

World Happiness Index Analysis

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Abstract—The world is a rapidly changing place. Among the fastest changing aspects are those relating to how people communicate and interact with each other. Finding that each country's life circumstances, including the social context and political institutions were such important sources to better understand people's living environment among different regions. World happiness index is one of the most famous indicators for demonstrating how people in different countries satisfy their living circumstances. From analyzing the world happiness index, we are able to know which country's citizens are most satisfied with their society and environment, which citizens think their country has the most severe corruption, and how people's perspective on happiness changed during those years. In 2020, COVID-19 made a serious influence on the world. For countries, their economics is affected by the decrease of export and traveling; for society, people's health, freedom and mood are largely affected by disease and fear. To find out how much did COVID-19 influence on people's happiness in 2020 and what part of the social environment is influenced in this year, we analyzed the world happiness index and other related data using graphs and models.

I. INTRODUCTION

THE purpose of the project is to identify which sections of the world occupy the extremes of the happiness index. Once the regions are identified for the happiest and least happy parts of the world the key aspects differentiating the populations from the rest of the world will be identified. Highlighting the variables that have the highest correlation to the happiness index will allow authorities to focus on improving these areas to maximize their countries overall well-being. Finally, the project will observe which regions have changed their happiness levels the most and describe if there is a pattern for drastically improving or decreasing the happiness index. For example, most recently COVID-19 has changed a lot in the aspects of health, freedom, and economics in the whole world from 2019 to 2020, so searching for a worldwide impact during this time period could give an indication the pandemic has had on the happiness of the world.

We searched some previous works that related to people's perception on happiness, and we found that there are studies about factors like smoking that influence people's life. We selected some published data sets from Gallup and The Global Database of Events, Language and Tone for analyzing our problems about world happiness. Then, we made some graphs and tried different models for finding the correlation of happiness and the social factors. There are some challenges when we are looking for the connection between world happiness, the Goldstein score and the tone of the media, so our models are based on the data sets from Gallup. We got many surprised findings from this study.

II. PREVIOUS WORK

The World Happiness Report has publicly available data from 2015 until 2020. During this time period it has garnered

attention for studying the factors impacting human happiness. In July of 2018 J.E. Drehmer published an article analyzing the relationship between tobacco smoking and perceived happiness [1]. Due to the strong difference in smoking habits between women and men, sex was also analyzed alongside tobacco smoking for determining the affect of smoking on happiness [1]. Tobacco use data was obtained from the World Health Organization for 2015 and 2016 World Happiness Report data was used for approximating happiness [1]. The results found tobacco smoking and male happiness are inversely correlated with a significant p -value of 0.03 [1]. However, for females the study found smoking tobacco and happiness were directly correlated with a very significant p -value of 0.00 [1]. Since the results indicated different results for the sexes they were compared to determine if there is a statistically significant difference between them [1]. The initial results were again supported as it was found that there is a statistically significant difference between the correlations with a p -value of 0.00 [1]. The results of the study signify that male happiness increases as smoking habits decreased but females experienced increased happiness as their smoking habits increased. To understand if these findings were only due to the measure of happiness, Drehmer then checked the correlation between the Positive Experience Index from a 2015 Gallop poll. The new poll agreed with the results that less smoking correlates with increased happiness with a statistical significance and the results for females showed a slight negative correlation between smoking and happiness [1]. Even though the new results contradicted the original findings, the correlation was not statistically significant with a p -value of 0.75. There appears to be strong evidence suggesting male tobacco smoking habits are indirectly related to happiness, however, females smoking habits indicated increased happiness with much less significance. Further study is needed for more factors leading to smoking habits but the preliminary results show reducing the population levels of tobacco smoking will increase their perceived happiness.

