Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

IBM-TCD PhD Fellowship in High Performance Computing

Title: Optimising Lattice QCD simulations at the convergence of HPC and Machine Learning

The School of Mathematics at Trinity College Dublin and IBM Research Dublin invite applications for a jointly supervised, fully funded PhD position. The PhD project will combine fundamental research in particle physics with innovative software development to accelerate scientific workflows on diverse computing infrastructures.

Lattice Quantum ChromoDynamics (QCD) is the numerical simulation of the strong nuclear interaction which binds the fundamental building blocks of matter, quarks and gluons, inside observable particles like protons and neutrons. The field has a long history of driving development at the forefront of High Performance Computing (HPC) and this project will extend current simulations to include new computing paradigms in Machine Learning and AI with HPC by deploying and optimising the IBM Accelerated Discovery platform with open source Lattice QCD codes. The successful candidate will join an innovative doctoral programme which will contribute to the development of a modular flexible workflow management platform which can compose workflows, automatically schedule jobs and integrate state of the art optimisation and machine learning algorithms to accelerate the scientific discovery process in Lattice QCD.

The PhD student will be a full-time registered student at Trinity College Dublin and will complete the required coursework and progress reports for the award of a PhD while supported as an employee of IBM Research. The student will join the active internationally-recognised Lattice QCD group at TCD and will make significant contributions to fundamental particle physics research – understanding the properties of matter using numerical simulations. Through joint supervision the successful candidate will gain experience of large-scale numerical simulation on state-of-the-art supercomputers, Bayesian optimisation, complex interactive workflow creation, data analysis, machine learning and deep learning. The student will be expected to make significant contributions to optimise computationally intensive workloads running in HPC and cloud deployments and to examine software paradigms that enable such functionality to be generalised across domains.

This selected student will have the following benefits:

- Access to resources both at IBM and TCD
- Research experience in both private and public sectors
- Employment opportunities after graduation
- **A substantial PhD Salary (>30,000) euro**

Further information and application

For further information please contact **Sinéad Ryan** (ryan@maths.tcd.ie) at Trinity College Dublin or **Gal Weiss** (wgal@ie.ibm.com) at IBM Research Dublin.

For consideration for the position please submit a full CV including the names of 3 potential referees to **Sinéad Ryan** (ryan@maths.tcd.ie).

Please note that a separate application will be required at IBM for shortlisted candidates.