

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

Research Experience

CMS Analysis Lead

CMS COLLABORATION (CERN)

Sep. 2016 - Dec. 2021

- Responsible for solving research problems independently, presenting solutions to stakeholders, and turning feedback into improvements.
- Wrote and maintained python-based analysis workflow and accompanying documentation and paper.
- 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 (arXiv:2104.12853).
- Produced reports on object identification performance that informed software decisions by the CMS Collaboration.

Statistics Contact

CMS COLLABORATION (CERN)

Sep. 2019 - Nov. 2021

- Advised teams on domain specific statistics software, often helping to refine and test likelihood based models.
- Responsible for reviewing statistical models for a dozen analyses/year with authority to approve projects for the next stage of review.

Projects

2D Alphabet

- Novel technique to construct a binned likelihood from 2D parametric distributions that are constrained by simulations.
- Launched Python framework with exposed API that is now being used by other collaborators to build, fit, and test 2D Alphabet models for other analyses.

TIMBER

- Python library to make fast data manipulation technologies more accessible to existing analysis workflows.
- Builds a directed acyclic graph from successive data manipulations so internal methods can leverage data provenance.
- Interface makes analysis development quicker while plug-and-play C++ modules reduce computation time by up to 20x.

Better ROOT Browser

- Interactive web application built with Plotly/Dash to improve the EDA experience with ROOT data formats.

Job App Manager

- Django-based website to track and manage job applications, interviews, and other application information.

Communication

Research

- Experience giving both weekly technical presentations to groups of 10-20 and general talks to groups of 100s at conferences and large workshops.
- Lead two CMS Data Analysis School exercises where I helped students re-create an analysis from scratch using TIMBER.

Teaching and Outreach

- Taught physics to Johns Hopkins freshmen aspiring to major in the subject with a focus on intuitive thinking.
- Tutored high school AP Physics students struggling with remote schooling during the COVID-19 pandemic.
- Designed and ran a virtual reality exhibit for the public as a part of the JHU physics outreach program.
- Served as revision-based writing tutor at the Rutgers Plangere Writing Center.

Technologies and Skills

Languages + Tools

Python, Git, Linux, C++, GitHub Actions, Docker, Doxygen, HTML, CSS, ROOT, LaTeX, Jekyll

Packages

Pandas, Plotly/Dash, Django, Beautiful Soup, scikit-learn, Keras, Pytest

Techniques

Statistical/ML modeling, web scraping, multi-processing, batch server computing, user support

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 (*submitted*), 2021
- “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 (*in review*)
- “Search for resonant production of HH to 4b in boosted and semi-boosted topologies,” CMS Collaboration (*in review*)