Lucas Corcodilos

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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*

Research Experience

Project Lead

CMS Collaboration (CERN) — *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 (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 framework with Python API that is now being used by analysis teams to build, fit, and test 2D Alphabet models.

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*)