A different study by Chris Tofallis in June of 2020 proposed the use of a new net happiness model. Currently, the World Happiness Report conducts surveys and other methods to collect and score several different categories. Then the final score for happiness is just the sum of each of the categories. This is so that each of the categories are independent from each other for the final score. Tofallis proposes a method of multiplying each of the categories with one another [2]. Creating a stronger dependency appears anecdotally logical. A population that is doing extremely well in every category except one will have a lower score than a population that does above average in every category. Since the "all but one" population has a clear focus point of their inadequacy the population will be less forgiving about a country that can accomplish so much but still

have a single point of failure. The takeaway from this model is populations should work on the lowest category score for finding the greatest area of improvement. Tofallis calculated a coefficient for the final product and exponent for each variable so there was a diminishing return as each individual variable increased [2]. To compare the linear model and multiplicative model Tofallis used the R^2 value as an indicator for how well the model explains the variation in happiness scores [2]. The linear model produces an R^2 of 77% vs the multiplicative model which produced an R^2 of 82.4%, improving the original model by 11% [2]. One observation of the variable exponents is the impact of GDP. GDP had the lowest exponential factor meaning even though it is significant, it will quickly have less impact on the final score as higher levels are attained [2]. Population financials are not as significant as they may initially appear to be.

III. DATA INFORMATION

For analyzing the factors that influence world happiness, several data sets were found on Kaggle [3]. Each data set shows the ranking of the happiness score of each country and indicates those countries' GDP per capita, social support, freedom score, generosity score and some other features that may influence people's happiness. The happiness reports from 2015-2019 were available for analysis. The happiness score and ranking used data from Gallup World Poll [4]. "Gallup World Poll is the poll that tracks the most important issues worldwide, such as food access, employment, leadership performance, and well-being. Gallup uses telephone surveys in countries where telephone coverage represents at least 80 percent of the population or is the customary survey methodology" [4]. The poll asked each respondent to select a level from 0-10 as the score that they estimate their happiness to be and give a score on economic production, freedom, generosity... for how much they think this factor contributes to their happiness. All of the data in each category is numerical. The data of world happiness was released in March each year, so each year's report is actually the condition of last year. For example, the report of 2021 mostly reflects the happiness score in 2020.

There are also scores other than the consistent yearly factors that were considered for world happiness such as family and dystopia. For example in 2015, each country has an evaluation on "Dystopia Residual", which is an "is an imaginary country that has the world's least-happy people" [5]. Dystopia is the opposite word of Utopia. However, not all the reports contain the score for dystopia. There are also some factors like "Whisker.high" and "Whisker.low" in 2017 that do not have corresponding variables in 2018. Thus, in the analyzing steps the inconsistent variables will not be considered as factors.

The research subjects and contents for world happiness report are not exactly the same in each year, so there are some differences between the countries and the variables of each table. For example, there were 156 countries in the table of 2019, and 153 countries in the table of 2020. The variables for each table are also not consistent, especially the difference of names for one feature. For example, in 2015, happiness score

is written as "Happiness Score", and in 2019 it is written as "Score", while in 2020, it is written as "Ladder score". Also, there are different names for health scores, freedom scores and other features. What's more, some tables contain a few more variables than others, like 2015 has the score for family, but in 2020 happiness score does not count family. Instead, it has "upperwhisker" and "lowerwhisker" as features.

The Global Database of Events, Language and Tone (GDELT) is an open source database available through Amazon Web Services that tracks events that impact the stability of every country around the world [6], [7]. Since 1979 the database has tracked more than 500 million world events [6]. The event record includes a vast array of information such as the type of event, the countries involved, the main people involved, and the Goldenstein scale. There are 267 significant events types recorded, for example protests, each of which carries a weighted Goldenstein scale value [8]. These events are placed on a scale from -10 to +10 that quantifies how intense the impact could have to help or hurt the stability of the country [8]. Some of the most extreme examples are a military attack worth -10 to the stability of the country or the acquisition of economic aid, worth +7.4 [8]. Although this number provides a baseline of the significance of the event, there is no variable for the size of the event [9]. For example, a protest of 10 or 10 thousand participants is worth -2.4 despite the large differential in participants.

To supplement the Goldstein scale, GDELT also tracks print and web media in over 100 languages from every corner of the world [6]. Starting in 2015 the database has identified approximately 900 million media items related to the events collected. This dataset collects information on the event discussed, the company publishing the article, the direct link to the article if available, the length of discussion relevant to the event, and the tone of the writing towards the event. This allows incredible insight into the perception of the event. If a protest occurs but has a neutral or insignificant tone, the event was most likely minor or had a low impact. On the other hand if the protest has a strong tone in the media, the event could be more impactful for the direction of the country or world. The tone is scored on a -100 to +100 scale from extremely negative to extremely positive [9]. Since each media mention is also recorded individually, the number of mentions could also lead to insight into how important the event was to the population. The expectation is an event that triggers increased media mentions along with a strong tone will be the events with the highest impact.

