RESOURCING/

JOB DESCRIPTION:

Research Associate

Ref Number:	**CEMS-005-20-R**
Salary Scale:	**Grade 7: £34,804 - £39,152 per annum**
Contract:	**For a fixed term period of 2 years AND Full-time**
School/Department:	**School of Computing**
Location:	**University of Kent, Canterbury Campus**
Responsible to[1]:	**Dr Stefan Marr**
Expected start date:	**1st of April 2021(or negotiable at point of offer)**

The Role

The School of Computing wishes to appoint a qualified and highly motivated researcher to work as a Research Associate. You will work on a project titled "CaMELot: Catching and Mitigating Event-Loop Concurrency Issues", which is funded by an EPSRC UK grant and is led by Dr Stefan Marr.

Modern server applications utilize concurrency in many ways. Actors and event loops are popular as programming paradigms since they avoid low-level concurrency issues. Unfortunately, even when using actors or event loops, server applications still show other types of concurrency bugs. Though, they can be mitigated with run-time detection techniques. In the CaMELot project, we want to make detection and mitigation fast enough to become useable in production systems. This way, even though software may contain bugs, we can reduce their impact on a program's behaviour.

Your role will be to develop lightweight techniques for detecting a wide range of concurrency issues as run time. One element of this work is to devise optimization strategies for a just-in-time compiled dynamic language. Another element is the development of tools that enable software developers to fix the bugs in their software. To ensure that this research solves relevant problems, we plan to engage with user groups and industrial partners to build a corpus of bugs to better understand the common issue and to enable an evaluation of this research.

The project builds on top of an existing research language for concurrency research called SOMns. SOMns provides one of the most advanced debuggers for actor languages currently available, and comes with support for executing tracing and snapshotting to support developers in identifying concurrency issues. Based on this foundation, we will explore

[1] Line Manager may be subject to change and will be confirmed in the employment contract issued to the successful candidate.

strategies for automated bug mitigation. By utilizing the Truffle/Graal framework of Oracle Labs, one of our industrial partners, SOMns already achieves performance competitive with state-of-the-art industrial languages. As part of this project, you will receive training in how to use the platform, and for instance how to optimize a language implementation.

For a detailed description of the project, please reach out to Stefan by email (s.marr@kent.ac.uk). He is happy to answer any further questions about this post you may have, and can provide you with a copy of the project description.

The starting date is negotiable.

Key Accountabilities / Primary Responsibilities

- Develop lightweight race detection techniques based on recognizing heap-access patterns
- Develop techniques for low-overhead run-time mitigation
- Develop tooling to use run-time information for debugging
- Build a corpus of concurrency issues for the evaluation of the research and wider use
- Report the results in academic papers

Key Duties

- Implement the techniques, experiments, and tools in an existing dynamic language implementation based on Oracle Lab's Truffle language implementation framework, under the guidance and in collaboration with the members of the project.
- Demonstrate and evaluate these techniques;
- Interact with the industrial community for the development of a corpus of concurrency issues;
- Present research outcomes at academic conferences and events;
- Potential opportunities to mentor junior members of the project (e.g. PhD students);
- Assist (if required) in the preparation of grant applications
- Other general duties commensurate with a postdoc or RA position

Such other duties, commensurate with the grading of the post that may be assigned by the Head of Department or their nominee.

Health, Safety & Wellbeing Considerations

This role involves undertaking duties which include the Health, Safety and wellbeing issues outlined below. Please be aware of these, when considering your suitability for the role.

- Regular use of Display Screen Equipment

Internal & External Relationships

Internal: Dr Stefan Marr, PhD students and undergraduate researchers associated with the project, and other relevant colleagues at the University of Kent as necessary to carry out the project.

External: Other researchers and project partners, including Prof. Elisa Gonzalez Boix (Vrije Univesiteit Brussel, Belgium), Prof. Hanspeter Mössenböck (Johannes Kepler University Linz, Austria), and researchers from Oracle Labs. Outreach activities may

include contact with software developers in industry, for instance via user group meetings, as well as conferences.

Person Specification

The Person Specification details the necessary skills, qualifications, experience or other attributes needed to carry out the job. Please be aware that your application will be measured against the criteria published below.

Selection panels will be looking for clear evidence and examples in your application, or in your cover letter where applicable, which back-up any assertions you make in relation to each criterion.

Qualifications / Training	Essential	Desirable	Assessed via*
PhD (completed or near completion prior to the start date) in Computer Science with an interest in programming language implementation or equivalent	✓		A

Experience / Knowledge	Essential	Desirable	Assessed via*
Background in programming languages, for instance interpreters, compilers, or virtual machines and/or Experience with concurrency and concurrent programming, e.g., in form of shared memory or message passing concurrency	✓		A, I, T
A good track record of peer-reviewed publications at scientific conferences or in journals		✓	A, I
Experience in communicating clearly with academics (writing papers, preparing presentations, speaking at conferences, or similar)	✓		A, I
Experience in communicating clearly with non-academic audiences (speaking at non-academic conferences, workshops, user groups, writing blog posts, or similar)		✓	A, I
Experience in conducting surveys of literature and code repositories (GitHub studies, bug tracker analyses, code history analyses, or similar)		✓	A, I
Experience in conducting performance experiments (benchmarking, performance comparisons, or similar)		✓	A, I

Skills / Abilities	Essential	Desirable	Assessed via*
Excellent programming skills		✓	A, I, T
Excellent problem-solving skills	✓		I
Ability to act on own initiative within the project context	✓		I

Additional Attributes	Essential	Desirable	Assessed via*
Ability to work independently but also successfully as a team member in collaboration with others	✓		I
A willingness to travel as and when required	✓		I

***Criterion to be assessed via:**
A = application form or CV/cover letter
I = interview questions
T = test or presentation at interview