# DIRAC AND HPE INNOVATION PLACEMENT IN HYBRID CLASSICAL-QUANTUM COMPUTING

## INFORMATION PACK
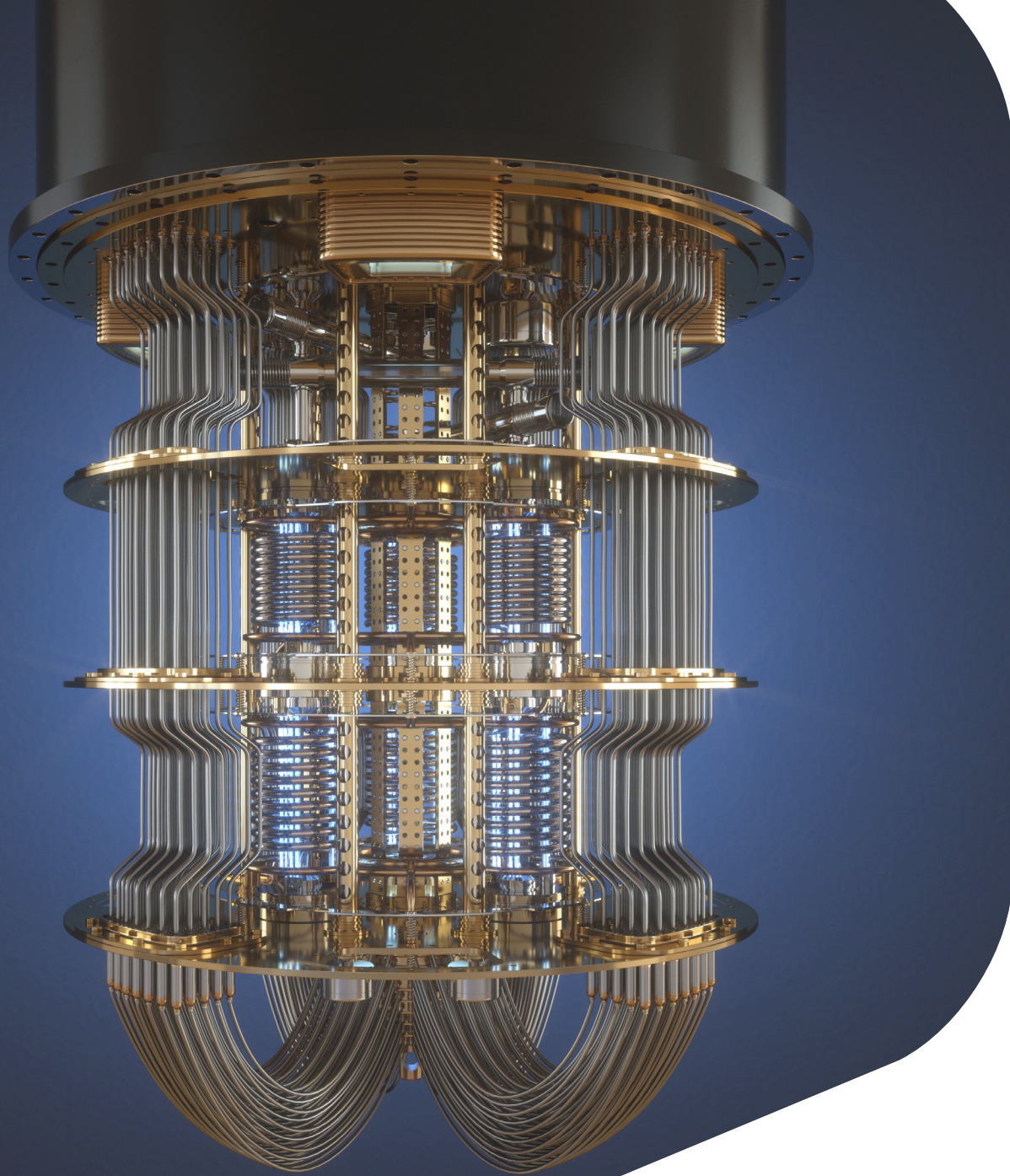
www.labs.hpe.com
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HPE

DiRAC
High Performance
Computing Facility

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In collaboration with the HPE HPC/AI EMEA Research Lab, DiRAC is pleased to invite applications for a 6-month Innovation Placement focusing on research in hybrid classical-quantum computing.

