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Summary

As a Ph.D. in Energetic Systems and an Electrical Engineer, I bring a wealth of experience from both industry and academia. My expertise lies in the optimization, control, and management of electric power and mobility systems. With a strong focus on renewable energies, distributed generation, and electric mobility, I offer a unique blend of technical proficiency and analytical thinking. My background aligns well with the requirements for the Data Scientist position, offering a solid foundation to tackle complex problems and deliver innovative solutions.

Education

Universidad Nacional de Colombia *2017-2022*

PhD in Engineering - Energetic Systems

• PhD Thesis: "Methodology for designing an optimal decision-making system for a shared electric vehicle fleet providing electrical ancillary services." Summary: Developed an optimal decision-making system for a shared EV aggregator participating in energy and frequency regulation markets. Utilized optimization and control techniques considering various contract types.

Universidad Nacional de Colombia *2015-2017*

M.S in Industrial Automation

• Master Thesis: "Methodology for designing isolated microgrids using numerical optimization methods." Summary: Introduced a methodology to design isolated hybrid microgrids. Developed the "Hymod" software tool based on iterative optimization methods.

Universidad Nacional de Colombia *2010-2015*

Electrical Engineer

• Bachelor Thesis: "Diagnosis and infrastructure plan for the local distribution system of the Norte de Santander - Colombia electricity network at voltage level III." Summary: Developed an electric infrastructure plan for new loads and regions, considering technical and economic criteria.

Experience

Ampx *05-2023 – now / Czech Republic*

Control systems engineer

• Developed control-based energy management algorithms in Python for grid-connected systems with renewable sources, storage, and EVs. Led a project evaluating battery degradation in renewable energy assessments using Python toolboxes for data analytics.

Garrett Motion *04-2022 – 04-2023 / Czech Republic*

RD Engineer in connected vehicles

• Researched and developed algorithms for intelligent BMS features in connected vehicles, focusing on optimization and model predictive control.

Universidad Nacional de Colombia *01-2018 – 01-2020 / Colombia*

Associated researcher

• Developed models for solar generation estimation and battery storage behavior prediction for micro-grid Energy Management System (EMS) software.

Deutsches Zentrum für Luft- und Raumfahrt *09-2019 – 01-2020 / Germany*

Ph.D. Internship student

• Developed a decision-making tool for optimal charging/discharging management of electric vehicle fleets, utilizing Python and SUMO traffic simulator.

Universidad Nacional de Colombia *05-2016 – 05-2017 / Colombia*

Young researcher

• Evaluated partitioning methods for coordinated voltage control in electrical power systems, implementing and comparing various methods.

Universidad Nacional de Colombia *01-2016 – 05-2016 / Colombia*

Young researcher

• Implemented control strategies for power systems with renewable sources, evaluating the role of storage systems in frequency control.

Ingeniería especializada IEB *03-2014 – 10-2014 / Colombia*

Engineering assistant

• Developed infrastructure expansion plans for electricity distribution networks, evaluating technical and economic criteria.

Skills

Software tools / Languages ***Advanced:*** Python (Pandas, Numpy, Scipy, Matplotlib, Seaborn, Scikit-learn) | Matlab

