Engineering and Physical Sciences Research Council Doctoral Landscape Award

PROJECT TITLE: Accelerating analyses for research funders and policymakers by using probabilistic programming

Lead Supervisor: Dr Tristan Snowsill

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Project details: Models are frequently used in health to decide how to allocate resources, from companies deciding which products to continue to develop, to national policymakers deciding which treatments should be made funded for NHS patients. These models are often developed from scratch to tight deadlines, yet some of the most useful analyses are computationally expensive and cannot be completed within the timeframe. Insights and innovations from mathematics and computer science can accelerate the development and running of these analyses.

The aim of this studentship is to develop methods and tools to accelerate the building and analysis of health economic models based on the principles of probabilistic programming and other insights from software engineering and scientific computing. The successful candidate will devise alternatives to computationally expensive nested Monte Carlo simulations, such as matrix methods for propagation of uncertainty. They will derive proofs of correctness or error bounds. The candidate will also explore other opportunities for health economic models and analyses to be made more efficient using techniques from outside the field.

The successful candidate will develop tools (packages) in the R programming language, which is popular at the forefront of health economic modelling, and will demonstrate the usefulness of these tools with contemporary applied examples. Analyses will include probabilistic analysis (identifying the joint distribution of outputs of interest given a joint distribution for inputs to the model), probabilistic one way sensitivity analysis (the same but where one parameter is controlled and others follow their conditional joint distribution), and value of information analyses (a class of methods designed to capture the value of further information by its ability to reduce the risk of making the wrong decision). The successful candidate will need to work with the University of Exeter's high-performance computing cluster to undertake comparator analyses. There are opportunities to develop novel value of information analyses when economic evaluations diverge from their standard format, and to collaborate with other researchers in this active area of methodological development.

The successful candidate would join the Health Economics Group and work alongside other PhD students. There will be the opportunity to explore the breadth of research undertaken in the Faculty of Health and Life Sciences. People join the field of health economics from a variety of backgrounds, in economics, psychology, mathematics, and beyond. We are committed to research which is methodologically robust and transparent, and which has potential for significant impact on the health and wealth of people in the UK and worldwide. Upon completion, the successful candidate will be placed to continue academic research or to take

up a career in industry: the UK has a thriving consulting sector and the skills developed and demonstrated within this project would be highly valued.

Project specific entry requirements: Bachelors or Masters degree in a related discipline (e.g., mathematics, computer science) or equivalent

Potential PhD programme of study: PhD in Health Science

Department: Health and Community Sciences

Location: South Cloisters, St Luke's Campus

Please direct project specific enquiries to: Tristan Snowsill t.m.snowsill@exeter.ac.uk

Please ensure you read the entry requirements for the potential programme you are applying for.

To Apply for this project please click on the following link - **APPLY HERE**