Emiliano Díaz Salas-Porras - Post-doctoral research fellow

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Academic Degrees

Universidad de Valencia (UV), Image and Signal Processing group. https://isp.uv.es/
November 2017-December 2023 **Phd in Electrical Engineering**
Thesis: Towards causal discovery for Earth system sciences.
https://hdl.handle.net/10550/91721
Defense date. 13th of December 2023.
Grade: outstanding *cum laude*

SWISS FEDERAL INSTITUTE OF TECHNOLOGY (ETHZ)
Aug 2014 - 2017   **MSc in Statistics**
Grade average 5.7 (out of 6).

INSTITUTO TECNOLOGICO AUTONOMO DE MEXICO (ITAM)
Aug 2004 - June 2009   **Bachelor in Industrial Engineering**
Graduated with special mention. Grade average 9.0 (out of 10).

INSTITUTO TECNOLOGICO AUTONOMO DE MEXICO (ITAM)
Aug 2004-Jun 2009 and 13- Aug 2014 Aug 2014   **Bachelor in Applied Mathematics**
Grade average 8.7 (out of 10).

Research projects

AI4CS
January 2024-January 2025.- Worked on the Valencian community project "AI for complex systems: Brain, Earth, Climate, Society (AI4CS)". Generalitat Valenciana. project (CIPROM/2021/056). https://isp.uv.es/projects/ai4cs/

USMILE
June 2019-December 2023.- Worked on the European project "Understanding and Modeling the Earth System with Machine Learning (USMILE)". European Research Council (ERC) Synergy grant. 2019 . https://www.usmile-erc.eu/

SEDAL
December 2017-June 2019. Worked on the European project "Statistical Learning for Earth Observation Data Analysis (SEDAL)" . European Research Council (ERC). Consolidator Grant 2014.

FDL 2024
June 2024- August 2024. Worked on the European Space Agency (ESA) funded Frontier Development Lab (FDL) 2024 research challenge on "3D clouds using multisensors". https://eslab.ai/fdl-europe-2024.

FDL 2022
June 2022- August 2022. Worked on the European Space Agency (ESA) funded Frontier Development Lab (FDL) 2022 research challenge on "Earth Observation (Live Twin):Aerosols". https://eslab.ai/fdl-europe-2022.

Selected publications

"Large Language Models for Causal Hypothesis Generation in Science". In Machine Learning: Science and Technology, 2024. https://iopscience.iop.org/article/10.1088/2632-2153/ada47f

"3D Cloud reconstruction through geospatially-aware Masked Autoencoders." In NeurIPS 2024 Workshop Machine Learning and the Physical Sciences, 2024. https://ml4physicalsciences.github.io/2024/files/NeurIPS_ML4PS_2024_255.pdf

"Pairwise causal discovery with support vector machines ". In Applied Soft Computing, 2024 . https://doi.org/10.1016/j.asoc.2023.111030

"Large language models for constrained-based causal discovery". In AAAI 2024 LLM-CP workshop . https://openreview.net/forum?id=NEAoZRWHPN

" Discovering causal relations and equations from data". In Physics Reports , 2023. https://doi.org/10.1016/j.physrep.2023.10.005

"Learning latent functions for causal discovery". In Machine Learning: Science and Technology, 2023. https://dx.doi.org/10.1088/2632-2153/ace151

"Pyrocast: a machine learning pipeline to forecast pyrocumulonimbus (pyrocb) clouds". In NeurIPS 2022 Workshop-Tackling Climate Change with Machine Learning, 2022. https://www.climatechange.ai/papers/neurips2022/71

"Identifying causes of pyrocumulonimbus (pyrocb)." In NeurIPS 2022 Workshop-Causality for Real-world Impact, 2022. https://openreview.net/forum?id=rM6HO4h1MI

"Inferring causal relations from observational long-term carbon and water fluxes records" 2022, Scientific Reports https://www.nature.com/articles/s41598-022-05377-7

Master Thesis at the Seminar for Statistics with Prof. Marloes Maathuis: "*Online deforestation detection*". https://arxiv.org/abs/1704.00829.

Semester Project at the Seminar for Statistics with Prof. Marloes Maathuis: "*Causality and Surrogate Variable Analysis*". https://arxiv.org/abs/1704.00588.

Semester Project at Prof. Joachim Buhmann's Information Science and Engineering group: "*Sparse Mean Localization by Information Theory*".   https://arxiv.org/abs/1704.00575.

