



UNIVERSITY OF LEEDS

CANDIDATE BRIEF

**Research Fellow in High-Performance Computing,
Faculty of Engineering and Physical Sciences**



Salary: Grade 7 (£39,105 – £46,485 p.a.)

Reference: EPSCP1159

Location: Leeds campus

Closing date: Sunday 13 October 2024

Fixed-term for up to 3 years

We are open to discussing flexible working arrangements

Research Fellow in High-Performance Computing, School of Computing.

Are you an ambitious researcher who enjoys working at the interplay between computer architecture and numerical software? Do you have experience in developing numerical software libraries or hardware units? Are you passionate about developing tools that can help us understand, document, compare, and standardise numerical behaviour of high-performance computers?

An EPSRC-funded project 'Informing Future Numerical Standards by Determining Features of Non-Standard Mathematical Hardware' is a 3-year project that aims to develop tools to improve our understanding of several numerical features of the numerical hardware present in datacentre GPUs and domain-specific machine learning accelerators. The main goal is to improve the existent almost entirely manual methods by focusing on three core aspects: automating, removing the need for specialized in-depth knowledge of mathematics of floating-point arithmetic, and informing the public about the features of the current hardware.

The work is spread across four work packages (WPs). Each WP contains a wide variety of tasks that will provide you with a unique experience of working with the low-level numerical software and mathematical hardware, as well as understand mathematics that underpin that software and hardware. As examples, it will involve creating models of mathematical hardware available in literature by utilizing custom-precision simulators, as well as designing high-level software wrappers that can manage low-level code targeted at an array of diverse hardware devices: from NVIDIA and AMD datacentre GPUs to Intel Ponte Vecchio accelerators.

The project is led by Dr Mantas Mikaitis and you will work closely with him in designing algorithms and software, preparing publications for high-visibility journals and conferences, organising minisymposiums with invited speakers, writing technical blog posts, presenting research at national and international conferences as well as internally at the School of Computing, working with international project partners and industrial partners, maintaining academic collaborations through regular meetings and exchange of knowledge, and working with undergraduate, MSc, and PhD students where required.



You will be in the Computational Science & Engineering research theme of the School of Computing and become a member of the Scientific Computing research group of academics, PDRAs and post-graduate researchers working on a wide array of topics, including partial-differential equations for fluid dynamics, numerical linear algebra, scientific machine learning, computer arithmetic, numerical analysis, algorithm design, software and hardware benchmarking and performance optimization, and hardware design and analysis. You will become a member of a new informal group Leeds Mathematical Hardware and Software Lab.

What does the role entail?

As a Research Fellow, your main duties will include:

- Gaining an in-depth understanding of mathematical hardware in HPC by reading publications, reference manuals, studying instruction sets, exploring patents, running experiments on available hardware, and engaging with industry;
- Leading the development of high-quality journal and conference papers, in some cases with international collaborators; using LaTeX in a systematic and efficient manner;
- Designing, testing, documenting and maintaining open-access software libraries and working with Research Software Engineers to assure best practices;
- Co-organising minisymposiums or workshops at SIAM and other conferences, preparing and presenting talks and research posters, visiting project partners;
- Generating and pursuing independent and original research ideas in the appropriate subject area;
- Developing research objectives and proposals and contributing to setting the direction of the research project and team including preparing proposals for funding in collaboration with colleagues;
- Making a significant contribution to the dissemination of research results by publication in leading peer-reviewed journals and by presentation at national and international meetings;
- Working independently and as part of a larger team of researchers, both internally and externally, to develop new research links and collaborations and engage in knowledge transfer activities where appropriate;
- Evaluating methods and techniques used and results obtained by other researchers and to relate such evaluations appropriately to your own research;



- Maintaining your own continuing professional development and acting as a mentor to less experienced colleagues as appropriate;
- Contributing to the training of both undergraduate and postgraduate students, including assisting with the supervision of projects in areas relevant to the project.

