Lucas Corcodilos

⌂ lucascorcodilos.com | ✉ corcodilos.lucas@gmail.com | ⓞ lcorcodilos

Education

Ph.D. Experimental Particle Physics *Baltimore, MD*
JOHNS HOPKINS UNIVERSITY *Sept. 2016 - Dec. 2021*

B.S. Physics, Minor Mathematics *New Brunswick, NJ*
RUTGERS UNIVERSITY *Sept. 2012 - May 2016*

Technical Skillset

> 5 years Python, Linux, Git, LaTeX
2-5 years Pandas, Numpy, Scipy, Doxygen, Pytest, scikit-learn
1-2 years PySpark, SQL, Polars, Docker, Black, mypy, Memgraph/Neo4j/Cypher, Pytorch, C++

Work Experience

Data Scientist II - Cybersecurity *Cambridge, MA*
VECTRA AI *May 2022 - Current*

- Developed advanced algorithms in Python to detect malicious behavior in network, AWS, and M365 environments, leveraging a combination of statistical techniques, machine learning, and custom logic
- Collaborated closely with security researchers to isolate attacker behaviors, with an emphasis on techniques that generalize across attacker tools and are robust to the imbalanced data natural to the cybersecurity space
- Performed exploratory analysis using PySpark and implemented detection logic with Polars, numpy, scipy, scikit-learn, and Python standard library tools.
- Implemented production algorithms in real-time streaming frameworks, balancing security coverage with memory usage, data throughput, and detection speed
- Wrote scalable and maintainable Python code, following best practices in type hinting, Black formatting, and unit testing
- Engaged in source code management with Git and in receiving and providing code reviews
- Actively participated in customer support tickets to root cause problems on Linux-based on-prem systems
- Presented research findings to both technical and leadership audiences, increasing visibility of team investments

PhD Student Researcher *Baltimore, MD*
COMPACT MUON SOLENOID COLLABORATION (CMS) *Sep. 2016 - Dec. 2021*

- Solved fundamental research problems as a part of the efforts of European Organization for Nuclear Research (CERN)
- Wrote and maintained Python-based analysis code for detecting evidence of never-before observed particles
- Modeled data distributions with Poisson likelihood models, evaluating the model through development with testing of Goodness of Fit, bias, and other metrics to test the validity of the model's fit to data
- Developed a novel modelling technique that increased sensitivity to detect specific particle decays by 10x

Projects

Cybersecurity

- Developed and released a new algorithm to detect attacks against Domain Controllers
- Migrated AWS and M365 cloud detection algorithms to a new streaming framework, meeting requirement to improve time-to-detect without changing attack coverage or alert frequency in customer environments
- Led efforts to modernize detection of LDAP-based recon activity, improving robustness without increasing noise
- Conducted an exploratory effort using Memgraph to create a graph representation of RPC activity in customer networks for the purpose of labelling network hosts
- Worked on a small team to explore opportunities to use LLMs in the product's user interface
- Designed and built a SQLAlchemy-based tool for defining, running, recording, and visualizing repeatable experiments with LLMs

Experimental Particle Physics

- Created novel technique with accompanying Python package to construct a binned likelihood from 2D parametric distributions that are constrained by simulations
- Built Python library with accompanying C++ modules to increase access to fast data manipulation technologies that reduce computation time by up to 20x

Publications

Primary Author

- "Search for a heavy resonance decaying to a top quark and a W boson at $\sqrt{s}$ = 13 TeV in the fully hadronic final state," CMS Collaboration, JHEP, 2021

Collaborator

- "Search for a heavy resonance decaying into a top quark and a W boson in the lepton+jets final state at $\sqrt{s}$ = 13 TeV," CMS Collaboration, JHEP, 2022

- "Search for a massive scalar resonance decaying to a light scalar and a Higgs boson in the four b quarks final state with boosted topology," CMS Collaboration, Phys. Lett. B, 2023