Team: Straw Hats

Solution Document for problem statement

Idea:
The goal of this project is to come up with a model that can accurately predict the life expectancy of a given Country based on some of the features, that is classifications and measurements of key statistics of the country. The data set provides 21 variables that could possibly be used to predict the life expectancy of the country. The idea is to first figure out and focus on the key factors that affect the life expectancy as not all variables hold equal weightage. Moreover, there might be certain variables that are completely irrelevant or may just carry inaccurate data that is far from useful.

Approach:

The First step is to perform an Exploratory Data Analysis to better understand the data, and its various variables. We use visualization and various statistical techniques such as the ANOVA test to verify various hypotheses regarding the dataset. This also helps us to figure out which of the variables actually have any statistically significant impact on the life expectancy of a country.

Next we Clean the data as well as possible. This includes getting rid of duplicate rows or rows where the target value, that is the life expectancy is not given. We account for the missing values as best as we can. Next, we train multiple models, with different algorithms to come up with various efficient models. We tune all the models and compare them to find the best one. This best performing model is then selected to be integrated into the UI platform.

The UI Platform inputs the data from the user and predicts the life expectancy based on the input variable. This value is presented to the user, possibly with a slight suggested range. The UI platform also examines the inputs and tries to determine what risks one might be exposed to that could endanger their life expectancy. The user is made aware of these pressing matters. The UI platform aims to not only examine and make aware the user of the current scenario, but rather help the user prepare for a better and longer tomorrow. The platform informs the user of various convenient methods and habits that are scientifically proven to help one increase their life expectancy.

Our project is called “No Time to Die” and the mission of the project is to promote a healthier future. It's not just about the numbers and the predictions, but rather the people whose lives we could touch. We try to bring a better, happier and healthier tomorrow for all of us.

Design:

```
model = Sequential()

model.add(Dense(28,input_shape=(3,),activation='relu', kernel_regularizer=regularizers.L1L2(l1=1e-3, l2=1e-2),
    bias_regularizer=regularizers.L2(1e-3),
    activity_regularizer=regularizers.L2(1e-4)))

#Hidden Layer
model.add(Dense(56,activation='relu'))
model.add(Dense(42,activation='relu'))
model.add(Dense(35,activation='relu'))
model.add(Dense(20,activation='relu'))

#Output layer

model.add(Dense(1))
```

```
model.compile(optimizer='Adam',loss='mse',metrics=['mae'])
```

Model Architecture

Execute & Test:

```
[ ]  1 model.fit(x=x_train_scaled,y=y_train.values,validation_data=(x_test_scaled,y_test.values),batch_size=128,epochs=600)
```

```
14/14 [==============================] - 0s 7ms/step - loss: 56.5964 - mae: 5.6460 - val_loss: 55.1076 - val_mae: 5.5728
Epoch 573/600
14/14 [==============================] - 0s 8ms/step - loss: 57.6780 - mae: 5.7054 - val_loss: 55.0681 - val_mae: 5.5982
Epoch 574/600
14/14 [==============================] - 0s 6ms/step - loss: 57.1614 - mae: 5.6905 - val_loss: 61.9036 - val_mae: 6.0145
Epoch 575/600
14/14 [==============================] - 0s 8ms/step - loss: 57.5642 - mae: 5.7212 - val_loss: 54.8389 - val_mae: 5.5778
Epoch 576/600
14/14 [==============================] - 0s 8ms/step - loss: 56.7407 - mae: 5.6597 - val_loss: 55.0098 - val_mae: 5.5681
Epoch 577/600
14/14 [==============================] - 0s 13ms/step - loss: 56.8729 - mae: 5.6741 - val_loss: 55.2666 - val_mae: 5.5980
Epoch 578/600
14/14 [==============================] - 0s 7ms/step - loss: 57.3381 - mae: 5.6806 - val_loss: 59.0480 - val_mae: 5.9639
Epoch 579/600
14/14 [==============================] - 0s 8ms/step - loss: 57.8465 - mae: 5.7397 - val_loss: 55.3213 - val_mae: 5.5988
Epoch 580/600
14/14 [==============================] - 0s 8ms/step - loss: 58.9324 - mae: 5.8073 - val_loss: 68.7102 - val_mae: 6.6123
Epoch 581/600
```

