Jack J. Mayo

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Skills	Programming: C++, MATLAB, Python, R, Lua, NetLogo, Mathematica Languages: English (native), Dutch (intermediate) Tools: LaTex, Linux Bash, scikit-learn, Tensorflow/Keras/Tensorboard, Quantum++

Education

University of Amsterdam   2020 - Present
PHD IN MATHEMATICAL STATISTICS

Project: Adaptive Online Learning in Unbounded Spaces.

University of Groningen   2018 - 2020
MSC NANOSCIENCE (DUTCH TOPMASTER) - GPA 8.0 (UK 1:1)

Highest ranked MSc programme in the Netherlands. Aimed at the top 10% of students with backgrounds in physics, chemistry and material science. Electives in condensed matter theory, many particle systems, quantum field theory and statistical mechanics.

University of Groningen   2015 - 2018
BSC PHYSICS (HONS) - GPA 8.2 (UK 1:1)

Specialisation in theoretical physics. Honours programme of 45 ECTS broadening and deepening classes, professional skills and project work. 237 ECTS obtained in total over a period of 3 years.

Bedford Sixth Form   2013 - 2015
A LEVEL

A in Physics, A in Mathematics, B in Chemistry

Experience

Teaching Assistant   2020 - Present
FACULTY OF SCIENCE AND ENGINEERING - UNIVERSITY OF AMSTERDAM

Preparation and presentation of bi-weekly (2 hour) exercise classes, grading homework and exams, course logistics support and exam invigilation. Gewone Differentiele Vergelijkingen and Machine Learning Theory (MasterMath)

Research Intern   Summer 2019
DONOSTIA INTERNATIONAL PHYSICS CENTER

Investigated and implemented analytical methods for solving a theoretical problem. Presented findings to an audience of academics and students during a mini-symposium. Project: Adiabatic Quantum Computing in Finite Time.

Research Intern   Summer 2017
ZERNIKE INSTITUTE FOR ADVANCED MATERIALS - UNIVERSITY OF GRONINGEN

Designed and conducted an investigation under the supervision of PhD's and academics. Conducted literature study. Wrote findings in an academic format. Project: Explaining Anomalous Spectral Broadening in Cylindrical J-Aggregates.

Teaching Assistant   2016 - 2018
FACULTY OF SCIENCE AND ENGINEERING - UNIVERSITY OF GRONINGEN

Preparation and presentation of bi-weekly (2 hour) exercise classes, grading homework and exams, course logistics support and exam invigilation. 8 courses in total including mathematical physics, thermodynamics, statistical physics and multivariable calculus. Additionally, I provided private tutoring.

Student Representative   2016 - 2018
HONOURS COLLEGE FACULTY COUNCIL - UNIVERSITY OF GRONINGEN

Served as the main point of contact between students from the Faculty of Science and Engineering (FSE) and the central administration of the Honours Programme. Communicated student concerns and comments. Represented the views and interests of the FSE cohort at council meetings.

Other 2008 - 2015
(NON ACADEMIC)

Private tutor in music. Promotions assistant (Jamm Brixton). Barman (The Bell, Westoning). Telephone interviewer (GfK NOP Research). Laborer (KJM Construction).

Project Work

Nonlinear Quantum Signal Processing in Organic Self-Assembled Aggregates   Individual
MSC THESIS - GRADED 8.5

- Implemented a reservoir computing system in modelled aggregates of functional organic molecules.
- Designed protocols for femtosecond laser experiments in collaboration with experimentalists.
- Worked formally with density matrices.
- Core theoretical work (backend) implemented in C++, using the Quantum++ library.
$\rightarrow$ Supervisors: Prof. Dr. Richard Hildner and Dr. Thomas La-Cour Jansen.

Adiabatic Quantum Computing in Finite Time   Individual
RESEARCH INTERNSHIP - GRADED 10.0 (MANUSCRIPTS PUBLISHED, OR UNDER PREPARATION)

- Found exact analytical methods for tracking defect statistics in the 1D Ising model under slow quench.
- Used methods to calculate cumulants, and bound kink numbers in large deviation theory.
- Developed strategies to conduct work in an analytical setting by searching relevant literature.
- Learned the use of Mathematica, and parallelism in Python using the native MPI.
$\rightarrow$ Supervisor: Prof. Dr. Adolfo del Campo.

Bio-Mimetic Signal Processing: A Primer in Architectural Advances for Device Physicists   Individual
RESEARCH PAPER - GRADED 8.5

- Compiled a review contrasting recent advances in neuromorphic architectures.
- Described processing of signals, including techniques for their sparsification and accumulation.
- Compared how different designs impacted reliability, performance and power consumption.
- Reviewed methods of interfacing device output with programming tools.
$\rightarrow$ Supervisor: Prof. Dr. Tamalika Banerjee.

