Candidate Information

Position: Research Fellow
School/Department: School of Mechanical and Aerospace Engineering
Reference: 25/112485
Closing Date: Monday 28 April 2025
Salary: £36,551-£43,605 per annum
Anticipated Interview Date: Thursday 8 May 2025
Duration: 9 months

JOB PURPOSE:

To be a highly skilled researcher pushing forward the state of the art in very high order computational fluid dynamics frameworks on high performance heterogeneous computing systems. In collaboration with the Edinburgh Parallel Computing Centre (EPCC) and our industry partners, you will develop a state-of-the-art CFD solver as part of an EPCC Embedded Computational Science and Engineering project. The key focus of the role is the development of a new solver for reacting, compressible flows, using as foundation advanced open-source software tools AMReX and Kokkos/Raja. This builds on our research group's strong heritage in the development of novel governing models and fast numerical methods, implemented in our solver Flamenco. You will then apply the newly developed solvers to challenging problems at the cutting edge of aerodynamics and compressible mixing, such as the supersonic reacting flows relevant to high speed combustion problems and external aerodynamics.

The post is a critical role for the delivery of this exciting research program, and as such, successful applicants will have responsibilities in independent research, supervision, planning, liaising and working with external and internal collaborators.

MAJOR DUTIES:

1. Undertake research under supervision within the eCSE funded project 'Very High-Order Solver Frameworks for Compressible Turbulent Mixing'.
2. Restructure the high-order compressible finite volume method Flamenco, then implement and validate them in the Kokkos/Raja framework. This will be undertaken in close collaboration with Professor Thornber, staff at the EPCC and our industrial partners.
3. Implementation and validation of selected core Flamenco algorithms into the AMReX platform.
4. Benchmarking of the newly developed solvers on national-level HPC facilities, on both CPUs and GPUs at significant scale.
5. Undertake and analyse large scale computations of compressible flow problems involving mixing and reactions.
6. Work collaboratively with the active Queen's University Belfast fluid dynamics group.
7. Document project outcomes in a series of high quality papers published in top international journals. This will include collaborating and co-authoring with the PI, EPCC and industry partners.
8. In consultation with the project team, promote research milestones and outputs at conferences and through social media (where applicable).
9. Assist grant holder in the preparation of funding proposals and applications to external bodies.
10. Carry out occasional educational supervision, demonstrating or lecturing duties within the post holder's area of expertise and under the direct guidance of a member of academic staff.

ESSENTIAL CRITERIA:

1. Normally have or be about to obtain a PhD specialising in a field such as computational fluid dynamics, high performance computing, fluid mechanics, turbulence, aerodynamics. Closely related fields requiring similar skills such as computational astrophysics may be considered.

2. Recent relevant research experience to include:
   • Undertaking research in computational science and engineering such as (not exhaustive) computational fluid dynamics, high performance computing for applications in computational science and engineering. Closely related fields requiring similar skills such as computational astrophysics may be considered.
   • Strong background in high performance computing and programming skills, in particular C++.
   • Ability to work independently and take initiative.
   • Working effectively as part of a research team in the development and promotion of the research theme.
3. Strong publication record commensurate with stage of career.
4. Must contribute to our research culture including taking part in (inside working-hours) social catch-ups and formal and informal research group meetings.
5. Evidence of ability to work in a team.
6. Demonstrate practical problem solving skills, independence of thought and initiative.
7. Proven ability to communicate complex information effectively in oral and written format.
8. Proven ability to build relationships/ to develop internal and external networks.
9. Ability to assess and organise resources.

DESIRABLE CRITERIA:

1. Experience of contributing to broader management and administrative processes.