Ismael Leal Askerova

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Education

University of Oxford *(September 2023 – September 2024)*
M.Sc. in Mathematical Modelling & Scientific Computing: **Merit (*Magna cum laude* equivalent)**

King's College London (September 2020 – July 2023)
B.Sc. in Physics (Hons): **First Class Honours (*Summa cum laude* equivalent)**

Academic & Professional Projects

Independent FEM Project (2024-2025):

Implemented a Finite-Element method for 2D domains to perfect my understanding of it, focusing on polishing the Python code and its documentation, and creating a library-like structure to allow for generalisations (different boundary conditions (Neumann and inhomogeneous Dirichlet), source functions, mesh sizes, criteria for refining the mesh…). It currently accepts any polygonal domain and interpolates the boundary conditions specified by the user.

M.Sc. Thesis (2024 with University of Oxford & Novo Nordisk Research Centre Oxford (NNRCO)): *Higher-order Interactions in Gene Dependency using Hypergraph Theory*

Conducted in collaboration with NNRCO, supervised by Prof. Alexander Scott. Developed novel models to analyse complex interactions in biological networks, demonstrating expertise in hypergraph theory and network analysis in a biological context.

Alzheimer's Disease Modelling using PDEs & Graph Theory (2024 with University of Oxford)

Developed an advanced mathematical model to simulate Alzheimer's progression through prion-like mechanisms, focusing on τ proteins within the brain's neural network. Used the Fisher-Kolmogorov-Petroski-Piskunov (Fisher-KPP) reaction-diffusion model as a foundation, adapting it to model τ concentrations across the brain's connectome provided by the Human Connectome Project. Incorporated clearance mechanisms to create a more biologically realistic model. Additionally, extended the model to account for neural damage over time, representing the deterioration of neural pathways as disease progression affects connectivity. This work required proficiency in PDEs, graph theory, and computational implementations in Python using implicit time discretisation.

Neural Network for Solving PDEs (2024 with University of Oxford)

Built and implemented a neural network-based solver for PDEs from scratch, demonstrating skills in machine learning and multi-physics numerical methods. The project underscored my ability to integrate machine learning with traditional simulation methods for complex systems.

Stochastic Modelling of Biological Patterns (2024 with University of Oxford)

Applied stochastic methods to deterministic equations, succesfully simulating complex biological patterns. This project highlighted adaptability in stochastic modelling to biological systems.

B.Sc. Thesis (2023 with King's College London): *2D Electromagnetic Wave Simulator Development in Python using Finite-Difference Methods*

Developed a Python-based simulator for studying wave propagation in optical fibers, applying finite-difference methods to analyse wave dynamics and signal loss, which strengthened my foundation in computational modelling.

Heart Disease Detection using ML Algorithms (2022)

Completed as part of HarvardX Data Science Professional Certificate, achieving a grade of 90.3 / 100. Conducted independent research on heart disease detection using machine learning algorithms, enhancing my skills in data-driven modelling, statistical analysis, and machine learning**.**

Technical Skills

- **Programming Languages**: Python (advanced), MATLAB (intermediate), R (intermediate)

- **Mathematical Modelling** and **Algorithmic Development**
- **Numerical Methods and Optimisation**, proficient in PDEs and optimisation techniques
- **Finite-Element Methods**: foundational knowledge and self-directed study
- **Data Science & Machine Learning**: proficient in Python for model development
- **Languages**: Spanish - native; English - fluent; Russian – conversational
- **Other tools**: LaTeX, Git

Work experience

Project Intern; Novo Nordisk Research Centre & University of Oxford; Oxford, UK
(May 2024 – September 2024)
- Conducted research on **gene dependency in cancer cells using Hypergraph Theory**, with potential applications in neurological disease modelling.
- Collaborated with industry professionals to align project outcomes with **industry standards in mathematical modelling**.
- Managed project timeline, ensuring all deliverables were completed on schedule
- Presented findings to a joint audience of academic and industry experts, enhancing m ability to communicate complex models and data-driven insights effectively.

Intern (Research Assistant); Mecwins Research Institute; Tres Cantos, Spain
(March 2018 - April 2018)
- Conducted laboratory measurements of contact angles between water (with/without nanomagnets) and metallic surfaces, gaining experience in **data analysis** and **experimental data processing**.
- Achieved analytical, technical, and presentation skills through data visualisation and summary reporting.

Achievements & awards

Merit Award in MSc; University of Oxford, UK
First Class Honours Award in Physics BSc; King's College London, UK
Silver Medal - Spanish National Physics Olympiad

Volunteer experience

Leisure time monitor; Grupo Scout Nuria; Madrid, Spain
(May 2016 - Present)
- Co-founded the organisation's webpage and coordinated activities for large groups, enhancing leadership, organisational, and **group management skills**.
- Acted as Secretary since 2020, responsible for participant data management and communication with families.

Hobbies & Interests

- **Music**: played the transverse flute for 8 years, leading the school orchestra.
- **Scouting**: Longstanding involvement in scouts, developing leadership, teamwork, creativity, and communication skills.