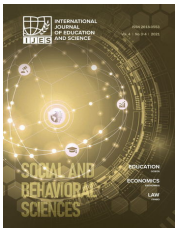
International Journal of Education and Science, Vol. 4, No. 3-4, 2021
print ISSN: 2618-0553; online ISSN: 2618-0561; DOI: 10.26697/ijes

International Journal of Education and Science
print ISSN: 2618-0553; online ISSN: 2618-0561; DOI: 10.26697/ijes
Journal Website: https://ijes.world

SOCIAL AND BEHAVIORAL SCIENCES
Education

ORIGINAL RESEARCH



Article History
Received: *29.09.2021*
Accepted: *01.11.2021*
Published: *25.12.2021*

Application of Machine Learning to Clustering Countries Based on Dominant Parameters of Happiness Index

Vijay A. ATHAVALE[1*], **Shakti ARORA**[1], **Ruchika YADAV**[2]

[1] *Panipat Institute of Engineering and Technology, India*
[2] *Seth Navrang Rai Lohia Jairam Girls College, India*
* *Corresponding Author's Email: vijay.athavale@gmail.com*

Застосування машинного навчання в країнах кластерного типу на основі домінуючих параметрів індексу щастя

Атавале В. А.[1], **Арора Ш.**[1], **Ядав Р.**[2]

[1] *Інститут техніки та технологій Паніпат, Індія*
[2] *Коледж Сет Навранг Рай Лохія Джейрам Герлс, Індія*

Применение машинного обучения в странах кластерного типа на основе доминирующих параметров индекса счастья

Атавале В. А.[1], **Арора Ш.**[1], **Ядав Р.**[2]

[1] *Институт техники и технологий Панипат, Индия*
[2] *Колледж Сет Навранг Рай Лохия Джейрам Герлс, Индия*

Abstract

Background: *Several researches have been done to study the role of various psychological factors to predict the happiness. The terms happiness, well-being, quality of life is used interchangeably. There is no universal definition of happiness, as happiness means different things to different people. It changes with time, age, place etc. Some of the countries have started measuring growth rate on the basis of happiness index of their nation's population.*

Purpose: *To explore the relationship among the various parameters of happiness index and designing a classification model for the various countries on the basis of their happiness.*

Materials and Methods: *In this research work we have applied machine learning model on the datasets available for the year 2018 to 2020 to find the correlation between various global parameters adapted for identifying the impact of those parameters on the happiness index for the 156 countries.*

Results: *With the help unsupervised K-means learning method, we can analyze the importance of various parameters and can put the country in the class/cluster like excellent, moderate, average or below average. The above-mentioned classes signify the placement of the country and accurate classification on basis of various parameters.*

Conclusions: *This paper discusses the current factors effecting the happiness index of the country. The concept of happiness index and dimensions that effects the happiness index of the nations is always the matter of discussion and contradiction. There is no such comprehensive work done on the global parameters of happiness index in the machine learning field.*

Keywords: *machine learning, classification, K-Means method, happiness, world record.*

DOI: https://doi.org/10.26697/ijes.2021.3.1 **JEL:** I12, I21, I25, I28 **UDC:** 37.012.1/3:159.9.07

Cite this article as: Athavale, V. A., Arora, S., & Yadav, R. (2021). Application of machine learning to cluster countries based on dominant parameters of happiness index. *International Journal of Education and Science, 4*(3-4), 16–23. https://doi.org/10.26697/ijes.2021.3.1

Introduction

In the last few years, the research towards happiness has attracted increased attention. The information about the happiness has exploded drawing attention of researchers from diverse backgrounds are contributing towards it. Attempts are being made to create, explore and document a wealth of knowledge about parameters that makes an individual happy. The world's happiness

index was created by Pierre Le Roy, the initiator of Globeco in the year 2000. The world happiness index helps to quantify the happiness of the nation's population which is then used to predict satisfaction level of the people 0 implemented by it to protect human rights in the nation (Stannard, 2018).

The world happiness index is a modification of human right development. It uses the same statistical aggregation method with the objective to measure the happiness of the country. The following standard parameters are considered for analyzing the happiness of the residents of the country: security and peace, democracy, human rights and freedom, life style/living standards, education, research, communication, culture.

The world happiness report is a land mark survey of the state of global happiness that ranks countries by how happy their citizens perceive themselves to be (Han et al., 2018). 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 devise their strategy deciding. The driving specialists across fields like financial aspects, brain research, overview examination, public insights, wellbeing, public arrangement, and that's just the beginning – portray how estimations of prosperity can be utilized viably to evaluate the advancement of countries.

Happiness could be an important indicator for presenting how well the society is doing. (Han et al., 2018) carried out a subjective evaluation of people's quality of life and demonstrated how various environmental parameters can impact an individual's well-being. He attempted to predict the happiness on the basis of air pollution and the level of air index quality required to get the optimal happiness score. Jassmi et al. (2019) applied a machine learning model to predict the happiness and life quality from the data received from OCED regional statistics of BLI of different countries of last four years to formulate psychological tracking process.

