

# RESOURCING/

## JOB DESCRIPTION:

### Research Associate



<b>Ref Number:</b>	<b>STM-146-20</b>
<b>Salary Scale:</b>	<b>Grade 7: £34,804 - £40,322 per annum</b>
<b>Contract:</b>	<b>For a fixed term period of 2 years AND Full time</b>
<b>School/Department:</b>	<b>School of Computing</b>
<b>Location:</b>	<b>University of Kent, Canterbury campus</b>
<b>Responsible to<sup>1</sup>:</b>	<b>Dr Dominic Orchard</b>
<b>Expected start date:</b>	<b>1<sup>st</sup> September 2020</b>

#### The Role

The School of Computing wishes to appoint a qualified and highly motivated researcher to work as a Research Associate funded by an EPSRC UK grant lead by Dr Dominic Orchard titled 'Granule: Verifying Resource-like Data Use in Programs via Types'.

Most programming languages treat data as unconstrained: it can be stored, manipulated, and communicated without restriction. However, this perspective is naïve and potentially harmful, e.g., some data is private so should not be shared arbitrarily; some data acts as a proxy for another resource and so is subject to a protocol of interaction. Ignoring constraints on data can lead to various software errors. The goal of this research is to verify data use internally to a programming language leveraging a combination of linear types, dependent types, and the relatively new concept of *graded modal types*. Graded modal types provides a way to capture and track different kinds of information about the structure of a program and the flow of data through it. This work combines theory and practice, developing a prototype language that demonstrates the use of linear, graded, and dependent types for verifying program properties.

You can see more details about the project, team, and links to publications of preliminary results here: <https://granule-project.github.io/>

#### Key Duties

- To contribute to the development of the theory of graded modal types, and its interaction with linear and dependent type theories;

<sup>1</sup> Line Manager may be subject to change and will be confirmed in the employment contract issued to the successful candidate.



- To contribute to the implementation of the prototype language Granule (written in Haskell) which applies these ideas in a practical setting;
- To assist in developing case studies of these techniques, including applications to security, privacy, communication protocols, and reasoning about physical resource use such as time and memory;
- To write up results for publication;
- To present research outcomes from the project at academic conferences and events;
- To assist more junior members of the project (e.g. PhD students);
- To generally develop the research agenda of type-based verification and be cognisant of its relationship to other notions of verification and program correctness.
- Other general duties commensurate with a postdoc or RA position.
- To assist (if required) in the preparation of grant applications.

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

If a potential applicant would like to discuss any aspects of these duties, the project, or the person specification beforehand, please contact Dominic at [d.a.orchard@kent.ac.uk](mailto:d.a.orchard@kent.ac.uk).

### 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 Screen Display Equipment

### Internal & External Relationships

**Internal:** Dr Dominic Orchard, PhD students and undergraduate researchers associated with the project, and other relevant UoK colleagues as necessary to carry out the project.

**External:** Project partners: Dr Harley Eades (Augusta University) and Galois Inc.

### 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 (or nearing completion of study for one) or equivalent, in Computer Science, especially with research interests in programming languages.	✓		A, I

Experience / Knowledge	Essential	Desirable	Assessed via*
Strong knowledge and hands on experience with functional programming.	✓		A, I
Good grasp of type systems and typed programming language definitions.	✓		A, I
Research experience in one of either programming language theory or practice.	✓		A, I
Research experience in proof theory, type systems, and semantics.		✓	A, I
Experience in linear logic and linear types.		✓	A, I
Experience in programming language implementation, e.g., building compilers, interpreters, or type checkers.		✓	A, I
Experience of presenting to academic audiences.	✓		A, I
A good track record of peer-reviewed publications in scientific journals and conferences.		✓	A, I

Skills / Abilities	Essential	Desirable	Assessed via*
Excellent problem solving skills	✓		I
Excellent mathematical skills	✓		I
Excellent programming skills		✓	A, I
Excellent skills in planning and prioritisation, and ability to meet deadlines	✓		I
Ability to act on own initiative within the framework of the aims and methods of the project	✓		I

Additional Attributes	Essential	Desirable	Assessed via*
Ability to work independently but also successfully as a team member in collaboration with others.	✓		I

**\*Criterion to be assessed via:**

**A = application form or CV/cover letter**

**I = interview questions**

**T = test or presentation at interview**