

# Gabriel Ryan

gabe@cs.columbia.edu | www.cs.columbia.edu/~gabe

## Education:

### Columbia University

Sep 2018 - Present

- PhD Candidate in Computer Science
- Conducting research in applications of deep learning to dynamic software analysis.

### Columbia University

Sep 2016 - December 2017

- M.S. in Computer Science (GPA 3.97)
- Conducted research in modeling and simulating user behavior for Intrusion Detection Lab.
- Selected Coursework: Security, Deep Learning, Advanced Deep Learning, Big Data Analytics, Data Exploration Systems, Machine Learning, Natural Language Processing, Operating Systems, High Performance Computing

### Swarthmore College

June 2013

- B.S. Engineering, B.A. Computer Science (In Major GPA 3.83)
- Selected Coursework: Advanced Algorithms, Theory of Computation, Artificial Intelligence, Probabilistic Robotics, Computer Systems, Computer Languages, Applied Statistics, Linear Optimization, Linear Systems

## Research Experience:

### Graduate Research Assistant, Columbia

Sep 2018 - Present

- Currently developing new methods for dynamic software analysis using deep learning methodologies under Prof. Suman Jana.

### Graduate Research Assistant, Columbia IDS Lab

Fall 2016 - Fall 2017

- Working in Prof. Salvatore Stolfo's lab, developed novel method for modeling and generating user behavior data with neural networks. Designed architecture combining recurrent neural networks with multi task prediction to jointly model events and event timing. Implemented networks in Pytorch and Tensorflow.
- Conducted evaluation and modeling of Simulated User Bots (SUBs). Demonstrated how SUB behavior could be deliberately preturbed to register as anomalies with three User Behavior Anomaly Detection Models: Gaussian Mixtures, One Class SVMs, and Isolation Forests. Contributed to Literature Review and Evaluation portions of paper on SUBs, published in IEEE SPW 2018.
- Developed framework for Simulated User Bots on mobile devices using Selenium and Appium. Designed Python API to enable automation of common user tasks, such as browsing the web and sending emails.

### Seminar Research, Data Exploration Systems

Spring 2017 - Spring 2018

- Implemented methods for quantifying visual complexity of line charts with entropy statistics. Conducted experiments comparing methods and demonstrated that one (Approximate Entropy) performed best for measuring visual complexity.
- Developed and conducted user studies demonstrating that users found comparison tasks more difficult when charts had high visual entropy. Implemented experiments in HTML and Javascript on Mechanical Turk.
- Presented at IEEE Infoviz 2018 conference and published in IEEE TVCG 2018.

### Seminar Research, Adv Big Data Analytics

Spring 2017

- Developed graph data queries and synthetic graph data in Tensorflow to demonstrate feasibility of using a deep learning approach to learn graph query parameters.
- Implemented Pagerank Algorithm in Tensorflow and demonstrated dampening parameter could be learned from labeled graph data using back propagation.

### Research Fellow, Bryn Mawr Intelligent Systems Lab

Summer 2013

- Developed tools using ROSJAVA package to run Java reinforcement learning algorithms on ROS robots and simulators using combination of Java and C++.
- Implemented the HORDE reinforcement learning algorithm in Java and successfully demonstrated that multi-task learning outperforms HORDE for robotic sensor prediction.

**Research Assistant**, Woods Hole Oceanographic Institute

January 2012

- Automated filtering and parsing of data from tow tank tests of a sub-Arctic current meter in MATLAB, setting research weeks ahead of schedule.
- Conducted frequency analysis of velocity data and developed burst sampling system that improved the signal to noise ratio by a factor of 3 while minimizing computation and radio usage.
- Published work in proceedings of Oceans 2012 conference.

**Research Fellow**, Swarthmore College Engineering

Summer 2011

- Developed a wireless thermostat prototype around an MSP430 microcontroller and Zigbee radios that used low power event driven processing to achieve an estimated life expectancy of 5+ years on a coin cell battery.
- Wrote MATLAB Zigbee library to interface with Zigbee radios, allowing user to configure and use Zigbee radios through a simplified API.

## Professional Experience:

**Software Engineer**, Allure Security Technology

Sep 2015 - August 2018

- Developed Novo web application for managing large scale deployments of User Behavior sensors and tracked documents using Java Spring Framework with AngularJS front end and Hibernate and Postgres data layer. Design and implement REST API using Swagger specification and OAuth2 authentication.
- Developed desktop application for managing and tracking files using Electron, AngularJS.
- Automated deployment and testing of new builds using Beanstalk and AWS Elastic Computing resources.
- Integrated high speed file system backed by MongoDB and optimized process for tracking new documents, increasing speed by a factor of over 270%.
- Designed and implemented new method for tracking documents in the cloud using Google Drive API.
- Developed document interception and tracking system using Squid Proxy and ICAP server to integrate with web content filters and automatically track incoming and outgoing documents.

**Robotics Software Consultant**, 3DDataLtd

May 2015 - Aug 2015

- Developed a framework for 3d Simultaneous Localization and Mapping using the Lidar Odometry and Mapping algorithm. Modified algorithm to integrate IMU Sensor data using an Extended Kalman Filter. Implemented in C++ with PCL and ROS.

**Radar Software Engineer**, Raytheon

Sep 2013 - April 2015

- Maintained radar configuration and verification tools in Perl and Cshell.
- Analyzed data from radar testing and provide software support for automated calibration, satellite tracking, antenna diagnostics, and maintenance prioritization software in Ada and C++.
- Developed additions to radar software front end in C++ and Qt to display results of new diagnostic capabilities
- Earned team achievement award for role in completing integration of new diagnostic capabilities ahead of schedule.

**Writing Associate**, Swarthmore College

Sep 2011- Dec 2012

- Selected for excellent written and oral communication skills to work in Swarthmore writing program.
- Conducted half hour conferences with students for revision and good writing practice in college writing center.
- Assisted one professor per semester in teaching a writing intensive course, meeting regularly with 10-14 students to work on writing skills and assist in planning and revising papers.

## Publications:

- Ryan G, Mosca A, Chang R, and Wu E. "At a Glance: Pixel Approximate Entropy as a Measure of Line Chart Complexity" 2018 IEEE Infovis
- Dutta P, Ryan G, Zieba A, and Stolfo S. "Simulated User Bots: Real Time Testing of Insider Threat Detection Systems" 2018 IEEE SPW
- A. J. Williams, G. P. Ryan and F. T. Thwaites, "Oversampling MAVS for reduction of vortex-shedding velocity-sensing noise," 2012 Oceans, Hampton Roads, VA, 2012, pp. 1-10.

## Technical Summary:

**Languages:** Proficient in C/C++, Java, Python, Matlab, and SQL.**Technologies:** Linux, Git, Beanstalk, AWS EC2, Tomcat, Spring, MySQL, POSTGRES, MongoDB, Jupyter Notebook, IPython, Numpy, Pandas, Matplotlib, PySpark, Pytorch, Tensorflow, Keras, ROS, LLVM