Imperial College London

STUDENTSHAPERS

StudentShapers Recruitment: Calling all students with an interest in Earth Surface Processes/Geomorphology, Coding, and Virtual Reality

ViRSE – Geomorphology

Bursary:

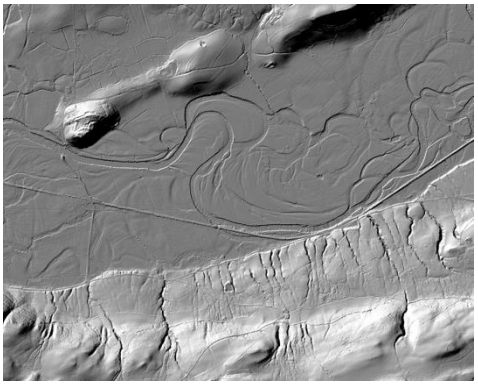
£365/week (8 full time weeks) – for one student

Who should apply:

Students with an aptitude for coding and enthusiasm for creating software, as well as an understanding of basic geomorphology/Earth surface processes and terminology. We anticipate that students enrolled on programmes in the Department of Earth Science and Engineering (ESE) will be best placed to meet these criteria, but all Imperial undergraduates are eligible. Preference will be given to students who are not in their final year.

Campus/Location: *South Kensington; some work can be done remotely, but on campus attendance will be expected for at least 50% of the project.*

Project details:



High-resolution lidar topographic model of River Tywi field trip study site in southern Wales that will be transformed into a ViRSE landscape.

The study of geomorphology, at its heart, relies on an understanding of the fundamental link between landforms and the processes that shape Earth's surface, including societally-relevant processes related to climate change, geohazards (e.g., floods, earthquakes, landslides, erosion), and sustainable resource management (e.g., water and soil). Earth surface processes and landforms are inherently dynamic and 3D and, therefore, a 4D understanding of processes and landform evolution is required to facilitate deep learning. However, student learning is currently limited by conventional methods of teaching, which rely on 2D representations of these 3D or 4D concepts. This is an opportunity to develop 4D Virtual Reality for Student Education (ViRSE) landscapes that will be used to reinforce key concepts and tools for undergraduate teaching of geomorphology/Earth surface processes in the Department of Earth Science and Engineering (ESE). The development of such virtual landscapes is timely because the availability of publicly-available, high-resolution remote sensing data and timeseries have exploded in recent years – we now have all the necessary inputs to construct ViRSE landscapes that can evolve through time for use in the classroom. Students will be able to immerse themselves in these virtual landscapes to explore changes occurring at the Earth's surface, e.g., how glaciers and ice-sheet melt and sea levels rise due to global warming, how a fault line ruptures the land during an earthquake, how deforestation drives soil erosion, and how rivers flood in response to extreme weather events. In this project, we will start with locations previously used in existing ESE teaching practical materials and adapt them into virtual landscapes using high-resolution topographic (e.g., lidar, drone photogrammetry), imagery (e.g., satellite, aerial photos, drone photography), and hydrology (e.g., stream gauge) datasets. We will initially implement these ViRSE landscapes in undergraduate modules EART40011 (Surface Processes) and EART70010 (Applied Geomorphology). In the former first-year module, students will use the ViRSE landscapes to deepen their understanding of foundational concepts related to hillslope (e.g., landslides), river, coastal, and glacial landforms and processes. In the latter upper-level elective module, the students will not only use the ViRSE landscapes to

complement and reinforce advanced quantitative spatial analysis exercises using Geographical Information Systems (GIS), but also to improve reconnaissance and training of tools used on the associated field trip in southern Wales. Specifically, the development of the ViRSE landscape for southern Wales will include virtual tools that will mirror actual tools used during hands-on data collection during the field trip, e.g., laser range finder, surveying equipment, stream flow velocity meter, Munsell colour chart, shovel and sledgehammer for sample collection, sediment grain size measurements, drone, etc. Like a medic student practicing the use of surgical tools, these virtual tools will build student confidence and improve practical use of modern data-collection technologies prior to use in the higher-risk, field-based learning environment. Furthermore, the ViRSE landscape for southern Wales will increase inclusivity and accessibility because it will function as a virtual alternative for students unable to participate in the in-person field trip.

The student undertaking this engagement will gain a deeper understanding of geomorphology/Earth surface processes, as well as gaining technical skills and experience in coding (in C#/Unity), and in three-dimensional visualisation. They will also gain experience in collaborative software-development as part of a professional team.

This engagement is part of the ViRSE (Virtual Reality Student Experience) project, which is developing a virtual reality platform to ease the development and deployment of 'multi-player' virtual reality into Imperial's teaching across a range of departments and subjects. ViRSE is built on the Unity game engine, and all ViRSE applications (including this project) are also built within Unity; code is written in the C# programming language. Students will not need to build a VR interface, write rendering code, or concern themselves with networking or administrative issues; these are handled by the ViRSE framework and the Unity engine. The development in this engagement will concentrate on the creation of a three-dimensional 'environment' specific to the project, and creating and testing the code necessary to make it function, and to interface with the ViRSE system.

All ViRSE student shaper engagements will commence with a two-week full time training course , which will provide the necessary grounding in the C# language, object-oriented programming, the Unity engine, the ViRSE platform, and 3D modelling tools. This course will take place on-campus July 3rd-14th 2023. In subsequent six project weeks the ViRSE student partners will lead on the development of the particular applications within Unity, in collaboration with the academic lead, and with the ViRSE team providing technical support and advice. These six project-development weeks are flexible in precise timing, but should take place over summer 2023, before the start of Autumn term of the 23/24 academic year.

How to apply:

Applications (300-500 words) should be made via the 'Student Expression of Interest' form on the StudentShapers website (here) or accessed using the above QR code. This will then be distributed directly to the appropriate staff partner.

Deadline: *31st March 2023*

Contact details: *Contact Dr Dylan Rood (Earth Science & Engineering), d.rood@imperial.ac.uk for further information*