Job Description & Person Specification

Section 1
Role Overview

Job title:	Research Assistant or Research Fellow in Resilient Timing Systems
Vacancy reference:	5439
Faculty:	Faculty of Engineering and Applied Sciences
Theme:	AI, Robotics & Space
Job type:	Full time Fixed Term Contract until 31 March 2029
Hours of work:	37 hours per week, normally worked Monday to Friday. Flexible working will be considered.
Salary details:	Research Assistant Salary level 4 – range £29,950 to £35,019 per annum with potential progression to £40,984 per annum Research Fellow Salary level 5 – range £38,655 to £46,492 per annum with potential progression to £53,108 per annum
Line Manager:	Professor Ivan Petrunin, Professor of Signal Processing and Intelligent Systems
Start date:	As soon as possible

Section 2

About Cranfield University

Cranfield's world-class expertise, large-scale facilities and unrivalled industry partnerships is creating leaders in technology and management globally. Find out more about our unique impact, and our vision, mission and values here.

We aim to create and maintain a culture in which everyone can work and study together and realise their full potential. We are a Disability Confident Employer. We are committed to actively exploring flexible working options for each role and have been ranked in the Top 30 family friendly employers in the UK by the charity Working Families. Find out more about our key commitments to Equality, Diversity and Inclusion and Flexible Working here.

Section 3

About the Faculty of Engineering and Applied Sciences (FEAS)

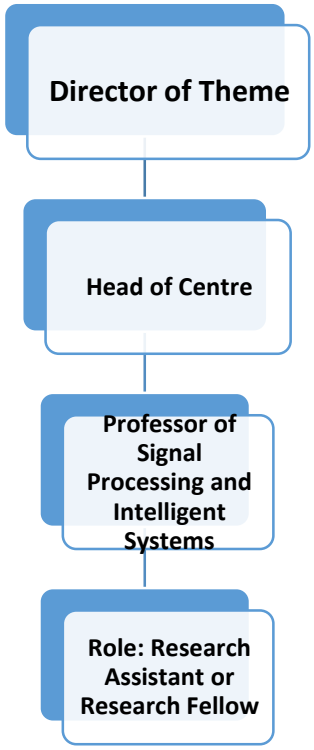
Cranfield's research and educational excellence is recognised internationally and is brought together in the Faculty of Engineering and Applied Sciences. The faculty hosts the associated core research and education 'Themes' which in turn host a number of world-class centres and institutes. The themes define their own research challenges and educational missions, with the Directors of Theme working closely with the Deputy Vice-Chancellor (FEAS).

About the Centre for Space Systems

Our reputation for leading in the field of aerospace, space, and cyber-physical systems, their autonomy, communication systems, and signal processing has been established through more than thirty years of research into this field.

We work in partnership with our industrial partners to provide high quality training, research, development and consultancy to meet the challenges of these competitive markets. We have an outstanding international reputation for the quality of our work and our capability of performing both theoretical and experimental studies. Our work covers academic provision and research. Research work spans from fundamental research and development to single-client contract research and development.

Organisational Chart



Section 4
Job Details

Job Purpose

This is a fixed-term position within the Centre for Space Systems (CfSS) to support research on the modelling, simulation and experimental validation of resilient timing architectures, with particular focus on integration of alternative, terrestrial and non-terrestrial, systems, as a complementary support and backup to GNSS. The work will address timing services for aviation, transport, and other critical national infrastructure, requiring accurate and reliable time.

The main aim of the role is to develop end-to-end models and simulation tools for timing architectures that represent the time dissemination and integration chain, including propagation effects, receiver processing, local oscillator behaviour, clock disciplining and holdover. The research will quantify timing error budget and system performance under nominal, degraded and outage conditions, and will support design choices for robust timing dissemination and integration with complementary timing sources.

This includes exploration and development of AI-based methods to address challenges in achieving robust and accurate integrated timing solution. Methods will be evaluated quantitatively with support of the developed models, simulation tools and experimental data against conventional statistical or model-based baselines, including assessment of robustness, uncertainty and generalisation to changing operating conditions.

Proposed models and algorithms will be validated using repeatable simulation, measured datasets and real test environments, including Cranfield's Time and Frequency Innovation Node and related PNT test facilities. The role will deal with analysis controlled fault and outage scenarios,

comparison of simulated and measured behaviour, preparation of project reports and deliverables, and dissemination of high quality research through publications and presentations. You will also be encouraged to contribute to teaching and student supervision where opportunities arise.

