

Guillermo Terrén-Serrano, Ph.D.

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Education

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- University of New Mexico (UNM), Albuquerque, NM, USA.** 2016 - 2022
Ph.D. in Engineering "pass with distinction" | Electrical and Computer Engineering Department. *Advisor: Prof. Martínez-Ramón*
- *Dissertation:* Intra-hour Solar Forecasting using Cloud Dynamics Features Extracted from Ground-Based Infrared Sky Images.
 - *Description:* On the framework of smart grid, microgrid, and renewable energy; implementation of machine learning techniques to develop predictive control algorithms for energy management.
 - *Core Courses:* Advanced Neural Networks, Big Data, Optimization Theory, Advanced Statistical Learning, Bayesian Modelling, and Time Series Analysis
- University of New Mexico, Albuquerque, NM, USA.** 2015 - 2016
M.Sc. in Power & Energy | Electrical and Computer Engineering Department. *Advisor: Prof. Martínez-Ramón*
- *Thesis:* Machine Learning Approach for Global Solar Radiation Time-Series Forecasting.
 - *Description:* The thesis analyzes the performances of different machine learning algorithms to forecast time series. The dataset is from a mesoscale weather station. The techniques explored are support vector machines, Gaussian processes, and supervised artificial neural networks. In addition to unsupervised deep learning for dimensionality reduction.
 - *Core Courses:* Advance Machine Learning, Photovoltaics, Smart Grids, and Power Electronics.
- Pontifícia Universidade Católica do Paraná, Curitiba, PR, Brazil.** 2011 - 2012
Bachelor Project & Academic Exchange | Escola Politécnica. *Advisor: Prof. Te-Vaarwer*
- *Bachelor Project:* Energy-Efficient University Campus in Southern Brazil.
 - *Description:* Design of self-sustained University Campus accommodated to the Southern Brazil climate. The design includes renewable energy, energy-efficient lighting, and sustainable passive architecture techniques. In the framework of energy net-balance, the aim was to balance the energy demanded and generated by the system. The power system was composed of thermal loads, dynamic electrical loads, and lighting loads.
- Universidad de Zaragoza (UZ), Zaragoza, Aragón, Spain.** 2006 - 2011
B.Sc. in Technical Industrial Engineering | Escuela de Ingeniería y Arquitectura. *Advisor: Prof. Ibáñez-Carabantes*
- *Description:* Designing of power systems and devices for energy generation, transportation, distribution, and usage.
 - *Core Courses:* Power Networks, Transformers and Drivers, Control Theory, Electronic Circuits, Electrical Design, and Power Plants.
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- ## Experience
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- University of California, Santa Barbara (UCSB), CA, USA.** 2022 - Present
Climate Innovation Postdoctoral Fellow | Environmental Markets (emLab). *Supervisor: Prof. Deshmukh*
- *Research:* Planning reserve margin and operating reserves quantification.
 - *Description:* Long-term and short-term operational planning of low-carbon emissions electricity systems.
- University of California, Santa Barbara, CA, USA.** Fall 2024
Lecturer | Environmental Studies Program. *Supervisor: Prof. Deshmukh*
- *Teaching:* ENV S105 Renewable Energy Systems. Undergraduate level course.
- University of California, Santa Barbara, CA, USA.** 2022 - 2023
Postdoctoral Research Associate | Statistics and Applied Probability Department. *Supervisor: Prof. Ludkovski*
- *Research:* Allocating risk to generators for price formation in electricity markets with high renewable energy participation.
 - *Description:* Operational Risk Financialization of Electricity Under Stochasticity (ORFEUS), Princeton University's PERFORM team.
- University of New Mexico, Albuquerque, NM, USA.** 2015 - 2022
Graduate Assistant | Electrical and Computer Engineering Department. *Supervisor: Prof. Martínez-Ramón*
- *Teaching Assistant:* Circuit Analysis, Electronic Circuits, Signals and Systems, and Data Structures and Algorithms.
 - *Research Assistant:* Smart grids, computer vision, and machine learning at the Center for Emerging Energy Technologies (CEET).
- Enerland Group, Zaragoza, Aragón, Spain.** 2012 - 2013
Project Engineer Intern | Renewable energy EPC company. *Supervisor: Mr. Ballet-Sala*
- *Projects:* Solar photovoltaic (PV) plants international technical and commercial project proposals (56MW, 1MW, 2.5MW, and 600kW).
- Institute of Technology for the Development (LACTEC), Curitiba, PR, Brazil.** 2012
Undergraduate Research Assistant | Electronic Engineering Department. *Supervisor: Prof. Zambenedetti*
- *Projects:* 30kW PV system (on-grid), and PV-powered wireless sensor for real-time measurements on transmission lines.

Academic Publications

Probabilistic Day-Ahead Forecasting of System-Level Renewable Energy and Electricity Demand. *Nature Communications (Under review)*, 2025. G. Terrén-Serrano, R. Deshmukh and M. Martínez-Ramón.

Extreme Day-Ahead Renewables Scenario Selection in Power Grid Operations. *Applied Energy*, 2025. G. Terrén-Serrano and M. Ludkovski.

