

GIS 5578

Wrap-Up 2

Choose one (1) of the following tasks and write a Python program that accomplishes it. Use multiple python files if necessary. Choose the task that will demonstrate your knowledge of programming. Be ambitious, but please do not torture yourself. You have not been provided a template for this exercise. Instead, you should write this code from scratch using a text editor or idle. Mock data has been provided for the appropriate tasks and you will find it on moodle.

You have all of the information necessary to complete this assignment. Utilize the ArcPy library for completing these tasks. You are **not** required to create ArcPy toolboxes and I do not suggest doing so. Examine your lecture notes, in class coding exercises, and labs for help to complete any of the following projects. We have done various parts of this work in class and you should be able to fall back on your previous homework or in-class exercises.

Code Submission

- Your code should
 - Be properly commented
 - Use proper variable name conventions “snake_case” or “camelCase”
 - Use descriptive variable names
 - Should be readable
- Your code must contain at least one function with the following properties.
 - A document string
 - Comments
 - Return Statement
- Use string formatting when appropriate
 - `aName = "Python"`
 - `the_variable = 2`
 - `Print("Hello World this is %s %s" % (aName,the_variable))`

Tasks

Task A: Raster Reclassification

Task B: Calculate Population Density

Task C: Spatial Analysis

Task A: Raster Reclassification

You have been provided a subset of the raster dataset Global Land Cover 2000. The global raster used for comparison is Global Landcover 2000 from the European Space Agency, which is spatial resolution of 0.0089 decimal degree or approximately one square kilometer at the equator. Information for the dataset can be found at <https://lta.cr.usgs.gov/GLCC>.

Your task is to build a small application that will allow the user to choose the pixel value they would like to have reclassified. The file, GLC2000_legend.csv will provide information about the pixel value associated with each label. You may need to do some preprocessing work to identify if there are any pixel values not present in your dataset and eliminate them.

1. User should be presented with the labels and values of the raster pixels.
2. User can enter in the value pair, which consists of the current value and the value that they would like it reclassify to.
3. User can enter in any number of value pairs.
4. An empty value pair, starts the reclassification process
5. User specifies the path for new file, reclassified dataset is written to the path as a tiff

<http://desktop.arcgis.com/en/arcmap/10.3/tools/spatial-analyst-toolbox/reclassify.htm>

<http://desktop.arcgis.com/en/arcmap/latest/extensions/spatial-analyst/map-algebra/a-quick-tour-of-using-map-algebra.htm>

Task B: Calculate Population Density

You have been provided two US datasets, from the National Historic Geographic Information System (NHGIS), which is a data project at the Minnesota Population Center at the University of Minnesota. NHGIS contains many of the US publicly release population datasets from 1790 to present day. Your task is to automate a number of tasks that allow you calculate the following things.

1. Which county and state have the highest population density?
2. Provide the top 10 counties of nation with the most dense population.
3. Provide the county per state that contributes the most population (in percentage).

For this task you should write code that does the following.

1. Convert CSV to DBF File
2. Join CSV files to the appropriate shapefiles
 - a. US_county_2010.shp
 - b. US_state_2010.shp
3. Add new fields (arcpy object) to the shapefile for storing your calculations
4. Uses the arcpy cursor to calculate the new values
5. Population Density per geographic unit (state and county)
 - a. Total Population / Area in square kilometer or miles
6. Fractional of Population Contributed
 - a. Population of county / population of state
 - b. Population of county / population of country
7. Answer 2 of 3 questions.

Task C: Raster and Vector Spatial Analysis

Utilize two datasets to complete this task. The first dataset is a subset of the raster dataset Global Land Cover 2000. The global raster used for comparison is Global Landcover 2000 from the European Space Agency. Information can be found at <https://lta.cr.usgs.gov/GLCC>. The second dataset is from the National Historic Geographic Information System (NHGIS) at the Minnesota Population Center.

For this exercise you will develop an application that automates the raster/vector clipping process. Specifically you will use the arcpy library to extract the raster datasets from a given vector file. a specific state chosen by the user. us_states.shp file to

1. The user will be prompted to enter in the name of a geographic feature.
 - a. There should be some error checking that informs the user of a potential bad choice and allows them to choose again.
 - b. If the user types in "quit" the program quits
2. Your program will select a feature from the existing shapefile
3. The selected feature will be used to extract the raster data contained within its boundaries.
4. The raster dataset will be written to a tiff with the same file path as the original tiff file.
 - a. `tiffFilePath = r"c:\work\us_states.tif"`
 - b. `outTiffPath = r"c:\work\Tennessee.tif"`