



POSITION DESCRIPTION

School of Electrical, Mechanical and Infrastructure Engineering
Faculty of Engineering and Information Technology

Research Fellow in Extreme-Scale Computational Fluid Dynamics

POSITION NO	0064105
CLASSIFICATION	Level A
SALARY	\$83,468 - \$113,262 p.a. (pro rata for part-time)
SUPERANNUATION	Employer contribution of 17%
WORKING HOURS	Full-time (1.0 FTE)
BASIS OF EMPLOYMENT	Fixed-term for 36 months <i>Applications for part-time or other flexible working arrangements will be welcomed and will be fully considered subject to meeting the inherent requirements of the position</i>
OTHER BENEFITS	https://about.unimelb.edu.au/careers/staff-benefits
HOW TO APPLY	Online applications are preferred. Go to http://about.unimelb.edu.au/careers , select the relevant option ('Current Opportunities' or 'Jobs available to current staff'), then find the position by title or number.
CONTACT FOR ENQUIRIES ONLY	Professor Richard Sandberg Tel +61 3 8344 9084 email Richard.Sandberg@unimelb.edu.au <i>Please do not send your application to this contact</i>

For information about working for the University of Melbourne, visit our website:
about.unimelb.edu.au/careers

Acknowledgement of Country

The University of Melbourne acknowledges the Traditional Owners of the unceded land on which we work, learn and live: the Wurundjeri Woi Wurrung and Bunurong peoples (Burnley, Fishermans Bend, Parkville, Southbank and Werribee campuses), the Yorta Yorta Nation (Dookie and Shepparton campuses), and the Dja Dja Wurrung people (Creswick campus).

The University also acknowledges and is grateful to the Traditional Owners, Elders and Knowledge Holders of all Indigenous nations and clans who have been instrumental in our reconciliation journey.

We recognise the unique place held by Aboriginal and Torres Strait Islander peoples as the original owners and custodians of the lands and waterways across the Australian continent, with histories of continuous connection dating back more than 60,000 years. We also acknowledge their enduring cultural practices of caring for Country.

We pay respect to Elders past, present and future, and acknowledge the importance of Indigenous knowledge in the Academy. As a community of researchers, teachers, professional staff and students we are privileged to work and learn every day with Indigenous colleagues and partners.

Commitment to Diversity and Inclusion

The Faculty of Engineering and Information Technology (FEIT) is committed to creating a diverse and inclusive environment that welcomes and values all people. We recognise that diversity is essential in contributing to the success of FEIT. Women, Aboriginal and Torres Strait Islanders, the LGBTIQ+ community, people living with disability and those from a culturally and linguistically diverse background, are strongly encouraged to apply.

Position Summary

This project will leverage the latest advances in high-fidelity CFD and machine-learning to gain critical insights that will fundamentally change our understanding of roughness effects upon film-cooling effectiveness in high-pressure turbine flows. Specifically, this project will focus on performing compressible LES / DNS of film-cooled flows in both canonical configurations (jet-in-cross-flow) and industry-relevant geometries (turbine vanes). The data resulting from these simulations will be used to a) investigate physical mechanisms that cannot be captured by traditional CFD methods, b) train bespoke turbulence and heat transfer models with a novel machine-learning capability based on Gene Expression Programming. The combination of high-fidelity simulation and machine-learned models will produce the scientific knowledge required for novel, efficient designs, ultimately leading to a paradigm shift in our understanding of film cooling effectiveness at engine-relevant conditions over realistic roughness topographies. Benefits include more efficient aircraft propulsion systems and energy technologies, reducing their cost and environmental footprint.

The primary research tool will be an in-house compressible Navier-Stokes solver which has been developed for DNS or LES of compressible turbulent on high-performance computers, running on tens of thousands compute cores with up to 35 billion grid points per calculation. The DNS/LES data will serve as benchmark data for other turbulence simulation approaches with

reduced computational cost, such as large-eddy simulation (LES), hybrid RANS/LES or RANS methods.

You will conduct independent research, leading to the preparation and publication of research outcomes in conferences and journals. You will be located in the Department of Mechanical Engineering in the Melbourne School of Engineering and will be expected to be an active member of the Department, collaborating with other researchers. You may undertake research supervision directly related to your area of research, as required.

1. Key Responsibilities

1.1 TEACHING AND LEARNING

- Contribute to research training (e.g. mentoring and supervision of PhD students)
- Supervise junior research staff in the appointee's area of expertise.

