autorank

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Chapter 1

Introduction

1.1 What is autorank

Autorank simplify the comparison between (multiple) paired populations. The performance measures on each data set are then the paired samples, the difference in the central tendency (e.g., the mean or median) can be used to rank the different algorithms.

The goal of Autorank is to simplify the statistical analysis for non-experts. Autorank takes care of all of the above with a single function call. Additional functions allow the generation of appropriate plots, result tables, and even of a complete latex document. All that is required is the data about the populations is in a Pandas dataframe.

1.2 What is the problem?

We would like to compare top countries in terms of new detected *Covid-19* cases and for better comparison and produce a comprehensive report, we have used this tool.

1.3 Data source

For this comparison, we have used the *Covid-19* data from WHO [1]and have extracted the part of the data that we want to feed the autorank.

[1] `https://covid19.who.int/WHO-COVID-19-global-data.csv`

1.4 Description of workflow

- Imported pandas, matplotlib.pyplot and autorank libraries.
- Downloaded the data with "wget" form the WHO website and read the file into a dataframe.
- Grouped the database by "country".
- Made a series for each country based on its new *Covid-19* detected cases and converted it into a dataframe.
- Extracted top countries based on their total new detected cases.
- Used matplotlib to plot the mean value of these top countries and save it.
- Used autorank to make an analytical report.
- Used autorank built-in functions to plot and print the result.
- Used LaTex to creat report PDF.
- Created Makefile to automate this procedure.

Chapter 2

Graphs

2.1 autorank Graph

In this section we see the autorank plot

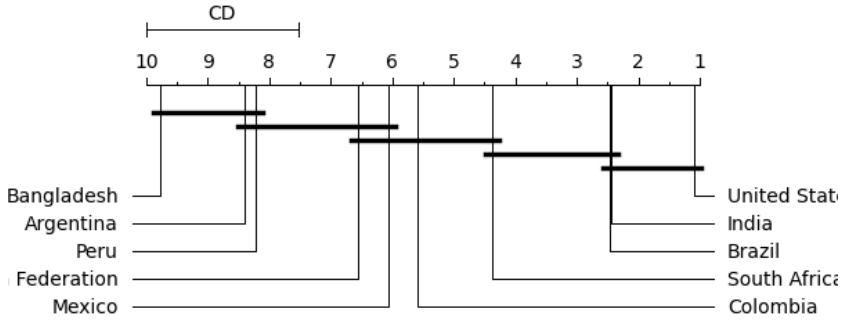

Figure 2.1: autorank plot

2.2 matplotlib Bar Garaph

In this section we see the top countries plot. In this plot I have compared their last month with a month before last.

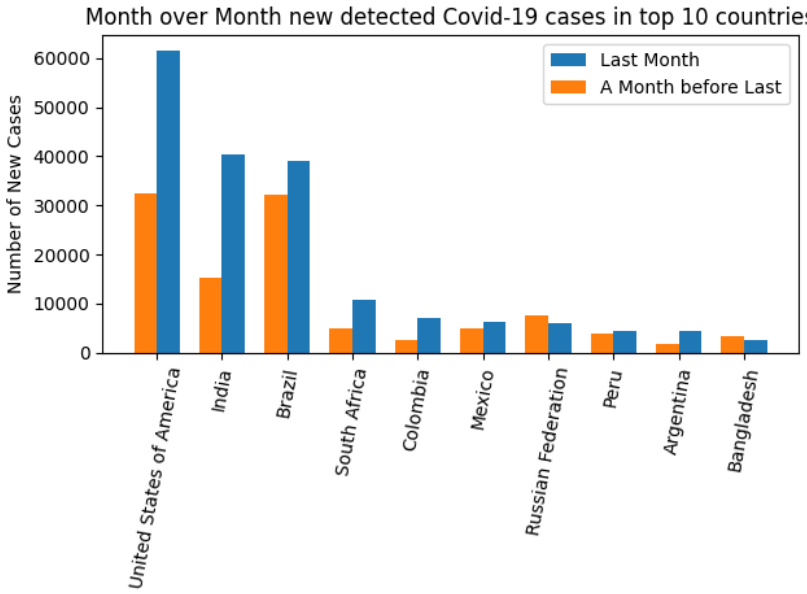

Figure 2.2: Countries with highest rate of new *Covid-19* detected cases in last month

2.3 matplotlib Line Garaph

In this plot we can see the detail of last month detected Covid-19 in top countries.

