



Jorge MONTALVO ARVIZU

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Energy engineer focusing on machine learning applications for power systems to help achieve a world powered 100% by clean energy and fight the climate change crisis. I am particularly excited about the use of reinforcement learning, causality, and generative models in the power grid of the future.

EDUCATION

SINCE 2022	Ph.D. in MACHINE LEARNING for Cyber-Physical Power Systems University of Liège (ULiège) , Belgium Supervisor: Louis WEHENKEL
2019 - 2021	M.Sc. in SUSTAINABLE ENERGY Study line: Electric Energy Systems Technical University of Denmark (DTU) , Denmark Thesis: Towards an Artificial Grid Operator Assistant: Congestion Risk Assessment Indices for Model-based Agents Supervisor: Spyros CHATZIVASILEIADIS (DTU) and Antoine MAROT (RTE) GPA: 10/12
2012 - 2017	B.Sc. in MECHANICAL and ELECTRICAL Engineering Monterrey Institute of Technology and Higher Education (ITESM) , Mexico GPA: 90/100
WINTER 2016	Exchange Semester in ELECTRICAL Engineering Ostfalia University of Applied Sciences , Germany

WORK EXPERIENCE

02/21 - 08/21	RÉSEAU DE TRANSPORT D'ÉLECTRICITÉ (RTE) - Copenhagen/Paris <i>Intern [full-time]</i> Master's thesis collaboration between the ELMA group at DTU and the AI department at RTE. The objective is to learn a risk assessment model to provide information about possible congestions in the power grid to a Deep Reinforcement Learning agent based on a cyber-physical system with complex automata.
2019 - 2021	EA ENERGIANALYSE AS - Copenhagen, Denmark <i>Student Assistant [14 hrs. per week]</i> Analysis of energy systems from a technical, economic and environmental approach, as well as analysis of energy and climate policy measures, using mathematical optimization. Part of the innovation group on machine learning applications for power systems.
2017 - 2019	NERA ECONOMIC CONSULTING Inc. - Mexico City, Mexico <i>Associate Analyst [full-time]</i> (Promoted from Research Associate in 2018) Support in the quantitative and regulatory analysis of the Mexican and international energy markets to private and public stakeholders. I was mainly involved in the modelling of the energy system of each project, e.g. PLEXOS modelling of the national network to project natural gas demand for the energy regulatory commission in Mexico to create the government's investment plan for the next 20 years.
SPRING 2016	DNV GL AS - Bonn, Germany <i>Energy Markets and Regulation Intern [full-time]</i> Provided analytic support to a highly experienced international consulting team working on a Bidding Zone Study for ENTSO-E, as well as an internal project on the simulation of the European natural gas market.

TEACHING EXPERIENCE

09/20 - 12/20 | **Technical University of Denmark, Denmark**
TEACHING ASSISTANT - Modelling and Analysis of Sustainable Energy Systems using Operations Research
The course introduces the basics of **optimization with mathematical programming**, the application to energy system modelling, and software implementation. I created several notebooks in Julia/Pluto to better explain the complex concepts to the students. | [Notebooks/Code](#)

PROFESSIONAL PROJECTS

SINCE 2022 | Multi-agent RL for renewable integration in the electric power grid
Collaborators: **Mila, Université de Montréal** and **Polytechnique Montréal, GERAD**
A collaborative multi-agent reinforcement learning approach to meet the algorithmic requirements for providing real-time power balancing with demand response.

SINCE 2021 | RANGL [\[website\]](#)
Collaborators: **Alan Turing Institute**
RangL is a competition platform created at The Alan Turing Institute based on OpenAI Gym. It offers a user-friendly environment to develop learning approaches to data-driven control problems, e.g. generation scheduling under uncertainty. The project is led by Professor John Moriarty from QMUL.

ACADEMIC PROJECTS

2021 | BAYESIAN METHODS ON PHYSICS-INFORMED NEURAL NETWORKS FOR POWER SYSTEMS [\[code\]](#)
Implementation of a Bayesian PINN in Pytorch/Pyro to estimate uncertainty of the swing equation directly solved by the NN using a method proposed by Raissi, et. al. and Yang, et. al. The network was implemented in NumPyro with a JAX backend for both MCMC and VI approaches.

2021 | DEEP LEARNING [\[code\]](#)
Based on NeurIPS 2020 challenge *Learning to run a power network in a sustainable world*, the project consists on training a Reinforcement Learning agent able to operate a small 14-node power grid to minimize operation costs and prevent a blackout. The agent was trained using DQN and DDQN model-free algorithms.

2020 | MODEL-BASED MACHINE LEARNING [\[code\]](#)
Probabilistic programming on Pyro and NumPyro, Probabilistic Graphical Models (PGM), and inference (exact, MCMC, variational). The final project focused on the development of a probabilistic Linear Dynamical System (LDS) to forecast energy consumption on US households, based on the *Great Energy Predictor III* competition on Kaggle.

PROFESSIONAL ACTIVITIES

SINCE 2022 | Reviewer for the International Conference on PROBABILISTIC METHODS APPLIED TO POWER SYSTEMS (PMAPS), and POWER SYSTEMS COMPUTATION CONFERENCE (PSCC)

SINCE 2015 | Member of the Institute of Electrical and Electronic Engineers (IEEE) and IEEE Power and Energy (PES) Society

SOFTWARE AND COMPUTER SKILLS

Languages	Python, Julia, R, MATLAB, L^AT_EX
Frameworks	Pytorch, PYRO/NUMPYRO (PPL), TensorFlow
Power Systems	PLEXOS, PowerFactory, and PowerWorld
Misc.	Linux (BASH), Git, Docker

LANGUAGES

FRENCH	Beginner
GERMAN	Intermediate - GOETHE-ZERTIFIKAT B1
ENGLISH	Fluent - TOEFL IBT 109/120
SPANISH	Native