# David **Sierra Porta**, PhD.

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**Ocup. actual:** Profesor Asociado (Fìsica y Ciencia de Datos), Facultad de Ciencias Básicas, Universidad Tecnológica de Bolivar, UTB (utb.edu.co)
**Ubicación actual:** Cartagena de Indias, Colombia.

## Relevant Expertise

**Data Science and Modelling:** *During my career I have learned techniques to collect, organize and analyze statistical data of various kinds, from the field of social sciences to experimental data associated with physical-natural processes. I have been studying and applying statistics through computational techniques for many years, with extensive experience in support of programming projects and project implementation. Mathematical and inferential modeling of processes and systems in general as well as the use of Machine Learning techniques for the description and prediction of data-driven systems.* **Preparation of accurate and understandable reports:** *I have presented the results of my work in papers in main scientific journals, as well as orally in a variety of settings from national conferences to general audience talks.* **Project Management:** *I have actively participated in the design, development, management, execution and evaluation of research and development projects for companies and academia.* **Teaching at University level:** *I have been teaching at a university for more than 15 years. I have taught a wide variety of students in different courses, ranging from engineering, humanities and pure sciences. I have taught courses in Statistical Mechanics, Quantum Mechanics 1 and 2, Mathematical Methods 1 and 2, Statistics and Probability, Numerical Methods, General Physics, Analytical Mechanics, Modern Physics, Experimental Techniques and Data Science.* **Experimental Physics:** *I have accumulated some experience in the study and characterization of astroparticle flows, as well as in the characterization of particle flow processes on structures and various materials. Understanding of cosmic rays and their interactions and detection by detectors.* **Physics-Mathematics:** *I have expertise in modeling dynamical systems and making use of various techniques to solve such systems. I have been interested in nonlinear dynamical systems describing physical processes and applications, and the resolution methods I have learned have to do with non-standard methods such as modeling by means of theoretical mechanics, use of Ritz's method, OHAM, energy balance method, etc.*

## Studies Completed - Academic Training

2016: **Doctor (Ph.D.) en Física Fundamental**.
Universidad de los Andes (ULA). Facultad de Ciencias. Mérida, Venezuela.

2004: **Magister Scientiae (M.Sc.) en Física Fundamental**.
Universidad de los Andes (ULA). Facultad de Ciencias. Mérida, Venezuela.

2001: **Licenciado en Matemáticas y Física**.
Universidad del Zulia (LUZ). Maracaibo, Venezuela.

## Networks and Partnerships

Member of American Physical Society (APS), No 62147697; American Statistical Association (ASA), No 29579; INTER-AMERICAN STATISTICAL INSTITUTE (IASI); and Colombian Statistical Society (SCE).

## Recent Expertise

Ene-2022-Actual: **Associate Professor - Full Time**. Universidad Tecnológica de Bolivar. Faculty of Basic Sciences. (https://www.utb.edu.co/). Researcher and Professor of the Master courses of Mechanics, Electromagnetism, Thermodynamics and Waves. Researcher and Professor of Postgraduate Master Courses in Statistics and Data Science, Data Mining, Machine Learning.

Dic-2021-May-2022: **Senior Data Scientist**. Company: DBAccess (`https://dbaccess.com/`). Business Analitics. Data analytics projects for international insurance, contractors, investment, etc. companies. Decision management, modeling, forecasting, visualization for business. Information data collection, analyze and accurately interpret the information obtained, prepare reports and reports that allow the visualization of the data in an understandable way to a general public and other information products resulting from data analysis.

Oct/Dic-2021: **Senior Data Analytics Expert**. Company: IMMAP-Colombia (`https://immap.org/colombia/`). Name of associated project: Migration of children and adolescents in Latin America, financed by UNICEF. To monitor the humanitarian situation of children, adolescents and their families in migration situations in Latin America and the Caribbean with a special focus on the conditions of mobility and access to basic services such as medical care, food and means of subsistence, health care, food and livelihoods, protection, education, shelter, water and sanitation, in order to inform programmatic decisions by UNICEF and its partners. Collect data information, analyze and accurately interpret the information obtained, prepare reports and briefs that allow the visualization of the data in a way that is understandable to a general audience and other information products resulting from the analysis of the data.

2020-2022: **Fellow Research Postdoctoral Position**. Associate project: Dark Energy Spectroscopic Instrument (DESI). Departamento de Física. Universidad de los Andes, Colombia. Estudio y análisis de datos del proyecto DESI https://www.desi.lbl.gov/. Trabajando en grupos de trabajo en el área de datos, BGS (Bright Galaxy Survey).

2018-2019: **Academic Staff - Research Associate**. Project name: Research Associate on Muon Tomography. Department of Physics and Astronomy. University of Sheffield. Sheffield, United Kingdom. Study and analysis of astroparticle fluxes in volcanic structures for the application of the technique of Volcanic Muongraphy (Muon Tomography applied to Colombian volcanoes). Theoretical and experimental studies in the field of astroparticles and characterization of cosmic ray detectors.