DiRAC & HPE INNOVATION PLACEMENT IN HYBRID CLASSICAL-QUANTUM COMPUTING

Application Pack

# HPE Labs
## Company background

Innovation drives progress, and HPE Labs drives innovation.

**+62,000**
employees worldwide

HPE is a global technology company dedicated to improving how people live and work. The company has led on society's digital transformation since the very beginning as one of the founders of Silicon Valley in 1939. Today, HPE continues to advance digital transformation by providing innovative solutions that address the complex needs of businesses and individuals. The company's commitment to innovation and collaboration drives its efforts to create meaningful technological advancements.

Following the acquisitions of SGI and Cray, HPE secured its position as the world leader in high-performance computing (HPC). This position as a global leader allows it to deliver top-tier performance in computing, facing computational challenges, from scientific research to advanced analytics and artificial intelligence.

The HPE HPC/AI EMEA Research Lab (ERL) exemplifies HPE's dedication to innovation and research. This facility focuses on technical and strategic engagements, driving progress in co-design efforts, future systems research, and advanced workload research. HPE Labs focuses on transfer of advanced technologies into next-generation products and solutions. They work in collaboration with HPE business groups and research partners to deliver innovation that propels their growth, creates competitive advantage, and provides industry leadership.

By taking advantage of DiRAC's Innovation Placement partnership, you can be a part of solving some of the most complex challenges for Hewlett Packard Enterprise businesses. ERL works hand-in-hand with HPE's businesses, bringing innovation roadmaps together with business roadmaps, integrating key technologies into products, and accelerating how HPE drives technology from R&D to commercialisation.

# DiRAC HPC

## Innovation Placements

DiRAC Innovation Placements provide a superb opportunity for doctoral students to collaborate with industry leaders on cutting-edge research projects of mutual benefit. Projects take place over six months and address current challenges with innovative, state-of-the-art solutions, ensuring that the research is relevant and impactful for both parties.

Innovation Placements offer a unique opportunity for researchers to bridge the gap between academia and industry, contribute to impactful research, and gain practical experience in the commercial sector.

## About DiRAC

Established in 2009, DiRAC provides HPC services to the UK's Scientific Research Communities in theoretical cosmology, nuclear physics, astrophysics, particle physics, and solar and planetary science. DiRAC is funded by the Science and Technology Facilities Council (STFC), part of UK Research and Innovation (UKRI). To date, capital funding for DiRAC systems has been provided by the Department for Business Innovation and Skills (BIS), the Department for Business, Energy and Industrial Strategy (BEIS), STFC and UKRI. UKRI is now part of the Department of Science Innovation and Technology (DSIT). DiRAC operations are funded by STFC.



DiRAC hosts three HPC services: the Extreme Scaling Service, the Memory Intensive Service, and the Data Intensive Service, with each tailored to the specific types of computational workflows needed to deliver our Science Programme. Innovation is a key part of DiRAC's activities and all our services are co-designed in collaboration with our research community, our technical and software engineering teams, and our vendor partners.

### Benefits to student

> **Practical Experience:** A placement allows you to apply theoretical knowledge in a real-world setting, enhancing your understanding of how your research can impact industry.

> **Skill Development:** You can develop valuable skills critical to your professional development, such as project management, teamwork, and communication in a corporate environment.

> **Enhance your Research:** Exposure to industry challenges can inspire new thinking, reasoning, and innovative approaches to your research, potentially leading to impactful findings.