IV. DATA SUMMARY AND CLEANING

In order to compare the happiness score and the factors for different years, we have to make the variables consistent. First, we have to make sure that all the country names are written in the same style so it is easy for selecting and filtering in further steps. For example, some tables use "Trinidad and Tobago", and the others use "Trinidad & Tobago". We choose "Trinidad and Tobago" for all the tables instead of "Trinidad & Tobago" because we do not want any symbols like "&" in the variables.

First, the country column from each table was copied and pasted into a new file for comparison. Disputable country

Turkmenistan	Paraguay	Paraguay	Libya	Serbia	Moldova
Mauritius	Romania	Hong Kong S.A.R., China	Philippines	Moldova	Tajikistan
Hong Kong	Estonia	Philippines	Honduras	Libya	Montenegro
Estonia	Jamaica	Serbia	Belarus	Montenegro	Russia
Indonesia	Croatia	Jordan	Turkey	Tajikistan	Kyrgyzstan
Vietnam	Hong Kong	Hungary	Pakistan	Croatia	Belarus
Turkey	Somalia	Jamaica	Hong Kong	Hong Kong	North Cyprus
Kyrgyzstan	Kosovo	Croatia	Portugal	Dominican Republic	Greece
Nigeria	turkey	Kosovo	Serbia	Bosnia and Herzegovina	Hong Kong S.A.R., of China

TABLE I

IN THIS CASE, SOME DATA SETS USE "HONG KONG" WHILE OTHERS USE "HONG KONG S.A.R. OF CHINA. ALL WILL BE DENOTED AS "HONG KONG" FOR THIS ANALYSIS

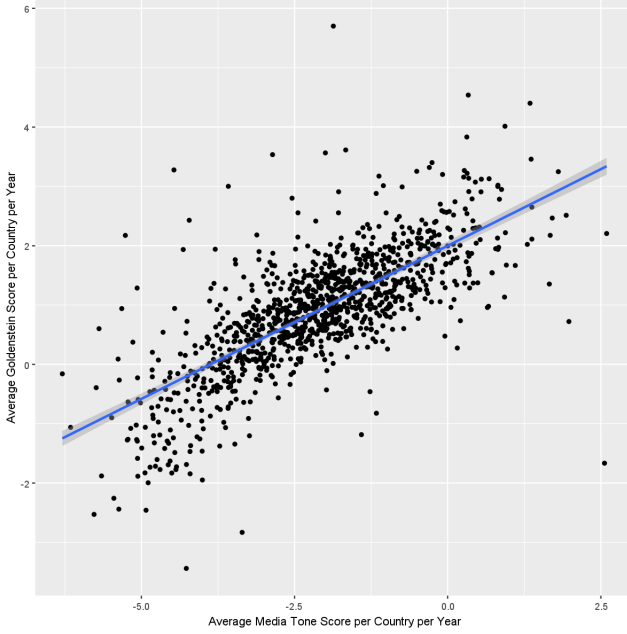


Fig. 1. Goldenstein Score vs Media Tone Score

names were checked and revised directly in Excel. Then, python was used to contrast the set of names in each table and delete countries that are not researched for all 6 years. Finally, 146 countries remain that are useful. For the features concise format was used naming, like changing "Healthy life expectancy" to "Health", "Freedom to make life choices" to "Freedom". There are no null elements in the tables. After deleting the unnecessary columns, six factors remained that will be used for further analysis, which are "GDP", "Health", "Social support", "Freedom", "Generosity", and "Corruption". Adding the basic variables "Country", "Happiness Score", and "Happiness Rank", we have 9 columns and 146 rows for each table.

Some original tables have standard errors as the variables while the others are not. We don't know how the data was calculated, so we cannot directly use those data, but we can calculate mean and standard deviation by ourselves for visualization and further analysis.