1.2 RESEARCH AND RESEARCH TRAINING

- Independently plan and carry out research on the nominated research project and work towards completion of the aims of the project.
- Develop effective timelines and milestones based on goals of the research programme.
- Develop extended capabilities of the existing in-house data-driven tools.
- Regularly write technical reports.
- Participate in preparation of manuscripts for publication in peer-reviewed journals.
- Liaise effectively with collaborators with a variety of internal and external stakeholders.
- Assist other researchers in carrying out research in order to work as a team and further the department's research output.
- Contribute to the development of the Department's and the School's strong research program in high-fidelity simulation of turbulent flows.
- Work towards building an independent research project.

1.3 LEADERSHIP AND SERVICE

- Active participation in the communication and dissemination of research.
- Identify sources of funding to support individual or collaborative projects, relating to teaching, research and engagement practice in the discipline.
- Effective supervision of research support staff

1.4 ENGAGEMENT

- Effective liaison with external networks to foster collaborative partnerships.
- Present results at local, national forums.
- Attend and actively participate in departmental seminars, meetings and/or committee memberships.

2. Selection Criteria

2.1 ESSENTIAL

- A completed or nearly completed PhD in Mechanical Engineering, Aerospace Engineering, Applied Mathematics, or closely related discipline.
- Experience in computational fluid dynamics, including LES / DNS of transitional / turbulent flows.
- A record of quality research as evidenced by publications in leading journals and at conferences commensurate with opportunity.
- Strong oral communication skills, with the capacity to relate to industrial collaborators, onsite operating personnel, as well as academic colleagues.
- Demonstrated capacity to communicate research concepts to technical and non-technical audiences.
- Excellent ability in analysing data, problem solving and maintaining accurate research records.
- Capability for innovative research, as evidenced by scholarly publication.
- Experience in using initiative, working with minimal supervision and ability to prioritise tasks to achieve project objectives within timelines.
- Excellent written and verbal communication skills, demonstrated by presentation of research results at conferences, internal forums and through manuscript submissions.
- Excellent interpersonal skills, including an ability to interact with internal and external stakeholders (academic, administrative and support staff) in a courteous and effective manner.

2.2 DESIRABLE

- Experience in high-performance computing workflow, including code development (F90 / C++), parallel programming (MPI / openACC) and data analysis (Python).
- Deep understanding of wall-bounded turbulence (especially over surface roughness) and convective heat transfer phenomena.

2.3 SPECIAL REQUIREMENTS OF THE ROLE

- This position requires the incumbent to hold a current and valid Working with Children Check.
- Occasional work out of ordinary hours, travel, etc.

3. Equal Opportunity, Diversity and Inclusion

The University is an equal opportunity employer and is committed to providing a workplace free from all forms of unlawful discrimination, harassment, bullying, vilification and victimisation. The University makes decisions on employment, promotion, and reward on the basis of merit.

The University is committed to all aspects of equal opportunity, diversity and inclusion in the workplace and to providing all staff, students, contractors, honorary appointees, volunteers and visitors with a safe, respectful and rewarding environment free from all forms of unlawful discrimination, harassment, vilification and victimisation. This commitment is set out in the Advancing Melbourne strategy that addresses diversity and inclusion, equal employment

opportunity, discrimination, sexual harassment, bullying and appropriate workplace behaviour. All staff are required to comply with all University policies.

The University values diversity because we recognise that the differences in our people's age, race, ethnicity, culture, gender, nationality, sexual orientation, physical ability and background bring richness to our work environment. Consequently, the People Strategy sets out the strategic aim to drive diversity and inclusion across the University to create an environment where the compounding benefits of a diverse workforce are recognised as vital in our continuous desire to strive for excellence and reach the targets of Advancing Melbourne.

4. Occupational Health and Safety (OHS)

All staff are required to take reasonable care for their own health and safety and that of other personnel who may be affected by their conduct.

OHS responsibilities applicable to positions are published at:

<https://safety.unimelb.edu.au/people/community/responsibilities-of-personnel>

These include general staff responsibilities and those additional responsibilities that apply for Managers and Supervisors and other Personnel.

