World Happiness Report

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Abstract—**The World Happiness Report is a landmark survey of the state of global happiness .The report continues to gain global recognition as governments, organizations and civil society increasingly use happiness indicators to inform their policy-making decisions.Leading experts across fields – economics, psychology, survey analysis, national statistics, health, public policy and more – describe how measurements of well-being can be used effectively to assess the progress of nations .The reports review the state of happiness in the world today and show how the new science of happiness explains personal and national variations in happiness.**

Index Terms—**component, formatting, style, styling, insert**

I. Problem Statement

The World Happiness Report is a milestone review of the condition of worldwide joy. The report keeps on acquiring worldwide acknowledgment as governments, associations, and common society progressively uses bliss markers to advise their strategy deciding. Driving specialists across fields – financial aspects, brain research, overview examination, public insights, well being, public arrangement, and that's just the beginning – portray how estimations of prosperity can be utilized viably to evaluate the advancement of countries. The reports survey the mindset of satisfaction on the planet today and show how the new study of joy clarifies individual and public varieties in joy.

II. Introduction

The World Happiness Report has been published since 2012, and it ranks 156 countries by how happy their citizens perceive themselves to be. This global data on happiness has the potential to inform policies and decision making on a national level, as well as provide valuable insights to companies looking to improve their culture or possibly solve such questions as, for example, employee retention.

This is an interesting dataset to explore, and an impressive body of work that draws attention to such vital questions as:

what are the main factors in achieving a happier state of mind in today's world, or what countries achieve a better life work balance, or what makes countries like Denmark, Finland, Norway or the Netherlands score consistently high in happiness rankings year after year? Is there anything we can learn from Denmark or the Netherlands when it comes to their happiness outlook?

We live in an age of stark contradictions. The world enjoys technologies of unimaginable sophistication; yet has at least one billion people without enough to eat each day. The world economy is propelled to soaring new heights of productivity through ongoing technological and organizational advance; yet is relentlessly destroying the natural environment in the process. Countries achieve great progress in economic development as conventionally measured; yet along the way succumb to new crises of obesity, smoking, diabetes, depression, and other ills of modern life.

These contradictions would not come as a shock to the greatest sages of humanity, including Aristotle and the Buddha. The sages taught humanity, time and again, that material gain alone will not fulfill our deepest needs. Material life must be harnessed to meet these human needs,most importantly to promote the end of suffering, social justice, and the attainment of happiness. The challenge is real for all parts of the world.

As one key example, the world's economic superpower, the United States, has achieved striking economic and technological progress over the past half century without gains in the self-reported happiness of the citizenry. Instead, uncertainties and anxieties are high, social and economic inequalities have widened considerably, social trust is in decline, and confidence in government is at an all-time low. Perhaps for these reasons, life satisfaction has remained nearly constant during decades of rising Gross National Product (GNP) per capita.

The realities of poverty, anxiety, environmental degradation, and unhappiness in the midst of great plenty should not be regarded as mere curiosities. They require our urgent attention, and especially so at this juncture in human history. For we have

entered a new phase of the world, termed the Anthropocene by the world's Earth system scientists. The Anthropocene is a newly invented term that combines two Greek roots: **"anthropo," for human; and "cene," for new, as in a new geological epoch.**

The Anthropocene is the new epoch in which humanity, through its technological prowess and population of 7 billion, has become the major driver of changes of the Earth's physical systems, including the climate, the carbon cycle, the water cycle, the nitrogen cycle, and biodiversity. The Anthropocene will necessarily reshape our societies. If we continue mindlessly along the current economic trajectory, we risk undermining the Earth's life support systems – food supplies, clean water, and stable climate – necessary for human health and even survival in some places. In years or decades, conditions of life may become dire in several fragile regions of the world. We are already experiencing that deterioration of life support systems in the drylands of the Horn of Africa and parts of Central Asia.

