The World's Happiness in Focus

Final Project - June 2021

Project Overview

This project aims to analyze the global state of ‘happiness’ in the world, from 2006 to 2020, from people in over 150 countries, using the United Nations Happiness Index dataset.

Data Story

Show the correlation between measurements of well-being and create a model to identify which one is essential to discovering the ‘key to happiness’.

Data Source

The raw dataset files were obtained from the Kaggle website as csv files.

Target Audience

Students and research professionals.

Happiness Index Definition & Background

Imagine a ladder, with steps numbered from 0 at the bottom to 10 at the top. The top of the ladder represents the best possible life for you, and the bottom of the ladder represents the worst possible life. On which step of the ladder would you personally say you stand at this point in time?

The definition of the Happiness Index originates from the Bhutanese Gross National Happiness Index. In 1972, Bhutan started prioritizing happiness over other factors such as wealth, comfort and economic growth. They created an indexation for happiness based on multiple measurable factors, and have kept track of this index ever since. This inspired the Happiness Council to devise their own definition of the Happiness Index.

Data

In total, there were six variables, and each variable reveals a populated-weighted average score on a scale running from 0 to 10 that is tracked over time and compared against other countries. These variables currently include:

Wellbeing variables

Perceptions of corruption, Generosity, Freedom , Social support Have you donated money to a charity in the past month? Is corruption widespread throughout the government or not? etc.

Measurable, economic variables

Healthy Life expectancy (calculated by the WHO based on over 100 different health factors). GDP per capita

Dystopia

Each country is also compared against a hypothetical nation called Dystopia. Dystopia represents the lowest national averages for each key variable.

How It Was Done

01 ETL/Web Design

02 ML Model/
Database Structure

03 Python "Flask" App

04 Heroku
Deployment

Data Processing

After establishing our data sources and dependencies, the ETL was implemented.

- null values/duplicates were removed
- columns renamed accordingly
- Groupby/sort/filter data accordingly

RAW DATA

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1949 entries, 0 to 1948
Data columns (total 11 columns):
 #   Column                            Non-Null Count  Dtype
---  ------                            --------------  -----
 0   Country name                      1949 non-null   object
 1   year                              1949 non-null   int64
 2   Life Ladder                       1949 non-null   float64
 3   Log GDP per capita                1913 non-null   float64
 4   Social support                    1936 non-null   float64
 5   Healthy life expectancy at birth  1894 non-null   float64
 6   Freedom to make life choices      1917 non-null   float64
 7   Generosity                        1860 non-null   float64
 8   Perceptions of corruption         1839 non-null   float64
 9   Positive affect                   1927 non-null   float64
 10  Negative affect                   1933 non-null   float64
dtypes: float64(9), int64(1), object(1)
memory usage: 167.6+ KB
None
```

TRANSFORMED DATA

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 1708 entries, 0 to 1948
Data columns (total 11 columns):
 #   Column                            Non-Null Count  Dtype
---  ------                            --------------  -----
 0   Country name                      1708 non-null   object
 1   year                              1708 non-null   int64
 2   Life Ladder                       1708 non-null   float64
 3   Log GDP per capita                1708 non-null   float64
 4   Social support                    1708 non-null   float64
 5   Healthy life expectancy at birth  1708 non-null   float64
 6   Freedom to make life choices      1708 non-null   float64
 7   Generosity                        1708 non-null   float64
 8   Perceptions of corruption         1708 non-null   float64
 9   Positive affect                   1708 non-null   float64
 10  Negative affect                   1708 non-null   float64
dtypes: float64(9), int64(1), object(1)
memory usage: 160.1+ KB
None
```

ML Model

Scikit-learn library was used to build our data model.

- LinearRegression and Regression Trees (rt) was chosen to work with our numeric target variables.
- train_test_split was used to create training and testing data (80% train , 20% test).
- Fitted the model to the training data.
- Tested the model to the unseen test data.
- The model was used to make predictions for 2021 data.

