

The background is a light cream color with various abstract shapes and patterns. In the top left, there's a pink dotted pattern. In the top center, a yellow brushstroke. In the top right, a pink circle and a teal circle with purple lines trailing off to the right. In the bottom left, a pink shape and a yellow brushstroke. In the bottom right, a purple shape with pink diagonal lines.

Happiness Around the World

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IMT 575 | Winter 2023

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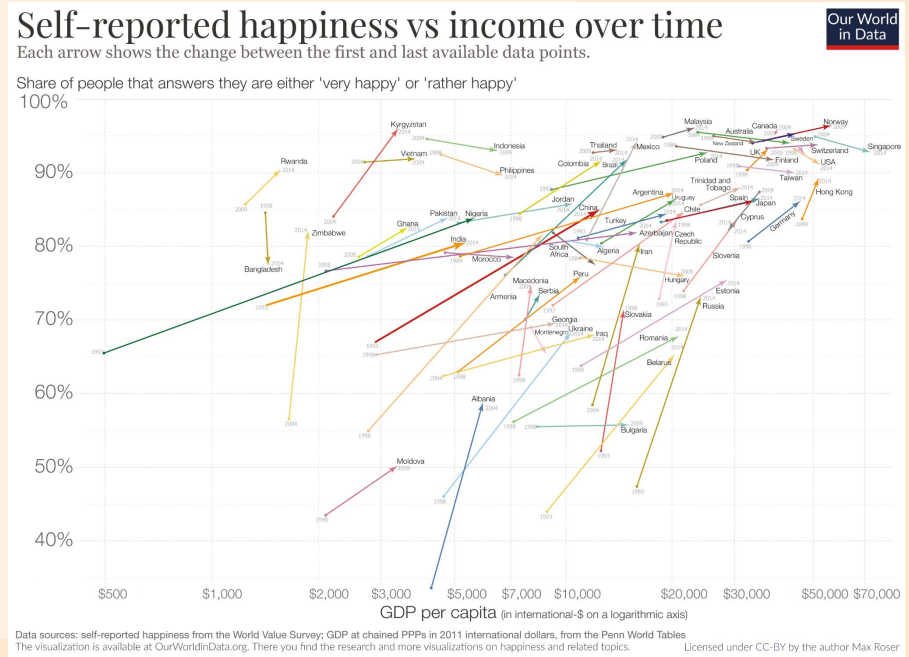
Subject Selection

- 2019 “**World Happiness Report**” dataset by the Sustainable Development Solutions Network
 - Landmark global happiness survey at the United Nations
 - Comprises 155 countries with 11 associated attributes
 - Economy, Family, Life Expectancy, Freedom and Trust, etc.



Relative Work

- 2013 “**Happiness and Life Satisfaction**” Study
 - Highlights the changes of happiness over time, and financial impacts on happiness
- Hopes to differentiate by analyzing the happiness scores by country
- Deeper understanding of variances between cultures or countries





**“Is there a significant factor
that makes one country
happier than others?”**

Project Objectives



Objective 1

To better understand whether nationally represented values impact the happiness score



Objective 2

To understand a factor that significantly increases or decreases in a country's happiness