Data Science Statistics | Experimental Design

Cloud Computing Azure

Development Prototype Development | Production-grade Code

Bibliographic production

- Conference paper: Load Frequency Control of a Multi-area Power System Incorporating Variable-speed Wind Turbines. Published in: XVII Latin American Conference in Automatic Control-CLCA. Year: 2016. URL: https://repositorio.unal.edu.co/handle/unal/58804
- Paper: Optimal Design for an Electrical Hybrid Microgrid in Colombia Under Fuel Price Variation. Published in: International Journal of Renewable Energy Research (IJRER). Volume 7. Number 4. Pages 1535-1545. Year: 2017. URL: https://www.ijrer.org/ijrer/index.php/ijrer/article/view/6128
- Conference paper: Optimal design of a diesel-PV-wind system with batteries and hydro pumped storage in a Colombian community. Published in: 2017 IEEE 6th International Conference on Renewable Energy Research and Applications (ICRERA). Year: 2017. DOI: 10.1109/ICRERA.2017.8191272
- Conference paper: Evaluation of power system partitioning methods for secondary voltage regulation application. Published in: 2017 IEEE 3rd Colombian Conference on Automatic Control (CCAC). Year: 2017. DOI: 10.1109/CCAC.2017.8276463
- Paper: PI and LQR controllers for Frequency Regulation including Wind Generation. Published in: International Journal of Electrical and Computer Engineering (IJECE). Volume 8. Number 6. Year: 2018. DOI: http://doi.org/10.11591/ijece.v8i5.pp3711-3721
- Paper: Multi-objective optimal sizing design of a Diesel-PV-Wind-Battery hybrid power system in Colombia. Published in: International Journal of Smart Grids, ijSmartGrid. Volume 2. Number 1. Pages 49-57. Year: 2018. URL: https://www.ijsmartgrid.ijrer.org/index.php/ijsmartgridnew/article/view/12
- Conference paper: Hymod: A Software For Hybrid Microgrid Optimal Design. Published in: 2018 15th International Conference on Electrical Engineering, Computing Science and Automatic Control (CCE). Year: 2018. DOI: 10.1109/ICEEE.2018.8533914
- Conference paper: An Optimal Battery Charging And Schedule Control Strategy For Electric Bus Rapid Transit. Published in: MOVICI-MOYCOT 2018: Joint Conference for Urban Mobility in the Smart City. Year: 2018. DOI: 10.1049/ic.2018.0004
- Paper: Optimal design of a diesel-pv-wind-battery-hydro pumped power system with the integration of electric vehicles in a Colombian community. Published in: Energies. Volume 12. Number 23. Year: 2019. DOI: https://doi.org/10.3390/en12234542
- Paper: Optimal vehicle-to-grid strategy for a fleet of EVs considering the batteries aging. Ingeniería e Investigación. Volume 39. Number 2. Year: 2019. DOI: https://doi.org/10.15446/ing.investig.v39n2.78639
- Conference paper: State of the Art in Strategies Allowing the Integration of a Shared EVs Service and the Active Participation of EVs With the Power Network. Published in: 2019 IEEE 4th Colombian Conference on Automatic Control (CCAC). Year: 2019. DOI: 10.1109/CCAC.2019.8921301
- Conference paper: Evaluation of batteries aging for EVs that participate smoothing intermittency of renewables. Published in: 2019 IEEE Workshop on Power Electronics and Power Quality Applications (PEPQA). Year: 2019. DOI: 10.1109/PEPQA.2019.8851574
- Paper: Optimal management strategy for a shared EVs aggregator participating in electricity and frequency regulation reserves markets. Published in: Technology and Economics of Smart Grids and Sustainable Energy. Year: 2022. DOI: https://doi.org/10.1007/s40866-022-00153-y
- Book chapter: State Feedback Controller Design for Batteries Participating in Load Frequency Control in Power Networks with Wind Generation. Published in: Wind Turbines: Technology, Applications and Efficiency. Editors: Nova Science Publishers. Year: 2022. DOI: https://doi.org/10.52305/AOXA6854

- Paper: V2G Ancillary Services Management Strategy for EVs with Solar Powered Charging Stations based on Artificial Intelligence Algorithms. Published in: International Journal of Smart Grid-ijSmartGrid. Year: 2023. DOI: https://doi.org/10.20508/ijsmartgrid.v7i4.314.g304
- Paper: Risk-Aware Control Approach for Decision-Making System of a Shared EVs Aggregator. Published in: International Journal of Renewable Energy Research (IJRER). Year: 2022. DOI: https://doi.org/10.20508/ijrer.v13i4.14238.g8840

Software production

- Hymod software: Tool for Hybrid Microgrids Optimal Design - Interface developed in Matlab and Python. Software based in Mixed-Integer Optimization. Matlab version available at the web repository: https://bitbucket.org/seruizal/hymod/src/master/. Year: 2018.
- SEMA: Shared Electric vehicles Management tool for an Aggregator agent - Interface developed in Matlab and Python. Software based in non-linear Mixed-Integer Optimization, which uses the **Google Maps API** to forecast the energetic consumption of vehicles. Year: 2020.

Patents

- Predictive power split with zero-emission zone handling
  Company: Garrett Motion. Application number: US 18/323,975. Date: May 25, 2023. Patent pending.
- Battery health aware thermal management system.
  Company: Garrett Motion. Application number: US 18/501,686. Date: November 3, 2023. Patent pending.
- EIS-based health-degradation handling fast charging for electric vehicles
  Company: Garrett Motion. Application number US 18/520,155. Date: November 27, 2023. Patent pending.

Google Scholar link

- https://scholar.google.com/citations?user=05xvrx4AAAAJ&hl=en

Personal references

- Name: MsC. Daniel Icaza Alvarez
  Profession: Professor, Researcher
  Company: Universidad Católica de Cuenca, GIRVyP Reserch Group (Cuenca - Ecuador)
  Telephone: +593 98 5154839
  Email: dicazaa@ucacue.edu.ec
  Relationship: He is a research partner with whom I wrote a book chapter about the integration of wind energy resources and battery storage in conventional power systems.
- Name: PhD. Matej Pcolka
  Profession: Technical leader
  Company: Garrett motion (Prague - Czech Republic)
  Telephone: +420-775108945
  Email: Matej.Pcolka@garrettmotion.com
  Relationship: He was a team partner in Garrett. We worked on the same project, he as the technical leader.
- Name: PhD. Manuel Alejandro Ospina Alarcón
  Profession: Associated Professor
  Company: Universidad de Cartagena (Cartagena - Colombia)
  Telephone: +57-3173208429
  Email: mospinaa@unicartagena.edu.co
  Relationship: He was my Ph.D. thesis jury. And currently, we are carrying out a research paper together titled: Robust Control Approach for Decision-Making System of a Shared EVs Aggregator.