VARIABLES

```
[7]  M↓

X = happinessByYears_df[['GDP_per_capita','Life_expectancy']]
y = happinessByYears_df['Life_ladder'].values.reshape(-1, 1)
print(X.shape, y.shape)

(1708, 2) (1708, 1)
```

MODEL

```
# Create the model using LinearRegression
from sklearn.linear_model import LinearRegression
model = LinearRegression()

[12]  M↓

# Fit the model to the training data and calculate the
model.fit(X_train, y_train)
training_score = model.score(X_train, y_train)
testing_score = model.score(X_test, y_test)

print(f"Training Score: {training_score}")
print(f"Testing Score: {testing_score}")

Training Score: 0.6423601987234213
Testing Score: 0.671824122479331 3
```

```
# Fit the model to the training data and calculate the
model.fit(X_train, y_train)
training_score = model.score(X_train, y_train)
testing_score = model.score(X_test, y_test)
```

PREDICTIONS

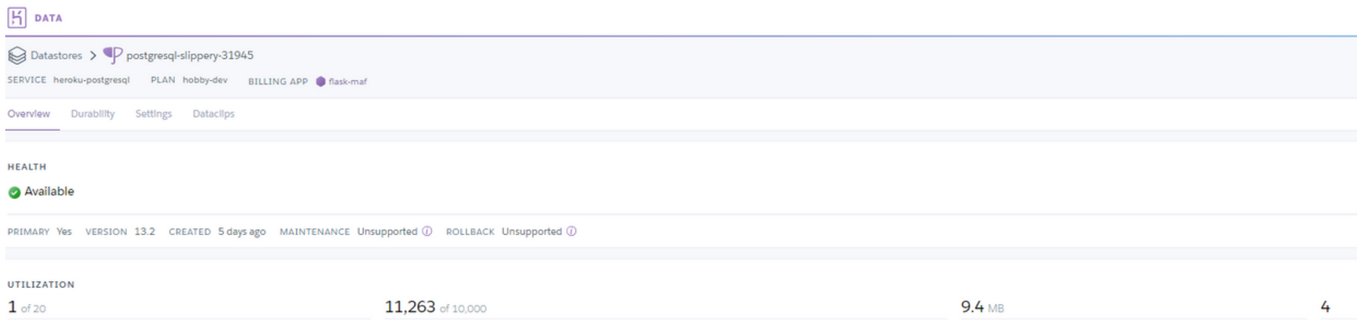
	Prediction	Actual
0	7.159857	7.842
1	7.159857	7.620
2	7.159857	7.571
3	7.159857	7.554
4	7.159857	7.464
...	...	...
144	4.357920	3.512
145	4.357920	3.467
146	5.368271	3.415
147	4.357920	3.145
148	4.357920	2.523

149 rows × 2 columns

Database

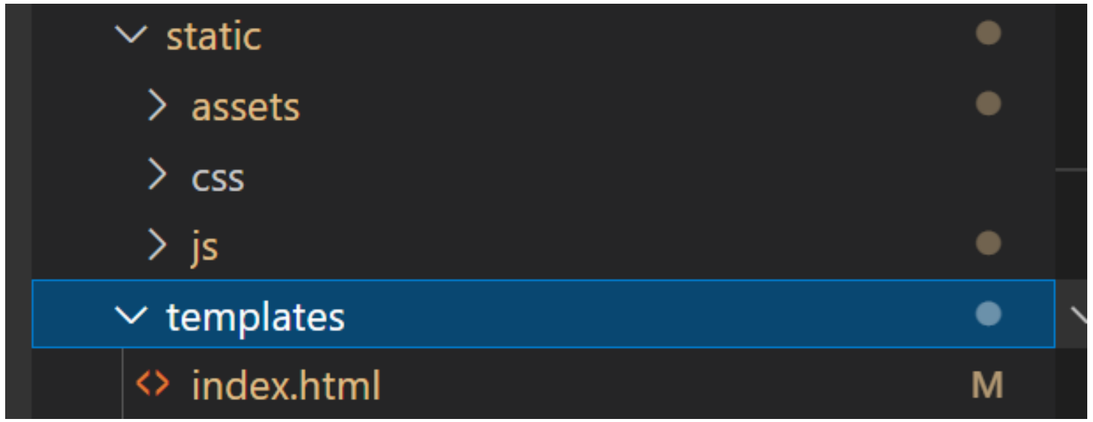
The transformed main dataframes and predictions dataframe were successfully loaded to the PostgreSQL database using sqlalchemy

```
[11]  M↓
happinessByYears_df.to_sql(name='happinessoveryears', con=engine, if_exists='append', index=False)
statistics.to_sql(name='statistics', con=engine, if_exists='append', index=False)
gbMainData.to_sql(name='gbmaindata', con=engine, if_exists='append', index=False)
bottom.to_sql(name='bottom', con=engine, if_exists='append', index=False)
top.to_sql(name='top', con=engine, if_exists='append', index=False)
```