Analysis Methods

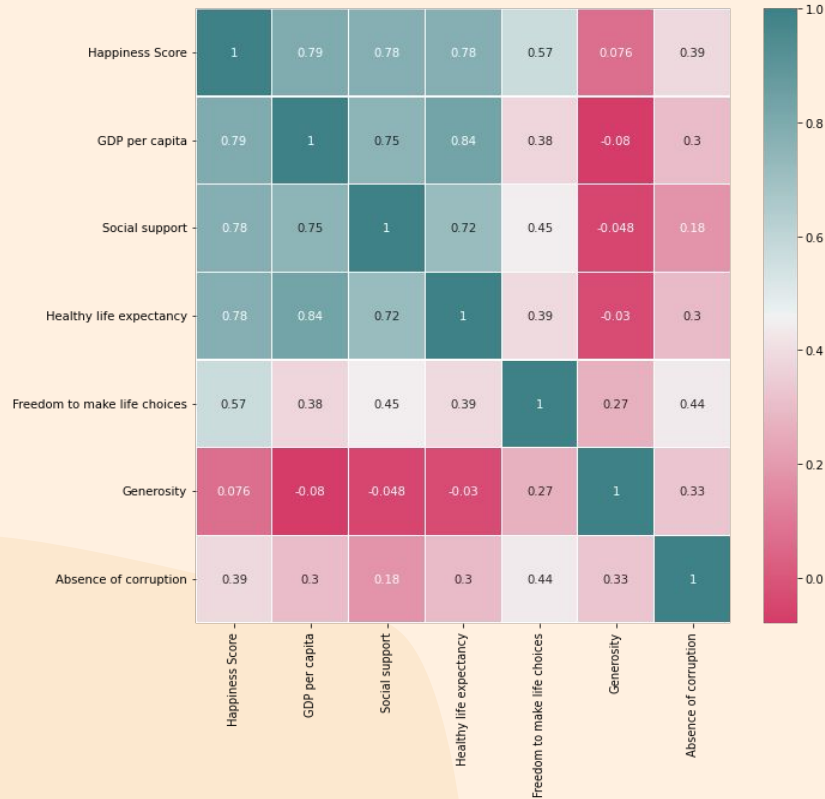
- Leverage data analysis tools such as Colab, and use Python and Tableau
 - Focus on identifying areas of correlation and influence
 - Particularly between objective data and subjective responses





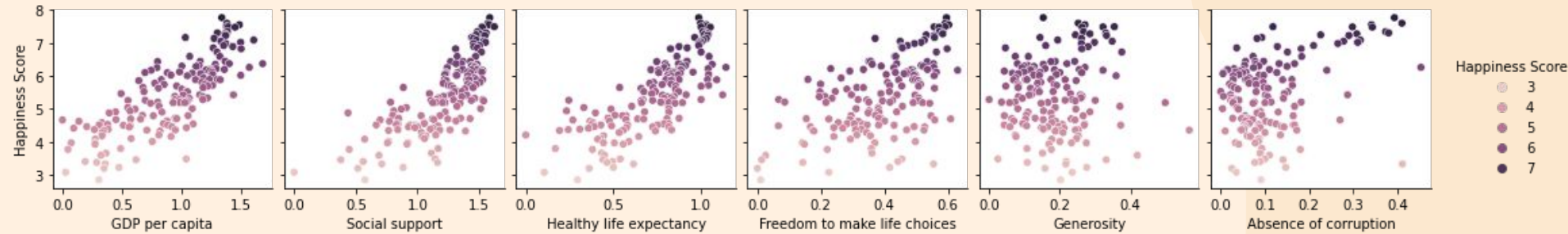
Our Findings

Correlation Matrix



- Strong correlation between several features
- **Green** represents **positive** correlation
 - Gross Domestic Product (GDP)
 - Social Support
 - Healthy Life Expectancy
- **Darker pink** represents **negative** correlation
 - Life Choices
 - Generosity
 - Perceptions of Corruption

