# Charles Topliff

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## Education

**Georgia Institute of Technology | Atlanta, GA**                                           *August 2018 - Present*
**National Defense Science & Engineering Graduate (NDSEG) Fellowship**
PhD. Machine Learning

**University of Kansas | Lawrence, KS**                                           *August 2014 – May 2018*
BS in Electrical Engineering, Magna Cum Laude

## Research Experience

**Graduate Research Fellow | Atlanta, GA**                                           *May 2019 – Present*
*Advised by Dr. Morris Cohen & Dr. Mark Davenport*

• Utilized convolutional autoencoders and other generative models to coronal images to reduce dimensionality for downstream time series forecasting and anomaly detection tasks

• Applied recurrent networks to time series prediction problems in forecasting geomagnetic substorms, improving the state of the art for substorm prediction

• Regularly utilized high performance computing resources to enable massively parallel training of neural networks for various hyperparameter searches

**Graduate Research Assistant | Atlanta, GA**                                           *August 2018 – May 2019*
*Advised by Dr. Douglas Williams & Dr. William Melvin*

• Implemented value iteration algorithms utilizing efficient linear program solvers to solve for optimal decision making policy in high-dimensional scenarios

• Investigated the use of Partially-Observable Markov Decision Processes in adaptive control for radar decision making

## Projects

**Semantic Classification of Financial Documents for Forecasting**                                           *Spring 2021*

• Applied ML techniques to the problem of predicting fixed income rate movements as a result of Federal Open Market Committee (FOMC) announcements.

• Pretrained BERT model used to predict positive, neutral, or negative semantics of FOMC documents to build overall semantic score; regressions to predict the movement of 1-Year to 10-Year instrument movements.

**IMDB Semantic Classification**                                           *Spring 2019*

• Applied long short-term memory networks to the problem of classifying semantics of IMDB movie reviews using n-gram embedding models, found an improvement over baseline methods.

• Compared model to different classical classification models such as logistic classification and kernelized support vector machines as a baseline.

## Coursework / Skills

**Relevant Coursework:** Statistical Machine Learning, Digital Signal Processing, Convex Optimization, Deep Learning, Theoretical Statistics, Stochastic Processes in Finance, Natural Language Processing, Numerical Methods in Finance.
**Programming / Software / Platforms:** Python, R, MATLAB, Git, Vim, VSCode, Slack, Linux (Ubuntu, Red Hat), High Performance Computing (PBS, Ray Hyperparameter Tuning library).

## Publications / Conference Presentations

• **C. Topliff**, M. Cohen, W. Bristow "Simultaneously forecasting global geomagnetic activity using Recurrent Networks." arXiv preprint arXiv:2010.06487 (2020). (NeurIPS Workshop ML4PS).

• **C. Topliff**, W.M. Melvin, D. Williams "Application of POMDPs to Cognitive Radar" 2019 53rd Asilomar Conference on Signals, Systems, and Computers, Pacific Grove, CA, USA, 2019, Accepted.

• J. Kota, **C. Topliff**, R. Prasanth, G. Ushomirsky and S. Kogon, "Radar Waveform Design Using Lagrangian Dynamics for Co-Channel Interference Mitigation," 2019 IEEE Radar Conference (RadarConf), Boston, MA, USA, 2019, pp. 1-5.

• J. Kota, **C. Topliff**, R. Prasanth, G. Ushomirsky and S. Kogon, "RF Convergent Waveform Design Using Time-Modulated Phase Functions,"2018 52nd Asilomar Conference on Signals, Systems, and Computers, Pacific Grove, CA, USA, 2018, pp. 409-413.