Covid New Deaths Prediction

Data Science

CRISP DM

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Design


Business Understanding
Data Understanding
Data Preparation
Modeling
Evaluation
Deployment
Data

Business Understanding

- Business type : Government’s statistic analysis center

- Question : Will the increment of vaccination amount make new death patients amount decreased?

- Understand the problem or business opportunity
  - How much does the vaccination amount effects the new deaths number?
  - If those are up or down, will the new deaths number decreased?

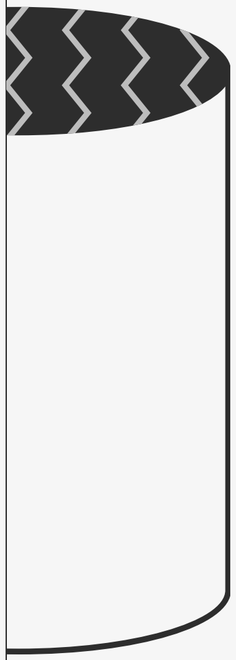
- Set outputs or goals
  - Understand what makes new deaths number increased or decreased.
  - Able to predict the new deaths number from given parameters.

- Analytical Method
  - Visualization
  - Machine Learning Prediction

Data Understanding

- Period / Duration : Covid-19 Thailand Data recorded since 2020/04/01
- Unit of analysis : Thailand daily covid record.
- Data size : 944 records
- Features : Country, ISO_CODE, Population, PopulationDensity, median_age, aged_65_older, aged_70_older, gdp_per_capita, extreme_poverty, cardiovasc_death_rate, diabetes_prevalence, female_smokers, male_smokers, handwashing_facilities, hospital_beds_per_thousand, life_expectancy, human_development_index, Vaccination, Covid-19 new cases, year, month, date, total_cases, total_deaths, reproduction_rate
- Target : New Death
  -

Data Preparation



- Selection : Covid-19 Thailand Data recorded since 2020/04/01
- Cleaning : Data Imputation
- Transform : Standardized scale

Modeling

- **Scaled data with StandardScaler**
- **Regressor Models**
  - **Ensemble**
    - RandomForestRegressor
    - GradientBoostingRegressor
  - **Linear**
    - LinearRegression
    - SGDRegressor
    - BayesianRidge
    - ElasticNet

Evaluation

- Benchmark models
- Evaluated in metrics; **R2, MAE, MSE, RMSE**
- The lowest **MSE** scored model will be **selected** to deploy.

Deployment

- Deploy in a form of API; FastAPI containerized docker image.
- Testing from 5 test cases; =>

Case #1


```
{
    "total_cases": 2912347,
    "new_cases": 20420,
    "total_deaths": 22976,
    "reproduction_rate": 1.14,
    "total_test": 21146224,
    "new_tests": 76230,
    "positive_rate": 0.3476,
    "tests_per_case": 2.9,
    "tests_units": 1,
    "total_vaccinations": 123999850,
    "people_vaccinated": 53665546,
    "people_full_vaccinated": 49702406,
    "total_boosters": 20631898,
    "new_vaccinations": 159477,
    "stringency_index": 48.61,
    "population": 71601103,
    "population_density": 135.132,
    "median_age": 40.1,
    "aged_65_older": 11.373,
    "aged_70_older": 6.89,
    "gdp_per_capita": 16277.671,
    "extreme_poverty": 0.1,
    "cardiovasc_death_rate": 109.861,
    "diabetes_prevalence": 7.04,
```

```
    "female_smokers": 1.9,
    "male_smokers": 38.8,
    "handwashing_facilities": 90.67,
    "hospital_beds_per_thousand": 2.1,
    "life_expectancy": 77.15,
    "human_development_index": 0.777,
    "year": 2022,
    "month": 3,
    "day": 17
```

```
{
    "Response": {
        "NewDeathPredicted": 39
    }
}
```


Error : 9.3%

2022	3	1	35

Case #2


```
{
    "total_cases": 1448792,
    "new_cases": 14555,
    "total_deaths": 15124,
    "reproduction_rate": 0.93,
    "total_test": 13221709,
    "new_tests": 52375,
    "positive_rate": 0.2602,
    "tests_per_case": 3.8,
    "tests_units": 1,
    "total_vaccinations": 43342103,
    "people_vaccinated": 28436015,
    "people_full_vaccinated": 1428599
    "total_boosters": 0,
    "new_vaccinations": 0,
    "stringency_index": 55.09,
    "population": 71601103,
    "population_density": 135.132,
    "median_age": 40.1,
    "aged_65_older": 11.373,
    "aged_70_older": 6.89,
    "gdp_per_capita": 16277.671,
    "extreme_poverty": 0.1,
    "cardiovasc_death_rate": 109.861,
    "diabetes_prevalence": 7.04,
    "female_smokers": 1.9,
    "male_smokers": 38.8,
    "handwashing_facilities": 90.67,
    "hospital_beds_per_thousand": 2.1,
    "life_expectancy": 77.15,
    "human_development_index": 0.777,
    "year": 2021,
    "month": 9,
    "day": 17
```



```
{
    "Response": {
        "NewDeathPredicted": 205
    }
}
```


Error : 8.47%

2021	9	17	189