On the other hand, if we act wisely, we can protect the Earth while raising quality of life broadly around the world. We can do this by adopting lifestyles and technologies that improve happiness (or life satisfaction) while reducing human damage to the environment. "Sustainable Development" is the term given to the combination of human well-being, social inclusion, and environmental sustainability. We can say that the quest for happiness is intimately linked to the quest for sustainable development.

A. What is Dystopia?

Dystopia is an imaginary country that has the world's least-happy people. The purpose in establishing Dystopia is to have a benchmark against which all countries can be favorably compared (no country performs more poorly than Dystopia) in terms of each of the six key variables, thus allowing each sub-bar to be of positive width. The lowest scores observed for the six key variables, therefore, characterize Dystopia. Since life would be very unpleasant in a country with the world's lowest incomes, lowest life expectancy, lowest generosity, most corruption, least freedom and least social support, it is referred to as "Dystopia," in contrast to Utopia.

B. What are the residuals?

The residuals, or unexplained components, differ for each country, reflecting the extent to which the six variables either over- or under-explain average 2014-2016 life evaluations. These residuals have an average value of approximately zero over the whole set of countries. Figure 2.2 shows the average residual for each country when the equation in Table 2.1 is applied to average 2014- 2016 data for the six variables in that country. We combine these residuals with the estimate for life evaluations in Dystopia so that the combined bar will always have positive values. As can be seen in Figure 2.2, although some life evaluation residuals are quite large, occasionally exceeding one point on the scale from 0 to 10, they are always much smaller than the calculated value in Dystopia, where the average life is rated at 1.85 on the 0 to 10 scale.

C. What do the columns succeeding the Happiness Score(like Family, Generosity, etc.) describe?

The following columns: GDP per Capita, Family, Life Expectancy, Freedom, Generosity, Trust Government Corruption describe the extent to which these factors contribute in evaluating the happiness in each country. The Dystopia Residual metric actually is the Dystopia Happiness Score(1.85) + the Residual value or the unexplained value for each country as stated in the previous answer.

If you add all these factors up, you get the happiness score so it might be un-reliable to model them to predict Happiness Scores.

D. Gross National Happiness

The GNH Index formulae can also be written GNH = Hh (Hn x As), where Hh is the percentage of happy people [Hh = (1=H)] and As is the percentage of dimensions in which the average not-yet-happy person enjoys sufficiency [As = 1-An].29 This way of presenting the same results focuses on happiness and suffi ciency; the first presentation focuses on the not-yet-happy people and their insufficiencies. Both formulae create the same number, and both are useful in explaining the GNH Index. The GNH Index can be decomposed by population sub-groups and broken down by indicators.30

So returning to our example, we take the following three numbers: The percentage of happy people we call Hh This is 43The percentage of not-yet-happy people Hn This is 57The percentage of domains in which not-yet-happy people enjoy sufficiency we call An This is 54They are then combined into a final GNH formula as follows: **GNH=(Hh+HnAs)**= 57Now, to identify the happiness gradient, apply the two additional cutoffs – 50identification of the two additional groups.

III. DATASET

- The happiness scores and rankings use data from the Gallup World Poll . Gallup World Poll: In 2005, Gallup began its World Poll, which continually surveys citizens in 160 countries, representing more than
- The columns following the happiness score estimate the extent to which each of six factors – economic production, social support, life expectancy, freedom, absence of corruption, and generosity – contribute to making life evaluations higher in each country than they are in Dystopia, a hypothetical country that has values equal to the world's lowest national averages for each of the six factors.
1) Ladder score: Happiness score or subjective well-being. This is the national average response to the question of life evaluations.
2) Logged GDP per capita: The GDP-per-capita time series using country specific forecasts of real GDP growth.
3) Social support: Social support refers to assistance or support provided by members of social networks to an individual.

4) Healthy life expectancy: Healthy life expectancy is the average life in good health - that is to say without irreversible limitation of activity in daily life or incapacities - of a fictitious generation subject to the conditions of mortality and morbidity prevailing that year.

