Lucas Flores

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Experience

July 2015 – Sept. 2021
University of Pennsylvania
Research Assistant

- Searched for theorized subatomic particles, furthering knowledge of the particle composition of the universe, by investigating petabytes of real and simulated proton-proton collision data (quadrillions of instances) at the Large Hadron Collider (LHC) with the ATLAS collaboration located in Geneva, Switzerland.
- Developed C++/Python framework with ROOT libraries to clean, analyze, transform, and visualize data, engineering new features and using them to optimize selections.
- Developed a framework for the preservation and re-usability (analysis reinterpretation using other theoretical physics models) of a physics analysis using git, Continuous Integration, Docker images, and workflows.
- Served as a software expert for the electron-photon performance group. Re-optimizing a multivariate likelihood based electron identification algorithm used in nearly all analyses on ATLAS. Also supported shared software used to process petabytes of upstream datasets (C++ & Python).

Aug. 2015 – May 2016
University of Pennsylvania
Teaching Assistant

- Taught introductory labs in both classical mechanics and electromagnetism.
- Laid out the purpose of each lab. Guided students to complete each lab with a good understanding of the experimental techniques and physics principles as well as how the lab connected to the lecture component.

Skills

LANGUAGES	(*Proficient*) C/C++, Python, Bash (*Good*) HTML, CSS (*Basic*) Java, JavaScript, Mathematica
SOFTWARE	(*Proficient*) Linux/Unix, git, CI, ROOT, LaTeX (*Good*) numpy, scipy, Docker
OTHER	Hypothesis testing, statistics, machine learning, regression analysis, scraping, web design, Arduino microcontrollers

Education

AUG. 2015 – SEPT. 2021 — **PhD** – Physics
University of Pennsylvania, Philadelphia, PA

AUG. 2015 – JUNE 2017 — **MS** – Physics
University of Pennsylvania, Philadelphia, PA

SEPT. 2010 – JUNE 2015 — **BS** – Physics & Applied Math.
University of California, Riverside, Riverside. CA

Selected Publications

2021 **Search for trilepton resonances from chargino and neutralino pair production in $\sqrt{s} = 13\ TeV$ pp collisions with the ATLAS detector**
→ Optimized background estimation in profile Likelihood ratio fit used in analysis of 13.9 million billion proton-proton collisions (instances). Lower limits on the $\tilde{\chi}_1^{\pm}/\tilde{\chi}_1^0$ masses are set at 625, 1050, and 1100 GeV for 100% branching fractions to a Z boson plus a τ lepton, muon, or electron, respectively. [doi.org/10.1103/PhysRevD.103.112003]

2019 **Electron reconstruction and identification in the ATLAS experiment using the 2015 and 2016 LHC proton-proton collision data at $\sqrt{s} = 13\ TeV$**
→ Developed, maintained, and optimized a data-driven Likelihood based electron identification algorithm. [doi.org/10.1140/epjc/s10052-019-7140-6]

Projects

2018 ***keypacitance* – PennApps XVII Hackathon**
Adds capacitive touch layer input to keyboard. Built VR keyboard object in Unity in demonstrated application.
blog post: lucasflores.com/blogfolio/keypacitance/

2017 ***cryptoino* – PennApps XV Hackathon**
Lightweight symmetric key exchange via Tree Parity Machine neural nets. Targeted small insecure Internet of Things devices. Semi-final qualifier.
blog post: lucasflores.com/blogfolio/cryptoino/

2016 ***eyeHUD* – PennApps XIV Hackathon**
Smart eye-tracking transparent window 'heads-up' display. Third place overall and Best Public Safety or Video Processing App (presented by Axon).
blog post: lucasflores.com/blogfolio/eyeHUD/