Timothy Lee

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Education

Imperial College London

Physics MSci *2021 – Present*

- *Expecting First Class Honours, based on a third-year grade of 71.*
- *Current Overall Grade: 69.*
- *Relevant Third Year Modules: Foundations of Quantum Mechanics (79), Solid State Physics (78), Nuclear and Particle Physics (76).*

University College School

*A level: 4 A*s in Physics, Maths, Further Maths, Latin.* *2014 – 2021*

GCSE: Eight 9s, one 8, one 7, one A, one A (highest grade in Additional Mathematics).*

Skills

Languages: English (native), Mandarin (conversational).

Programming: Python, MATLAB, Mathematica, TensorFlow, PyTorch, Qiskit, Cirq.

Research Interests

My research interests span experimental and computational physics, with a focus on probing the Standard Model and discovering the cause of the matter-antimatter asymmetry. In particular I am interested in:

- Developing and implementing novel data reconstruction, pattern recognition, and analysis techniques to extract precise information from data such as neutrino oscillation parameters.
- Exploring optimisation methods and algorithmic approaches to address computationally hard problems such as the Shortest Vector Problem.
- Developing robust methods for handling and interpreting large datasets. Focus areas include multi-dimensional parameter estimation, machine learning integration and precision modelling in detectors.

Projects

Quantum Algorithmic Approaches to Solving the Shortest Vector Problem *2024 – Present*

Project Supervisor: Florian Mintert

- Developing efficient computational algorithms for solving the Shortest Vector Problem, a critical challenge in lattice-based cryptography.
- Exploring the application of quantum Ising models, focusing on the use of Ising Hamiltonians optimised for experimentally realisable interaction geometries.
- Investigations involve using the gate model of quantum computation to develop and apply novel Quantum Approximate Optimisation Algorithms within the constraints of contemporary quantum architectures.

Analysis of Neutrino Oscillation Parameters using Minimisation Techniques *2023 – 2024*

- Conducted a comprehensive analysis of muon neutrino oscillation parameters by applying multiple minimisation techniques (e.g. Quasi-Newton and Simulated Annealing methods) to a muon event dataset.
- Evaluated each minimisation method's reliability, efficiency, and accuracy, particularly in handling multi-dimensional minimisation challenges involving the mixing angle and mass differences of neutrinos.
- The analysis contributed meaningful insights into multi-dimensional optimisation methodologies for complex particle physics problems.

Work Experience

Project Coordinator *2023 – Present*

International Elite (company offering summer schools, study tours, and personal tutoring)

* Organising and leading educational tours, managing logistical planning and group coordination.

Maths and Science Tutor *2022 – Present*

MH Education (private tutoring company)

* Delivering lessons in Maths and Physics, from GCSE to A-level standard.
* Marking and providing constructive feedback on coursework.

Amateur Violinist

* Played in Imperial College Symphony Orchestra and London Schools Symphony Orchestra.
* 4-time finalist in the South East Schools Chamber Music competition.
* Performed in major London venues such as Royal Albert Hall, Royal Festival Hall and the Barbican.

Awards

Physics:

* British Physics Olympiad: Senior Physics Challenge (Gold award).
* School Physics Prize.

Maths:

* UK Maths Trust Challenge (5-time Gold award).

Music:

* Violin: Licentiate of Trinity College London (LTCL) with distinction (equivalent to final-year undergraduate degree level).
* Piano: Associate of Trinity College London (ATCL) (equivalent to first-year undergraduate degree level).
* Bassoon: Grade 8.