

Higher-dimensional structure in weather data

Supervisor: [Nina Otter](#)

Research Group: [Statistics and Data Science](#)

Project description:

The North Atlantic Oscillation (NAO) is an atmospheric pattern that describes winter weather in eastern North America and Europe. Prolonged anomalies in such patterns are often linked to extreme weather events, and understanding the variations behind the NAO is an important problem in the context of global climate change.

The aim of this project is to use techniques stemming from the field of topological data analysis (TDA), to shed new light onto the NAO. Traditional techniques used by climate scientists rely on parameter choices taken during pre-processing steps, which make it difficult to obtain results that one can interpret and reproduce. Methods from TDA can help in obtaining global summaries of patterns in data, in a way that is robust to perturbations of the input data, and allows to account for different parameter choices, such as the density of the points, or the resolution scale at which one studies the data set.

This project will have a wide potential impact for climate science, as well as TDA, since it will require the student to tackle known algorithmic and computational challenges in TDA; many of the techniques from TDA have known computational cost because they require large amounts of computing memory, therefore, a significant part of this project will be devoted to developing efficient algorithms and implementations thereof.

Further information:

[How to apply](#)

[Entry requirements](#)

[Fees and funding](#)