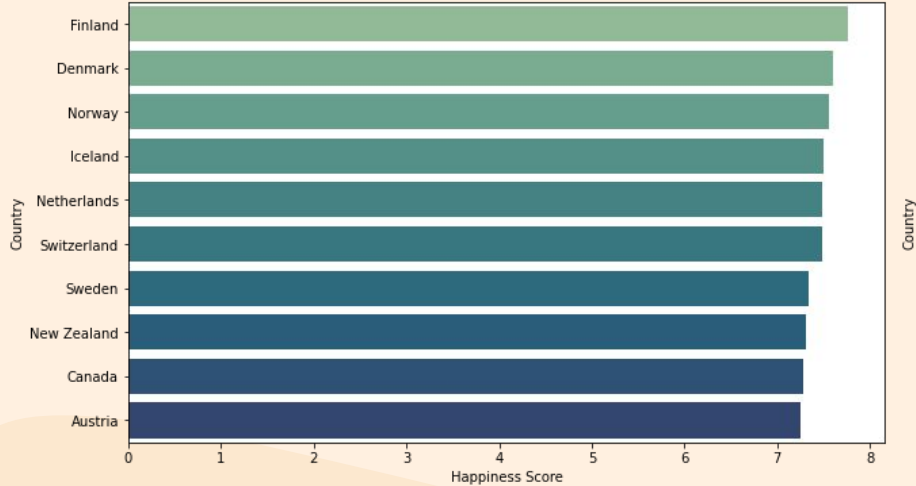
Pair Plot



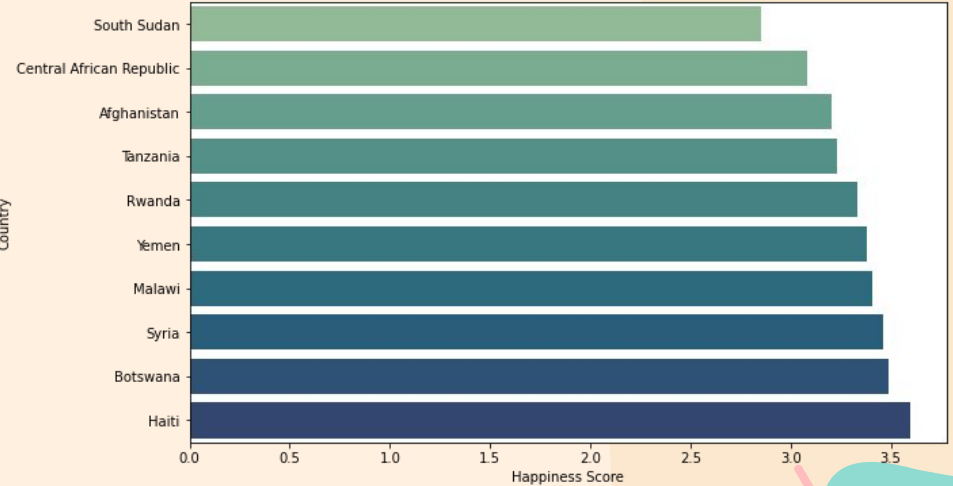
- Countries with **higher** scores tend to exhibit a correspondingly **high** GDP per capita
- Countries with **lower** healthy life expectancies are generally **less** happy
- Countries with the **highest** levels of perceived corruption exhibit **higher** happiness score

