# **CS 115 - Introduction to Programming in Python**

# **Lab 09**

**Lab Objectives:** Numpy.

Instructions:

• In this lab, you will use Jupyter Notebook.

• Complete the questions in the spaces provided and upload the solution to Moodle when finished.

**NOTE: For the following questions, you should not use loops or if statements!**

1. Download the files covid\_data.txt and covid\_country.txt from Moodle.
2. The file covid\_data.txt has 3 rows. Rows 1 – 3 contain the following: total cases per 1 million, total deaths per 1 million, tests per 1 million.
3. The file covid\_country.txt has a heading row and 2 columns, the first contains country names, and the second the continent.
4. The two files are parallel and contain the data for the same countries.
5. Create a python file, yourname\_Lab09.py that does the following (see sample run on next page):
   1. Load the data from the file covid\_data.txt into a numpy array, covid\_data.
   2. Load the data from the file covid\_country.txt into a numpy array, covid\_country.
   3. Transpose and update the covid\_data array.
   4. Calculate and display the maximum tests per 1 million.
   5. Display the names of the countries in Asia.
   6. Display the names of the countries with less than 50 deaths per 1 million.
   7. Calculate and display the average deaths per 1 million for Europe.
   8. Display the name of the country/countries with the minimum total cases per million in Europe. (note: there may be more than one country with the same minimum, but they may not all be in Europe, you should only display those in Europe).
   9. Create a new array, test\_result, where the first column contains country names, and the second column contains the total cases per 1 million. Hint: your new array should have 2 columns and 172 rows, not 172 columns and 2 rows.
   10. Output the data in test\_result to a file, test\_data.txt.

**Sample Run:**

Maximum test per 1 million: 995282.0

Countries in Asia: ['India' 'Iran' 'Saudi\_Arabia' 'Pakistan' 'Bangladesh' 'Turkey' 'Iraq'

'Philippines' 'Indonesia' 'Qatar' 'Kazakhstan' 'Oman' 'Israel' 'Kuwait'

'UAE' 'Singapore' 'Bahrain' 'Japan' 'Armenia' 'Kyrgyzstan' 'Afghanistan'

'Azerbaijan' 'Uzbekistan' 'Nepal' 'South\_Korea' 'Palestine' 'Malaysia'

'Lebanon' 'Maldives' 'Hong\_Kong' 'Thailand' 'Sri\_Lanka' 'Jordan' 'Cyprus'

'Georgia' 'Vietnam' 'Taiwan' 'Myanmar' 'Brunei']

Countries with less than 50 deaths per 1 million:

['India' 'Pakistan' 'Bangladesh' 'Philippines' 'Indonesia' 'Egypt'

'Ukraine' 'UAE' 'Singapore' 'Poland' 'Nigeria' 'Japan' 'Ghana'

'Afghanistan' 'Azerbaijan' 'Morocco' 'Uzbekistan' 'Kenya' 'Venezuela'

'Nepal' 'Costa\_Rica' 'Ethiopia' 'Australia' 'Czechia' 'Cameroon'

'Ivory\_Coast' 'South\_Korea' 'Palestine' 'Madagascar' 'Sudan' 'Senegal'

'Norway' 'Malaysia' 'Gabon' 'Guinea' 'Haiti' 'Zambia' 'Mauritania'

'Paraguay' 'Lebanon' 'Croatia' 'Greece' 'Libya' 'Maldives' 'CAR' 'Malawi'

'Zimbabwe' 'Hong\_Kong' 'Thailand' 'Eswatini' 'Sri\_Lanka' 'Cuba'

'Cabo\_Verde' 'Namibia' 'Mali' 'Slovakia' 'South\_Sudan' 'Lithuania'

'Estonia' 'Mozambique' 'Rwanda' 'Suriname' 'Guinea-Bissau' 'Benin'

'Iceland' 'Tunisia' 'New\_Zealand' 'Angola' 'Uruguay' 'Latvia' 'Jordan'

'Uganda' 'Cyprus' 'Georgia' 'Niger' 'Togo' 'Jamaica' 'Malta' 'Gambia'

'Botswana' 'Bahamas' 'Vietnam' 'Lesotho' 'Reunion' 'Guyana' 'Taiwan'

'Burundi' 'Myanmar' 'Mauritius' 'Guadeloupe' 'Martinique' 'Aruba'

'Trinidad\_Tobago' 'Cayman\_Islands' 'Papua\_New\_Guinea' 'Brunei' 'Barbados'

'Antigua\_Barbuda' 'Liechtenstein' 'Belize' 'Curacao' 'Fiji']

Average cases per 1 million in Europe: 4075.3555555555554

Country with minimum total cases per 1 million in Europe: Slovakia