Alejandro Sanchez

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EDUCATION

Ph.D. in Physics **August 2017 – Present**

Carnegie Mellon University, Pittsburgh, PA

Thesis Title: *Search for Dark Matter at the Large Hadron Collider in a Model Independent Approach using Image-Based Deep Learning Classifiers*

Expected Graduation Date: May 2022

Bachelor of Science in Physics with Honors, Minor in Mathematics **May 2017**

Florida State University, Tallahassee, FL

Honors in the Major Thesis: *Exploration of Deep Learning Methods for Vector Boson Fusion Event Discrimination*

Dean's List: 5 Semesters; Overall GPA: 3.691/4.0; *Cum Laude*

RESEARCH

Graduate Research Assistant **August 2017 – Present**

Advisor: Manfred Paulini, Physics Department, Carnegie Mellon University

CMS Experiment

- Collaborating as a member of the Compact Muon Solenoid (CMS) experiment at CERN in Geneva, Switzerland to search for new physics, including supersymmetry and dark matter
- Developing a deep learning multi-classifier as a novel way to discriminate between particles using an image-based, end-to-end approach
- Maintaining, debugging, and developing the data quality monitoring (DQM) software, plots, and GUI for the CMS electromagnetic calorimeter (ECAL) subdetector
- Stationed at CERN during summer 2018, collaborating with CMS members in person

Undergraduate Research Assistant **January 2015 – May 2017**

Advisor: Harrison Prosper, Physics Department, Florida State University

CMS Experiment

- Implementing deep machine learning methods used to facilitate the training of handwriting recognition neural networks to generate discriminants of high energy particle collider events from raw data without having to create clever variables while retaining accuracy
- Studied neural networks and various training techniques to look for more efficient and accurate forms of particle collider data analysis
- Wrote and tested my own version of a deep Bayesian neural network code from scratch and generalized to allow the customization of the number of hidden layers, input weights, and potential of implementing GPU parallelization for computationally intensive sections

TEACHING

Graduate Teaching Assistant **August 2017 – Present**

Physics Department, Carnegie Mellon University

- Run introductory recitation classes twice a week, providing unsupervised instruction of 15-25 students
- Review recently learned physics concepts and assign problems to be worked on and discussed in groups
- Collaborate with undergraduate teaching assistant assistants (TAAs) in answering students' questions
- Grade homework assignments and exams and maintain gradebook for students in my sections

Undergraduate Teaching Assistant **August 2015 – December 2017**

Physics Department, Florida State University

- Oversaw two freshmen and sophomore physics classes with 75 and 35 students, respectively, in recitation-style discussions of introductory physics topics
- Collaborated alongside professor and graduate teaching assistants
- Ensured that materials required for the class are organized and where they belong, such as collecting quizzes, handing back graded assignments, or setting up physics demonstrations

OUTREACH

Adopt-a-Physicist **September 2017 – November 2017**

Sigma Pi Sigma/National Science Foundation/American Physical Society

- Participated in Q&A style online forum where high school students were invited to ask physicists one-on-one questions about their experiences in the field
- Answered roughly 2-3 questions a day during a two-week period with responses between 250-1000 words in length

College Success Mentor **October 2016 – December 2016**

Take Stock in Children, Key Largo, FL

- Provide advice to an individual in early years of high school about how to pursue a future career in STEM and what steps to take now based on personal experiences
- Interact with a student through Skype calls or by email to assume the role of a relatable model
- Teach professional etiquette to a young mind such as how to write formal emails

Science Workshop Assistant **February 2014 – April 2014**

Broward Library, Davie/Cooper City Branch, Davie, FL

- Contributed to 2-hour presentations about electrostatics and magnetic fields.
- Supervised approximately 30 elementary school students.
- Prepared demonstrations involving Van de Graaff generators, tesla coils, and rare-earth magnets.

HONORS

Florida State University Honors Student	August 2016 – May 2017
Florida State University Dean's List, 5 Semesters	August 2014 – May 2017
Sigma Pi Sigma Honor Society	April 2017
Phi Beta Kappa Honor Society	April 2017
National AP Scholar Award	July 2014

SKILLS

- Programming Languages: C++, Python, Bash, Java, ROOT, LaTeX
- Moderate knowledge of CMS software and framework
- Native Fluency in English and Spanish
- Beginner fluency in French