Top 10 Happiest and Least Happy Countries

Top 10 Happiest Countries in 2019



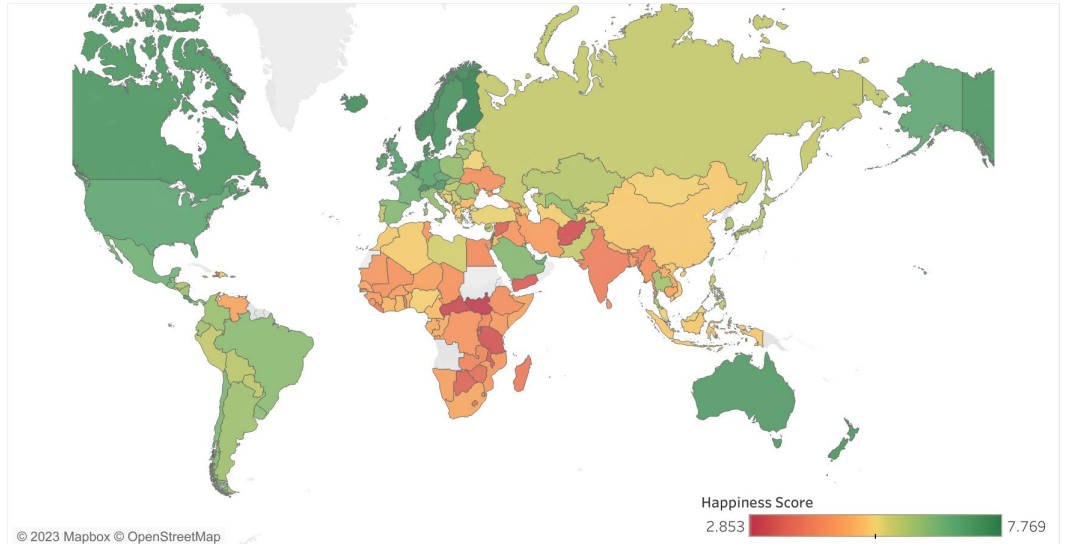
Top 10 Least Happy Countries in 2019



Choropleth Map

- Generally **lower** happiness score:
 - Africa
 - Asia
- Generally **higher** happiness score:
 - North America
 - South America
 - Antarctica
 - Europe
 - Australia

Happiness Score by Countries



Happiness vs. GDP per Capita

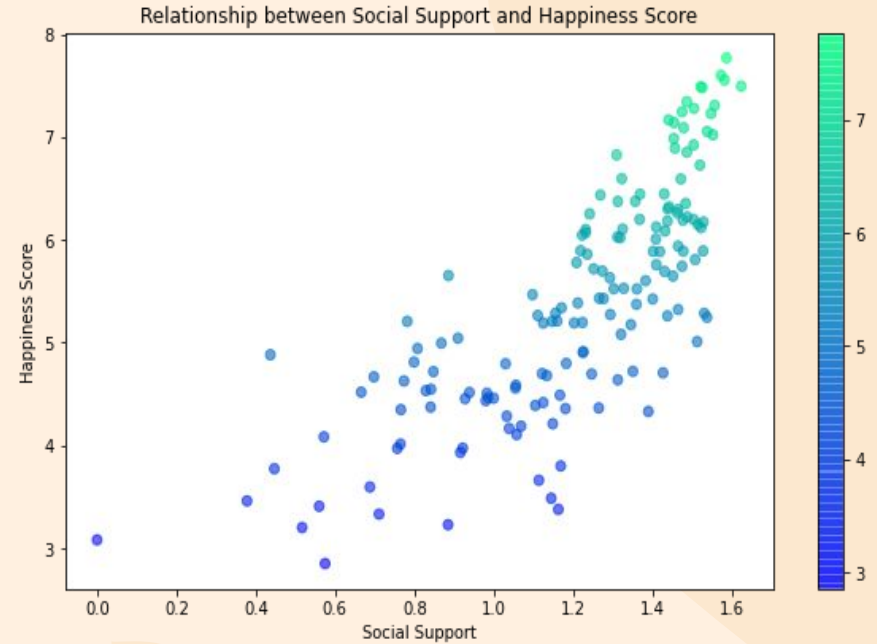
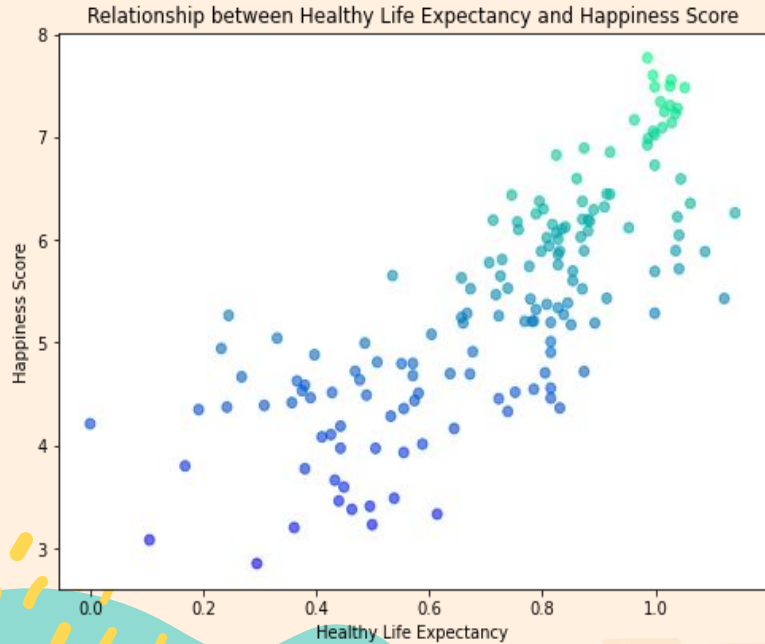
Higher GDP Per Capita

