Mahdi Tavakol, PhD, MSc, BSc

mahditavakol90@gmail.com ● *Oxford, UK*

Qualification Summary

Computational researcher and software engineer with 12+ years of experience in physics-based simulation, numerical modelling, and high-performance computing. Skilled in Modern C++ (C++17/20) with 3+ years of active development experience, as well as Python and Linux environments, with additional expertise in parallel programming (MPI, OpenMP, CUDA). Holding BSc, MSc, and PhD degrees in Mechanical Engineering, I bring strong analytical foundations, mathematical depth, and engineering expertise. I have proven experience extending complex simulation frameworks, implementing control algorithms, and developing software for data acquisition and automation. Known for adaptability and the ability to quickly master new domains, I am eager to apply my skills to guidance, navigation, and control (GNC), robotics simulation, and autonomy development. Eligible to live and work in the UK without visa sponsorship.

Technical Skills

Programming & Scripting: Modern C++ (C++17/20), C, Python (NumPy, Pandas, Matplotlib, Scikit-learn), Bash
Numerical & Stochastic Methods: Free energy molecular dynamics, stochastic estimators, Monte Carlo–style sampling, optimization, numerical integration.
Machine Learning: Feature engineering, neural networks (Kaggle certifications), developing a custom C++ ML frameworks (NeuralNetworkMPI)
Parallel & High-Performance Computing: MPI, OpenMP, GPU acceleration (CUDA, AMD GPUs).
Build & CI/CD: Git, GitHub, Debugging and testing, gcc, VS Code, Visual Studio.
Platforms: Linux (HPC, clusters, local workstation), Windows (builds and adaptation).
Data Engineering & Automation: High-throughput workflow automation, data pipeline design, reproducibility.
Networking & Systems: Distributed computing, workload scheduling (SLURM, PBS).
Databases & Cloud: SQL (basic), AWS Cloud Computing (basic).

Professional Experience

Researcher at Department of Engineering Science, University of Oxford **2024 – Present**
- Developed C++ modules for large-scale simulation frameworks, improving runtime performance & flexibility.
- Automated high-throughput workflows using Python/C++ and Bash, reducing analysis time for hundreds of simulations.
- Designed and extended algorithms for advanced sampling methods, enhancing reliability of simulation outcomes.
- Collaborated with cross-disciplinary teams, applying computational methods to engineering challenges.

Researcher at Department of Physics, University of Durham **2022 – 2024**
- Built quantitative models of complex systems, implementing advanced numerical simulations in C++ and Python.
- Developed automated data analysis pipelines, reducing turnaround times for large-scale experiments.
- Collaborated on multi-team projects, applying scalable software solutions to physics research problems.

Visiting Scholar at Department of Chemical and Biological Engineering, University of Colorado at boulder **2017–2018, 2022–2023**
- Developed C++ tools for pathway analysis and simulation, improving performance and scalability.

Postdoctoral Researcher at Biomedical Engineering, National University of Ireland, Galway **2019 – 2022**
- Designed multi-scale models in C++ and Python to simulate structural and dynamic behaviour.
- Developed new simulation algorithms, reducing computational costs by 50% through automation.
- Applied parallel computing (MPI/OpenMP) to accelerate simulations across HPC systems.

Certificates and Courses

Machine Learning & Data Science:
"Python", "Introduction to machine learning", "Intermediate machine learning", **"Feature Engineering"**, **"Data Cleaning"**, **"Intro to Deep Learning"** and **"Intro to Deep Learning":** Certificates from Kaggle.

High-Performance & Parallel Computing:
Attended **"Message-passing programming with MPI"**, **"Advanced Message-Passing Programming**", "**Shared Memory Programming with OpenMP**", **"Accelerating your applications with AMD GPUs"** and **"Cross-vendor GPU development with C++ and SYCL"** workshops held by Edinburgh Parallel Computing Center (EPCC).

Programming & Software Development:
"C++ (Intermediate)" and **"Problem Solving (Intermediate)"** Certificates from Hackerrank, "**Debugging, Testing and Correctness Workshop**" at University of Durham. **"Version Control with Github"**, **"Object Oriented Programming", "Version Control with Github"**, **"Collaboration with Github"**, **"Software testing"**, **"Continuous Integration"** and , **"CUDA programming on Nvidia GPUs"** courses held at University of Oxford.

Computational Biophysics & Engineering:
"ONETEP Masterclass in Computational Chemistry" master-course held at Rutherford Appleton Laboratory, UK.
Certificates from Kaggle.

Entrepreneurship & Cloud Computing:
"Scientific Entrepreneurship" and **"101 AWS workshop"** held at University of Oxford.

Education

PhD in mechanical engineering, Sharif University of Technology, Iran 2018
MSc in mechanical engineering, Sharif University of Technology, Iran 2014
BSc in mechanica engineering, Isfahan University of Technology, Iran 2012

In National University Entrance Exams for B.Sc. M.Sc. and Ph.D ranked ***402nd , 2nd and 1st*** **among more than 319000, 25000 and 1000** candidates.
In National Student Olympiad in 2012 ranked 17th, Iranian National Elite Foundation prizes in 2016 and 2017, Iranian National Elite Sabbatical Scholarship in 2018.

Teaching, leadership, Teamwork and Presentation Skills

Teaching experience: Served as a teaching assistant for four courses at Sharif University: Continuum Mechanics, Elasticity, FEM, and Advanced FEM.
Teaching experience: Served as a teaching assistant for two courses at Durham University: Machine Learning and Scientific Computing.
Leadership experience: Co-advised a team of three Master students at Sharif University, monitoring their weekly thesis progress and providing feedback on the sections I oversaw.
Teamwork experience: International collaboration with researchers from University of Western Australia, Sorbonne Universite and University of Sydney on the "Amorphous Solid formation at the Solid/Liquid Interfaces".
Teamwork experience: Collaboration with researchers from Sloan Kettering Institute for Cancer Research of New York, Sapienza University of Rome and Harvard school of medicine on the "Personalized Medicine Concept".
Teamwork experience: Collaboration with researchers from Aarhus University, Freie University, Karolinska Institute, Tehran University of Medical sciences and Harvard school of medicine on the "Nanoparticle therapy for the Parkinson's disease".
Presentation Skills: Teaching assistant positions and international collaboration strengthened my presentation skills.