

Ismael Medina Suarez

Ph.D. in data science and optimization

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PROFESSIONAL INTERESTS

I am Ph.D. optimization with a broad experience in machine learning, data science and scientific computing. My main drive is to apply my technical expertise to solve data-backed problems in the energetic transition.

EDUCATION

Ph.D. in Mathematical Optimization and Data Science

Nov. 2020 – Dec. 2024

Georg-August-Universität Göttingen

Göttingen, Germany

- See entry in EXPERIENCE for more details.

Master in Mathematics

Oct. 2018 – Oct. 2020

TU Munich

Munich, Germany

- Operations research and optimization.
- Computational statistics, machine learning and deep learning.
- Dynamical systems, differential equations and stochastics.

Bachelor in Mathematics + Bachelor in Physics

Oct. 2013 – Jun. 2018

Universidad Complutense de Madrid

Madrid, Spain

EXPERIENCE

Scientific Staff (as a Ph.D. candidate)

Nov. 2020 – Present

Georg-August-Universität Göttingen

Göttingen & Munich, Germany

- Developed the PyTorch - CUDA libraries LOGSINKHORNGPU and DOMDECGPU, demonstrating 10-100x speed up for medium to large optimal transport problems w.r.t. the state of the art.
- Proved experience with CPU and GPU parallelization of optimization and machine learning algorithms using MPI and CUDA. Experience with High Performance Computing in GWDG's SCC cluster.
- 4 scientific papers in optimization [1, 2, 4, 5].
- Supervision of 3 bachelor and master students in their respective final theses.

Scientific Trainee

Oct. 2023 - Feb. 2024

Joint Research Center, European Commission

Ispira, Italy

- Developed and tested mathematical models for the performance of photovoltaic (PV) devices.
- Used geo-spatial data to investigate the geographical dependence of energy storage requirements (e.g. batteries) for a given self-sufficiency or grid flexibility capability.
- 2 scientific papers in PV science [3, 7]
- Gave internal trainings in Python packaging, unit testing, git and CI/CD.

Research assistant

Feb. - Jul. 2020

Faculty of informatics, TU Munich

Munich, Germany

- Contributed to the Python open-source, fermion simulation package FERMIFAB.
- Contributed to the Julia open-source, quantum computing packages QAINTESSANT.JL and QAINTESSANT.JL.
- We enforced strict code quality guidelines, including comprehensive unit-testing and an automated CI/CD pipeline
- 1 peer-reviewed scientific paper [6].

Working student

Aug. - Dec. 2019

Siemens Corporate Technology

Munich, Germany

- Implemented algorithms for model order reduction and remaining lifetime estimation using NX and Amesim.
- Developed both Python and C/C++ modules for Amesim.

SOFTWARE

DomDecGPU | *Python, C++, CUDA* | *PyTorch*

2022 – Present

- A GPU implementation of domain decomposition for optimal transport
- Achieves 10-100x speed up with respect to the state of the art on large problems.

LogSinkhornGPU | *Python, C++, CUDA* | *PyTorch*

2022 – Present

- A GPU implementation of the Sinkhorn algorithm for optimal transport
- Achieves 10x speed up with respect to the state of the art on medium-sized, batched problems.

TECHNICAL SKILLS

Programming languages: Python, Julia, C/C++, CUDA, Bash/Shell, R, Matlab

Libraries: PyTorch, Keras, NumPy, Scikit-learn, Pandas, Matplotlib

LANGUAGES

Spanish. Native speaker

English. C1 (113/120 in TOEFL iBT)

ETS, April 2018

German. B2.2

Ludwig-Maximilian Universität's Language Center, 2023

REFERENCES

- [1] Mauro Bonafini, Ismael Medina, and Bernhard Schmitzer. Asymptotic analysis of domain decomposition for optimal transport. *Numerische Mathematik*, 153:451–492, 2023.
- [2] Clément Cancès, Daniel Matthes, Ismael Medina, and Bernhard Schmitzer. Continuum of coupled wasserstein gradient flows, 2024.
- [3] Anatoli Chatzipanagi, Nigel Taylor, Ismael Medina, Teodora Lyubenova, Ana Martinez, and Ewan D. Dunlop. An updated simplified energy yield model for recent photovoltaic module technologies. *Submitted for publication*, 2024.
- [4] Ismael Medina, The Sang Nguyen, and Bernhard Schmitzer. Domain decomposition for entropic unbalanced optimal transport, 2024.
- [5] Ismael Medina and Bernhard Schmitzer. Flow updates for domain decomposition of entropic optimal transport, 2024.
- [6] Philipp Seitz, Ismael Medina, Esther Cruz, Qunsheng Huang, and Christian B. Mendl. Simulating quantum circuits using tree tensor networks. *Quantum*, 2024.
- [7] Ewan Dunlop Teodora Lyubenova, Ismael Medina. Climate specific energy rating (cser) analysis of outdoor pv field data. *Progress in Photovoltaics, 2024*, 2024.