Victor Calderon

Problem Solver • Model Builder • Rapid Learner • Servant Leader

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Education

Vanderbilt University — Nashville, TN
- *Ph.D. in Physics with focus in Astrophysics; Adviser: Andreas Berlind* — *Aug. 2013 – Aug. 2019 (expected)*
  Title: *Understanding the Galaxy-Halo connection through galaxy group catalogues*

Florida Institute of Technology — Melbourne, FL, USA
- *B.Sc. degrees in Astrophysics, Physics and Mathematics; Magna Cum Laude* — *Aug. 2009 – July. 2013*

Work Experience

Vanderbilt University — Nashville, TN
- *Ph.D. candidate in computational Physics/Astrophysics* — *Aug 2013 - Present*
  - **Machine learning in galaxy catalogues**: Applied machine learning techniques to determine the masses of galaxy systems. My analysis improved on current mass estimates of galaxy systems by up to factors of 10x improvement over more traditional methods of determining masses of galaxy systems. I trained Random Forest, `XGBoost`, and a neural network on synthetic galaxy catalogues to predict the masses of galaxy systems.
  - **Galaxy Formation and Evolution**: Ran N-body simulation of the Universe to study the formation and clustering of galaxies. Constructed various algorithms to analyze astronomical data, and made statistical inferences about how galaxies form and evolve in simulations. I analyzed >200 GB of astronomical data in order better understand how galaxies are clustered at various scales on the sky. Constructed packages and tools to handle the analyses of the various datasets.

Massachusetts Institute of Technology — Cambridge, MA
- *MSRP Summer Research Intern - Aerospace Engineering* — *Jun 2012 - Aug 2012*
  - **CubeSats**: Design and fabrication of an electrospray system capable of producing sub-micron glass droplets, ultimately enabling the manufacturing of high-power nano-structured emitters on planar surfaces I developed mathematical models and algorithms to depict the physical characteristics of borosilicate glass, such as viscosity, volumetric flux, and thermal expansion.

Florida Institute of Technology — Melbourne, FL
- *Undergraduate Researcher in observational and computational Astrophysics* — *Aug 2011 - May 2013*
  - **Variable stars**: Development of astronomical algorithms to study stars with variable luminosity. I developed a data analysis pipeline in Python to study the chemical abundances and luminosities of pulsating stars.
  - **Understanding black holes**: I performed photometric observations of the dust around black holes using observatories in Tucson, AZ and Cerro Tololo, Chile., and constructed a Python-based pipeline to analyze the data.

Programming Skills

- **Languages**: Python (esp. scipy, pandas, matplotlib, numpy, scikit-learn, seaborn, Bokeh), C, Cython, Bash, SQL, R, high-performance computing, multiprocessing, Unix/Linux; *Beginner*: Keras, Tensorflow
- **Technologies**: TravisCI, ReadTheDocs, Git
- **Technical Writing**: HTML/CSS, Markdown, reStructuredText, LaTeX

Teaching and Projects

- **sdss-catls-utils and cosmo-utils**: Open-source python librares for analyzing cosmological datasets of the large-scale structure and galaxies.
- **Workshops and Tutorials**: Designed and taught a set of computational workshops and tutorials meant to introduce PhD students to data-science techniques and good-coding practices.
- **Other tools and packages**: I have developed command-line packages that handle the file and folder structure of different kinds of projects, e.g. dissertations, data-science-related projects, etc.

Honors and Awards

- Author on 7 research papers and counting — Ongoing
- Offered an **Insight Data Science Fellowship** — 2019
- Offered a **The Data Incubator Data Science Fellowship** - *declined* — 2019
- 2nd Best Poster Award with $500 prize - *Big Data Symposium* at Vanderbilt University — 2018
- Summer Research Awards at *Vanderbilt University* — 2013, 2014
- Best Poster Presentation Award - *NSF 2012 AGMUS Research Symposium* in Puerto Rico — 2012
- Outstanding Senior in Astrophysics & Astronomy Award at *Florida Institute of Technology* — 2012
- Distinguished Student Scholar Award at *Florida Institute of Technology* — 2011
- Elected to Phi Kappa Phi Honor Society at *Florida Institute of Technology* — 2011
- Elected to Phi Eta Sigma Honor Society at *Florida Institute of Technology* — 2010
- Dean's List at *Florida Institute of Technology* — 2009 - 2013

1st-Author Publications

- **Calderon, Victor F.**, Berlind, Andreas A. *"Prediction of Galaxy Cluster and Group masses in SDSS DR7 via a machine learning approach"*, 2019, (*submitted to Monthly Notices of the Royal Astronomical Society*)
- **Calderon, Victor F.**, Berlind, Andreas A., Sinha, Manodeep *"Probing the Stellar Content of Galaxy Groups with Value-Added Group Catalogues in the SDSS DR7"*, 2019, (*submitted to Monthly Notices of the Royal Astronomical Society*)
- **Calderon, Victor F.**, Berlind, Andreas A., Sinha, Manodeep *"Small- and Large-Scale Galactic Conformity in SDSS DR7"*, 2018, Monthly Notices of the Royal Astronomical Society, 480, 2, 2031 - 2045

Academic Service

- Maintainer of Vanderbilt Astro - Starting Grad School Guide — 2018 - Present
- Instructor of the Vanderbilt-Fisk Computational Bootcamp — 2018
- Local Organizing Committee member of SciCoder Nashville — 2017
- Co-leader of the Vanderbilt Computational Workshop — 2017
- MIT Summer Research Program Review Committee — 2016 - Present
- Web Admin for the Vanderbilt Astronomy Group website — 2015 - Present
- Host for Vanderbilt Astronomy Journal Club — 2015 - Present

Contributed Talks/Poster and Workshops

- Big Data Analysis in Astronomy and Machine Learning at *La Laguna, Tenerife, Spain* — 2018
- .Astronomy X Workshop in *Baltimore, MD* — 2018
- Sugar Rush 2018 in *Shanghai, China* — 2018
- Center for Quantitative Science - Machine Learning & Statistics workshop in *Nashville, TN* — 2018
- Vanderbilt Data Science Symposium at *Nashville, TN* — 2018
- Quantifying and Understanding the GalaxyHalo Connection in *Santa Barbara, CA* — 2017
- SnowPAC 2016: Galaxy-Halo Connection in *Salt Lake City, UT* — 2016
- AAS 227^{th} Winter Meeting in *Kissimmee, FL* — 2016
- Inclusive Astronomy 2015 in *Nashville, TN* — 2015
- AAS 225^{th} Winter Meeting in *Seattle, WA* — 2015
- School on School on Dark Energy and Galaxy Redshift Surveys in *Corfu, Greece* — 2014
- Summer School in Statistics and Bayesian Modeling for Astronomers in *State College, PA* — 2014
- SciCoder Workshop at New York University in *New York City, NY* — 2013
- National Collegiate Research Conference at Harvard University at *Cambridge, MA* — 2013