

# Lucas Corcodilos

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## Education

### Ph.D. Experimental Particle Physics

JOHNS HOPKINS UNIVERSITY

*Baltimore, MD*

*Sept. 2016 - Dec. 2021*

### B.S. Physics, Minor Mathematics

RUTGERS UNIVERSITY

*New Brunswick, NJ*

*Sept. 2012 - May 2016*

## Work Experience

### Data Scientist - Cybersecurity

VECTRA AI

*Cambridge, MA*

*May 2022 - Current*

- Developed advanced algorithms to detect malicious behavior in network and cloud environments, leveraging both machine learning models 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.
- Implemented production algorithms in near real-time streaming frameworks, balancing security coverage with memory usage, data throughput, and detection speed.
- 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 to increase visibility of team investments.

### PhD Student Researcher

CMS COLLABORATION (CERN)

*Baltimore, MD*

*Sep. 2016 - Dec. 2021*

- Solved fundamental research problems, presented solutions to stakeholders, and turned feedback into improvements.
- 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 modeling technique to leverage in-situ data measurements that increased the world-best sensitivity to detect specific particle decays by almost 10x.
- Served as an official statistics consultant, advising teams on domain specific statistics software and reviewing statistical models for a dozen analyses per year with authority to approve projects.

## Projects

### Vectra AI

- Developed and released a new algorithm to detect attacks against Domain Controllers via the DRSUAPI.
- 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 affecting coverage.
- Conducted exploratory effort to use a graph representations of RPC activity to label network hosts.
- Worked on a small team to explore opportunities to use LLMs in the product's user interface.
- Designed ORM-based Python package for defining, running, and visualizing repeatable experiments with LLMs.

### CMS

- 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.

## Technologies and Skills

### Languages + Tools

Python, Linux, Git, Docker, Memgraph/Neo4j/Cypher, Doxygen, C++, LaTeX

### Packages

Pyspark, Polars, Numpy, Scipy, Pandas, Black, mypy, Pytest, scikit-learn, Pytorch

### Techniques

Statistical and ML modeling, algorithm design, source code management, code reviews

## Publications

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### 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