The happiness score is prepared by interviewing random sample of population from individual country, to think about the happiness ladder index with best possible life for them and the worst possibility of living standard. The metrics supplied by each country affects the happiness score. Both linear regression and multiple linear regression with a number of parameters are applied to predict the happiness score of the country. This is completely an artificial exercise where multiple linear regression model of machine learning is used for experiment. This study evaluated the effectiveness of automating happiness tracking as a leading indicator for parameters calculation. (Bullen, 2016) presented a supervised machine learning model to predict the life satisfaction score of the country based on various parameters. He applied the models on dataset of 187 countries, the applied algorithm identified the parameters needed to be improved by various countries to improve the happiness index of the citizens.

From the above discussion it is evident that no comprehensive machine learning model is applicable to classify for all the important factors' affecting happiness index of the various countries based on the essential parameters for the world.

The proposed unsupervised machine learning model uses K-means clustering method to classify the happiness index. The K-means algorithm is used to make the clusters of unlabeled data. The datasets of 156 countries are downloaded from the Kaggle (https://www.kaggle.com, n. d.), which show the happiness index based on the different parameters like GDP, corruption, social support, life expectancy etc. The K-means algorithm is applied to divide the datasets into number of clusters. We have made five clusters to group the data into similar classes. Choosing an appropriate of value of k is a challenging task, iteratively changing the value of k and performing different number of iterations can help to get the optimize value of k with proper partitioning of datasets into clusters. Clusters are labeled to check the accuracy of system. Datasets are further partitioned into training data and testing data. K-means algorithm provides the accuracy where we have a similar type of dataset available and troubles in creating the clusters with varying size of dataset. Outliers can be identified and tracked by retrieving the centroid of the clusters formed (Faik, 2020; Laconic Machine Learning, 2019).

The aim of the study. To explore the relationship among the various parameters of happiness index and designing a classification model for the various countries on the basis of their happiness.

Materials and Methods

Step 1: data is partitioned into two separate partitions, where happiness index could be classified into two different sections of happiness.

Step 2: data is partitioned into training and test datasets (Alba, 2019; Diener, 2000; Pérez-Benito, 2019; Seligman & Csikszentmihalyi, 2000).

Following python libraries are used in the machine learning model:

1) Matplotlib is used for visualizing the required information.
2) NumPy is used for manipulating the high dimensional arrays, for creating the data frames.
3) Pandas and Scikit libraries are used to perform statistical operations required to apply machine learning algorithms.

Results

The dataset was taken from Kaggel (https://www.kaggle.com, n. d.) of last three years 2018-2020. The Happiness Score is a national average of the responses to the main life evaluation question asked in the Gallup World Poll (GWP), which uses the Happiness metrics – Cantril Ladder, economic metrics include – GDP per capita & health life expectancy at birth, Social Metrics – social support, Generosity, freedom to make life choices and perception of corruption. To apply the ML model, firstly data set must be normalized, scaled and applied feature

International Journal of Education and Science, Vol. 4, No. 3-4, 2021
print ISSN: 2618-0553; online ISSN: 2618-0561; DOI: 10.26697/ijes

transformation according to requirements. The process is called data wrangling/data cleaning. Data preparation helps to accurately analyses and process the data. A similarity metric must be created for to form the clusters based on the similarity of the dataset. We have selected only the important parameters from the dataset only relevant variables are considered (Figure 1).

Figure 1
Loading the Dataset

```
In [48]: inp_data = df[df.columns[:-1]]
         inp_data
```

Out[48]:

	Overall rank	Score	GDP per capita	Social support	Healthy life expectancy	Freedom to make life choices	Generosity
0	1	7.769	1.340	1.587	0.986	0.596	0.153
1	2	7.600	1.383	1.573	0.996	0.592	0.252
2	3	7.554	1.488	1.582	1.028	0.603	0.271
3	4	7.494	1.380	1.624	1.026	0.591	0.354
4	5	7.488	1.396	1.522	0.999	0.557	0.322
...	...	...	...	...	...	...	...
151	152	3.334	0.359	0.711	0.614	0.555	0.217
152	153	3.231	0.476	0.885	0.499	0.417	0.276
153	154	3.203	0.350	0.517	0.361	0.000	0.158
154	155	3.083	0.026	0.000	0.105	0.225	0.235
155	156	2.853	0.306	0.575	0.295	0.010	0.202

156 rows × 7 columns

K-Means machine learning model is applied on the above Data frame of 156 countries where Happiness Index/Score is depending upon various features like GDP Per Capita, Social support, Health life expectancy, Freedom to make Choice, Generosity, Corruption. Overall ranking of the countries is provided on the cumulative features.

