School of Architecture, Planning and Geomatics

Geomatics Division

APG 4009F : Computing for GIS

Assignment

This assignment incorporates all the skills gained throughout the term i.e. Numpy, Pandas and Matplotlib will all be incorporated towards solving the assignment problem in Section B.

Section A: Guided Code.

1. Plotting NumPy array data.

Run the following lines of code

```
import numpy as np
import matplotlib.pyplot as plt

fig, ax = plt.subplots(figsize = (10, 10))
x = np.arange(-5, 5)
y = np.arange(-5, 5)

extent = np.min(x), np.max(x), np.min(y), np.max(y)

z = np.random.random((10, 10))

mp = ax.imshow(z, cmap = 'hsv', interpolation = 'kaiser', extent = extent)
cbar = fig.colorbar(mp, shrink = 0.6, spacing = 'proportional',
orientation = 'vertical', label = 'units', pad = 0.06, ax= ax)

cbar.minorticks_on()
```

Change the interpolation to ‘`nearest`’ and inspect the difference.

Pass the ‘ `interpolation_stage = “data”` ’ argument to the ax.imshow function and notice the change in the plotted figure.

If need be, change the `interpolation` and `interpolation_stage` arguments and notice how the plot changes.

Section B: Assignment Problem. **[100 marks]**

The realities of climate change are being experienced worldwide. In this assignment you will be required to extract and plot time series (in years) of temperature changes of South Africa and her neighbouring states.

The excel workbook provided contains temperature anomalies (Months: ‘*Meteorological year’*, Element: ‘*Temperature Change’*) from 1961 to 2019 of the states on planet earth as well as various continents and regions (Data Source: *Kaggle.com*). The baseline of the data is the time period 1951 – 1980.

Use the excel workbooks and the skills gained throughout the term as well as in section A of the assignment to visualise the temperature changes of the following countries and continent:

1. South Africa
2. Namibia
3. Botswana
4. Zimbabwe
5. Mozambique
6. Lesotho
7. Eswatini
8. Africa

Find the mean temperature change for each country and region and the standard deviation and plot them as text on each individual plot in the following format: `Mean: 123 ° ± 456 ° Celsius`

The criteria of the plot should be as follows:

The figure should have 4 rows and 2 columns (Each figure corresponding to a particular country and/or continent)

Chart type: Line graphs

Title fontsize: 20 points (Name of Country or continent)

All other font sizes: 14 points

Your program should save the output to a pdf named “Temperature Data.pdf”.

The order of the plots should be as listed in the bullet points i.e. South Africa first and Africa last.

Note: Marks will be awarded for ‘automation’ as opposed to ‘hardcoding’.

Submission:

Please submit your .py file containing the solutions to the assignment problem only. No report is required for section A.

Label the .py file as your student number e.g. ABCXYZ001.py. You need not submit the pdf generated by your program.