Key Deliverables

	Description of Deliverables	% of time
1	Work with colleagues in the Centre and project partners to develop and deliver research on resilient integrated timing architectures. Responsibilities include: • Develop end-to-end models and simulation tools for alternative to GNSS timing, including transmitter, propagation, receiver, clock, disciplining and holdover behaviour. • Develop and evaluate AI/ML methods for anomaly detection, timing quality assessment and clock drift learning/prediction, using clear performance metrics and conventional baselines. • Plan and conduct verification using simulated and measured data, including controlled faults, outages and repeatable test scenarios; integrate validated algorithms into Cranfield timing/PNT testbeds. • Work with academic and industrial partners to interpret results, refine the timing architecture and develop a research roadmap.	**80%**
2	Write and publish in high quality journals suitable for the Research Excellence Framework. Participate in international conferences to disseminate the results of your work.	**10%**
3	Contribute and support MSc, PhD student supervision, grant proposal writing and delivery of teaching activities.	**5%**
4	Contribute to supporting Cranfield's research culture and taking on citizenship roles, as may be relevant. Contribute to the effective operation of the AI, Robotics and Space theme. Carry out other activities as directed by your manager. Ensure that Environmental, Health and Safety policies are adhered to as required by the Faculty and University.	**5%**

Please be advised that the percentages allocated for the key deliverables may be adapted to take into account the needs of the Faculty and / or University.

Planning and organising

You will be expected to deliver modelling, algorithm development, experimental validation and teaching support within the time-scales agreed with your line manager.

The role will involve day-to-day planning of simulation and test activities, interaction with the wider project team, management of research data and models, and organisation of technical meetings. Different tasks will require different planning horizons, so flexibility and good coordination skills will be important.

Models, assumptions, software, datasets and test results will need to be documented clearly to provide traceability from requirements through simulation to experimental verification. On an ad-hoc basis you may be required to assist with related timing and PNT projects where your skills are relevant.

Communicating and influencing

You will need to be able to demonstrate excellent interpersonal skills to communicate with staff from all organisations across a wide range of disciplines to discuss project methodologies and to interpret results.

You will be expected to articulate information about your work in a clear and concise manner and to discuss problems constructively with your line manager and colleagues.

You will also need to be confident in engaging with stakeholders and key informants. An active and collegiate team mentality is the expected norm at Cranfield.

You will be expected to communicate scientific results effectively through reports and presentations at national and international meetings/conferences, and to prepare articles suitable for publication in peer-reviewed journals that will have the widest dissemination and engagement for the relevant user community. There is an expectation that at least two high quality peer-reviewed journal papers will be published from the projects supported by this role.

There will be opportunities to present project outputs at industry and science conferences through oral presentation and a need to be able to actively contribute to workshops, technical meetings and seminars. A confident approach to presentation and delivery is required.

Problem solving

You are expected to be an early-career but promising researcher. You will be able to work independently for a significant part of your time, with reference to your line manager and other project colleagues for points of clarification.

You will be able to think through and solve problems in timing system architecture, modelling assumptions, clock and propagation error representation, signal/data analysis, AI/ML method selection and interpretation of test results. You will make design decisions in close collaboration with project partners and Cranfield colleagues, develop simulation and processing software, define quantitative performance measures, and plan verification activities that compare models and algorithms with measured behaviour. You will also contribute to the integration of validated timing algorithms into prototype and test environments.

Most problems will be solved through experience and through the guidance and mentoring available. You will be expected to discuss problems constructively with the line manager or other colleagues.

Decision making

I) Decisions you will take without reference to others

- Day-to-day management and planning of ongoing research within the overall specifications provided by the project terms of reference / proposal.
- Draft delivery of high quality research and reports to deadline and quality standards.
- Writing draft journal and conference papers.
- Preparing material for jointly authored papers and conference presentations.
- Active participation in the implementation of health and safety procedures in the areas in which you work.
- Drafting reports, minutes, actions and papers.
- Identifying, collating and communicating associated research papers and reports.
- Engaging with industrial, government and research stakeholders.

II) Decisions you will refer to your manager/colleagues

- Developing new research ideas, proposals, and identifying sources of funding.
- Balancing ongoing research commitments, project management and publication/proposal-related activities.
- Activities to enable the dissemination and exploitation of research results.
- Aspects potentially affecting the operation of the project or the outcome of the results, such that they will influence the success of the project in meeting the goals.
- Budgetary issues related to research contracts.
- Decisions that involve modifications to contracted deliverables.
- Writing journal and conference papers through to final submission.
- Research support for PhD and MSc students.
- Teaching support in MSc courses.

