

Fernanda Alvarez-Carrascal

Ph.D. Student, Earth and Environmental Sciences, Vanderbilt University

Nashville, TN — maria.fernanda.v.alvarez-carrascal@vanderbilt.edu — fernalvarez16@gmail.com —
(629) 252-1969

Summary

My research lies in the interface of climate variability and change, environmental degradation, natural resources, its influence on social systems, and the related decision-making processes to guarantee the well-being of human societies. I couple environmental knowledge with social behavior systems to study how these can mitigate or adapt to the effects of the current environmental emergency. To achieve this, I utilize different statistical methodologies, machine learning algorithms, and agent base modeling.

Education

Vanderbilt University

Nashville, TN, USA

Ph.D., Earth and Environmental Sciences

Thesis: Lies in the Environmental Justice Scope [In progress]

Advisor: Dr. Jonathan M. Gilligan

Achievements: IBM Fellowship

National Central University

Taoyuan, Taiwan

M.Sc., Sustainable Development

December 2018

Thesis: Influence of Climate Change on Streamflow in Pamplonita and Zulia Watershed, Colombia

Advisor: Dr. Ray-Shyan Wu

Achievements: 3.94/4.0 GPA; ICDF Scholarship

Universidad Francisco de Paula Santander

Cucuta, Colombia

Bachelor of Science, Civil Engineering

June 2016

Thesis: Environmental Impact Assessment of Social Interest Housing in the San Jose de Cucuta area [Translated from Spanish]

Advisor: Dr. Alvaro Pedroza

Achievements: 4.25/5.0 GPA; Undergraduate honorary mention thesis; Civil engineering scholarship

Professional & Research Experience

Vanderbilt Department of Earth and Environmental Sciences

Nashville, TN, USA

Graduate Research Assistant, Advisor Dr. Jonathan M. Gilligan

August 2022 – Present

- Understanding the demographic, socio-economic, political, and environmental variables that can accurately predict the adoption of solar panels in residential areas
 - Exploring different machine learning algorithms and Bayesian statistics methods to define feature importance in predicting Photovoltaic Panel Area per Area.

Suramericana (SURA) S.A.

Medellin, Colombia

Professional in Civil Engineering and Sustainability

December 2020 – Jun 2022

- Generate knowledge relating environmental hazards and sustainability to the insurance industry.
 - Development of flood spots using the HAND methodology for the entire American continent to be used as a tool for decision-making in cover areas and insurance claims assessments
 - Framework creation to measure the environmental, social and environmental sustainability in small and medium companies.
 - Trends mapping around climate change and sustainability to identify opportunities for further development of the company portfolio.

- Development of new "solutions" (insurance) in the SURA portfolio that allow the transfer of hydroclimatic risks and leverage the transformation of companies in connection with sustainability
- Support on decision-making processes related to hydraulics, hydrology, climatology, and meteorology for technical projects inside the company or corporate clients
- Collection and generation of hydrometeorological and climate risk to leverage the GeoSURA platform
- Research and publication of applied technical knowledge through the Geociencias magazine, aiming to offer the general public an understanding of climate, environment, and sustainability.
- Participation in the 'Planetary Health Cell' as a connection with the company's sustainability strategy and other transversal initiatives

National Central University

Graduate Research Assistant, Advisor Dr. Ray-Shyan Wu

Taoyuan, Taiwan

August 2018 – July 2020

- Influence of Climate Change on Streamflow in Pamplonita and Zulia Watershed, Colombia.
 - This study uses the Long-term Water Balance to forecast the streamflow in the Pamplonita and Zulia watersheds in Colombia under two different scenarios (RCP4,5 and RCP8,5) by 2030 and 2050. The Historical data was generated using meteorological information from IDEAM and satellite data from NASA. The streamflow projections were estimated using a handful of general circulation models, created in the framework of the 5th IPCC report. These results serve as a tool for policymakers in the region, as a reference for future decisions on water resource management in this location.

Universidad EIA

SITE Researcher

Medellin, Colombia

September 2017 – September 2018

- Domestic Energy Consumption Due to Climatic Conditions, Efficiency and Thermal Comfort of Buildings in Medellin
 - The energy requirement and thermal efficiency of 10 case studies in the Aburrá Valley were estimated using measurements of temperature and relative humidity for 15 days. The estimation of energy needed to maintain the spaces within the comfort zone stipulated by the ISO7730:2005 was computed using the thermal load methodology. The thermal efficiency of each building was determined by the methodology proposed by the Brazilian standard NBR15220. Furthermore, the theoretical thermal sensation was estimated using the Fanger method and was compared with the thermal sensation expressed by the inhabitants of the spaces under study. This analysis provides valuable information for future Colombian urban energy demand, in addition to providing data about the influence of building design on energy consumption.

Sedic S.A.

Training Civil Engineer

Medellin, Colombia

November 2016 – September 2017

- Revision and management of georeferencing information of the Aburrá Valley sewer network according to the project "Hydraulically model the sewer system operated by EPM in the Aburrá Valley, including the topography of the elements and calibration of the models".

Hidraforcis S.A.S

Training Civil Engineer

Cucuta, Colombia

July 2016 – November 2016

- Trace of hydro-sanitary networks for different residential sets, drawing of plans and profiles of sewers, aqueducts, gas networks and fire networks for Jardin Plaza Mall and free flow channel design.

