ELISA
GÓMEZ DE LOPE

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PhD student in Biomedical Data Science

Hello! I'm a doctoral researcher in biomedical data science. I'm excited about machine learning methods to decipher the biology of health and disease, with a particular interest on graph representation learning, and my background blends bioinformatics and ML.

EDUCATION

2020–(2024)	**PhD – Biomedical Data Science Group, Luxembourg Center for Systems Biomedicine, University of Luxembourg** Thesis: *Interpreting Omics Data in Parkinson's Disease: A Statistical, Machine Learning, and Graph Representation Learning Approach* Supervisor: Professor Enrico Glaab, LCSB, University of Luxembourg.
2022-2023	**Visiting PhD - University of Cambridge, UK** Supervisor: Prof. Pietro Lió, Department of Computer Science and Technology
2023	**MIT Catalyst Fellowship – Massachusetts Institute of Technology (MIT), USA** Supervisor: Professor Martha Gray, MIT, MIT SLOAN, linQ, IMES
2019-2020	**Postgraduate course – Data science and big data, Universitat de Barcelona** Project: Histopathological cancer detection with CNNs
2017-2018	**MSc. Bioinformatics – Universitat Autònoma de Barcelona** Thesis: *A Parametrized Approach to LogP-based Hydrophobic Descriptors in Virtual Screening with Pharmscreen®* Supervisors: Professor F. Javier Luque and Dr. Enric Herrero
2013-2017	**BSc. (Comp.) Biotechnology – Universidad Politécnica de Madrid** Thesis: *Inferring population structure from ancient DNA of the Tollense battlefield* Specialization: Computation (Programming, databases, ML, structural bioinformatics) Supervisors: Prof. Daniel Wegmann (University of Fribourg), Prof. Pablo R. Palenzuela
2017	**Visiting Student – University of Fribourg (Switzerland)** Supervisor: Prof. D. Wegmann, Statistical and Computational Evolutionary Biology

RESEARCH & WORK EXPERIENCE

MIT Catalyst Fellow   *2023 - Present*

Massachusetts Institute of Technology, Catalyst (linQ)

Validating clinical unmet needs and building a prototype dashboard connecting objective data from wearables to guide treatment of sleep disturbance in PTSD.

Advisors: Prof. Martha Gray (MIT), Dr. Anne Quaadgras (MIT Sloan), and Nancy R. Steele.

Visiting researcher   *2022 - 2023*

The Computer Laboratory (CS department), University of Cambridge (Prof. Pietro Lio)

Applications of graphs and GNNs for modeling omics data in neurodegeneration.
Co-supervision of MSc Student at the University of Cambridge.

Doctoral researcher   *2020 - Present*

Biomedical Data Science, University of Luxembourg (Prof. Enrico Glaab)

Statistics, machine learning (ML) models and networks for the analysis and modelling of omics data in Parkinson's disease (PD):

- Cross-sectional and longitudinal profiling of PD transcriptomics and metabolomics.
- NestedCV class: Nested cross-validation class compatible with the scikit-learn extensions suite
- Interpretable machine learning for omics biomarker discovery in PD and for the study of UPDRS III prognosis.
- Graph representation learning for the study of omics data in Parkinson's disease. A comparative study using sample similarity networks versus molecular interaction networks.

Advisor, data scientist and bioinformatician   *2021 - 2022*

Farmelody

Building the prototype of a dashboard, management and predictive system of industrial dairy farms, pre-seed stage.

Data Scientist & consultant   *2019 - 2020*

Accenture Applied Intelligence

- *Computer vision: OCR detection from labels.*
- *Sales forecast: Time-series auto-regressive and ML models for sales prediction.*
- *Fraud detection: Statistics for anomaly detection in insurance claims.*

Capgemini   *2018*

Data extraction, transformation & analysis. ETL and database migration.

Bioinformatics intern & MSc Thesis   *Spring & Summer 2018*

Pharmacelera SL

Developed a pipeline for the parametrization of molecular hydrophobicity descriptors based on atom types, reaching speedup x30 with no loss of accuracy in virtual screening tool Pharmscreen.