Training

```
mse = np.sqrt(mean_squared_error(y_test,predictions))
print("mse: ", mse)
```

```
mse:  10.520814958301001
```

```
[ ]  1 predictions = model.predict(x_test_scaled)
```

```
37/37 [==============================] - 0s 2ms/step
```

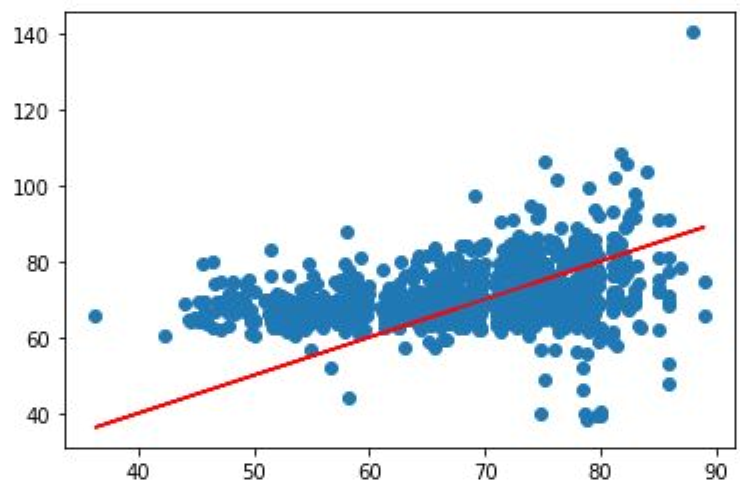
```
[ ]  1 mae = mean_absolute_error(predictions,y_test)
     2 print("mae: ", mae)
     3 mse = np.sqrt(mean_squared_error(y_test,predictions))
     4 print("mse: ", mse)
```

```
mae:  5.59319305355046
mse:  7.397369446937791
```

```
[ ]  1 model.evaluate(x_test_scaled,y_test)
```

```
37/37 [==============================] - 0s 2ms/step - loss: 54.8137 - mae: 5.5932
[54.813724517822266, 5.5931925773620605]
```