In order to study the relationship between world happiness, the Goldstein score, and the tone of the media, the yearly average Goldstein score and tone score of each country will be used to evaluate the connection. Since the open source

data is only available through the end of 2019, there are 1113 data points for both the Goldstein and media tone scores representing the average score for each country for each of the 5 years. The overall average Goldstein score is approximately 0.898, which indicates that the world as a whole is generally stable as well as the standard deviation of 1.02, showing a low variance in the stability of different countries. The 95% confidence interval for the mean of the Goldstein score is from 0.838 to 0.958 indicating that there is a strong degree of confidence the average score is greater than 0, supporting both initial assumptions. The overall distribution appears to be normally distributed albeit with a low variance.

The average tone of the media score is -2.13 indicating that despite the strong sense of stability from the Goldstein score, the media tends to portray these events negatively. The standard deviation is 1.44, indicating there is a larger discrepancy between the portrayal of world events than compared to the Goldstein scale. The 95% confidence interval for the media average ranges from -2.13 to -2.05 validating that the media tends to portray events with a higher negativity than the Goldstein scale. The tone averages also resemble a normal distribution with an increased variance, fattening the bell curve. Using the Goldstein averages to predict the tone of the media using a linear model produces a slope of 1.03 and an intercept of -3.05 each of which having a p -value of less than 2×10^{-16} . The slope shows a near direct relationship between the change in Goldstein average and change in the tone of the media. The close link compliments each other pushing the idea that both are good scales for judging the impact of an event. However, the extreme intercept demonstrates a strong digression between the Goldstein and media tone. When the Goldstein scale predicts an event to have a negligible impact on the stability of a country, the media portrays the event negatively. This offset is significant enough that despite an overwhelming 84% of the events scored positively on the Goldstein scale but only 7.3% scored positively in the media.

A brief analysis comparing the Goldstein scale for world events to average yearly world happiness reveals there is a 0.31 to 1 relationship between the scale and happiness. The connection produces a statistically significant p -value of 4.37×10^{-10} strongly establishing the relationship. However, the trend also has a very low R^2 value of 0.054. So even though there is a statistically significant trend between the Goldstein scale and world happiness scores, very little of the variation in world happiness is explained by the Goldstein

Country	R2020	Overall Rank	Compare Rank
Benin	86	136	50
Guinea	102	140	38
Kosovo	35	66	31
Niger	103	134	31
Congo (Brazzaville)	88	114	26
Liberia	124	149	25
Bosnia and Herzegovina	69	93	24
Ivory Coast	85	107	22
Philippines	52	71	19
Slovenia	33	51	18

TABLE II
COUNTRIES

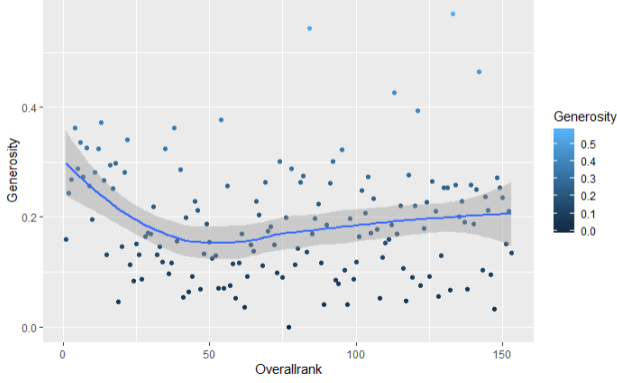


Fig. 2. Generosity vs Overall Rank

scale. Similarly, using the media tone scores to compare the impact of media on world happiness produces a slope of 0.198 with a p-value of 2.64×10^{-8} . Again, even though the trend is statistically significant the model accounts for very little of the variation due to a low R^2 value of 0.043.

V. DATA ANALYSIS

The R programming language was used for initial data analysis. First, is to find the relationship between the 6 variables and their overall rank. A linear model was used to represent the relationship. The result is : there are 5 variables that have a negative linear relationship between ranking, except the “Generosity” graph shown below. Since this variable is different than the others, more analysis will be conducted in the future.

Analysis was also used to find which country improved the most on the happiness index in the past few years.

The initial hypothesis is these countries are not significantly affected COVID-19. Take Benin (Benin, officially the Republic of Benin and formerly Dahomey, is a country in West Africa) as an example. Benin has a very small number of COVID-19 patients compared to other countries around the world. There are only 5434 cases in Benin before February 28th, 2021. The rest of the countries are listed in the graph. All these countries have not faced a strong impact from COVID-19.

