

# Sara Pessognelli

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## EXECUTIVE SUMMARY

**Operations Analyst, Software Engineering, and Systems Engineering** professional responsible for technical solutions for Department of Defense (DoD), National Oceanic and Atmospheric Administration (NOAA), and commercial contractors, utilizing various analytical tools, including STK, Python, MATLAB, R, Fortran, C++, AWS, Docker, and Git. Helped lead technical teams to success by securing various contracts through proposal development and feasibility assessment, deploying new algorithms to federal cloud-based programs, and developing and maintaining complex technical documentation of novel processes. Expertise includes Algorithm Development, Operations Analysis, and Data Analysis. Career supported by a military background with leadership experience and an active DoD Secret Clearance, technical certifications in Deep & Machine Learning, an Applied Mathematics B.S. (with Physics minor), an Applied & Computational Mathematics Graduate Certificate, an in-progress Data Science M.S. with a concentration in Engineering & Big Data Analytics, and other various technical certifications.

## EXPERIENCE

### **GAMA-1 Technologies (NOAA Contractor) | March 2024 – Present**

#### ***Scientific Software Engineer | Greenbelt, MD (Remote)***

Responsible for migrating weather monitoring applications to a cloud environment. This included receiving compilable code from a NOAA research team and then developing automation code using Python and CI/CD pipelines. The resultant Python wrappers and Docker containers can then be migrated to the AWS Cloud9 environment to ensure test cases produce the same results as the original code. This regularly included coordinating with users on Jira and Confluence regarding project customization and creating and maintaining documentation to facilitate knowledge sharing and avoid redundancy. Once the code has been validated by the science team, it is then deployed across NOAA's Cloud architecture for use by the federal government.

- Work to standardize software for various NOAA data collecting algorithms, such as ASOS, MiRS, and AWIPS.
- Facilitate the migration of software utilized by various NOAA constellations and satellites, including JPSS, GOES, and NEON's Quicksounder, that monitor weather patterns to a cloud environment.
- Organize and manage up to four of these projects at a time, also ensuring the compatibility of any up or downstream software dependencies.

### **Lockheed-Martin | October 2020 – January 2024**

#### ***Operations Analyst | Valley Forge, PA | Denver, CO | Arlington, VA***

Responsibilities included determining the capacity and coverage capabilities of a proposed satellite constellation in feasibility studies, while working as a Systems Engineer & Operations Analyst on an Operations Analysis Team. This enabled better understanding of how a satellite constellation's radio communications abilities would interoperate with other military or commercial assets in contested environments before they are built. Created physics-based models and simulations of different satellite systems in Python and STK, then performed analysis on the results in MATLAB, Python, or Microsoft Excel to determine the efficacy of the proposed constellation. Because of the nature of these analyses, they often involve optimization algorithms or explorations into Machine Learning and Operations Research.

- Using Python and STK, developed a radio communications analysis tool that models LEO satellite flight paths using two-line element (TLE) data and uses a variable link budget to determine platform susceptibility to jamming.
- Statistical analysis and machine learning models could then be applied to the data derived from this model, leading to actionable results regarding the feasibility of the constellations communication systems.
- This model and others were used to conduct up to five analyses at a time, while also presenting findings and delivering complete packages.

### **Johns Hopkins Whiting School of Engineering | May 2023 – Present**

#### ***Graduate Grader | Baltimore, MD (Remote)***

Selected to be a TA/Grader for a graduate Matrix Theory class while working towards a Graduate Certificate in Applied & Computational Mathematics. Duties include grading a class of 10-15 students' assignments, identifying mistakes, and then providing detailed and thoughtful feedback on their work.

## **UNITED STATES ARMY RESERVES | May 2020 – Present**

### ***Engineer Officer (Platoon Leader) | 459<sup>th</sup> Multi-Role Bridging Company (MRBC), Bridgeport, WV***

Responsible for the planning, preparation, and execution of training for platoon level operations for multiple platoons ranging from 20 to 30 service members. This requires coordination of efforts from separate elements, including transportation, communications infrastructure, and supply logistics

- Drafted and delivered training briefings on topics including obstacle breaching, obstacle emplacement, technical reconnaissance, and bridging operations.
- Oversaw platoon-level training and practical exercises in multiple critical disciplines including bridging and reconnaissance.
- Served as the Officer in Charge (OIC) of four Battalion weapons ranges; responsible for logistics preparation, material estimates, and resource coordination with Ft. Indiantown Gap and Ft. Carson range control and operations.

## **EDUCATION**

- **Applied Mathematics, B.S.**, minor in Physics | Virginia Military Institute
  - Institute Honors Program | Distinguished Military Graduate | 3.75 GPA | May 2020
- **Applied & Computational Mathematics, Graduate Certificate** | Johns Hopkins University
  - 4.0 GPA | January 2025
- **Data Science & Analytics** | Old Dominion University | In Progress
  - Concentration in Engineering & Big Data Analytics

## **AWARDS**

### **Extraordinary Engineering & Technology Award (EETA) | Lockheed Martin | November 2022**

Awarded to the members of our team working on the Space Development Agency (SDA) PDR, for technical excellence and persistent dedication to high quality modeling, analysis, & delivery of results to the customers in an evolving and time-constrained schedule.

