China Scholarship Councel – University Maastricht PhD Programme

Application form

Basic information

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1. Information on prospective UM supervisors and Promotor

1a. First Supervisor:

- Title(s), initial(S), first name, surname: Prof. dr. Frank Thuijsman

- Research group: FSE / Department of Advanced Computing Sciences (DACS)

- Address for correspondence: PO Box 616, 6200 MD Maastricht

- Telephone: +31-43-3883489

- E-mail: f.thuijsman@maastrichtuniversity.nl

1b. Second Supervisor:

- Title(s), initial(S), first name, surname: Prof. dr. Pim Martens

- Research group: FSE / MSI

- Address for correspondence: PO Box 616, 6200 MD Maastricht

- Telephone: +31-43-3883555

- E-mail: p.martens@maastrichtuniversity.nl

1c. Promotor (if applicable):

Same as supervisors.

2. Information on University Maastricht Faculty / Department/ Institute/ School contact person:

- Initial(S), first name, surname: Ellen Narinx

- Research group: FSE/DACS

- Address for correspondence: PO Box 616, 6200 MD Maastricht

- Telephone: +31-43-3883459

- E-mail: ellen.narinx@maastrichtuniversity.nl

3. Research field(s)

Global Change and Regional Response, Evolutionary Game Theory, Agent Based Modeling, Machine Learning, Sustainability and Data Science

4. Title of research plan for CSC-UM PhD Programme

A data science and game theoretic approach towards a sustainable healthy future

5. Short summary of research plan (max. 250 words) (A full plan has to be submitted later)

Introduction: Infectious disease threats are re-emerging as a result of climate change and associated environmental impacts, population growth, unplanned urbanization, as well as animal husbandry and trade. A wealth of data about these threats and their causes is available through a wide variety of sources. Based on transition theory and complex systems theory, we use machine learning, evolutionary game theoretic simulation models, and gaming sessions to enable rapid, personalized treatment of infected patients/animals and tracking and control of infectious disease outbreaks. Other lines of research will address population driven models towards a healthy and sustainable environment.

Hypothesis and Objectives: We want to understand the intrinsic and extrinsic factors influencing the spread of zoonosis driven by animal trade, biodiversity loss, and climate change. We plan to do so by applying machine learning to data of a wide range of datasets to tune our game theoretic models and to compare the outcomes with human and animal health parameters and environment-related indicators.

Setting and Methods: We take a "One Health approach," coupled with fusing data from a wide range of relevant sources depending on the infectious disease threat. These may include human (community, hospital, or laboratory health services) and animal health surveillance, health registries, microbial and viral genomic data (including next generation sequencing), pathogen resistance data, mapping of vectors, climate and environmental data.

Impact: By combining knowledge, data and methods from different fields of science, we expect to develop realistic control models for decision makers to enable working towards a sustainable healthy future.

Top 5 selected publications:

1. Dahmouni, I., & Kanani Kuchesfehani, E. (2021): Necessity of Social Distancing in Pandemic Control: A Dynamic Game Theory Approach. Dynamic Games and Applications DOI: 10.1007/s13235-021-00409-9.

2. McIntyre, K.M., Setzkorn, C., Baylis, M., Waret-Szkuta, A., Caminade, C., Morese, A.P., Akin, S., Huynen, M., Martens, P., & Mornad, S. (2010): Impact of climate change on human and animal health. The Veterinary Record, 167, 586. DOI: 10.1136/vr.c5523

3. Oosterbroek, B., De Kraker, J., Huynen, M., & Martens, P. (2016). Assessing ecosystem impacts on health: A tool review. Ecosystem Services, 17 (237- 254). DOI: 10.1016/j.ecoser.2015.12.008

4. Pacheco, J. M., Vasconcelos, V.V., & Santos, F.C. (2014): Climate change governance, cooperation and self-organization. Physics of Life Reviews 11, 573–586. DOI: 10.1016/j.plrev.2014.02.003

5. Schüller, K., Stankova, K., & Thuijsman, F. (2017): Game theory of pollution: national policies and their international effects. Games 8, 30, DOI: 10.3390/g8030030.