A Study of Self-Assembled Tunneling Junctions With Deep Learning   Individual
NANOSCIENCE SHORT PROJECT - GRADED 8.0

- Trained an autoencoder to predict JV properties of junctions from their molecular structure.
- Achieved absolute error $< 0.1\sigma$ of sample standard deviation on a database of 300 molecules.
- Up to 70% improvement achieved when trained with additional molecular properties.
- Learned how to develop models in Tensorflow/Keras, and to interface with Tensorboard.
$\rightarrow$ Supervisor: Prof. Dr. Ryan C. Chiechi.

Reservoir Computing With Dynamic Memristors   Individual
BACHELOR'S THESIS - GRADED 8.0

- Programmed a numerical model of a set of dynamic memristive devices.
- Performed a set of time-series emulation and classification experiments using programmed devices.
- Learned how to construct classes and objects in MATLAB, as well as multi-threading.
- Learned to interpret and implement concepts from the machine learning literature.
$\rightarrow$ Supervisors: Prof. Dr. Patrick Onck and Prof. Dr. Michael Biehl.

Explaining Anomalous Spectral Broadening in Cylindrical J-Aggregates   Individual
RESEARCH INTERNSHIP (ADVANCED PROJECT I) - GRADED 8.0 (MANUSCRIPT UNDER PREPARATION)

- Quantitatively explained anomalous features of polarization resolved 2D electronic spectra.
- Learned how to implement spectral calculations in MATLAB.
$\rightarrow$ Supervisor: Prof. Dr. Thomas La Cour Jansen.

EEG Signal Classification with DWT, PCA and SVM's   Partnership
FMNS RESEARCH PROJECT (10 ECTS) - GRADED 8.0

- Designed and implemented a coded investigation to classify 52 channel EEG time-series data.
- Method distinguished patient classes with an accuracy of 0.85, against 0.45 permutation control.
- Learned how to process data in MATLAB's signal processing library, as well as scikit-learn in Python.
$\rightarrow$ Supervisor: Dr. Marieke van Vugt.

Neuromorphic Computation and the Reservoir - Literature Review   Individual
ADVANCED PROJECT II - GRADED 8.5

- Compiled a literature review on the subject of reservoir computing systems in software and hardware.
$\rightarrow$ Supervisor: Prof. Dr. Patrick Onck.

Sustainable Islands   Team of 7
HONOURS COLLEGE ATELIER - GRADED 8.5

- Investigated the adoption patterns of sustainable technologies by inhabitants of the Friesian Islands.
- Learned to program agent-based simulations in NetLogo, and coordination within a larger team.
$\rightarrow$ Supervisor: Dr. Wander Jager.

Publications	Distribution of Kinks in an Ising Ferromagnet After a Thermal Quench. Jack J. Mayo, Zhijie Fan, Gia-Wei Chern, Adolfo del Campo. Manuscript in preparation. Full Counting Statistics of Topological Defects after Crossing a Phase Transition Fernando J. Gómez-Ruiz, Jack J. Mayo, and Adolfo del Campo Phys. Rev. Lett. 124, 240602. (2020) Unravelling Structural Disorder within Molecular Aggregates Through Single Aggregate Spectroscopy. Kunsel, T. , Mayo, J. J., Löhner, A., Köhler, J., Jansen, T.L.C., Knoester, J. J. Chem. Phys. 153, 134304. (2020)
Organisation	**NanoSymposium 2019 - "From the Bottom Up" (http://www.nanosymposium.nl/2019/)** Team of 12 MSC RESEARCH SYMPOSIUM Organised industrial sponsorship from ASML, GBB, Zyngus and Stichting Physica Organised and accommodated external keynote speaker (Prof. Bertus Beaumont - TU Delft)

Awards/Honours	Paper "Unravelling Intra-Aggregate..." awarded Editors Pick in J. Chem. Phys.	2020
	Paper "Full Counting Statistics..." awarded Editors Choice in Physical Review Letters	2020
	DIPC Internship Scholarship - living stipend	2018
	Zernike Scholarship - Tuition fee waiver and living stipend	2019
	FSE Honors College Research Symposium - award for best poster	2018

Additional Activities	Gave 4×2 hour support lectures in neurophysics, calculus 1 and 2. Prepared several mock examinations to prepare a class of around 20 undergraduates for their finals. Organised and participated in support sessions in statistical physics for a similarly sized class. Rosalind Franklin Fellowship selection committee 2019 (student member). RuG Impact Award 2019, advisory jury member.
Other Programming	**Actor Critic Methods for Continuous Games** PERSONAL INTEREST Implemented an Actor-Critic network in Lua. Learned to translate examples from the machine learning literature into executable code, and to manipulate/interface systems with hexadecimal memory.