Francisco Mendoza-Torres
Curriculum Vitae

✉ mentofran@gmail.com ☐ +52 5521526029
GitHub/mathphysmx LinkedIn/in/mathematicalphysicist

💼 WORK EXPERIENCE

Machine learning - Professor
`2020/Feb - ...`

Geophysics Institute, National Autonomous University of Mexico (UNAM)

Teach machine learning algorithms and software tools to graduate geoscience students, mainly following the books of Aurélien Géron, 2019 and Guangren Shi, 2013. The website of the course is `https://github.com/mathphysmx/teaching-ml/`

Data Science - Manager
`2019 - ...`

Energetika

Automation of time series data ETL using Python and dashboards generation using Tableau. Cronjobs execute ETL and for web scraping. Scripts deployment to AWS EC2 Linux instance. IoT Startup. Close collaboration with the Engineering department to ensure the quality of data from sensors, and with the IT department for the development of backend analytics and frontend JavaScript visualizations.

Data Science - Postdoctoral Fellow
`2018 - 2019`

Energy and Mineral Engineering, Penn State University

Extracted semi-structured data from multiple public sources using Python scrapers, transform the information into a usable stage and load it into a database. Exploratory data analysis for quality control and insights. Benchmarking oil and gas monthly production volumes using R. Shiny interactive app development for data analysis, manipulation and geographical mapping. Machine learning, feature engineering. Random forest and deep learning for regression.

Geostatistics - Adjunct Professor
`2014 - 2017`

Geophysics Institute, National Autonomous University of Mexico (UNAM)

Taught project-centered courses to students in the *Earth Sciences* and *Exploration and Production of Natural Resources* graduate programs. No previous knowledge of statistics was assumed for this course, however the course did teach up to multivariate linear models for spatial estimation and simulation, mainly using gstat and geoR packages from the R software. Datasets for this class were selected to show different real case scenarios.

Spatial statistics - Researcher
`2011 - 2013`

Mexican Petroleum Institute (IMP)

Adapted stochastic geometric models and developed computational code for geological fracture networks analysis, modeling and simulation. Commercial software was used to validate our software. Besides fixing the import/export lack of compatibility between these two software, the programs written also added more general functions, which were applied in real datasets. This was an interdisciplinary project. The Geostatistics team, which I belonged to, had weekly meetings, and several general meetings with the other research areas of the project were held every month.

Mathematics - Professor

University: Instituto Tecnolgico Superior De La Región Sierra (ITSS)

> As a Professor of Mathematics (PDE, Numerical methods, Linear Algebra, Calculus) and Physics (Electromagnetism), I designed and wrote course notes which included software tutorials for MATLAB, laboratory experiments and theoretical exercises.

🎓 EDUCATION

Statistical Modeling - Ph.D. in Earth Sciences 2013 - 2017

National Autonomous University of Mexico (UNAM)

> Produced a methodology, numerical algorithms and computational codes for the analysis, modeling and simulation of joint random variables. These results were applied in a spatial statistics case study of geologic fractures (DFN).
>
> **Courses:** Mathematical Statistics, Mathematical Analysis, Group Theory.

Geomodeling - M.Sc. in Earth Sciences 2008 - 2011

National Autonomous University of Mexico (UNAM)

> Cleaned, processed, analyzed/interpreted and modeled spatial (geological) data, most of the time, writing Matlab routines and scripts. Finally, I used commercial software (Schlumberger's Petrel) to integrate the overall model of an Earth's subsurface crater. Grade 9 (Scale 1-10, 10 Highest Mark).
>
> **Courses:** Geostatistics, Numerical Methods, Inverse theory in Geophysics, Geophysical data processing, Elastodynamics, Seismic Data Processing, Exploration Seismology, Petrophysics (Rock physics and well log interpretation), Static Reservoir Characterization, Geology, Sequence Stratigraphy, Plate Tectonics.

B.Sc. Physics 1999 - 2005

Autonomous Júarez University of Tabasco (UJAT)

> Realized the importance of mathematical physics and gained the skills to, mathematically, model physical phenomena.