VI. GENEROSITY

Attribute Generosity is different because there isn’t a linear relationship between Generosity and Overall rank. However

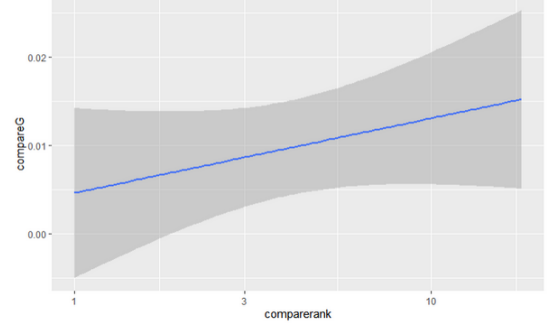


Fig. 3. Change in Generosity vs Change in Rank

other 5 attributes have positive linear relationships with ranks. Even though there is no strict evidence to prove, we still hypothesis that high generosity can improve people’s happiness.

So we decided to use R to do some data cleaning and visualization and try to find a relationship between generosity and Ranks. After several tries, we got the result. We join two tables which are close years, for example 2019 and 2020. And make two new variables called “comparerank” and “compareG”. “comparerank” is simply the new year rank - old year rank. And “compareG” is the new year Generosity - old year Generosity. Then we found there is a positive linear relation between them. And these result can prove our hypothesis that high generosity improve people’s happiness.

VII. MODEL PROPOSAL

Data visualization will be used on the data sets to see the trends of people’s happiness in the last 5 years and their thoughts towards each social factor. Further investigation into why the variable “Generosity” is different from others since the relationship is not linear. he impact of the factors influence happiness, so the countries’ happiness can be predicted through their social situation and development in further years. To achieve this goal, the data will be split into training and testing sets, and try different models like logistic regression and random forest because the data is supervised and numerical.

Another focus will be on 2019 and 2020 data to determine if COVID-19 impacted the happiness index significantly. Identifying a single factor that improves it’s ranking significantly which might not be affected by COVID-19. Next step is to find some countries that have a lower ranking than before and find

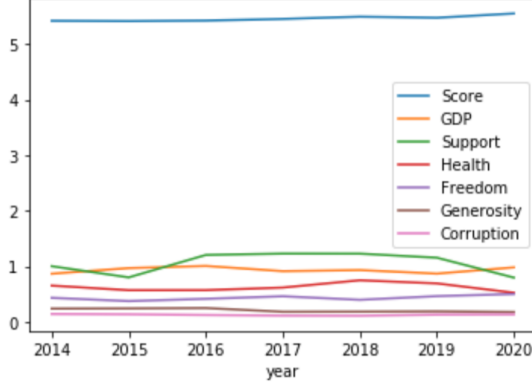


Fig. 4. Average happiness score and social factors in 2014 to 2020 in the whole world.

if there is a relationship between their rank and COVID-19 cases.

A. Linear Regression

In our hypothesis, COVID-19 will slow down the increase of GDP or even make a negative impact for most of the countries, and it will also cause the decrease in the measurement in health, freedom, and social support.

For testing this hypothesis, we made a linear regression model based on the world happiness score and social factors scores during 2015-2020 to find out how does the environment changes caused by COVID-19 effect on people's perspective to their society and happiness.

First, we make an average of the scores of happiness and all the factors for all the countries in each year, and make a linear graph for the data of 2014-2019 to show the trend of the people's perspective towards the social environment in the whole world through years and predict how much will be the world happiness score and factors scores in 2020. Then we are going to find the difference between our predicted score and the true score for 2020. In the observation, most of the measurement scores do not have any remarkable changes during 2014-2019. The average happiness score was kept increasing in the last few years, and it is predicted to be higher than 5.5 in 2020. The true average happiness score of 2020 is 5.55. It seems that COVID-19 did not influence people's happiness. The social support score in the last 3 years was approximately 1.22, but in 2020 it decreased to 0.797. This indicates a large change of people's idea for support. The score of health was the highest in 2018, but it kept decreasing then. In the previous 5 years, people's perceptions of corruption had continued decreasing by years. It is predicted to be about 0.10 in 2020, but the actual score is 0.135. The result is surprising that GDP, the true score of freedom does not seem lower than previous years as we hypothesized. This result may be caused by some measurements like the government's subsidies and tax reduction policy that make people's lives kept stabilized in 2020. However, the average happiness score, social support score, and corruption score for the world seems to have been influenced by COVID-19.