5. Other Information

SCHOOL OF ELECTRICAL, MECHANICAL AND INFRASTRUCTURE ENGINEERING

The School of Electrical, Mechanical and Infrastructure Engineering undertakes teaching and research across a range of disciplines that are internationally recognised for their contribution to fundamental research. It has a number of well-established industry linkages and international partnerships. It is building a vibrant profile of interdisciplinary research, working with industry with an aim to contribute to society. It offers a comprehensive range of accredited Masters of Engineering and Master of Information Technology programs taught through the Electrical, Mechanical and Infrastructure departments as well as professional Masters programs. It has a substantial cohort of research higher degree students. A major focus of the school is to attract and retain outstanding and internationally recognised academic staff. The School is committed through strategy, culture and mentorship to increasing the number of female engineers and scientists on its staff.

DEPARTMENT OF MECHANICAL ENGINEERING

The Department of Mechanical Engineering is one of the largest in Australia. It provides teaching into subjects in the three-year undergraduate degrees of Science and Commerce, which can be followed by a two-year professional Master of Engineering.

The Departmental philosophy is to attract and retain the highest quality staff available in order to maintain a vigorous research effort. Our strategic plan is to address the most urgent contemporary problems of our rapidly developing industrial society, with investigations into biomechanical engineering, fluid mechanics and thermal sciences.

www.mech.unimelb.edu.au

5.2 FACULTY OF ENGINEERING AND INFORMATION TECHNOLOGY

The Faculty of Engineering and Information Technology (FEIT) has been the leading Australian provider of engineering and IT education and research for over 150 years. We are a multidisciplinary School organised into three key areas; Computing and Information Systems (CIS), Chemical and Biomedical Engineering (CBE) and Electrical, Mechanical and Infrastructure Engineering (EMI). FEIT continues to attract top staff and students with a global reputation and has a commitment to knowledge for the betterment of society.

FEIT has never been better positioned as a global leader, anchored in the dynamic Asia Pacific region, creating and curating knowledge to address some of the world's biggest challenges. Through our students and our relationships with communities, we can not only respond to society's needs but anticipate and create engineering and IT solutions for the future.

<https://eng.unimelb.edu.au/>

<https://eng.unimelb.edu.au/about/join-feit>

Our ten-year strategy, FEIT 2025, is our School's commitment to bring to life the University-wide strategy Advancing Melbourne and reinforce the University of Melbourne's position as one of the best in the world.

To achieve our ambitions, we will continue to build new infrastructure to enable our teaching, research and engagement; we continue to recruit outstanding people from around the world; and we continue to attract high-quality students from across the globe who are at the heart of our enterprise.

<https://eng.unimelb.edu.au/about/feit-2025>

5.3 THE UNIVERSITY OF MELBOURNE

Established in 1853, the University of Melbourne is a leading international university with a tradition of excellence in teaching and research. The main campus in Parkville is recognised as the hub of Australia's premier knowledge precinct comprising eight hospitals, many leading research institutes and a wide-range of knowledge-based industries. With outstanding performance in international rankings, the University is at the forefront of higher education in the Asia-Pacific region and the world.

The University employs people of outstanding calibre and offers a unique environment where staff are valued and rewarded.

Further information about working at The University of Melbourne is available at <http://about.unimelb.edu.au/careers>

5.4 ADVANCING MELBOURNE

The University's strategic direction is grounded in its purpose. While its expression may change, our purpose is enduring: to benefit society through the transformative impact of education and research. Together, the vision and purpose inform the focus and scale of our aspirations for the coming decade.

Advancing Melbourne reflects the University's commitment to its people, its place, and its partners. Our aspiration for 2030 is to be known as a world-leading and globally connected Australian university, with our students at the heart of everything we do.

- We will offer students a distinctive and outstanding education and experience, preparing them for success as leaders, change agents and global citizens.

- We will be recognised locally and globally for our leadership on matters of national and global importance, through outstanding research and scholarship and a commitment to collaboration.
- We will be empowered by our sense of place and connections with communities. We will take opportunities to advance both the University and the City of Melbourne in close collaboration and synergy.
- We will deliver this through building a brilliant, diverse and vibrant University community, with strong connections to those we serve.

The means for achieving these goals include the development of the University of Melbourne's academic and professional staff and the capabilities needed to support a modern, world-class university. Those means require a commitment to ongoing financial sustainability and an ambitious infrastructure program which will reshape the campus and our contribution to the communities we engage with. This strategy, and the priorities proposed, is centred around five intersecting themes; place, community, education, discovery and global.

5.5 GOVERNANCE

The Vice Chancellor is the Chief Executive Officer of the University and responsible to Council for the good management of the University.

Comprehensive information about the University of Melbourne and its governance structure is available at <https://about.unimelb.edu.au/strategy/governance>