	Country	Happiness Score	GDP per capita	Social support	Healthy life expectancy	Freedom to make life choices	Generosity	Absence of corruption
28	Qatar	6.374	1.684	1.313	0.871	0.555	0.220	0.167
13	Luxembourg	7.090	1.609	1.479	1.012	0.526	0.194	0.316
33	Singapore	6.262	1.572	1.463	1.141	0.556	0.271	0.453
20	United Arab Emirates	6.825	1.503	1.310	0.825	0.598	0.262	0.182
50	Kuwait	6.021	1.500	1.319	0.808	0.493	0.142	0.097

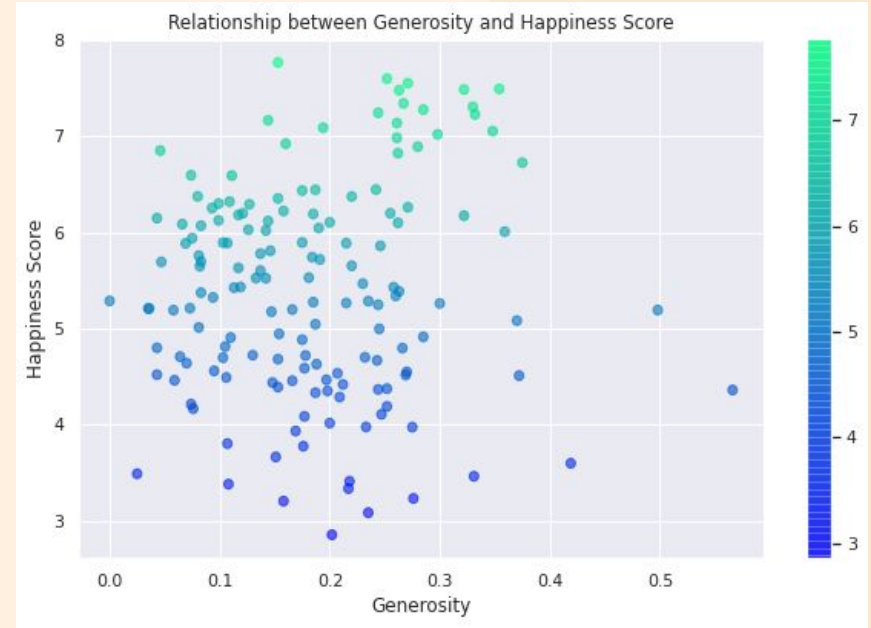
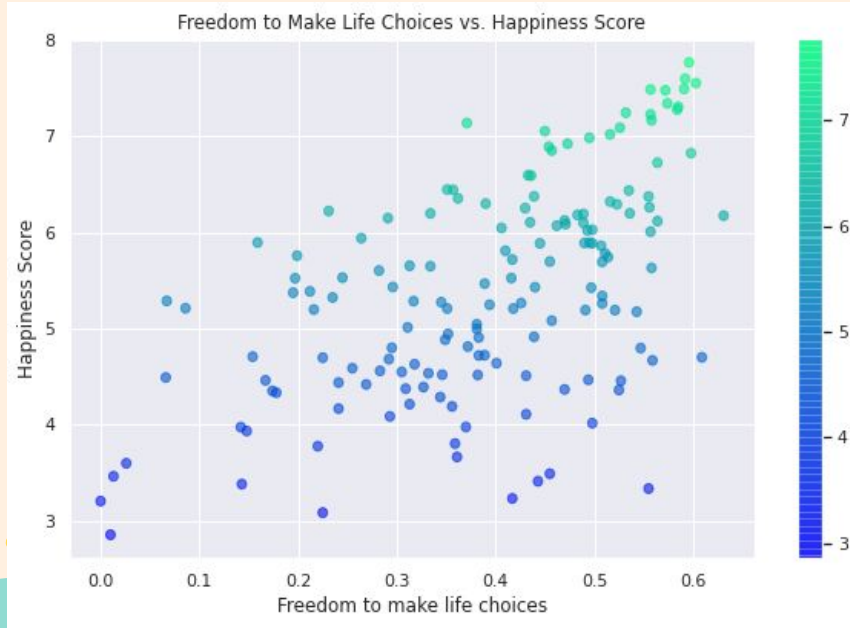
Lower GDP Per Capita