⚙ SKILLS

Languages	Spanish (native), English (fluent)
	Portuguese (intermediate), French (basic reading)
Software	Linux, Windows,
	R (Shiny, tidyverse), python (Pandas, Scikit-Learn, ...)
	Keras
	C++
	git(-hub), SQL/ODBC, shell scripting
	HTML5, LaTeX, MarkDown
	VSCode, Vim, Docker
	Petrel, FracaFlow, Gmsh
	Regular Expressions (RegEx)
Project Management	MS Office, MS Project, MindManager, Todoist

⚙ SOFTWARE DEVELOPED

Package name	Description
cleanTable	Utilities for cleaning data in the form of tables, for instance, from spreadsheets.
geoFileFormat	Import and export functions for DFNs (.fab) and Eclipse reservoir Simulator (.eclgrd) files.
empiricalDistribution	Univariate and multivariate empirical distribution functions.
bernstein	Tensor approach of the Bernstein-Bézier approximation of a function.
inverseFunction	Numerical inverse of a univariate function.
percolation	Percolation analysis utilities.
gmshR	An R package to export geometric elements to .geo gmsh files in order to mesh spatial domains.

🏆 AWARDS

- Alfonso Caso silver medal for academic merit in the doctoral studies (2017),

- 1st place, UNAM-BAL Earth Sciences Doctoral Thesis Award (2017),

- Member of the National Union of Researchers of Mexico Council of Science and Technology (SNI-CONACYT),

- 2009 COMEXUS-FULLBRIGHT awardee,

- Faculty top grades in two semesters in the university,

- Top grades awardee in high school,

👥 VOLUNTEER EXPERIENCE

- Volunteer in the International Conference and Exhibition (ICE) of the AAPG and SEG societies in Cancun, September/2016. I gave help to presenters and applied surveys to attendees.

- Participation in the PUMA oceanographic vessel campaign MORTIC08 in the Pacific Ocean in order to gather bathymetric data. 2-23, March 2009.

- Participation as volunteer (workshop instructor) in the Earths day Fair in the Palacio de Mineria, Mexico City. 13-25, January 2009.

- Volunteer in several natural disasters (flooding, earthquake).

📖 PUBLICATIONS

- Mendoza-Torres F, et al. *Machine learning approaches to estimate oil and gas production.* In progress.

- Mendoza-Torres F, Díaz-Viera MA, Erdely A. *Bernstein copula modeling for 2D discrete fracture network simulations.* Journal of Petroleum Science and Engineering. 2017 Jul 1;156:71020. Available from: `http://www.sciencedirect.com/science/article/pii/S0920410517305193`

- Díaz-Viera MA, Erdely A, Kerdan T, del-Valle-García R, Mendoza-Torres F. *Bernstein Copula-Based Spatial Stochastic Simulation of Petrophysical Properties Using Seismic Attributes as Secondary Variable.* In: Gómez-Hernández JJ, Rodrigo-Ilarri J, Rodrigo-Clavero ME, Cassiraga E, Vargas-Guzmán JA, editors. Geostatistics Valencia 2016. Springer International Publishing; 2017. p. 487504. (Quantitative Geology and Geostatistics). Available from: `http://link.springer.com/chapter/10.1007/978-3-319-46819-8_33`

- Díaz-Viera MA, Casar-González R, Checa-Rojas P, Hernández-Maldonado VM, Méndez-Venegas J, Mendoza-Torres F. *Geological and petrophysical model of the multiwell 331, Coyotes field, Chicontepec basin.* National Institute of Copyright, Mexico. Registration number 3-2013-110512112200-01, November 11, 2013.

- Díaz-Viera MA, Casar-González R, Hernández-Maldonado VM, Méndez-Venegas J, Mendoza-Torres F, Checa-Rojas P. *Methodology for Geological and Petrophysical Modeling using Fractal Geostatistics.* Registration number: 03-2013-091112215300-01, National Institute of Copyright, Mexico. September 18, 2013.

- Casar-González R, Díaz-Viera MA, Méndez-Venegas J, Hernández-Maldonado VM, Checa-Rojas P, Mendoza-Torres F, et al. *Geological and petrophysical model of the pilot test of CO2 Injection in the multiwell 331, Coyotes reservoir at Chicontepec basin.* Registration number 3-2013-091112234500-01, National Institute of Copyright, Mexico. September 18, 2013.