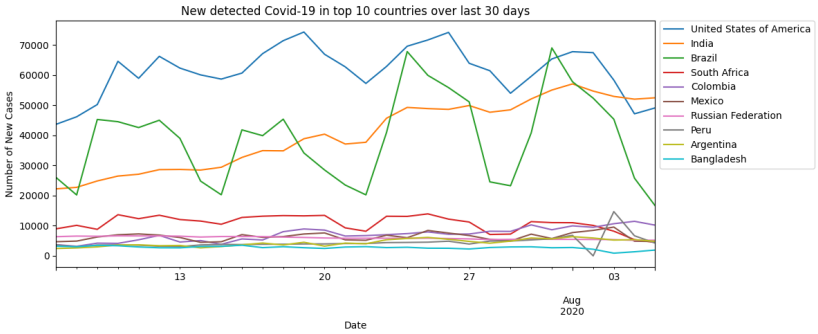

Figure 2.3: Countries with highest rate of new *Covid-19* detected cases in detail

Chapter 3

autorank Reports

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The statistical analysis was conducted for 10 populations wi
th 30 paired samples.
The family-wise significance level of the tests is alpha=0.0
50.
We rejected the null hypothesis that the population is norma
l for the populations Peru (p=0.000) and Bangladesh (p=0.002
). Therefore, we assume that not all populations are normal.
Because we have more than two populations and the population
s and some of them are not normal, we use the non-parametric
 Friedman test as omnibus test to determine if there are any
 significant differences between the median values of the po
pulations. We use the post-hoc Nemenyi test to infer which d
ifferences are significant. We report the median (MD), the m
edian absolute deviation (MAD) and the mean rank (MR) among
all populations over the samples. Differences between popula
tions are significant, if the difference of the mean rank is
 greater than the critical distance CD=2.473 of the Nemenyi
test.
We reject the null hypothesis (p=0.000) of the Friedman test
 that there is no difference in the central tendency of the
populations United States of America (MD=62578.500+-10725.50
0, MAD=6650.202, MR=1.100), India (MD=39663.500+-13810.500,
MAD=15737.799, MR=2.433), Brazil (MD=40912.000+-18338.500, M
AD=20193.753, MR=2.467), South Africa (MD=11297.500+-2663.50
0, MAD=2862.901, MR=4.367), Colombia (MD=7211.000+-3035.500,
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MAD=2667.939, MR=5.600), Mexico (MD=6332.000+-1792.500, MAD =1459.620, MR=6.067), Russian Federation (MD=5866.500+-592.0 00, MAD=625.657, MR=6.567), Peru (MD=3957.000+-1565.000, MAD =644.190, MR=8.233), Argentina (MD=4240.500+-1420.000, MAD=1 495.943, MR=8.400), and Bangladesh (MD=2772.000+-542.500, MA D=375.839, MR=9.767). Therefore, we assume that there is a s tatistically significant difference between the median value s of the populations.
Based on the post-hoc Nemenyi test, we assume that there are no significant differences within the following groups: Uni ted States of America, India, and Brazil; India, Brazil, and South Africa; South Africa, Colombia, Mexico, and Russian F ederation; Mexico, Russian Federation, Peru, and Argentina; Peru, Argentina, and Bangladesh. All other differences are s ignificant.

Abstract

autorank is a simple Python package with one task: simplify the comparison between (multiple) paired populations. This is, for example, required if the performance different machine learning algorithms or simulations should be compared on multiple data sets. The performance measures on each data set are then the paired samples, the difference in the central tendency (e.g., the mean or median) can be used to rank the different algorithms. In 2.1 you can see one output sample of this library

Bibliography

[1] @articleHerbold2020, doi = 10.21105/joss.02173, url = https://doi.org/10.21105/joss.02173, year = 2020, publisher = The Open Journal, volume = 5, number = 48, pages = 2173, author = Steffen Herbold, title = Autorank: A Python package for automated ranking of classifiers, journal = Journal of Open Source Software