2016-2018: **Post-Doctoral Position**. Project name: Muon Telescope (MuTe-UIS) for muongraphy of Colombian volcanoes; and Simulation of scintillators and cherenkov detectors for the muon telescope for volcanic muongraphy, MuTe-UIS. Relativity and Gravitation Research Group (GIRG) and Halley Group of Astronomy and Aerospace Sciences. Industrial University of Santander. School of Physics. Bucaramanga, Colombia. Study and analysis of astroparticle fluxes in volcanic structures for the application of the Volcanic Muongraphy technique (Muon tomography applied to Colombian volcanoes). Theoretical and experimental studies in the field of astroparticles and characterization of cosmic ray detectors.

## Recent Publications in peer-reviewed journals

See also: GOOGLE SCHOLAR: https://scholar.google.com.co/citations?user=-OInFfYAAAAJ&hl=es

1. J. E. Forero-Romero and D. Sierra-Porta. *On the Convergence of the Milky Way and M31 Kinematics from Cosmological Simulations*. The Astrophysical Journal, Volume 939, Number 1. https://doi.org/10.3847/1538-4357/ac92ea.
2. Sierra-Porta, David, and Andy-Rafael Domínguez-Monterroza. *Linking cosmic ray intensities to cutoff rigidity through multifractal detrented fluctuation analysis.* Physica A: Statistical Mechanics and its Applications 607 (2022): 128159. https://doi.org/10.1016/j.physa.2022.128159.
3. Jesús Peña-Rodríguez, Alejandra Vesga-Ramírez, Adriana Vásquez-Ramírez, Mauricio Suárez-Durán, Ricardo de León-Barrios, David Sierra-Porta, Rolando Calderón-Ardila, Jonathan Pisco-Guavabe, Hernán Asorey, José David Sanabria-Gómez, Luis Alberto Núñez. Muography in Colombia: simulation framework, instrumentation and data analysis. *Journal of Advanced Instrumentation in Science*, 271(1) 1-9 (2022). https://doi.org/10.31526/jais.2022.271.
4. R. de León-Barrios, J. Peña-Rodríguez, J.D. Sanabria-Gómez, A. Vásquez-Ramírez, R. Calderón-Ardila, C. Sarmiento-Cano, A. Vesga-Ramírez, D. Sierra-Porta, M. Suárez-Durán, H. Asorey, and Luis A. Núñez. Muography for the Colombian Volcanoes. *37th International Cosmic Ray Conference (ICRC 2021)*, 8 pages. Proceedings of Science, 2021, PoS(ICRC2021)280. https://doi.org/10.22323/1.395.0280.
5. D. Sierra-Porta. Efficient improvement for the estimation of the surface free energy of asphalt binder using Machine Learning tools. Revista UIS Ingenierías, Vol. 20, n.° 3, pp. 179-188 (2021), https://doi.org/10.18273-revuin.v20n3-2021013
6. A. Vesga-Ramírez and J. D. Sanabria-Gómez and D. Sierra-Porta and L. Arana-Salinas and H. Asorey and V. A. Kudryavtsev and R. Calderón-Ardila and L. A. Núñez. Simulated Annealing for Volcano Muography, arXiv 2005.08295 [physics.geo-ph]. *Journal of South American Earth Sciences* 109, 103248 (2021), https://doi.org/10.1016/j.jsames.2021.103248.
7. Sierra-Porta, D. Analytic Approximations to Liénard Nonlinear Oscillators with Modified Energy Balance Method. *J. Vib. Eng. Technol.* 8, 713–720 (2020). https://doi.org/10.1007/s42417-019-00170-9.
8. Sierra-Porta, D. Hydrogeochemical Evaluation of Water Quality Suitable for Human Consumption and Comparative Interpretation for Water Quality Index Studies. *Environ. Process.* 7, 579–596 (2020). https://doi.org/10.1007/s40710-020-00426-7.
9. A. Vesga-Ramírez, D. Sierra-Porta, J. Pena-Rodriguez, J.D. Sanabria-Gomez, M. Valencia-Otero, C. Sarmiento-Cano, M. Suarez-Duran, H. Asorey, L. A. Nunez. Muon Tomography sites for Colombian volcanoes. *Annals of Geophysics*, 63, 6, VO661, (2020), https://doi.org/10.4401/ag-8353.
10. J. Peña-Rodríguez, J. Pisco-Guabave, D. Sierra-Porta, M. Suárez-Durán, M. Arenas-Flórez, L.M. Pérez-Archila, J.D. Sanabria-Gómez, H. Asorey and L.A. Núñez. Design and construction of MuTe: a hybrid Muon Telescope to study Colombian volcanoes. *Journal of Instrumentation*, Volume 15 (2020). https://doi.org/10.1088/1748-0221/15/09/P09006.

## Interests

- Data Science, Computational Tools of Data Science, Scientific Visualization.
- Mathematical Physics, Mathematical Methods, Experimental Physics, Modeling of Natural Phenomena, Data Science, Data Analysis, General Relativity. Gravitation and Cosmology. Analytical Mechanics.

## Skills

**Computer Science** Python, R, Maple, Mathematica Software, SPSS, PSPP, Origin, LaTeX, OverLeaft, OpenOffice, Excel-Microsoft, Word-Microsoft, Linux, Microsoft Windows, Gimp, Kadabra.
**Communication** More than 20 publications in indexed and refereed journals (publications attached). Oral presentation in congresses and events through conferences.