School of Computing, Engineering, and the Built Environment
Edinburgh Napier University

PHD STUDENT PROJECT

Funding and application details

Funding status: Self funded students only

Application instructions:
Detailed instructions are available at https://blogs.napier.ac.uk/scebe-research/available-phd-student-projects/

Prospective candidates are encouraged to contact the Director of Studies (see details below) to discuss the project and their suitability for it.

Project details

Supervisory Team:

- DIRECTOR OF STUDY: Stathis Tingas (Email: E.Tingas@napier.ac.uk)
- 2ND SUPERVISOR: Nick Wheelhouse

Subject Group: Engineering & mathematics

Research Areas: Mathematics, Mathematical Modelling, Applied Mathematics, Biological Sciences, Computational Biology

Project Title: Mathematical modelling of transmission and worldwide distribution of neglected zoonotic diseases

Project description:

Neglected zoonotic diseases associated with farms are infectious diseases that can be transmitted from animals to humans and are often overlooked or under-prioritized in low-resource agricultural settings. These diseases tend to affect individuals who work closely with animals or are in regular contact with livestock and wildlife. Occasionally, these diseases can lead to the outbreak of epidemics. Such diseases have received an increase in attention as a potential source of human disease and possible preventative measures in both livestock and humans,

yet there is still limited understanding on the transmission dynamics of these diseases.

Hence, for public health, economic and animal health concerns, it is important to control infections that give rise to such diseases. However, understanding and predicting the spread of the involved bacteria/viruses in a herd or identifying such key parameters cannot be assessed by field experiments alone. In this context, mathematical epidemiological models are useful tools for understanding how the infection spreads within the herd and how various inputs (such as epidemiological characteristics of infected animals and different host species) affect the dynamics.

The objective of the project will be a new modelling approach for the transmission of neglected zoonotic diseases among different host species and to humans. The new approach will combine features and tools from asymptotic analysis and control theory, supplemented with machine learning algorithms and will be validated against field data. The research work will not be limited to the UK but it will be extended to African countries like Ghana and Kenya, where these diseases pose significant risks to both animals and humans. Therefore, the synergistic approach and the multidisciplinary character of the work will enable tackling effectively the transmission of highly infectious bactera/viruses, both in the UK and abroad (especially in countries of the Global South that lack the necessary resources).

References:

Candidate characteristics

Education:

A first-class honours degree, or a distinction at master level, or equivalent achievements in Mathematical Biology, Epidemiology, or Biology

Subject knowledge:

- infectious disease transmission modeling

Essential attributes:

- Experience of fundamental modelling of dynamical systems of infectious disease transmission.
- Competent in programming.
- Knowledge of compartmental deterministic modelling.
- Good written and oral communication skills
- Strong motivation, with evidence of independent research skills relevant to the project
- Good time management

Desirable attributes:

- Knowledge of asymptotic analysis and/or control theory. Knowledge of stochastic models of infectious disease transmission. Knowledge of machine learning algorithms.
- Experience in undertaking independent research.
- A completed or near completion MSc in a re