

GISC405-22S1(C) (21 February to 03 June 2022)  
GIS Programming and Databases  
“Advanced Earth and Environmental Analytics”



## Assignment 4 (marked 25%)

Due: Friday, 3<sup>rd</sup> of June 2022, 10:00pm

Hand in your Jupyter Notebook into the Learn assignment dropbox and rename it with your user code: **abc123\_Ass04.ipyn**. Use commenting within your notebook to explain the objective of the scripts you write and rely on markdown to structure your notebook including discussion text and analysis whenever relevant in the assignment.

In this assignment you will be exploring new analytics for the Fire Weather Index by investigating the spatial clustering of FWI over a longer period of time and explaining this variability based on understanding of its meteorological drivers.

This assignment is designed to build on your developing experience in this course and the spatio-temporal statistics you have been applying to previous assignments and lab exercises. More specifically, you will rely on the Self Organizing Map notebook and concepts introduced in Lab 10. You are required to answer the following three questions by designing and coding the relevant analytics on the FWI and other meteorological indices derived from the spatially gridded WRF datasets.

**In addition to your comprehensive answer to the three questions below you will be also marked based on the following criteria:**

1. *Demonstrate the use of data chunking for optimizing the code*
2. *Use geographic projections for producing maps*
3. *Detailed code commenting to explain code block/function objectives*
4. *Elaborate discussion of your results in form of comments along with the results.*
5. *A sound analytical methodology that is also discussed relevant to the objectives.*
6. *The SOM algorithm requires tuning and optimization with respect to the learning rate, node number, and epoch values as shown in the lab. It is expected that you demonstrate in your notebook how you have done that and what supports your chosen settings to answer the questions.*

**Question 1: Is there a regional preference for high Fire Weather Index in New Zealand and what can be driving this spatial variability?** *Hint: This is a two part question, so make sure you cover both. Please use the years 2015 to 2020 (so 5-years) to answer this question. To evaluate the meteorological drivers for FWI feel free to either use the meteorological parameters (like wind speed, temperature, etc ...) or the indices that are calculated for the FWI, but explain your methodology and discuss the results. I am not expecting an essay, but merely a very pretty and comprehensive notebook.*

**Question 2: The summertime is usually New Zealand's fire weather season. Where are the regions that exhibit more extreme fire weather during the summers between the year 2015 to 2020?**

**Question 3: Redo question 1 but by only choosing the South Island as the input for your SOM algorithm.**

For further information please contact the course coordinator/lecturer:

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