- Díaz-Viera MA, Mendoza-Torres F. *Statistical analysis of the fracture network properties observed in a hand sample from the Xochitln outcrop, Veracruz.* In: Nuevas metodologías y herramientas de caracterización estática y dinámica considerando las propiedades fractales de los yacimientos petroleros. Mexico City; 2013. (Proyecto Fondos SENER-CONACYT No. 143935 (Y-00114)).

- Díaz-Viera MA, Mendoza-Torres F, Casar-González R, Méndez-Venegas J, Checa-Rojas P, Hernández-Maldonado VM. *Statistical analysis of the alignments properties in Acatepec.* In: Nuevas metodologías y herramientas de caracterización estática y dinámica considerando las propiedades fractales de los yacimientos petroleros. Mexico City; 2013. (Proyecto Fondos SENER-CONACYT No. 143935 (Y-00114)).

- Casar-González R, Díaz-Viera MA, Hernández-Maldonado VM, Méndez-Venegas J, Mendoza-Torres F, Checa-Rojas P. *Methodology for the Geological and Petrophysical Modeling using Geostatistics.* National Institute of Copyright, Mexico. Registration number: 03 -2012-071712190800-01. July 26, 2012.

🎙 PRESENTATIONS

Invited

- Mendoza-Torres F, Díaz-Viera MA. *Bivariate probabilistic dependence between intrinsic properties of 2D distributed Boolean objects.* 50th National congress of the Mathematical Society of Mexico. 2017 Oct; Mexico City. Available from: `www.smm.org.mx`

- Mendoza-Torres F. *Wavelet analysis as a natural extension of Fourier analysis: Introduction and some applications.* 21st National Science and Technology Week. 2014; Mexico.

Contributed

- Mendoza-Torres F. *Flexible Discrete Fracture Network simulation using R or Python.* Accepted for oral presentation at: 20th Annual Conference of the International Association for Mathematical Geosciences (IAMG); 2019 August. Pennsylvania, U.S.

- Mendoza-Torres F. *Big data in oil and gas.* Oral presentation at: Penn State Postdoctoral Society Annual Research Exhibition; 2018 September. State College, Pennsylvania.

- Mendoza-Torres F, Díaz-Viera MA. *Probabilistic dependence in intrinsic properties of Boolean objects: application to discrete fracture networks.* Oral presentation at: 5th Metropolitan Modeling and Numerical Simulation Congress; 2017 May. Mexico City.

- Díaz-Viera MA, Erdely A, Kerdan T, del-Valle-García R, Mendoza-Torres F. *Geostatistical Prediction of Reservoir Petrophysical Properties by Copula-Based Dependence Models Between Seismic Attributes and Petrophysical Properties.* Oral presentation at: AAPG — SEG 2016 International Conference & Exhibition; 2016 Sep 9; Cancun, Mexico. Available from: `http://www.aapg.org/events/conferences/ice`

- Díaz-Viera MA, Erdely A, Kerdan T, del-Valle-García R, Mendoza-Torres F. *Bernstein copula-based spatial stochastic simulation of petrophysical properties using seismic attributes as secondary variable.* Oral presentation at: 10th International Geostatistics Congress; 2016 Sep 8; Valencia, Spain. Available from: `http://geostats2016.webs.upv.es/`

- Mendoza-Torres F, Díaz-Viera MA. *A general and flexible methodology to model dependencies in discrete fracture network simulations using Bernstein copula approach.* Poster presented at: 8th International Conference on Porous Media & Annual Meeting; 2016 May 11; Cincinnati, Ohio, USA. Available from: `https://www.interpore.org/events/8th-international-conference-on-porous-media-annual-meeting`

- Mendoza-Torres F, Díaz-Viera MA. *Bernstein copula approach to model direction-length dependency for 2D discrete fracture network simulation.* Poster presented at: AGU Fall Meeting; 2015 Dec 8; Moscone Center, San Francisco, California, USA. Available from: `https://agu.confex.com/agu/fm15/webprogram/Paper58431.html`

- Mendoza-Torres F, Díaz-Viera MA. *Cluster analysis to discriminate between two families of fractures in 3D.* Oral presentation at: XXVIII Technical Conference of the Association of Petroleum Engineers of Mexico, 2013 October; Mexican Petroleum Institute.