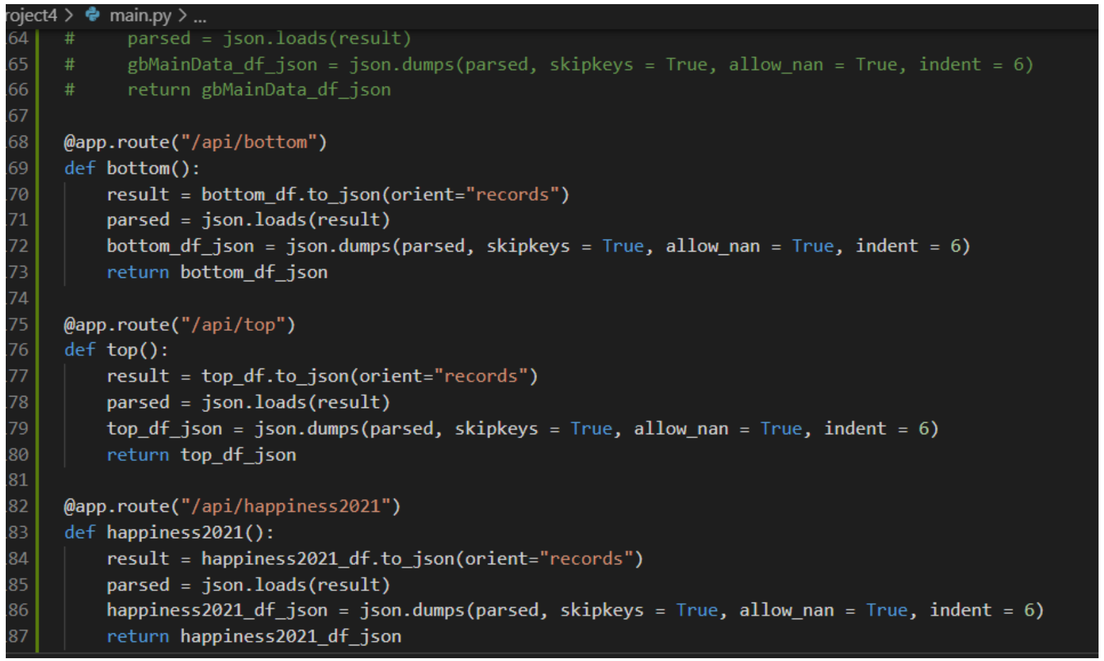
Web Design

JavaScript, HTML, CSS from a Bootstrap template were used for this section. Changes were made accordingly.



Flask

Connection to the database was done via flask API Calls. API routes for each table were created to get the data in json format for the visualizations.