Then, we want to have a look that does covid-19 influence people's happiness in those countries that are most influenced by covid in 2020, like China, United State, and India. We make linear models of the scores for each country, but we did not find any remarkable differences from the score 2020 with the previous years as we expected. The only thing that is mentionable is that the happiness score ranking of most of those countries have gotten lower through 7 years.

Using scikit-learn's linear regression model the difference in score style can also be assessed. Combining the common columns for every year and using GDP, Family, Health, Freedom, Corruption, Generosity, and Year for predicting the summed score and multiplicative score. The summed score is the one proved by the World Happiness Report and the best multiplicative function found by Tofallis is given by

$$\text{Score} = 2.087 + 0.075 (\text{GDP}^{0.076} \text{Health}^{0.810} \text{Freedom}^{0.296} \text{Generosity}^{0.011} \text{Corruption}^{0.02})$$

Once the second scoring method is added to the data, the data is split 70% to 30% for training and testing data. There are two splits with the same x values for both splits but different scoring methods for the y values. Both scoring methods are then fitted with a linear regression model with the different target values. Scikit-learn's .score() method is used for evaluating the two methods. The original model produced a score of 0.786, already fairly accurate. However, the multiplicative scoring method produced a score of 0.887. A 12.9% improvement on the original scoring method. This improvement of results are similar to Tofallis' improvements, signifying the better method is a multiplicative model.

B. Logistic Regression

We would like to deep analyze the happiness index data. Since they are supervised and numerical data, we build a logistic regression model to test two things via python.

First of all, we use a single table like the 2019 dataset to fit into the logistic regression model and try to predict the rank based on the value of 6 main attributes. To achieve this goal, we first split the dataset into train and test data with 2 : 8, we put out the "Rank" attribute as an independent variable to build a logistic regression model, then import accuracy.score from sklearn.metric to test the accuracy. And sadly, the accuracy is pretty low for all 6 tables at 0.0603. Which means the logistic regression model cannot be used to predict the rank.

Then, we try to figure out whether we can use a logistic regression model to predict rank improvement using multi-tables. First, we need to join two tables and do some data cleaning. We drop the country's attributes and replace it by the assigned number since the country name is not numerical, then we check whether the rank is improved or not. And assign 1 if the ranks greater than previous rank or no changes and -1 if it ranks less than previous rank.

We split the dataset into train and test data with portion 2:8. And consider the "Improve" attribute as an independent variable to build a logistic regression model. After fit the model

	Improve	Score	GDP	Support	Health	Freedom	Generosity	Corruption
0	1	7.632	1.305	1.592	0.874	0.681	0.202	0.393
1	-1	7.594	1.456	1.582	0.861	0.686	0.286	0.340
2	-1	7.555	1.351	1.590	0.868	0.683	0.284	0.408

TABLE III
EXAMPLE OF TABLE AFTER CLEANING

into test data. The accuracy is around 0.6-0.8. Based on this result, we strongly believe that it is possible to use a logistic regression model to predict rank improvement. Due to the time limit, we just try 2 tables to test the model. We consider use multi tables in future to predict rank improvement.

C. XG Boost

To find the best model to predict the improvement, we studied the squared error variation of XGboost. This method is based on the Gradient Boosting algorithm. There is room for improvement using this method due to the regularization term. Traditional Gradient Boosting is prone to quickly overfitting a model but the regularization term in the XGBoost model flattens the final weights to help avoid this pitfall [?]. The hypothesis is that XGboost can improve the overall prediction compared to the previous Logistic regression model discussed. The dataset was split into train and test data at a 70 percent training and 30 percent testing ratio. In our initial model, the traditional happiness scoring method was used and produced an accuracy rating of 84.34 percent. Next, a model implementing the multiplicative happiness scoring method was built and produced an accuracy score of 97.19 percent. This is a strong improvement over the previous model as improving accuracy becomes increasingly difficult as it approaches a perfect score. Checking the feature importance in the XGBoost model show that both Health and Freedom were the two most significant features in the dataset. Health alone accounted for 0.371 whereas Freedom was still a significant 0.235. Together they accounted for more than 0.6 of the feature importance. Analyzed abstractly, this appears logical. Health is a primary need of all people. Without it life is a constant fight for the next day, there is never time to pursue interests outside of what will keep them alive. Freedom also has a similar effect in a much different way. Even though life may no longer be the battle it could be when someones health is constantly at risk, they are again unable to pursue passions outside what is forced or approved for them. Both factors indicate there is a strong desire for trivial pursuits with human happiness.