5) Freedom to make life choices: Freedom to make life choices is the national average of binary responses to the GWP question 'Are you satisfied or dissatisfied with your freedom to choose what you do with your life?' ... It is defined as the average of laughter and enjoyment for other waves where the happiness question was not asked

6) Generosity: Generosity is the residual of regressing national average of response to the GWP: 'Have you donated money to a charity in the past month?' on GDP per capita

7) Perceptions of corruption: The measure is the national average of the survey responses to two questions in the GWP: 'Is corruption widespread throughout the government or not' and 'Is corruption widespread within business or not?"

8) Ladder score in Dystopia: It has values equal to the world's lowest national averages. Dystopia as a benchmark against which to compare contributions from each of the six factors. Dystopia is an imaginary country that has the world's least-happy people... Since life would be very unpleasant in a country with the world's lowest incomes, lowest life expectancy, lowest generosity, most corruption, least freedom, and least social support, it is referred to as 'Dystopia.' in contrast to Utopia.

IV. DATA ANALYSIS

We merged certain dataframes and formed a single dataframe for the analysis. There were certain columns with missing values. We filled the missing values with the value accordingly(mean/zero) as we can not assume the value for a certain attribute as it is not inter-related between any countries.

Next, to deal with outliers we specified the Inter-Quartile Range and considered only those data points which lie within the range. To find the correlation between the features, we plot a correlation heatmap.

From the correlation heatmap we can determine how various features are correlated to the happiness score of the country and how various features are correlated to each other.
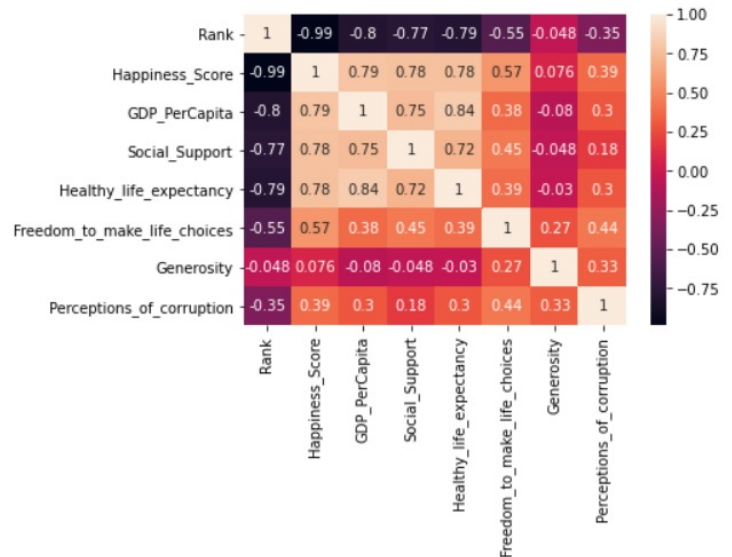

Fig2. Correlation Heatmap

1) Correlation between features and happiness score
The objectives of this section were to analyse the following:
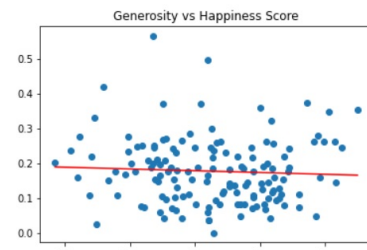
- Generosity vs Happiness Score :

Fig1. Generosity vs Happiness Score

From the above scatter plot, we can conclude that generosity is weakly correlated with the happiness score
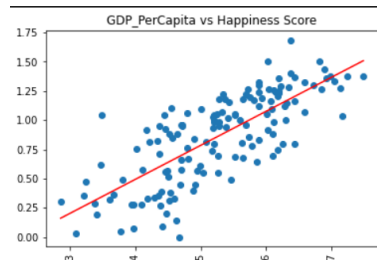
- GDP PerCapita vs Happiness Score :