Bachelor Thesis Industrial Engineering: "*Estimation of reference priors using simulation*". https://arxiv.org/abs/1704.01932

Bachelor Thesis Applied Mathematics : "*Analysis of cointegration with an application to the debt market in the United States, Canada and Mexico*". https://arxiv.org/abs/1706.05912

Academic Conferences

EGU 2023
Gave presentation on *"Learning causal drivers of PyroCb."* presented at the European Geosciences Union General Assembly 24-28 April 2023 https://meetingorganizer.copernicus.org/EGU23/EGU23-16846.html

NEURIPS 2022
Presented poster on "Identifying the causes of pyrocumulunimbus (pyrocb)" at the neural information processing system conference workshop on "Causal machine learning for real-world impact)".
https://openreview.net/forum?id=rM6HO4h1MI

PHIWEEK 2019
Gave presentation on "Inferring Causal Relations in Earth Observation: Methods, Applications and a Web-platform" at the European Space Agency (ESA) Earth Observation Phiweek 9-13 September 2019.
https://nikal.eventsair.com/NikalWebsitePortal/esa-eo-phi-week-2019/test-3/Agenda/AgendaItemDetail?id=b55801ff-c7d5-4ace-9362-d7a99fe087c6

EGU 2019
Gave presentation on *"Causal Inference in Geosciences with multidimensional kernel deviance measures"* at the European Geosciences Union General Assembly 07-12 April 2019
https://meetingorganizer.copernicus.org/EGU2019/EGU2019-15318-1.pdf

IGARS 2018
Gave presentation on: *"Consistent regression of biophysical parameters with kernel methods"* 2018 International Geoscience and Remote Sensing Symposium. https://www.igarss2018.org/Papers/viewpapers.asp?papernum=4149

Academic Workshops

KERMES 2020
February 2020. Participated in the Third KErnel MEthods for Structured data (KERMES) Workshop, Santander (Feb. 20-21. 2020) with a talk on Using the conditional mean embedding for causal discovery.

OBERWOLFACH INSTITUTE
June 2023. Attended the Oberwolfach "Machine Learning for Science: Mathematics at the Interface of Data-driven and Mechanistic Modelling" workshop.

Research stays

UNIVERSITY OF OXFORD, DEPARTMENT OF STATISTICS
Oct 2019- Nov 2019 **Research stay.**
Collaboration with Dino Sejdinovic at Oxford Computational Statistics and Machine Learning network (OxCSML).

Diplomas

INSTITUTO TECNOLOGICO AUTONOMO DE MEXICO (ITAM)
Sept 2013 - July 2014 **Diploma course in Dynamic Econometric Models**
Grade average 9.0 (out of 10).

BOCCONI UNIVERSITY
July 2018. Attended the **Summer School in Advanced Statistics and Probability: Graphical Models.**

DEEPLEARN 2019. July 2019. Attended the **Third International Summer School on Deep Learning.**

Teaching Experience

SWISS FEDERAL INSTITUTE OF TECHNOLOGY (ETHZ)
Species Distribution Modeling - Teaching Assistant at the department of Environmental Systems Science
Autumn 2016 and Spring 2017 semesters (Prof. Dr. Loïc Pellissier).

SWISS FEDERAL INSTITUTE OF TECHNOLOGY (ETHZ)
Machine Learning - Teaching Assistant at the department of Computer Science
Autumn 2015 and Autumn 2016 semesters (Prof. Dr. Buhmann)

Professional Experience

Research Analyst and Junior Partner
FINANCIAL SCIENCE (http://www.financial-science.net/)
Mexico City, Mar 2011- August 2015
Line of business: Risk management and Asset and Liability management consulting for financial institutions.
Business intelligence for the consumer sector.
Responsibilities: Responsible for model design and development including exploratory analysis, model specification, regressor selection, model estimation, parameter testing, diagnostic testing and model documentation. Acted as project manager in charge of the coordination of a modeling team in several instances.
Projects:

- ❏ AgroFinanzas. Design and implementation of AgroFinanzas' risk management unit, including the design of the Value at Risk models for market, credit, and liquidity risk.
- ❏ Financiera Rural Bank. Development of a model to update the probability of default of agriculture loans based on meteorological and price-based risk factors. Implementation in an R package.
- ❏ Asociación Mexicana de Instituciones de Seguros (AMIS). Design and development of a simulation model to estimate the loss distribution of portafolios composed of agricultural insurance products.
- ❏ Implementation of model in an R package and development of a user interface based on the R package Shiny. The model was approved as the Solvency II regulatory methodology for calculating probable maximum loss of agricultural insurance portfolios. https://www.gob.mx/cms/uploads/attachment/file/73537/ANEXO_5.6.1-a.pdf

Research Analyst
ANALYSE PROFESSIONAL SERVICES
Mexico City, *April 2009-February 2011*
Line of business: Risk management consulting for banks and other financial institutions.
Responsibilities: Assistance in model development. Economic analysis of consumer loans sector, interpretation and forecasts.
Projects:

- ❏ HSBC Bank: Statistical segmentation of the bank's Mortgage Portfolio to discriminate clients into profitability categories.
- ❏ Banorte Bank: Statistical segmentation of the bank's Auto Loans Portfolio to discriminate groups of loans according to risk and profitability.
- ❏ Banorte Bank: Logit model to estimate probability of default of loans from consumer portfolios (Auto loans, personal loans, credit card).
- ❏ Scotiabank: Validation and backtesting of existing models that estimate probability of default.

Languages and Certificates

Spanish: First Language
English: Proficient II (C2). Toefl Score 117 (Nov 2013)
French: Intermediate
GRE (October 2013): Verbal reasoning 167 (97th percentile) - Quantitative reasoning 166 (93rd percentile)

Software

MS Office	Word, Excel, Access
Visual Basic, C, Java	Programming language
Matlab	Mathematics
SQL	Database management
R, Python	Statistics