# Lucas Corcodilos

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## Education

**Johns Hopkins University** — *Baltimore, MD*
PH.D. PARTICLE PHYSICS — *Sept. 2016 - Dec. 2021*
*The 2D Alphabet Background Modeling Method and its use in the Search for an Excited Bottom Quark*

**Rutgers University** — *New Brunswick, NJ*
B.S. PHYSICS, MINOR MATHEMATICS — *Sept. 2012 - May 2016*
*GPA: 3.9, Summa Cum Laude, Honors Scholar, Phi Beta Kappa, Presidential Scholar*

## Research Experience

**CMS Collaboration**
CMS ANALYSIS LEAD (ARXIV:2104.12853) — *Sep. 2016 - Dec. 2021*

- Wrote and maintained python-based analysis workflow and accompanying publication and internal documentation.
- Developed novel 2D background estimation technique (2D Alphabet).
- Improved current world best limit on the mass of an excited bottom quark by a factor of two.
- Analysis selected as a long-exercise for CMS Data Analysis Schools (below).

STATISTICS CONTACT - B2G PHYSICS ANALYSIS GROUP — *Sep. 2019 - Nov. 2021*

- Review statistical models and use of software tools in the analyses produced by the group (40-60 members).
- Provide resources for group members on topics of CMS statistics software, modeling issues, and group requirements.

## Projects

**2D Alphabet**
CREATOR, LEAD DEVELOPER

- Framework to build two-dimensional binned likelihood model, fit the model to data, and collect results.
- Uses novel technique to measure combinatorial backgrounds from data while simultaneously fitting other backgrounds and extracting the signal.
- Recently refactored to expose API for custom complex model building.

**TIMBER**
CREATOR, LEAD DEVELOPER

- Library of Python and C++ tools that automate CMS data processing algorithms.
- Interfaces with ROOT's RDataFrame to reduce processing times from the order of days to hours.
- Provides 20x increase in processing speed to calculate the time-intensive jet energy corrections.

## Teaching and Outreach

**Long Exercise Facilitator** — *CERN, Fermilab*
CMS DATA ANALYSIS SCHOOL — *Sep. 2020, Jan. 2021*

- Provided python code to students, presented on statistics concepts, and answered student questions.

**Teaching Assistant** — *Baltimore, MD*
JOHNS HOPKINS UNIVERSITY — *Sep. 2016 - Dec. 2020*

- Taught for freshman physics major course since Fall 2017.

**Physics Outreach with Virtual Reality** — *Baltimore, MD*
JOHNS HOPKINS UNIVERSITY — *Spring 2018, 2019*

- Provided personal hardware (PC + HTC Vive) to run a virtual reality exhibit at the annual JHU Physics Fair.

## Skills

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| **Experienced** | Python, Linux, Git, Statistical modeling, Parallel computing, Pytest, Doxygen/Sphinx, ROOT, LaTeX |
| **Familiar** | Machine learning, TensorFlow/Keras, scikit-learn, pandas, C++, SQL, HTML, SCSS |
| **Non-technical** | Oral and written communication for technical and non-technical audiences, project and group leadership |