Fig3. GDP PerCapita vs Happiness Score

From the above scatter plot, we can conclude that GDP Per Capita of a country is strongly correlated with the happiness score of the country

- Freedom to make life choices vs Happiness Score :

Fig4. fred vs Happiness Score

From the above scatter plot, we can conclude that Freedom to make life choices is strongly correlated with the happiness score of the country
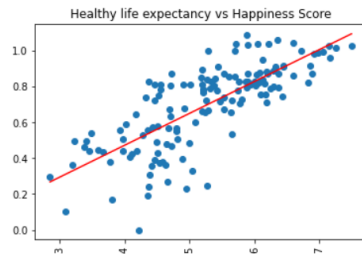
- Healthy Life Expectancy vs Happiness Score :

Fig5. Healthy Life Expectancy vs Happiness Score

From the above scatter plot, we can conclude that Healthy Life Expectancy of a country is strongly correlated with the happiness score of the country

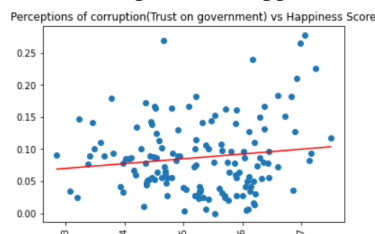- Perceptions of corruption vs Happiness Score :

Fig6. Perceptions of corruption vs Happiness Score

From the above scatter plot, we can conclude that Perceptions of corruption by the people of that country is weakly correlated with the happiness score of the country

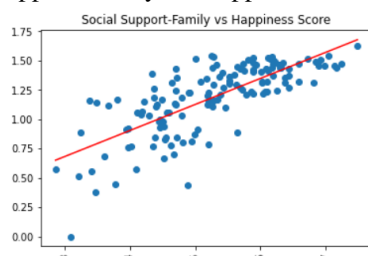- Social Support-Family vs Happiness Score :

Fig7. Social Support-Family vs Happiness Score

From the above scatter plot, we can conclude that Social Support of a country is strongly correlated with the happiness score of the country

2) Correlation between features:
   From the code, we can conclude the following relation between features:

- Freedom to make life choices is strongly correlated to GDP of the country
- Generosity is weakly correlated to happiness index i.e, happiness is not majorly effected by the amount of corruption by the local government or by the trust of the people on the government
- Social Support and the GDP PerCapita of the country are positively correlated
- Freedom to make life choices is strongly correlated to GDP Percapita unlike Perception of Corruption by the citizens with respect to the ruling government in their country.
- Social support is strongly correlated with Healthy Life Expectancy of the citizens and their freedom to make life choices but is not likely effected by Perception of Corruption in the country
- The Healthy life Expectancy of a person living in a country seems to be strongly correlated with the Freedom to make life choices and is not effected by the Perception of Corruption.
- Generosity is also negatively correlated with the Healthy Life Expectancy
- Freedom to Make life choices by a citizen of any country is positively correlated with generosity and perception of Corruption.

3) Some irregularities in the dataset:

- From scatter plot we can conclude that even though country like Guatemala has low GDP and life expectancy , people are happy because of high generosity and low corruption
- By observing graph and table, we can conclude that there are countries like Botswana,Egypt which has comparatively higher GDP per capita, but still at the bottom of the happiness score list because it has lower Trust on government and low generosity

4) Variation of factors over the years:
   We have combined datasets from the years 2015 to 2019, we haven't considered the years 2020 and 2021 as these years were hit by covid 19 and played huge role on the factors and happiness score of the country.
   We have grouped together the countries into their regions. We have analysed how factors variate through the years with the help bar plot
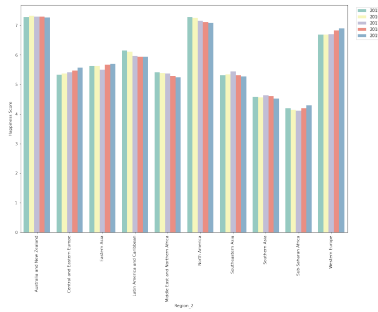
- Happiness Score:

Fig8. Happiness Score
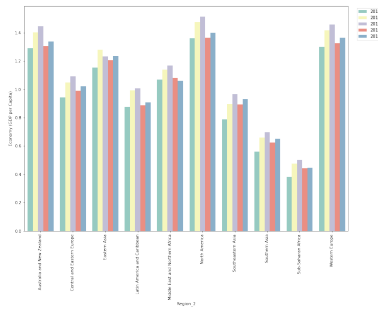
- GDP PerCapita:

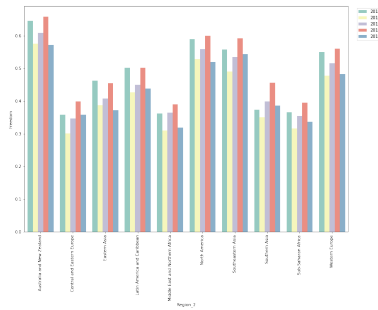Fig9. GDP PerCapita

- Freedom to make life choices:

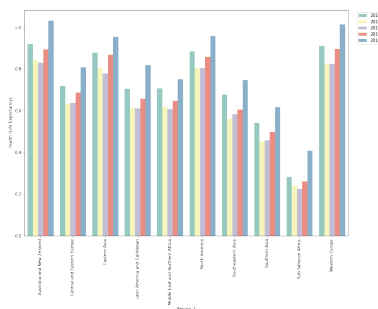Fig10. Freedom to make life choices

- Healthy Life Expectancy:

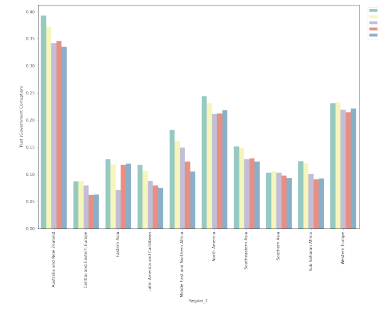Fig11. Healthy Life Expectancy

- Perception of Government:

Fig12. Perception of Government

V. MACHINE LEARNING MODELS

We have created and compared two Machine Learning Models for this report. We have trained our model on the features-GDP PerCapita, Healthy Life Expectancy, Generosity, Freedom to make life choices, Social Support and Perceptions of corruption to predict the Happiness Score

- Multiple Linear Regression:
  Using MLR, we got test score of 0.82 and RMSE of 0.417

	Actual value	Predicted value
144	3.775	3.299172
30	6.321	6.172192
94	5.082	5.477397
109	4.696	4.879165
68	5.631	5.514041

```
Training set score: 0.72
Test set score: 0.82
```

```
Mean Absolute Error: 0.3426333499523245
Mean Square Error: 0.1745270395058463
Root Mean Square Error: 0.4177643348897154
```

- XGB Regressor:
  Using XGB Regressor, we got a test score of 0.76 and RMSE value of 0.477

```
Training set score: 0.91
Test set score: 0.76
Mean Absolute Error: 0.38981425269444775
Mean Square Error: 0.22787948985214937
RMSE :  0.477367
```

Since the errors of XGBoost ¿ errors of MLR and test score of MLR ¿ test score of XGBoost , we can conclude that MLR is a better machine learning model than XGBoost to predict the happiness score of a country.

VI. WORDCLOUD

The bigger and bolder the word appears, the more often it's mentioned within a given text and the more important it is in the combined dataset

WordCloud

VII. Acknowledgment

We would like to acknowledge our Data Analytics Course Professor Jyothi R for encouraging and providing us with this opportunity to get a hands-on experience in the field, and guiding us along the way. We would also like to acknowledge our assistant professors who have prepared the course content and also the teaching assistants who have been constantly providing resources to practice the learnt concepts..

References

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