

Ismael Medina Suarez

Ph.D. in data science and optimization

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PROFESSIONAL INTERESTS

I am a Ph.D. in 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 energy transition.

EDUCATION

Ph.D. in Mathematical Optimization and Data Science <i>Georg-August-Universität Göttingen</i> <ul style="list-style-type: none">• See entry in EXPERIENCE for more details.	Nov. 2020 – Dec. 2024 <i>Göttingen, Germany</i>
Master in Mathematics <i>TU München</i> <ul style="list-style-type: none">• Operations research and optimization.• Computational statistics, machine learning and deep learning.• Dynamical systems, differential equations and stochastics.	Oct. 2018 – Oct. 2020 <i>München, Germany</i>
Bachelor in Mathematics + Bachelor in Physics <i>Universidad Complutense de Madrid</i>	Oct. 2013 – Jun. 2018 <i>Madrid, Spain</i>

EXPERIENCE

Scientific Staff (as a Ph.D. candidate) <i>Georg-August-Universität Göttingen</i> <ul style="list-style-type: none">• 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 on optimization [1, 2, 4, 5].• Supervision of 3 bachelor and master students in their respective final theses.	Nov. 2020 – Present <i>Göttingen & München, Germany</i>
Scientific Trainee <i>Joint Research Center, European Commission</i> <ul style="list-style-type: none">• 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 on PV science [3, 7]• Gave internal trainings in Python packaging, unit testing, git and CI/CD.	Oct. 2023 - Feb. 2024 <i>Ispira, Italy</i>
Research assistant <i>Faculty of informatics, TU München</i> <ul style="list-style-type: none">• 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 on quantum computing [6].	Feb. - Jul. 2020 <i>München, Germany</i>
Working student <i>Siemens Corporate Technology</i> <ul style="list-style-type: none">• Implemented algorithms for model order reduction and remaining lifetime estimation using NX and Amesim.• Developed both Python and C/C++ modules for Amesim.	Aug. - Dec. 2019 <i>München, Germany</i>

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.