

Bachelor thesis topics Derek Karssenber

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Title: Personal environmental exposure assessment

Brief description: In environmental health and natural hazards research it is often required to quantify personal environmental exposure, i.e. the exposure of an individual to an environmental variable (e.g. flooding, air pollution, heat). To calculate personal exposure of an individual, it is required to know his/her space-time path over the period of interest. The objective of this research is to review and apply approaches to model (uncertain) space-time paths of individuals in the context of personal exposure assessment.

Supervisor: Derek Karssenber, Room 5.20, d.karssenber@uu.nl

Restrictions: Requires knowledge and skills in geographic information science

Title: Computer hardware limitations to global hydrological modelling

Brief description: Global hydrological models are computer simulation models that calculate hydrological states and fluxes for the global land surface. They require considerable computer power as a large number of calculations need to be done for a large number of locations and time steps. In this research, you will review the level of detail currently used in these models and predict the level of detail that can be reached in the near future by extrapolating trends in processing power of hardware.

Supervisor: Derek Karssenber, Room 5.20, d.karssenber@uu.nl

Restrictions: Requires interest in hydrological modelling and computer science or related fields

Title: Forecasting of catastrophic shifts using statistics and/or machine learning

Brief description: Catastrophic shifts in earth systems (e.g. desertification, climate change) involve a considerable, often irreversible, change in system state. Predicting such shifts is extremely difficult. In this research, you will apply statistical methods or modern machine learning techniques to forecast catastrophic shifts, generated by a computer simulation model of an ecosystem.

Supervisor: Derek Karssenber, Room 5.20, d.karssenber@uu.nl

Restrictions: Requires interest in statistics and/or machine learning

Title: Environmental exposures: the global population at risk

Brief description: Remote sensing and global simulation models provide global, spatial, information on various environmental variables that may have negative impacts on human health. Examples are flooding, air pollution, and surface water (providing hotspots for diseases such as malaria). Recently, a number of very high-resolution global population maps have been created, which also show changes in the geographical distribution of the population. In this research, you will combine these two sources of information to quantify the global population at risk of various environmental hazards, and to investigate historical trends and differences between countries and continents.

Supervisor: Derek Karssenber, Room 5.20, d.karssenber@uu.nl

Restrictions: Requires interest in natural hazards or health geography and basic knowledge of geographical information systems

Title: Linked data for publishing environmental information

Brief description: Linked data is a method of storing and publishing structured data so that it can be interlinked and stored in a meaningful way such that it can be accessed through semantic queries. It is currently widely used for instance by Wikipedia and for publishing health data. In this research you will review current use of linked data for publishing environmental data and, if possible, develop methods for linked data to do so.

Supervisor: Derek Karssenbergh, Room 5.20, d.karssenbergh@uu.nl

Restrictions: Requires interest in (geographical) information science

Title: Credibility in environmental models

Brief description: Construction of numerical models is an important activity in the geosciences. It involves the design of new process representations or the selection and re-combination of existing ones. In this process, the modeller often selects model components that are the most 'credible', that is, components that are most trustworthy. Unlike the concept of model validation, model credibility has received limited attention in the geosciences. In this research, you will study how modellers report on model credibility in their scientific publications (other topics related to this are possible as well).

Supervisor: Derek Karssenbergh, Room 5.20, d.karssenbergh@uu.nl

Restrictions: Interest in sociology of science or philosophy of science is a requirement.

Title: Parallel algorithms for environmental modelling

Brief description: Algorithms for environmental modelling are at the heart of any raster-based environment model. Current hardware requires the use of parallel algorithms, that is algorithms that can be distributed (and run parallel) on multiple CPU cores or computer nodes. In this research, you will design and test a parallel algorithm for a model component simulating spatial diffusion or a similar process.

Supervisor: Derek Karssenbergh, Room 5.20, d.karssenbergh@uu.nl

Restrictions: Interest in geographical information science, geocomputation, computer science, or related field is a requirement.

Title: Environmental justice

Brief description: Human exposure to our environment has considerable effects on human health. The spatial distribution of human exposures to environmental variables such as air pollution, urban green, noise and fast-food restaurants, is believed to reflect differences in income, ethnicity, unemployment and education-levels. This study aims to explore the patterns of the environmental exposures across the Netherlands and identify the relations with neighbourhood deprivation (income, ethnicity, unemployment and education-levels). The results of this study would have implications in restoring environmental justice and consequently reduce health inequalities amongst different socio-economic groups. The thesis can include a literature study and some data analysis. The thesis will be conducted at Geosciences department, Utrecht University in cooperation with Julius Centre, UMCU

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Restrictions: Knowledge of and experience with techniques for spatial data analysis is preferable.