Homer Durand

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Education

- **Universitat de València** — València, Spain
  PhD in remote sensing — *Nov 2022 - Nov 2025*
  Causal Representation Learning for Earth Sciences
  Project: *Learning causal representation and develop causal tools robust to distributional shifts for spatio-temporal and potentially high-dimensional data. Apply these methodologies to concrete Earth sciences and remote sensing problems such as Detection and Attribution of climate change.*

- **Sorbonne University** — Paris, France
  Master's degree in mathematics and applications — *Sept 2021 - Nov 2022*
  Specialisation in Statistics
  Courses: *Nonparametric inference, High dimensional linear models, Statistical learning, Sequential convex optimization, Bayesian statistics, Statistical analysis of graphs, Statistical models for ecology.*

- **Polytech Sorbonne** — Paris, France
  Master's degree in engineering — *Sept 2018 - Sept 2021*
  Specialisation in Applied Mathematics and Computer Science
  Courses: *Functional analysis, Numerical analysis, Probability, Statistics, Machine Learning, Data Analysis, Convex and non-convex optimization, High Performance Computing*

Skills Summary

- **Languages**: Python, R, Matlab, SageMath, C++, Cuda, C
- **Frameworks**: Scikit-Learn, Pytorch, TensorFlow, Keras, NLTK, SpaCy
- **Tools**: Markdown, LaTeX, Git, Bash, MySQL
- **French**: Mother Tongue
- **English**: Fluent (C1 - TOEIC 925)
- **Spanish**: Intermediate (B1)

Experience

- **Image Processing Lab-ISP group - Causal Representation Learning**
  Internship — *Jun 2022 - Nov 2022*
  - **Topic of research**: Learning *causal representation* for spatio-temporal data with machine learning
  - **Applications**: Biosphere-Climate interaction - understanding of the *causal effect* of *ENSO* on *vegetation in Africa* Teleconnection patterns - Analysis of the *confounding effect* of ENSO on Southern Hemisphere jet stream and the Solar Polar Vortex
  - **Outcome**: Master thesis

- **Locean-IPSL Laboratory - Statistical learning for climate models calibration**
  Internship — *Mar 2021 - Sept 2021*
  - **Topic of research**: Dynamical model calibration with *History Matching* methodology using *Gaussian Process*, *Random Forest* and *Bayesian Neural Network* regressions
  - **Outcome**: Paper published in AGU JAMES journal

- **Kyntus comp. - Web app developpement**
  Internship — *Jul 2019 - Aug 2019*
  - **Project**: Web app development for schedules management (*PHP, SQL, HTML*)
  - **Outcome**: Web applications automating schedules and projects management

Projects

- **Statistical Learning - Robust Machine Learning - The Median of Mean estimator**: (4 months - Sorbonne University) *Study of the application of the* ***median of mean*** *estimator for* ***robust machine learning*** *as proposed in Lecue & Lerasle, 2017.*See more.
- **Data Challenge - Land cover predictive modeling from satellite images**: (4 months - Sorbonne University) *Image segmentation using* ***Unet*** *and* ***Linknet*** *architecture for land cover segmentation.* See more.
- **Nonparametric estimation - Censoring models for nonparametric density estimation**: (2 months - Sorbonne Université) *Study of the results presented in: Brunel & al. 2016.* See more.
- **Explainable Artificial Intelligence - Lung cancer image detection**: (3 months - Sorbonne University) *Explainable deep learning for* ***lung cancer detection****. Use of Grad-CAM and Layer-Wise Relevance Propagation for explainability.*
- **Medical Image Processing - Deep learning for deficient MMR crypts detection**: (6 months - Polytech Sorbonne) *Statistical learning for the detection of deficient MMR crypts to aid in the* ***diagnosis of Lynch disease****.* ***Pairwise ranking*** *with* ***Siamese convolutional neural networks.***See more.
- **Natural Language Processing - Statistical analysis of political content**: (10 months - Polytech Sorbonne) *Statistical analysis of letters from MPs to ministries for the* ***study of mechanisms of political influence****. Use of NLP tools (TF-IDF, cooccurence matrix, ngram models) and time series statistical analysis (anomaly detection, classification, dimensionality reduction).*

Publications

- **Semi-Automatic Tuning of Coupled Climate Models With Multiple Intrinsic Timescales: Lessons Learned From the Lorenz96 Model**:
  AGU - Journal of Advance in Modeling Earth Systems
  Redouane Lguensat, Julie Deshayes, Homer Durand, Venkatramani Balaji
  2023 - https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2022MS003367

Interest

Recent reading

- **J. Pearl 2018**: The Book of Why : The New Science of Cause and Effect
- **M. Mudelsee 2020**: Statistical Analysis of Climate Extremes
- **IPCC report**:
  - Climate Change 2021: The Physical Science Basis
    - Chapter 3: Human Influence on the Climate System
    - Chapter 10: Linking Global to Regional Climate Change
    - Chapter 11: Weather and Climate Extreme Events in a Changing Climate
  - Climate Change 2022: Impacts, Adaptation and Vulnerability
    - Chapter 4: Water
    - Chapter 5: Food, Fibre and Other Ecosystem Products
    - Chapter 8: Poverty, livelihoods and sustainable development
- **Tania López-Marrero and Ben Wisner, 2012**: Not in the same boat: disaster and differential vulnerability in the insular caribbean
- **Piketty 2013**: Capital in the Twenty-First Century

Music

- **Personal project**: Language models for music generation
- **Piano**: 5 years