

Project Title: Mathematical modelling of the spread of Covid-19

Description: This project will utilise ODE models to model the spread of Covid-19. We will be modelling the impact of social distancing measures, such as national lockdowns, 'circuit-breakers' and the percentage of the population wearing masks. Prior experience in ODE models will be necessary. Prior experience in computer programming would be beneficial but not necessary.

Project Title: Machine Learning in MRI Scanning

Description: Machine Learning and Artificial Intelligence are becoming increasingly popular tools in science, including MRI Scanning. In this project we will test a variety of AI models to identify health problems in humans using MRI scans. No prior experience is needed, just enthusiasm.

Project Title: Stopping antimicrobial resistance in moles

Description: Every year, hundreds of moles are treated for a variety of horrific diseases. Over time, these diseases are learning to fight these treatments. In this project, you will have hand-to-hand experience in administering and testing treatments on moles. Prior lab experience will be necessary – in particular, experience working with animals would be useful but not needed. Familiarisation with data techniques would also be beneficial to measure the efficacy of the treatments.

Project Title: The effects of climate change on UK forests

Description: Climate change is the greatest threat to mankind. In the arctic, the effects of this are clear and known, with the ice caps melting. Climate change also affects our forests here in the UK however. The student taking on this project will be expected to undertake a variety of fieldwork within Wytham Woods, collecting data on the characteristics of dozens of species of trees, to measure trends within their changes over time. The student will then utilise previous data collected over decades to trend any notable changes or trends from climate change. No prior experience is needed, simply an enthusiasm to get stuck into nature.

Project Title: Modelling patterns in leaves

Description: Pattern formation occurs within a variety of biological and ecological systems, including tundras, snake skins and petri-dishes. In this highly mathematical project, the student will be expected to apply the theory of pattern formation to the different types of leaves, and see if the models resulting from the theory can explain why different types of leaves get their patterns. Mathematical skills needed, and prior knowledge of pattern formation theory would be very useful. Familiarisation with Python is necessary.

Project Title: Radio technology in echolocation of bats

Description: The navigation of bats using echolocation is a phenomenon that has been studied for decades within Biology. However, the exact measurements of how close a bat can come between an object before moving is not known. The student of this project will be expected to utilise radio technology to collect thousands of data points in experiments with bats. The student will then statistically analyse this data to determine key questions regarding echolocation. Experience in data analysis would be useful. Students with lab work experience will be prioritised.

Project Title: The psychology of viruses: How thinking can impact the spread of disease

Description: The placebo effect has been noted in a variety of health contexts within human biology. One instances this has not been explored however is within the spread of the common cold. The student will study whether various psychological mind states can delay, accelerate or in some way impact the onset and therefore spread of the common cold within an individual and the wider population. Prior understanding of psychological theory will be required. Experience in data handling would be useful, but this will be taught as part of the project.