	Country	Happiness Score	GDP per capita	Social support	Healthy life expectancy	Freedom to make life choices	Generosity	Absence of corruption
111	Somalia	4.668	0.000	0.698	0.268	0.559	0.243	0.270
154	Central African Republic	3.083	0.026	0.000	0.105	0.225	0.235	0.035
144	Burundi	3.775	0.046	0.447	0.380	0.220	0.176	0.180
140	Liberia	3.975	0.073	0.922	0.443	0.370	0.233	0.033
126	Congo (Kinshasa)	4.418	0.094	1.125	0.357	0.269	0.212	0.053

Life Expectancy & Social Support



Freedom to Make Life Choices & Generosity



Predictive Models

- Machine Learning Algorithms:
 - Linear Regression
 - Random Forest
 - Decision Tree
- Evaluation Metrics:
 - Mean Absolute Error (MAE)
 - Accuracy Score

```
# Linear Regression
lm = LinearRegression()
lm.fit(X_train, y_train)

lm_pred = lm.predict(X_test)
lm_mae = metrics.mean_absolute_error(y_test, lm_pred)

print('Mean Absolute Error (MAE): ', round(lm_mae, 3))
print('Accuracy Score: ', round(lm.score(X_test, y_test), 3))
```

Mean Absolute Error (MAE): 0.0
Accuracy Score: 1.0

```
# Random Forest
rf = RandomForestRegressor()
rf.fit(X_train, y_train)

rf_pred = rf.predict(X_test)
rf_mae = metrics.mean_absolute_error(y_test, rf_pred)

print('Mean Absolute Error (MAE): ', round(rf_mae, 3))
print('Accuracy Score: ', round(rf.score(X_test, y_test), 3))
```

Mean Absolute Error (MAE): 0.033
Accuracy Score: 0.998

```
# Decision Tree
dt = DecisionTreeRegressor()
dt.fit(X_train, y_train)

dt_pred = dt.predict(X_test)
dt_mae = metrics.mean_absolute_error(y_test, dt_pred)

print('Mean Absolute Error (MAE): ', round(dt_mae, 3))
print('Accuracy Score: ', round(dt.score(X_test, y_test), 3))
```

Mean Absolute Error (MAE): 0.052
Accuracy Score: 0.994

Limitations

Subjective Data

Happiness is a social construct, vary between societies and groups



Term Definition

“Happiness” can be defined in various ways



Not Enough Data

Need additional data over multiple years



Overfitting Data

Potentially remove attributes that are not useful in analysis

Conclusion

- Valuable to understand happiness and the driving causes that improve happiness
- Find ways to improve other countries' happiness by studying countries with high happiness
- United Nations in 2011:
 - Resolution that happiness is a fundamental human goal
 - “Promote and improve the happiness and well-being of all peoples”
- Collaborative effort of public policies and the creation of mutual and symbiotic goal-setting:
 - Creates strong societies that are ultimately resistant to failure

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Thank You for Listening!

