.M. (2018). Discrete Cosine Transform Spectral Pooling Layers for Convolutional Neural Networks. *ICAISC*. [Paper]

**RESEARCH EXPERIENCE**

**Graduate Research Assistant**, Georgia Institute of Technology — August 2018 – present

Data-Free Class-Incremental Learning

- More details available upon request
- Advisor - Dr. Zsolt Kira

Semi-Supervised Continual Learning

- We formalized the realistic Semi-Supervised Continual Learning (SSCL) setting, where data distributions reflect object class correlations between, and among, the labeled and unlabeled data distributions
- We propose a novel learning approach that works within this realistic, memory-constrained continual learning setting, DistillMatch, notably outperforming closest prior art
- Advisor - Dr. Zsolt Kira

Unsupervised Progressive Learning

- We posed the Unsupervised Progressive Learning (UPL) problem: learning representations for downstream tasks (such as classification) from a non-stationary stream of unlabeled data in which the number of object classes increases with time
- Developed a neuro-inspired architecture for UPL which involves an online clustering modules, called Self-Taught Associative Memory (STAM)
- Advisor - Dr. Constantine Dovrolis

**Graduate Research Assistant**, Auburn University — May 2017 – May 2018
Deep Learning for Object Classification and Image Compression

- Developed the Levenberg-Marquardt with Weight Compression (LMWC) algorithm to combat diminishing gradients in second-order neural network optimization
- Developed a new spectral pooling techniques for convolutional neural networks using discrete cosine transformations
- Advisor - Dr. Bogdan M. Wilamowski

**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
- Advisor - Dr. Michael E. Baginski

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

- Optimized Method of Moments (MoM) Fortran code simulating current induction on large bodies to dramatically decrease run time and increase memory management
- Advisor - Dr. Sadasiva M. Rao

**WORKSHOPS**

Smith, J., Baer, S., Taylor, C., & Dovrolis, C. (2020). Unsupervised Progressive Learning and the STAM Architecture. *Lifelong Learning Workshop, ICML 2020*.

Smith, J., Baer, S., Kira, Z., & Dovrolis, C. (2019). Unsupervised Continual Learning and Self-Taught Associative Memory Hierarchies. *Learning with Limited Labeled Data Workshop, ICLR 2019*.

**PRACTICAL EXPERIENCE**

**Radiance Technologies Machine Learning Engineer** — May 2018 – August 2018

- Developed deep learning software for laser system target identification and classification
- Applied reinforcement learning to automate high-level decision making in simulation environment

**Dynetics Student Engineer** — May 2016 – August 2016

- Used Matlab Simulink to model systems purposed for an analysis simulation environment

**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

**RELEVANT COURSES**

**Georgia Tech**

- **CS 6476** – Computer Vision
- **CS 8803** – Machine Learning with Limited Supervision
- **ISYE 6412** – Theoretical Statistics
- **ISYE 6663** – Nonlinear Optimization
- **ECE 6254** – Statistical Machine Learning
- **ECE 8843** – Math Foundations of Machine Learning
- **ECE 6555** – Optimal Estimation

**Auburn**

- **COMP 6600** – Artificial Intelligence
- **ELEC 8900** – Advanced Intelligent Systems
- **ELEC 6410** – Digital Signal Processing
- **PSYC 7400** – Cognitive Neuroscience
- **COMP 7970** – Deep Learning
- **ELEC 7450** – Digital Image Processing

**HONORS/AWARDS**

- NSF Graduate Research Fellowship Program Honorable Mention (2018)
- Alton B. Zerby and Carl T. Koerner National 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)