

TMTplus Introduction to Scientific Programming

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Note from the teaching staff

The materials that we use for this course are somewhat new and have been heavily reworked. We will likely have made mistakes in this work or have glossed over issues that deserved better or different treatment. Where you find issues worth noting please do report these to us as it will allow to repair and improve.

By the way, welcome to the Exercise book for Introduction to Scientific Programming! We believe this book is self-explanatory, so go ahead and practice.

Chapter 12

Integrating *gdal* raster and vector data with *numpy*

In many geospatial data projects, disparate data sources may cause you to work with both data in vector and data in raster formats. We explore some of that space in these exercises.

The exercises

For the next exercises, you will need data. It is in a zipped folder and contains the following files:

2014.tif This is a geotiff file that holds the daily measurements of temperature for Netherlands in the year of 2014. This file contains 365 bands, with each band corresponding to a single day.

NL_provinces.shp This is a single shapefile that provides the provinces of Netherlands.

ovRoads.geojson This is a single geojson file that contains the roads of Overijssel province.

In this block of exercises, you will recreate the steps made in the theory slides.

Find and extract the pixels from the raster `2014.tif` that are inside Overijssel province. Save the results as a new raster with the same characteristics as `2014.tif`.

Ex 12.1

Open and check the results with either QGIS or ArcGIS.

Ex 12.2

Rasterize `ovRoads.geojson` and save as a new Gtiff file with the same characteristics as `2014.tif`. Ensure that pixel values in this new raster correspond with the number of vehicles per hour that the road allows.

Ex 12.3

In the lecture, using *gdal*, *ogr* and *numpy*, we were able to answer the question: What are the lowest temperatures experienced in 2014 along motorway A1 in the province of Overijssel?

Using similar steps try to figure out what are the highest temperatures felt in 2014 along that road in the province of Overijssel.

Note: In the lecture, to answer this question we removed values equal to -9999, by using a *numpy* filtering mechanism:

```
roadsMinTemperature[roadsMinTemperature == -9999] = None
```

Now, in this exercise you will need to remove all values that are below or equal to 0, using a similar technique.

Ex 12.4

Save the highest temperatures experienced in 2014 along the road as a Gtiff raster file, in which pixels represent the highest temperature recorded. Ensure that this file has the same characteristics as `2014.tif`.

Open and check the results with QGIS or ArcGIS