Guiding framework

The guiding framework for this role is the University's Corporate Plan – Ambition 2027.

Our performance and development review (PDR) scheme provides a set of objectives agreed with the line manager for the year ahead and expected SMART targets. All staff must conform to the requirements of the Financial Manual. The post will be subject to normal Faculty and University systems, policies and procedures.

You will be provided with every opportunity to develop and grow a successful research activity which complements and enhances the existing research and teaching skills within the Faculty.

Impact

You will have a significant role in ensuring that the research projects you support achieve their aims, and you will be expected to provide a high quality research contribution in resilient timing, timing system modelling, clock holdover and AI-assisted timing assurance, including effective interaction with industrial and public-sector partners.

You will have access to the world-class research facilities of the university such as:

- Time and Frequency Innovation Node.
- Digital Aviation Research and Technology Centre.
- Intelligent Mobility Engineering Centre.

- Multi-User Environment for Autonomous Vehicle Innovation.

Much of the research work carried out could be commercially sensitive. Therefore, any technical papers that involve contribution/results from the project might first need to be approved by the project partners involved in the project. No direct responsibility for the budget or other staff/students is associated with this role.

However, opportunities to co-supervise PhD / MSc students will be provided, and we expect all our post-doctoral researchers to take an active role within the Centre and more widely within the Faculty to both inform others of their ongoing work and to make best use of existing knowledge and expertise. There will also be scope to develop linked project bids and to work with colleagues in responding to research calls, as appropriate. You will be expected to present work at national and international meetings/conferences and to write peer-reviewed journal papers.

Facts and Figures

Cranfield University excels in strategic and applied research. In the latest 2021 Research Excellence Framework (REF), 88% of our research was considered ‘world leading’ or ‘internationally excellent’ in its quality. We are in the top 30 in the world for Engineering – Mechanical, Aeronautical and Manufacturing (QS World University Rankings by Subject 2023). As an institution Cranfield has the second highest income of all UK universities in terms of income per FTE from industry (source: HESA 2019/20 data). Our world class academics, with proven research records, are in constant touch with industry through research, consultancy and product development. Over 5,000 students from over 100 countries study either full- or part-time, or in parallel with their career.

At Cranfield, we value Diversity and Inclusion and aim to create and maintain a culture in which everyone can work and study together harmoniously with dignity and respect and realise their full potential. We particularly welcome female applicants and actively consider flexible working options such as part-time, compressed or flexible hours and/or an element of homeworking. To further demonstrate our commitment to progressing gender diversity in STEM, we are members of WES & Working Families, and sponsors of International Women in Engineering Day.

Section 5
Am I suited to this role?

Criteria	Essential	Desirable
Education / Qualifications	PhD (or close to completion) in Engineering, Computer Science, Applied Mathematics or a related discipline, with a link to modelling or simulation, signal processing, estimation, timing and synchronisation and/or machine learning.	PhD with research focus on PNT, time and frequency, radio navigation, communications timing or a related field.
Experience	Evidence of independent research design and execution, including quantitative validation. Experience modelling and simulating timing, synchronisation, dynamic or signal processing systems and analysing time series data. Experience applying AI/ML to physical-system data.	Experience with radio navigation, timing, clock modelling/disciplining, time transfer or distribution. Experience validating algorithms with laboratory or field data, hardware-in-the-loop or representative testbeds.
Knowledge	Timing and synchronisation concepts, including error budgets and uncertainty. Statistical and AI/ML methods for time-series anomaly detection, prediction, and quality assessment.	Alternative timing architectures, transmitter/receiver error and propagation error models.
Skills / Aptitudes	<u>Programming:</u> Python and/or MATLAB for numerical modelling, simulation, data analysis and algorithm prototyping. <u>Other:</u> Ability to build reproducible simulations and tests, process time series data, define performance metrics and reconcile model and experiment. Excellent communication and presentation skills across academic, industrial and project partners. Ability to write high quality technical reports and papers. Ability to work independently and in the team.	C/C++, SDR/data acquisition, instrument control, version control or automated testing. Time/frequency measurement and characterisation, UTC traceability, laboratory timing instrumentation.
Values	Ability to demonstrate our values: Ambition, Impact, Respect and Community.	
Other	Ability to travel independently across the UK for partner meetings and experimental testing.	