Advances in Solar Forecasting: Computer Vision with Deep Learning. *Advances in Applied Energy*, 2023, Q. Paletta, G. Terrén-Serrano, et al.

Processing of Global Solar Irradiance and Ground-Based Infrared Sky Images for Solar Nowcasting and Intra-Hour Forecasting Applications. *Solar Energy*, 2023. G. Terrén-Serrano and M. Martínez-Ramón.

Detection of Multiple Wind Velocity Fields using Ground-based Infrared Sky Images. *Knowledge-Based Systems*, 2023. G. Terrén-Serrano and M. Martínez-Ramón.

Deep Learning for Intra-Hour Solar Forecasting with Fusion of Features Extracted from Infrared Sky Images. *Information Fusion*, 2023. G. Terrén-Serrano and M. Martínez-Ramón.

Kernel learning for intra-hour solar forecasting with infrared sky images and cloud dynamic feature extraction. *Renewable and Sustainable Energy Reviews*, 2023. G. Terrén-Serrano and M. Martínez-Ramón.

Geospatial Perspective Reprojections for Ground-Based Sky Imaging Systems. *IEEE Transactions on Geoscience and Remote Sensing*, 2022. G. Terrén-Serrano and M. Martínez-Ramón.

Girasol, a Sky Imaging and Global Solar Irradiance Dataset. *Data in Brief*, 2021. G. Terrén-Serrano, A. Bashir, et al.

Comparative Analysis of Methods for Cloud Segmentation in Ground-Based Infrared Images. *Renewable Energy*, 2021. G. Terrén-Serrano and M. Martínez-Ramón.

Multi-Layer Wind Velocity Field Visualization in Infrared Images of Clouds for Solar Irradiance Forecasting. *Applied Energy*, 2021. G. Terrén-Serrano and M. Martínez-Ramón.

An Experimental Method to Merge Far-field Images from Multiple Long-Wave Infrared Sensors for Short-term Solar Forecasting. *Solar Energy*, 2020. A. Mammoli, G. Terrén-Serrano, et al.

Evaluation of Dimensionality Reduction Methods Applied to Numerical Weather Models for Solar Radiation Forecasting. *Engineering Applications of Artificial Intelligence*, 2018. O. García-Hinde, G. Terrén-Serrano, et al.

Conference Proceedings

Day-Ahead Operational Forecast of Aggregated Solar Generation Assimilating Mesoscale Meteorology Information. *IEEE PES Grid Edge Technologies Conference & Exposition*, San Diego, USA, 2025. G. Terrén-Serrano, R. Deshmukh, and M. Martínez-Ramón.

Explicit Basis Function Kernel Methods for Cloud Segmentation in Infrared Images. *Energy Reports*, 2022. G. Terrén-Serrano and M. Martínez-Ramón.

Wind Flow Estimation in Thermal Sky Images for Sun Occlusion Prediction. *IEEE PES ISGT-Europe*, Espoo, Finland, 2022. G. Terrén-Serrano and M. Martínez-Ramón.

Segmentation Algorithms for Ground-Based Infrared Cloud Images. *IEEE PES ISGT-Europe*, Espoo, Finland, 2022. G. Terrén-Serrano and M. Martínez-Ramón.

Workshops

2025 Forecasting & Markets Workshop (ESIG), Presentation. Nashville, TN, USA.

2024 Macro-Energy Systems Workshop (MES), Presentation + Poster. Princeton University, NJ, USA.

2023 International Energy Workshop (IEW), Presentation. Colorado School of Mines, CO, USA.

Honors and Awards

UNM-Iberdrola Graduate Scholarship, 2015. Iberdrola Scholarship for graduate studies at the ECE department of the UNM in the USA, within the grant King Felipe VI Endowed Chair of the UNM, sponsored by the Iberdrola Foundation (Avangrid).

UZ-Santander Bank Americampus Scholarship, 2011. Santander Bank grant for an exchange year at Latin-American universities. My goal was to learn sustainable architecture and apply my knowledge of renewable energy to develop self-sustainable energy systems.

Grants

UCSB CNSI Climate Innovation Postdoctoral Fellows 2023-2025. Funding (50% salary) to develop translational I&E activities for technologies to address critical state climate action goals. My investigation focuses on extending the joint day-ahead solar forecast to wind and energy demand.

UCSB CNSI Climate Innovation Found 2023-2024. Funding (\$30K) to accelerate the development of innovations that promote climate resilience. The funding is for computing resources and attending conferences.

UCSB IEE Research Seed Program 2022-2023. 1 year of funding (\$50K) to develop software for Smart Grids' control systems, a hierarchy of energy storage solutions, and market mechanisms. My investigation focuses on developing an efficient joint day-ahead solar forecast.

Institutional Service and Community Involvement

Mentor. UCSB EUREKA! Program 2022 for STEM undergraduate students, Santa Barbara, CA.

Mentor. UCSB CAMP Research School Year Internship 2022, Santa Barbara, CA.

Translator. Parent-teacher conferences for Spanish speakers at South Valley Academy (SVA), Albuquerque, NM.

Reviewer. *Applied Energy*, *Renewable Energy*, *Knowledge-Based Systems*, *Solar Energy*, and *Data in Brief*.