

Research Experience Placement (REP) Scheme Project

Project Supervisors:

Dr. Martin Hurst (martin.hurst@glasgow.ac.uk) (early career) plus support from the wider supervisory team at Glasgow, Stirling, Nature Scotland and JBA Trust/Consulting.

Host Organization and Department (if applicable):

School of Geographical and Earth Sciences, University of Glasgow

Project Title:

Machine learning classification of coastal water bodies from satellite imagery

Project Description:

Anthropogenically forced climate change is currently impacting our coasts, not only via present and projected sea level rise decreasing the widths of our beaches and shifting back vegetation, but also via an increased frequency and severity of coastal storm events. Due to its inherent dynamism, the shoreline is difficult spatially and temporally to measure from the ground, yet it can offer vast insights into the health of a beach and the vulnerability of coastal communities to flooding and erosion from storm events and sea level rise. Publicly available satellite imagery offers a moderate to high pixel resolution with daily to weekly return periods, meaning there is a wealth of data to be used in identifying the coastal edge. By stacking these images up over time, we can gain a time-series of shoreline change which can have important uses in shoreline change detection and future modelling. However, the large amount of data means manual identification of water bodies is highly inefficient. The application of deep learning techniques like convolutional neural networks for classifying land cover from multispectral satellite imagery have become increasingly popular. However, the application of machine learning techniques like these to coastal water body identification is relatively novel. The student will work with coastal scientists to develop a test-case for coastal edge detection using machine learning techniques, using pre-existing programming packages. The student will have the opportunity to demonstrate their abilities in machine learning and automated data collection and analysis, and gain valuable experience applicable to other environmental sciences.

Skills and Career-Development Opportunities:

The student will be interacting with a team of coastal specialists and will have the opportunity to expand their field of research knowledge and application. They will be in regular contact with a current IAPETUS2 PhD student which will give them greater insight into the PhD process and the value of DTP research. Dependent on progress and increasing complexity of the project, there may also be the potential for co-authorship on a scientific paper.

Wider context of research:

The student will be taught how to collect and process satellite imagery for the purposes of land cover classification, and will have the opportunity to perform fieldwork to a nearby coast to collect ground-truthing data to ratify automated results with. If fieldwork is not possible, previously collected field data can be used.

Project Timeframe:

8 weeks throughout July and August, flexible start date possible. The project will commence with 1-2 weeks of background reading and short tutorials on satellite imagery data collection, with an optional week of field data collection to capture and process ground-truthing data. Write-up of a short report on methods and results will be performed throughout the 8 weeks as well as one or both of the training courses in July 2021 below.