Alexander Hawkridge

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Objective: Seeking a challenging role where I can apply my specialisations in financial mathematics and data analytics while continuing to learn in the process.

Education

Scientific Computing & Data Analysis with Financial Mathematics — *MSc* Sep 2023 - Sep 2024
Grade: Distinction Average Grade: 77%
Relevant Modules: Financial Mathematics, High Performance Computing, Advanced Statistics and Machine Learning
Durham University, Durham, UK.

Physics — *BSc* Sep 2019 - Sep 2023
Grade: First Class Honours Average Grade: 82%
Relevant Modules: Scientific Computing, Computer Algebra & Technical Computing, Industrial & Financial Mathematics
University of Lincoln, Lincoln, UK.

Work Experience

Medical Physics and Data Science — *Internship* May 2022 - Sep 2022

- Worked with medical physicists and engineers to integrate electrometer systems with UNIX and JavaScript, optimising radiotherapy procedures and ensuring accurate readings were saved to an SQL database for data management.
- Installed, configured, and developed Django modules in Python for QATrackPlus on UNIX, enhancing radiotherapy quality assurance processes.
- Utilised SQL to extract and analyse data for automating Winston-Lutz and Picket Fence quality assurance tests in PyLinac.
- Developed comprehensive documentation to support future software changes.

Projects

Stochastic volatility models to overcome Black-Scholes Deficiencies

- Expanded upon the constant volatility of Geometric Brownian Motion by integrating stochastic volatility models, using Monte Carlo simulations to calculate implied volatility and capture the volatility smile, addressing one of the key deficiencies in the Black-Scholes model.
- Develop a Markov switching pricing model that extends the Black-Scholes framework to better capture the implied volatility smile observed in real markets, allowing for more accurate pricing and hedging of financial instruments.
- Conducted validation of the stochastic volatility models by simulating stock paths and comparing the outcomes against derived distributions.

The Mathematical Basis of the Brain Function: The Hodgkin-Huxley Model

- Developed and implemented Python scripts to model the Hodgkin-Huxley equations, simulating the ionic mechanisms in neurons using methods such as the fourth-order Runge-Kutta, with the aim to conduct a detailed study of action potential propagation in neurons.
- Solves a set of non-linear differential equations to derive and visualise the conductance of ion channels, contributing to the understanding of neuron network dynamics.
- Chains several of the model neurons together to create a small neural network to see how the system behaves in comparison to artificial neural networks used in machine learning.

Skills

Programming: Python, R, C++/C, JavaScript, SQL, OMP, MPI, Matlab.
Financial: Stochastic/Itô Calculus, Volatility modelling, Bayesian statistics, Derivative Pricing, Hedging.
Machine Learning: Logistic Regression, Random Forest, Gradient Boosting, Neural Networks.
Data Analysis: Data visualization, Exploratory data analysis, Time-series analysis.

Awards

- Commendation in Physics, University of Lincoln - Awarded for exceptional academic work
- Edward Delaval Award, University of Lincoln - Awarded for achieving the highest average grade of the academic year
- Duke of Edinburgh Award - Bronze & Silver
- Young Enterprise Award