# Lucas Flores, Ph.D.

**California, United States** (Open to relocation)

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*6+ years in Data Science/ML, focused on analyzing petabytes of data from the biggest particle physics collider in the world using Python/C++ and big data tools.*

## Experience

**Research Assistant/Physicist**, *University of Pennsylvania, Philadelphia, PA* Jul 2015 – Dec 2021

- Investigated petabytes of proton-proton collision data produced by the Large Hadron Collider in search of theorized subatomic particles, furthering the knowledge of fundamental physics
  - Researched, constructed, optimized and implemented two new features used to form control, validation, and signal regions for robust statistical hypothesis tests
  - Processed big data sets utilizing the LHC Computing Grid (AWS analogue), a powerful distributed computing resource, and distributed computing software HTCondor (TORQUE/SLURM analogue), RUCIO (Hadoop analogue), and PanDA (Airflow analogue)
  - Set exclusion limits at a 95% confidence level over a large parameter space scan for the existence of new fundamental particles via a profile likelihood ratio fit
  - Computed experimental acceptance rates for 42 independent particle decay channels over a large parameter scan and compiled values into striking visualizations
  - Presented technical methods and results to the physics community at two international conferences

- Performed model tuning, software development and new user onboarding/mentorship in an expert level role in a major performance division within the collaboration
  - Maintained, developed and documented the Python/C++ based electron identification analysis framework
  - Instructed, mentored and guided four new technical users and developers of the framework
  - Re-optimized 108 independent multivariate likelihood models designed to identify electrons, AKA "the electron likelihood (LH)." This is integrated in nearly every analysis in the 5000+ member collaboration
    - Trained models on a 20% larger, most current, and most representative data set
    - Tuned 324 selection parameters (3 per model), achieving targeted precision/recall benchmarks
    - Transitioned training models from a 25% simulated 75% real data hybrid to 100% real data
  - Investigated a new metric for tuning the *electron LH* to retain desired signal and background rates for different particle detector environments
  - Re-tuned *electron LH* parameter that created a gain in signal rate in 50% busier detector environments

## Selected Projects

**PermaLost** — github.com/lucasflores/PermaLost Jul 2022 - Present

- Engineered predictive permafrost loss tool in application to vulnerable "soft" artifact decay in Greenland using Python, pandas, scikit-learn, and matplotlib

**cryptoino** — lucasflores.com/blogfolio/cryptoino/ Jan 2017

- In identifying need for secure IoT devices, Implemented Tree Parity Machine neural nets into a lightweight symmetric key exchange protocol between two Arduinos in Python/C#

**eyeHUD** — lucasflores.com/blogfolio/eyeHUD/ Sep 2016

- Built an eye-tracking transparent window 'smart heads-up display' out of a deconstructed monitor, two webcams and Python/OpenCV → won 3rd place over-all

## Education

Aug 2015 – Dec 2021 **PhD & MS** – Particle Physics *University of Pennsylvania, Philadelphia, PA*

Sep 2010 – Jun 2015 **BS** – Physics & Applied Mathematics *UC Riverside, Riverside. CA*

## Skills

Languages: Python, C++, BASH, SQL, HTML, CSS, YAML, JavaScript

Software/Tools: UNIX, Git, CI, matplotlib, Tableau, scikit-learn, pandas, Keras, TensorFlow, Docker, HTCondor, NumPy

Other Skills: Hypothesis testing, statistics, machine learning, regression analysis, data visualization, JIRA, Jupyter, web design, web scraping

## Honors & Awards

**MARC U STAR Scholar Fellowship**, *The University of California, Riverside* [Honor] Sep 2014-Jun 2015

- Two year full tuition and research stipend fellowship

**Robert T. Poe Memorial Scholarship Award for Outstanding Bachelor of Science Graduate**, *The University of California, Riverside* [Award] Jun 2015