Visualizations

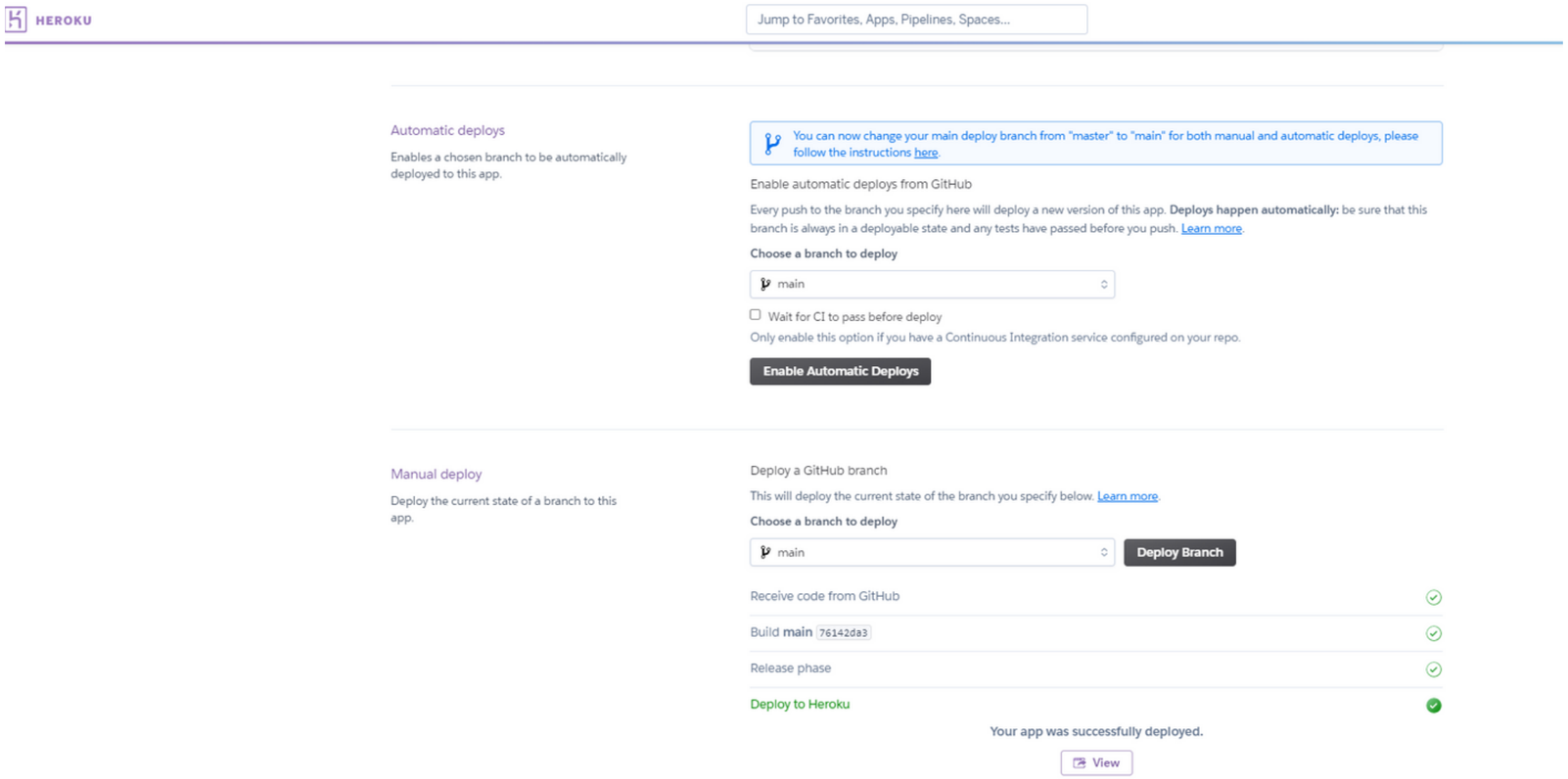
async function was used in our JavaScript visualization file to connect to the database via API call.

For Loop was used to get each individual variables from the json objects for the traces.

D3 and Plotly were used for the charts/maps

```
1
2   const api_url_main = '/api/main'
3
4   async function getData_main(){
5   const response_main = await fetch(api_url_main)
6   const data_main = await response_main.json();
7   console.log(data_main)
8
9   let xl = []
10  let yl = []
11  let Country = []
12  let Corruption = []
13  let Freedom =[]
14  let GDP_per_capita =[]
15  let Generosity =[]
16  let Life_expectancy =[]
17  let Social_support = []
18
19  for (var i=0; i< data_main.length; i++){
20  xl.push(data_main[i]['year'])
21  yl.push(data_main[i]['Life_ladder'])
22  Corruption.push(data_main[i]['Corruption'])
23  Freedom.push(data_main[i]['Freedom'])
24  GDP_per_capita.push(data_main[i]['GDP_per_capita'])
25  Generosity.push(data_main[i]['Generosity'])
26  Country.push(data_main[i]['Country'])
27  Social_support.push(data_main[i]['Social_support'])
28  Life_expectancy.push(data_main[i]['Life_expectancy'])}
29
30  // add choropleth map (avg Life_ladder/ years & countries)
31  var data = [{
```

Heroku Deployment



Heroku Deployment

https://flask-maf.herokuapp.com/

Questions ?

Thank You:)