Responsive project application form: ULTSEC Innovation Fund 2015/16

Please complete all sections in minimum 10 point font size. The maximum length of an application is 2 pages. Please email completed applications to innovfund@ncl.ac.uk by 5pm on the closing date (see section 1 above).

A. Contact information

A1 Project title	**Developing *Shiny* web applications to bring research into the classroom**
A2 Project lead (name and academic unit/service)	**Lee Fawcett (School of Mathematics & Statistics)**
A3 Project lead's email address	**lee.fawcett@ncl.ac.uk**
A4 Names and academic units/services of other staff/students on the project team	**Joseph Matthews (PhD student, School of Mathematics & Statistics)** **Keith Newman (PhD student, School of Mathematics & Statistics)** **Undergraduate student interns to be recruited from the School of Mathematics & Statistics**
A5 Name of finance administrator in your unit	**Mrs Jacqueline Williams**
A6 Use this space for a statement of support from the appropriate Head(s) of Unit (see 3.3), including their name	**I fully support Lee's application. He constantly strives to improve the student experience by developing novel approaches in his teaching practice, and this project – aimed at bridging the gap between his research and teaching – should have a positive impact on students within the School of Mathematics & Statistics and our outreach and recruitment efforts. I think the idea of research-informed teaching and showcasing some of our research to prospective students and other budding Mathematicians in local schools, using these apps, is an excellent idea.** ***Professor Robin Henderson, 5th November 2015***

B. Project information

B1 What is the proposed project intended to do?	**This project will develop user-friendly software applications ("apps") to enable the incorporation of the Project Lead's research in teaching, outreach and recruitment activities. Within the University, the aim of the project is to enhance the learning and teaching experience through the inclusion of *research-led/research-based* activities (Healy, 2005) in an advanced Stage 4 undergraduate module in Statistics (MAS8306). Here, the apps will enable students to go beyond lecture material to explore statistical modelling techniques for data on environmental extremes, used in recently-published articles from the Project Lead's primary research area, without them having to get embroiled in any of the complex mathematics associated with these methods. Indeed, the *research-teaching nexus* has been the focus of much recent research in Higher Education, and the apps we propose to develop will form only one part of the Project Lead's efforts to improve students' engagement, enthusiasm and *deep learning* by incorporating ideas from his research into classroom activities. Outside the University, the apps will also be used within the Project Lead's outreach and recruitment sessions (e.g. Royal Institution Master-classes, school visits) to promote the practical application of Mathematics/Statistics and showcase recent research activity within the School of Mathematics & Statistics to a non-technical audience. Under/post-graduate interns will gain valuable computing/coding experience relevant to their degree programmes and curriculum vitas.**

B2 How will the project team do the project? How will students be involved in doing the project?	The two named PhD students on the project team already have experience at producing interactive applications within the *R* software environment for statistical computing, using the dedicated *Shiny* package (R Core Team, 2015) for building apps. For example, Keith Newman did this successfully for a recent *University Strategic Development Grant for Impact-Generating Activity*, awarded to the Project Lead in November 2014. The PhD students will create the first app in January 2016, using one of the Project Lead's most recent publications (Fawcett and Walshaw, 2015). In total, 4 such apps will be developed to demonstrate advanced techniques for analysing environmental data on rainfall, sea-surge and wind speed extremes. The aim would be for students to use these apps in dedicated undergraduate research seminars in MAS8306 in the second half of semester 2 2015/16. During the Easter vacation 2016, two undergraduate interns will be employed to help develop a similar app for use in the Project Lead's outreach and recruitment activities. These undergraduates will have developed some basic coding skills within the *R* software environment for statistical computing in one of their stage 1 undergraduate modules (MAS1801/2). This app will be trialled in several school visits, and a Royal Institution Master-class, in April/May 2016.
B3 How much funding do you need to do the project?	Keith Newman, one of the postgraduate students on the project team, has used this software to produce similar apps before; we anticipate each of the 4 main apps will take around 5 days – or 37.5 hours – to develop and test. Given the specialist knowledge required to build these apps, from both a mathematical and coding point-of-view, the current JobsOC higher rate of £9.23 per hour seems appropriate, giving £9.23×37.5 hours = £346.13 per app developed. Between the two postgraduate students, 4 apps will be developed, giving £346.13×4 = ==£1384.52==. It is our intention to give undergraduate students with some basic statistical computing experience the opportunity to work on the project. These students will write the *R* source code for the app we intend to use in school visits, this app being based on more basic material than the 4 apps for use in MAS8306. We would like two undergraduates to work on this app together, for 5 days (or 37.5 hours), being paid at the lower rate JobsOC rate, giving 2×£7.51×37.5 hours = ==£563.25==. The Project Lead will use some funds from his staff travel allowance to cover costs for the ICME conference (see B6 below); however, a request is made for this project to fund the conference registration fee of 370 Euros – approx. ==£263== (the project lead's remaining travel allowance is to be used for research visits and another conference). Thus, the total funding requested is £1384.52 + £563.25 + £263 = ==£2210.77==.
B4 How will the project team know if the project has worked?	As discussed in B1, our intention is to improve students' engagement, enthusiasm and deep learning in module MAS8306. The Project Lead taught this course in 2012/13 without any research-led activities, and so a direct comparison of students' experiences can be made through students' comments in the University's EVASYS questionnaires/our own module evaluation questionnaires. The Project Lead will assess students' level of deep learning through the assessment of small group activities in dedicated undergraduate research seminars, and associated project reports. It is our intention to let students and school teachers use the apps themselves in hands-on sessions in outreach/recruitment activities; feedback from such events will also be used to help quantify the success of the project.
B5 Will there be any project outputs for sharing (internal and external to NU)?	The Project Lead is in the process of responding to referees' comments about a paper he recently submitted to a journal in the Mathematics Education literature focussing on the teaching/research interface – part of this response will include a section on the usefulness of the apps we propose to develop. The author intends to submit a paper on the use of research-based case studies to the ICME (International Congresses in Mathematical Education) 2016 conference to be held in Hamburg – this paper will include a discussion of the apps we propose to develop. Of course, at a more local level, dissemination to the School of Mathematics & Statistics will also take place – there are regular School meetings at which such presentations are given. The Project Lead is also willing to present his findings at any University Learning and Teaching Conferences being held in 2016 and the annual "Three Rivers" Conference. All apps developed will be made available to other staff in the School of Mathematics & Statistics to use, and we intend to produce an instruction guide for others to develop such apps themselves.