ΠΑΝΕΠΙΣΤΗΜΙΟ ΠΕΙΡΑΙΩΣ
UNIVERSITY OF PIRAEUS
DEPARTMENT OF DIGITAL SYSTEMS

NCSR DEMOKRITOS
INSTITUTE OF INFORMATICS AND
TELECOMMUNICATIONS

Machine Learning Project

Covid-19 Mortality Prediction

Gkatsis Vasileios

MTN 2004

Overview

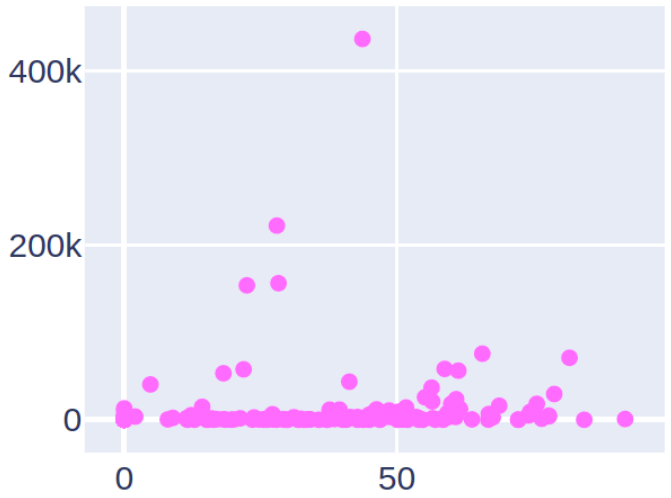
Create machine learning models capable of predicting the number of people dying from covid-19 in a country during a month.

- Gather and process data. (Our World In Data)
- Extract the more explanatory features.
- Create and tune models.
- Evaluate the models.

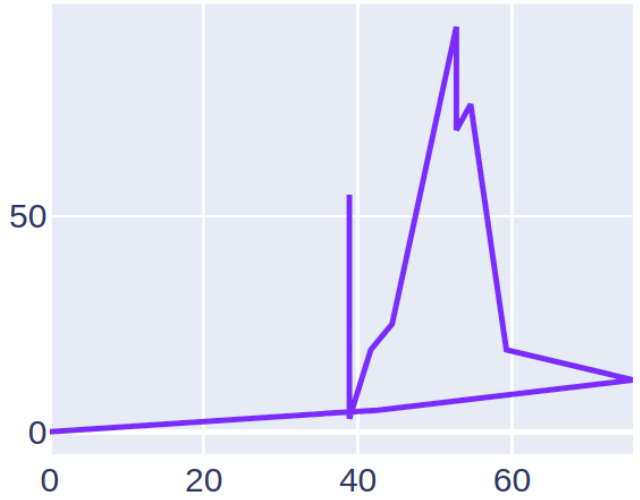
Feature Extraction

Choose the features that explain better the data using simple graphs.

Total Deaths - Smokers



Total Deaths – Stringency Index



Create Models

- Linear Regression
- Lasso Regression
- Ridge Regression
- K-NN Regression
- Elastic-Net
- Decision Trees
- Support Vector Machines

(SGD, and Tweedie Regression
Where also tested but left out due to very bad results)

Python library: scikit-learn

Tune Models

Split data on train and validation.

Perform k-fold on train data and find average MAE.

Find MAE of validation dataset.

Keep the combination of parameter values that minimize both MAE scores

Test

Make predictions for the test dataset.

Count performance using the following metrics:

- R^2
- Mean Average Error (MAE)
- Mean Squared Error (MSE)
- Rooted Mean Squared Error (RMSE)

Results

	Linear Regression	Lasso Regression	Ridge Regression	kNN Regression	Elastic Net	Decision Trees	SVM
R2	0.79	0.78	0.69	0.2	0.78	0.92	-0.15
MAE	2326.4	2360	2438.9	4643.7	2419.1	1599	5232.1
MSE	18312097	19008276	27148578	69774062.2	19427773	7362844	100242603
RMSE	4279.26	4359.8	5210	8353	4407.7	2713.46	10012

Final Thoughts

- Not a feasible project.
- Not with simple machine learning tools.
- Not without including more data (epidemiological, cultural etc.)
- Maybe deep learning methods can produce more stable models.