D. Random Forest

Then we tested the random forest model. While we set the random-state at 1, the accuracy isn't significantly improved. However we set other values of random-state, like 5 or 10. All accuracy improves a lot more than XGBoost.

Using the Random Forest Regressor model in the scikit-learn package produced similar results to the XGBoost Regression models. The data was again split in a 70 to 30 ratio for training and testing. Using the primary sum happiness score model with a max depth of 10 and a random state of 42 produced an accuracy of 83.2 percent, very similar to the initial XGBoost model. Then when applying the multiplicative

happiness score with similar parameters as the initial Random Forest Regression model, it produces an accuracy of 96.3 percent. Compared to the final 97.19 percent accuracy of the final XGBoost algorithm it is clear that both methods produced a similar overall accuracy between both happiness scoring methods. The primary features of importance in the Random Forest Regression model were the same as XGBoost with Health and Freedom leading, but the value of these features changed significantly. Random Forest gave Health a majority 0.7914 of the importance value, more than Health and Freedom combined from the XGBoost model. Freedom was now given 0.1169 of the importance value, much less than previously found. This method not only indicates that Health is one of the more important aspects in human happiness but an overwhelming decisive factor in it. Assuming this is the case, the primary focus should clearly be on improving healthcare for everyone around the world as quickly as possible. However, even though both models clearly agree on the importance of health, this model is extremely dependent on health for the overall happiness score. The XGBoost model is favored for its more diverse feature importance rating.

VIII. CONCLUSION

Human emotion is one of the fundamental aspects of human nature. It can be influenced by the environment and our choice but remains as the medium through which we view the world. Discarding any potential quantitative impact improving world wide happiness such as productivity or prosperity, it should still be one of the core focuses of our curiosity due to the improvement it could make on everyday life for the billions of people worldwide.

World happiness index was measured by Gallup World Poll in recent several years for measuring the quality of society in which people live. From analyzing the data in the world happiness report, we can solve many questions like which country is happiest in the world, and what social factors influence people's happiness. We did some clean on the data sets to make them easy for analysis.

In this study, our experimentation found evidence reinforcing the improvement of the overall happiness score by using a multiplicative total model. Every model testing for predicting the overall happiness saw a significant improvement when replacing the target scores from the traditional summed model to the multiplicative model. It was hypothesized this is due to the strong interdependency between the different aspects covered rather than being completely independent of each other. Several models were built and tested using both regression methods for predicting the overall happiness and classification methods for predicting whether the community will improve or decrease their happiness score the following year. Several of these models produced similar strong rates of

success, however, the XGBoost model was favored due to the lower amount of dependency on a single variable. It was also found the two most significant areas for overall happiness are the health and freedom of the population. It was hypothesised these values were favored due to the importance of trivial pursuits in everyday life. When people are healthy and free, they also have the ability and opportunity to chase ambitions that go beyond the mundane task required to just survive another day. In the future, since the results found clearly prioritized health as the leading factor to human happiness further investigation is required to understand just how significant health is to overall happiness due to the extreme variance found in our results. In our existing analysis, people's perspectives for their living environments did not have observable changes through 2015-2020. This could be due to the slow change in many populations and should simply require more data to properly gauge the change in populations over time. The lack of impact from COVID-19 produced conflicting results due to the priority of health found in the predictive models could be due to many things such as the overvaluing of health in our models, the lack of impact was not fully captured when the 2020 data was captured, or the abnormal nature of the pandemic produced a unique response by affecting the entire world at roughly the same time. Further investigation is need to fully study the impact of COVID-19 on the impact of world happiness.

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