Testing



Regression Line

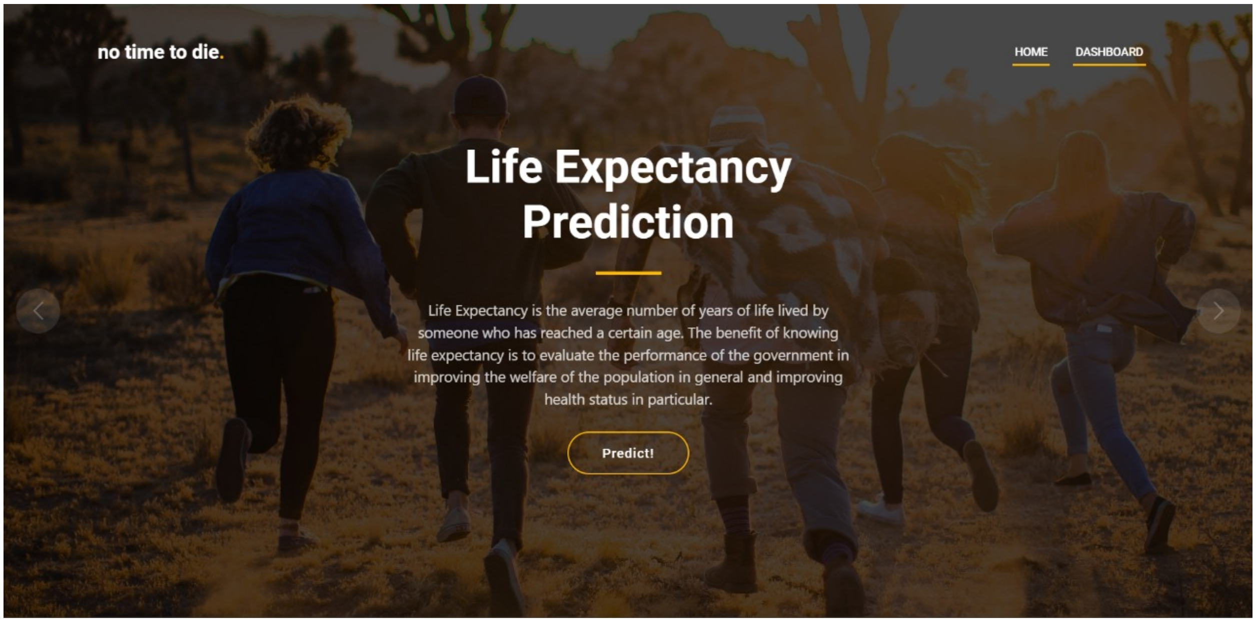
021

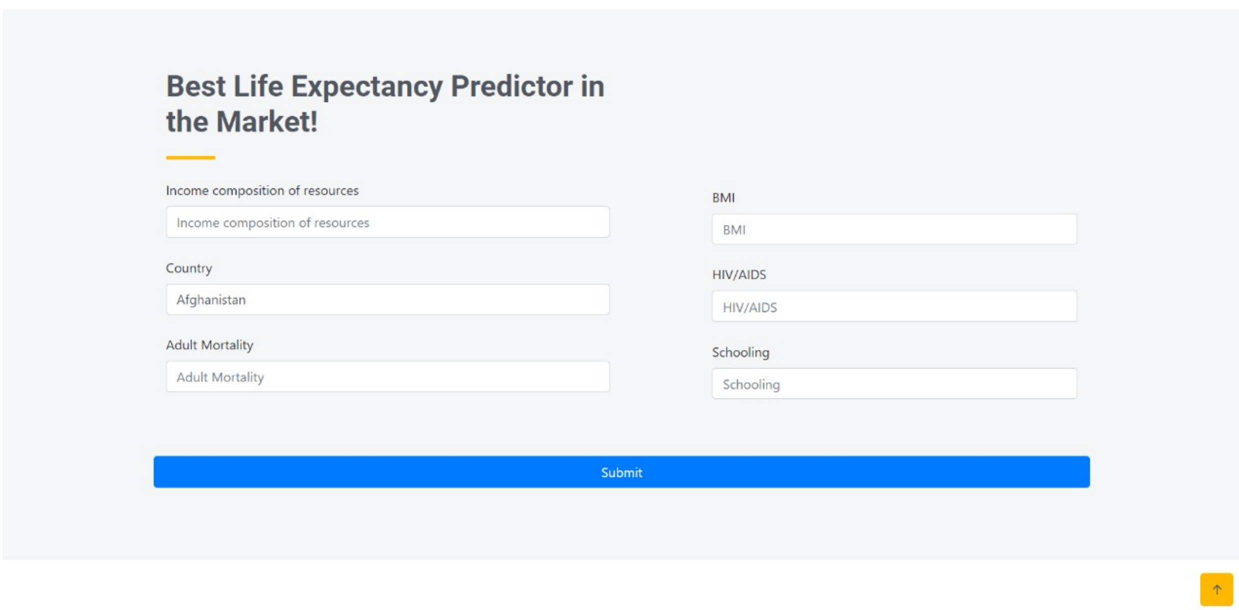
```
model =XGBRegressor()
model.fit(X_train, y_train)
y_pred = model.predict(X_test)
mse = mean_squared_error(y_test, y_pred)
mae = mean_absolute_error(y_test, y_pred)
r2 = r2_score(y_test, y_pred)
print("XGBRegressor")
print("rmse: ",np.sqrt(mse))
print("mse: ",mae)
print("r2 score: ",r2)

```

```
XGBRegressor
rmse:  0.03644841259527988
mse:  0.02355041113892913
r2 score:  0.9601590056228894
```

Final Model

The UI Platform:





Predicted Life Expectancy

We are very delighted to inform you that you only have predicted life expectancy with you
Your Life Expectancy will be:

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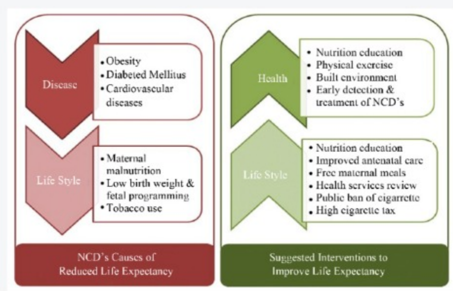
Optimising Life expectancy of a Country

The life expectancy of a country is the average number of years a newborn infant could expect to live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life.



- With appropriate measure and self care, people can improve their expectancy rate.
- An ideal BMI is known to be between 18.5 and 24.9
- There is huge scope for government intervention as loss of years from life expectancy lead to huge opportunity cost to the nation.
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