Universidad Francisco de Paula Santander

Undergraduate Research Assistant, Advisor Dr. M.Sc. Alvaro Pedroza

Cucuta, Colombia

June 2015 – June 2016

- The life cycle analysis methodology was used to estimate the environmental impacts generated by several social interest housing systems. The software Athena Impact Estimator for Buildings was used to determine the different emissions and consumptions of each system. With the results obtained, we established the most harmful system for the environment, considering material consumption (from the extraction as raw material to its final disposal), system orientation, and how the union of these two factors affects the operational energy consumption. The products of this research can be used as a reference to reduce the environmental footprint generated by a massive housing development.

Publications

Peer-Reviewed Publications

Soto-Estrada, E., **Álvarez-Carrascal, F.**, GómezLizarazo, J., and Valencia-Montoya, D I. 2019. Confort térmico en viviendas de Medellín. Revista Ingenierías Universidad de Medellín. doi: 10.22395/rium.v18n35a4.

Presentations

Contribute Talks at International Scientific Conferences

Álvarez-Carrascal, F., (2022). IX Jornada académica de Geología, Geotecnia y Minería 6 y 7 de Diciembre 2022. Influence of Climate Change on Streamflow in Pamplonita and Zulia Watershed, Colombia.. Retrieved from

Awards & Honors

- IBM Fellowship - Vanderbilt Department of Civil and Environmental Engineering 2022-2023
- ICDF - International Higher Education Scholarship Program 2018-2020
- Norte de Santander Governance Distinction 2017
- Colciencias (Colombian Science Ministry) Fellowship Research 2017
- Francisco de Paula Santander University Distinction 2016
- Undergraduate honorary mention thesis, Civil Engineering, Universidad Francisco de Paula Santander 2016
- Civil Engineering scholarship - Honorary Student, Universidad Francisco de Paula Santander 2011-2016

Technical Skills

- **Coding:** Advanced proficiency in R; proficiency in Python; basic proficiency in Java (Google Earth Engine)
- **Geographic Information Systems:** Advanced proficiency in ArcGIS (ArcMap, ArcPro); familiarity with QGIS
- **Microsoft Office:** Advanced proficiency in Excel, Word, and PowerPoint
- **Technical Writing & Reports:** Ability to carefully detail methodological approaches, including data acquisition and limitations; advanced proficiency in preparing figures in R, Python and ArcGIS; advanced proficiency in preparing reports in LaTeX

Training

- Summer of Applied Geophysics Experience (SAGE) 2022
- Responsible Conduct of Research Training through online CITI course & in-person 2020

Teaching

Earth and Environmental Sciences Department

Nashville, TN, USA

Teaching Assistant for Dynamic Earth Laboratory, Vanderbilt University. Dr. Annie Klyce

Fall 2023

- Preparation and teaching of laboratory sessions for the class lecture Dynamic Earth.
- Support students in developing advanced skills in maps and topography generation and interpretation, mineralogy, and general geology
- Grade laboratory reports and assessments
- Hold office hours

Civil and Environmental Department

Nashville, TN, USA

Teaching Assistant for Water Resources, Vanderbilt University. Dr. Alan Bowers

Spring 2023

- Support students in developing advanced skills in hydrology and hydrological modeling.
- Grade laboratory reports and assessments
- Hold office hours

Civil and Environmental Department

Teaching Assistant for Fluid Mechanics Laboratory, Vanderbilt University. Dr. Alan Bowers

- Support the instructor in the preparation and teaching of fluid mechanics laboratory sessions
- Support students to develop knowledge and intuition in the assessment of fluids
- Grade laboratory reports and assessments
- Hold office hours

Nashville, TN, USA

Fall 2022

ABC Live School

Elementary School English Teacher

- Support students between 4 and 12 years old to in developing listening and speaking skill in the English language

Taoyuan, Taiwan

August 2019 – July 2020

Professional Affiliations

- American Geophysical Union

Leadership & Community Involvement

Turner Family Center for Social Ventures- Vanderbilt University

Project Pyramid committee member

Nashville, TN, USA

May 2023 - Present

Vanderbilt Association of Women Geoscientists

Treasurer

Nashville, TN, USA

August 2023 - Present

TECHO Organization

Housing Program Team member

Medellin, Colombia

January 2022 - August 2022

TECHO Organization

Housing Program Coordinator - Manantiales de Paz Neighborhood

Medellin, Colombia

August 2017 - September 2018

TECHO Organization

Housing Program Team member - Manantiales de Paz Neighborhood

Medellin, Colombia

April 2017 - August 2017

AIESEC

Local Volunteer for GCDP Team

Cucuta, Colombia

February 2014 - August 2014

Languages

- **English:** C1
- **Portuguese:** B1
- **Spanish:** First language

References

Dr. Jonathan M. Gilligan

Associate Professor of Earth and Environmental Sciences

Vanderbilt University

(615)322 2976 (department office) — jonathan.gilligan@vanderbilt.edu

M. Sc. Alvaro Pedroza

Distinguish Professor of Civil Engineer

Universidad Francisco de Paula Santander

(+57)315383 6867 — alvaroorlandopr@ufps.edu.co

Ing. Andres Usuga

Spc.Roads and highways Engineer

IDOM S.A.

(+57)310 506 8552 — david.j.furbish@vanderbilt.edu