These duties provide a framework for the role and should not be regarded as a definitive list. Other reasonable duties may be required consistent with the grade of the post.

What will you bring to the role?

As a Research Fellow, you will have:

- A PhD (or have submitted your thesis before taking up the role) in Computer Science, Applied Mathematics, Electronic and Electrical Engineering or a closely allied discipline;
- A strong background in a research area that involves using, developing, or analysing numerical software or hardware based on the floating-point or other representation of numbers;
- Programming skills in languages such as MATLAB and C, or similar, and a willingness to extend your knowledge of these languages and learn new ones;
- Good time management and planning skills, with the ability to meet tight deadlines and manage competing demands effectively without close support;
- A developing track record of peer-reviewed publications in international journals;
- Excellent communication skills both written and verbal, and the ability to communicate your research at national and international conferences;
- A proven ability to work well both independently and in a team;
- A strong commitment to your own continuous professional development.

You may also have:

- Experience of using devices, such as NVIDIA V100/A100/H100, AMD MI250X, Intel Ponte Vecchio, Graphcore IPU, and similar;
- Familiarity with the theory of floating-point numbers as a subset of the reals;
- Knowledge of rounding error analysis;
- Familiarity with computer arithmetic standards, such as IEEE 754, OCP8, MX, and others;



- Experience developing hardware in languages such as Verilog and VHDL and using EDA tools for simulation and synthesis;
- Experience working with FPGAs.

How to apply

You can apply for this role online; more guidance can be found on our [How to Apply](#) information page. Applications should be submitted by **23:59** (UK time) on the advertised [closing date](#).

Contact information

To explore the post further or for any queries you may have, please contact:

[Dr Mantas Mikaitis](#), Lecturer

Email: M.Mikaitis@leeds.ac.uk

Additional information

Faculty and School Information

Further information is available on the research and teaching activities of the [Faculty of Engineering & Physical Sciences](#), and the [School of Computing](#).

A diverse workforce

As an international research-intensive university, we welcome students and staff from all walks of life and from across the world. We foster an inclusive environment where all can flourish and prosper, and we are proud of our strong commitment to student education. Within the Faculty of Engineering and Physical Sciences we are dedicated to diversifying our community and we welcome the unique contributions that individuals can bring, and particularly encourage applications from, but not limited to Black, Asian and ethnically diverse people; people who identify as LGBT+; and people with disabilities. Candidates will always be selected based on merit and ability.

The Faculty of Engineering and Physical Sciences are proud to have been awarded the Athena SWAN [Silver](#) Award from the Equality Challenge Unit, the national body that promotes equality in the higher education sector. Our [equality and inclusion webpage](#) provides more information.



Working at Leeds

We are a campus-based community and regular interaction with campus is an expectation of all roles in line with academic and service needs and the requirements of the role. We are also open to discussing flexible working arrangements. To find out more about the benefits of working at the University and what it is like to live and work in the Leeds area visit our [Working at Leeds](#) information page.

Information for disabled candidates

Information for disabled candidates, impairments or health conditions, including requesting alternative formats, can be found on our [Accessibility](#) information page or by getting in touch with us at hr@leeds.ac.uk

Salary Requirements of the Skilled Worker Visa Route

Please note that this post may be suitable for sponsorship under the Skilled Worker visa route but first-time applicants might need to qualify for salary concessions. For more information, please visit: www.gov.uk/skilled-worker-visa.

For research and academic posts, we will consider eligibility under the Global Talent visa. For more information, please visit: <https://www.gov.uk/global-talent>.

Criminal record information

Rehabilitation of Offenders Act 1974

A criminal record check is not required for this position. However, all applicants will be required to declare if they have any 'unspent' criminal offences, including those pending.

Any offer of appointment will be in accordance with our Criminal Records policy. You can find out more about required checks and declarations in our [Criminal Records](#) information page.