### **John H. French Medal | Virginia Military Institute | Spring 2020**

Awarded to the member of the graduating class with the highest proficiency in mathematics.

## **CERTIFICATIONS**

- Secret Security Clearance | Department of Defense | December 2016
- STK Level 1 Certification | Fall 2019
- MATLAB Machine Learning Onramp | November 2020
- MATLAB Deep Learning Onramp | November 2020
- Introduction to Deep Learning with PyTorch | Summer 2023

## **PROFESSIONAL RESEARCH & DEVELOPMENT**

### **Machine Learning Data Science Sponsored Innovation (DSSI) | Lockheed Martin | August 2021 – January 2022**

Worked on building a recommendation service that could use SWaP and other specified communications requirements to suggest an appropriate set of communications equipment to a user. The recommender attempts to minimize SWaP while still fitting the user's requirements using a genetic algorithm. After the recommendation is made, the variables and output are cached for memorization.

## **GRADUATE RESEARCH PROJECT**

### **Probability & Stochastic Processes I Research Project | Johns Hopkins University Whiting School of Engineering | August – December 2023**

#### ***“Counting Processes, Regression, and Bayesian Methods for Epidemiology”***

A research project exploring counting processes, regression, and Bayesian methods in the context of gleaning information about epidemics from real world data. The data included health factors and eventual outcomes of various epidemics, pandemics, and other diseases (including the 2014 West Africa Ebola outbreak and the 2020 COVID-19 pandemic) gathered from sources such as the CDC, CSSE at Johns Hopkins, and the WHO. This data was then used to model the spread of disease through a population, focusing on Galton-Watson branching processes for the early stages of an outbreak and the SIR model for later

stages.

The idea of treating infectious periods as a random variable from a Poisson process was also explored, and several techniques for estimating the parameter  $R_0$  from the data are discussed. These techniques include objective Bayesian parameter estimation, linear regression (best linear predictor), and Bayesian linear regression. Other explorations in this paper include using Bayesian A/B testing to examine how  $R_e$  changes overtime due to mitigation efforts and finally, a look at the efficacy of Gaussian Naïve Bayes' (GNB) classifiers and Bayesian logistic regression for prediction of disease outcomes.

## UNDERGRADUATE HONORS THESIS

### **Machine Learning & Algorithm Development | VMI Applied Mathematics Department | August 2019 – May 2020** *"Causal statements in observational data with a focus on the study of terrorist attacks"*

This thesis used statistical machine learning methods, specifically decision trees in conjunction with bagging, predictor importance, principal component analysis, and the Back-Door Path criterion to analyze a dataset pertaining to terrorism rates across the globe, over the past several decades. These methods were used to write a MATLAB code that first analyzes the dataset and determines the predictor importance of all the variables on the response (the number of terror attacks in a given country, in a given year). The code then attempts to apply the Back-Door Path Criterion by first asking the user for input about the theoretical possibility of causation between predictors. Then, principal component analysis is performed on sets of variables that are too intertwined to evaluate separately. It repeats this process until the Back-Door Path criterion can be applied to a reduced dimension set of variables, to determine the causality of the predictors on the response.

The final product of this thesis was a MATLAB script which performed this analysis on any input dataset, a paper about the causal nature of certain predictors on terrorism, and a presentation for the VMI Undergraduate Research Symposium.

## UNDERGRADUATE RESEARCH

### **Applied & Industrial Mathematics Internship (AIM) | VMI Applied Mathematics & ECU Departments | Summer 2018**

Worked concurrently with the Applied Mathematics and ECU departments to analyze over 20 years' worth of socioeconomic factors believed to contribute to terrorism across the globe. Used a variety of statistical machine learning methods and the Back-Door Path Criterion, a function was developed that could be used to model or predict future terrorism within a given country.

### **Summer Undergraduate Research Internship (SURI) | VMI Chemistry Department | Summer 2017**

Worked with the Chemistry Department to test a surfactant PAR's ability to bind with aqueous cobalt (and several other heavy metals), creating a complex with an absorbance that could be measured with UV-spectroscopy, in order to determine the concentration of cobalt displaced by the surfactant.

## TECHNICAL SKILLS

- Python | 7 Years Experience
  - PyTorch | PyMC | ITU-R | Sci-Kit Learn | Keras | Tensor Flow
- MATLAB | 7 Years Experience
  - Machine Learning | Deep Learning
- R | 6 Years Experience
- Excel | 6 Years Experience
- STK | 5 Years Experience
- C++ | 4 Years Experience
- Git | 2 Years Experience
- Fortran 90 | 2 Years Experience
- PuTTY | 1 Year Experience
- AWS Cloud9 | 1 Year Experience
- Docker | 1 Year Experience
- Professional Military Education Courses:
  - Engineer Basic Officer Leader Course | Ft. Leonard Wood, MO | January – June 2021
  - Unit Movement Officer Course | Ft. McCoy, WI | September 2020
  - Anti-Terrorism Officer Basic Course | Force Protection Training Division, Ft. Leonard Wood, MO | April 2023