### Benefits to Career

> **Improved Employability:** Experience in an industrial setting will enhance your CV, making you more attractive to employers in both academic and non-academic fields.

> **Confidence Building:** Navigating a professional environment will build your confidence in your abilities and prepare you for future workplace challenges.

> **Career Exploration:** It provides insight into different career paths outside academia, helping you make informed decisions about your future.

> **Networking Opportunities:** Placements facilitate connections with industry professionals, which can lead to collaborations, mentorship, and future job opportunities.

# Placement Details

In a fast-moving research field, HPE is proposing three distinct topics for potential work. Applicants are encouraged to express their interest in one of the three topics listed below:

## 01 Evaluating AMD Instinct™ Accelerators for Quantum Circuit Simulation

Despite the rising accessibility of quantum hardware, simulation of quantum circuits will remain an important tool for algorithm development, analysis and debugging. Simulators utilising GPUs have shown considerable success in this field, but the ecosystem is supported by only a few accelerator hardware vendors. We propose investigating the performance and scaling of AMD Instinct™ family accelerators for state vector and tensor network circuit simulators.

## 02 Optimising Task Scheduling for Hybrid Quantum-Classical Workflows in HPC Systems

Hybrid quantum-classical workflows constitute one of the most promising and realistic use cases in the NISQ era. In these, the quantum device is the limiting factor for task scheduling as it is shared among multiple classical resources. We propose studying novel methods of task-based and job-based scheduling for coupled workflows with one or more NISC devices in a large HPC system setting, utilising well-established tools from the HPC ecosystem.

## 03 Benchmarking and Enhancing Noisy Simulation Tools for NISQ Devices

For the foreseeable future, NISQ devices will be predominant. Simulation environments do permit utilising custom noise models, but performance and scaling, as well as parametric behaviour under variable noise models of more 'realistic' quantum simulations is less understood compared to ideal circuits. We propose investigating, benchmarking, and improving existing noisy simulation tools with custom models for specific hardware and compare the outcomes with results obtained on actual NISQ devices.

# Applicant Profile

Strong team spirit but capable of independence. Ability to represent oneself and the team both inside and outside the company. A knack for finding fun in the complex and difficult.

# Responsibilities

- Analysis of the existing state of the art in the technical and industrial field.

- Contribute to proposing, designing, and prototyping a solution with an industrial approach.

- Assess the quality of the proposed solution with a robust methodology and a strong emphasis on result reproducibility.

- Communicate the results both to internal and external audiences with the right level of technical details.

- Participation in a distributed team's work.

# Skills & Experience

Familiarity with frameworks for circuit execution on (simulated) quantum hardware, e.g. Qiskit or Pennylane, as well as knowledge of tensor network simulations. Experience with Python and optionally, compiled languages such as C, C++, or Fortran.

Experience in Linux based software development and execution in HPC environments (SLURM, MPI, …).

Excellent time management skills, with the ability to coordinate your own work with a distributed team.

Minimum of MSc in computer science, physics, mathematics, engineering, or a related technical field.

# Equality, Inclusion & Diversity

We are unconditionally inclusive in the way we work and celebrate individual uniqueness. We know diverse backgrounds are valued and succeed here. We have the flexibility to manage our work and personal needs. We make bold moves, together, and are a force for good.

We welcome applications from all, regardless of background.

# How to apply

Complete the application form on our website at dirac.ac.uk/innovation-placements by 9.00am on Monday 10 November 2025.

If you have any questions, please email them to:

🖥 [DiRAC_placements@leicester.ac.uk](mailto:DiRAC_placements@leicester.ac.uk)

## Placement Stipulations

The Placement is open to PhD students and is fully funded but you must get your supervisor's permission before applying – under UKRI rules participation in the scheme is only allowed with their consent.

The successful candidate will remain based at their home university. We do our best to offer flexibility; part-time working can be arranged as long as the placement does not exceed 1 year.

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