Visiting undergraduate research assistant & BSc Thesis   *Spring 2017*

Statistical and Computational Evolutionary Biology, University of Fribourg (Prof. D. Wegmann)

Inferring population structure from ancient DNA of the Tollense battlefield:

- Comparison of ATLAS base quality scores recalibration methods (BQSR vs. Recal)
- Population genetics and statistics: The Hardy-Weinberg equilibrium in Tollense

Undergraduate research assistant   *Summer 2015*

Macromolecular structures, Spanish National Biotechnology Center (Prof. J.M.. Valpuesta)

Isolation and purification of p53 chaperones and chaperonins complexes

SKILLS SUMMARY

Programming languages: Python, R, Bash, Perl, Matlab, HTML, CSS, javascript

Data: SQL, SAS, Google Cloud Platform

Libraries/modules: PyTorch, Pytorch geometric, Scikit-learn suite; caret, tidyverse

Bioinformatics: ATLAS, VCFtools, SAMtools, RDKit, Pymol, swisspdbviewer

Other tools: Git, HPC slurm, Blender, Visual Basic, Google Cloud Platform

Languages: Spanish, English & French (fluent); Italian, Catalan (conversational)

CONTRIBUTIONS AND DISSEMINATION

Journal publications

- Gómez de Lope E, Loo R, Rauschenberger A, Ali M, Pavelka L, Marques T, Gomes C, Rejko Krüger, Glaab E. Comprehensive blood metabolomics profiling of Parkinson's disease reveals coordinated alterations in xanthine metabolism– *Accepted by Nature Portfolio journal*
- Diaz-Uriarte R, Gómez de Lope E, Giugno R, Fröhlich H, Nazarov PV, Nepomuceno-Chamorro IA, Rauschenberger A, Glaab E. Ten quick tips for biomarker discovery and validation analyses using machine learning. PLoS Comput Biol. 2022
- Gómez de Lope E, Vinas Torne R, Lio P, Glaab E. Graph representation learning for investigating complex diseases: sample-similarity networks versus molecular interactions networks – *in preparation*.
- Gómez de Lope E et al. Carnitine shuttle alterations in Parkinson's disease -*in preparation*

Conferences

- ISMB/ECCB 2023 (poster): Graph neural networks for investigating complex diseases: A case study on Parkinson's Disease. Gómez de Lope E, Vinas Torne R, Lio P, Glaab E
- RISP 2023 (talk): Unravelling Inflammatory Pathways in Parkinson's Disease: Insights from Pathway-Based Machine Learning Analysis of Transcriptomics Data.
- Cambridge Trustworthy AI for Medical and Health Research Workshop (poster): Machine learning applied to higher order functional representations of omics data reveals biological pathways associated with Parkinson's Disease. Gómez de Lope E, Glaab E
- ECCB 2022 (talk, poster): Machine learning to identify pathways in Parkinson Disease? Gómez de Lope E, Glaab E
- ICSB 2022 (flash talk, poster): Machine learning based pathway deregulation analysis of metabolomics data for Parkinson's Disease. Gómez de Lope E, Glaab E

AWARDS & ACHIEVEMENTS

- 2023 MIT Catalyst Fellowship
- LCSB-RIKEN grant for RISP 2023
- 2022 Elected Doctoral Program representative at University of Luxembourg
- 2021 Pelican Award Grant by Fondation de Luxembourg
- 2020 Marie Slodowska-Curie Fellowship

- Pytorch DL Scholarship Challenge by Facebook, Inc & Udacity 2018
- Third prize winner in Critical Care Datathon Tarragona 2018 by MIT Critical Care Unit
- 2013 Academic Excellence Scholarship. Community of Madrid, Spain. Awarded to undergraduate students with outstanding academic records.
- 2011 St. Viator National Research Award in Science for the project "Un cacao de disoluciones"

VOLUNTEERING, AFFILIATIONS

2022 Journal club of the Luxembourg Center of Systems Biomedicine co-organizer & speaker.

2020 – 2022 Board member at ISCB Luxembourg's Regional Student Group. Organization of workshops, talks and events around hot topics in the field of bioinformatics and ML.

2021 – Present Global Shaper at Global Shapers Luxembourg hub. Projects for social good, initiative by the World Economic Forum (Geneva).

2019 Pint of Science Barcelona Co-organizer. Pint of Science is a scientific festival, my role was contact, management, and logistics of speakers and presenting the sessions.

2019 Biotechnology Annual Congress of Spain Co-organizer. My role was related to the congress' website management.

2013 – 2017 Leisure activities instructor at CAL – Madrid. Instructor at a youth association

MENTORING, NON-ACADEMIC CONTRIBUTIONS

Talk: AI Saturdays bootcamp kick off 2021: *Ethics & AI*.

Talk: AI Saturdays AIxFP program 2020: *Etica & Inteligencia Artificial*.

Girls in tech by Accenture 2019/2020: Teaching programming bases (pseudocode, scratch) to 9 year old girls to initiate and encourage them into coding and careers in STEM.

AI Saturdays mentor Barcelona 2019/2020: Teaching the basics of ML to study groups.

School support teacher 2013-2017: Freelance tutor for teenagers with scholar needs.