The most important is to apply the optimal value of K, thumb rule to define the k is square root of n, where n is the total observations. K-Means machine learning model (Figure 2) is applied to take the cluster of the countries that are having similarity in the happiness score. In the figure, all the rows and columns of input data frames are divided into five clusters, total 3000 iterations are applied in the algorithm.

Figure 2
Applying K-Means Machine Learning Model

```
In [50]: from sklearn.cluster import KMeans

In [51]: kmeans = KMeans(n_clusters = 5, random_state=0, max_iter=3000,tol=0.00001 )
         kmeans

Out[51]: KMeans(algorithm='auto', copy_x=True, init='k-means++', max_iter=3000,
                n_clusters=5, n_init=10, n_jobs=None, precompute_distances='auto',
                random_state=0, tol=1e-05, verbose=0)

In [52]: kModel = kmeans.fit(inp_data)

In [53]: kModel.labels_

Out[53]: array([0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
                0, 0, 0, 0, 0, 0, 0, 0, 0, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3,
                3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 3, 4, 4, 4, 4,
                4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4,
                4, 4, 4, 4, 4, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
                1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 2, 2, 2, 2, 2, 2, 2,
                2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2,
                2, 2])
```

In Figure 2 K-Means module is imported from Sklearn, all the machine learning models are prebuilt in the Sklearn library and according to the objective and type of dataset, the desired machine learning model can be applied. In the above process we have applied 3000 iterations to train the model and check the accuracy of the proposed system.

International Journal of Education and Science, Vol. 4, No. 3-4, 2021
print ISSN: 2618-0553; online ISSN: 2618-0561; DOI: 10.26697/ijes

The clustering process is based on the similarity of the dataset and the centroid of the cluster is used to map all the elements. In Figure 3 all the centroids are calculated, five different centroids and their mapping neighboring elements are combined and kept into class/cluster.

Figure 3

Calculation of Centroid Applied Prediction on Input Data Frame

```
In [54]: kModel.cluster_centers_

Out[54]: array([[ 16.        ,   6.98058065,   1.33774194,   1.47235484,
                   0.9653871 ,   0.50932258,   0.22751613],
                [109.5       ,   4.7239375 ,   0.6479375 ,   1.03221875,
                   0.5784375 ,   0.3665    ,   0.1715625 ],
                [141.        ,   3.879     ,   0.45545161,   0.88016129,
                   0.43819355,   0.28567742,   0.20951613],
                [ 47.        ,   6.05580645,   1.10996774,   1.39416129,
                   0.86303226,   0.44248387,   0.15535484],
                [ 78.        ,   5.41819355,   0.98293548,   1.27087097,
                   0.78590323,   0.35970968,   0.16070968]])

In [36]: y_kmeans = kmeans.predict(inp_data)
         y_kmeans
```

In the Figure 3 the centers of all the five clusters are computed through which neighboring elements are placed together in to five individual clusters. Clusters are defined by various parameters which are not specifically based on the happiness, they are measurement of GDP, health life expectancy, generosity, social support, freedom to live life and corruption etc.

In Figure 4 visualization of the clustering/classes is presented with five different clusters, the centroid of each cluster pointing the cluster.

Figure 4

Matrix Distribution of All the Rows into 5 Clusters

```
In [13]: pd.crosstab(out_data, kModel.labels_)
```

Out[13]:

col_0	0	1	2	3	4
Score					
2.853	0	0	1	0	0
3.083	0	0	1	0	0
3.203	0	0	1	0	0
3.231	0	0	1	0	0
3.334	0	0	1	0	0
...	...	...	...	...	...
7.488	1	0	0	0	0
7.494	1	0	0	0	0
7.554	1	0	0	0	0
7.600	1	0	0	0	0
7.769	1	0	0	0	0

155 rows × 5 columns

If we “pretend” that we don’t have survey happiness scores for the countries listed in the test data-set, we can use our K-Means model created in Figure 2 to predict their happiness based on the metrics GDP, Social Support, Life Expectancy, Freedom, Generosity, Corruption.

we are going to check the correlation between different features of the dataset. To find the Pearson correlation, use the Pandas correlation function. Correlations are used to get the quick insight about the data, identifying the casual relationship between the data elements is very crucial in decision making for example country with high life expectancy tend to be average happy does not mean that people with long life will not evaluate their life badly or good healthcare system can make their life happiest. To handle such type of questions, it is necessary to use statistical tools like regression.

In Figure 5 the correlation between all the parameters used in the dataset is described.

From the Figure 5 we can easily identify parameters influencing the overall score as well as the parameters which are more interdependent.

In Figures 6-8 it is clearly visible that all the individual clusters are isolated (cluster 0 – excellent, cluster1 – high, cluster 2 – moderate, cluster 3 – average, cluster 4 – below average). No overlapping and intersection of the clusters is found. It is evident that the applied algorithm has given the accurate clusters/classification on the basis of similarity features detected by algorithms.

Figure 5
Correlation Matrix of Parameters of Dataset

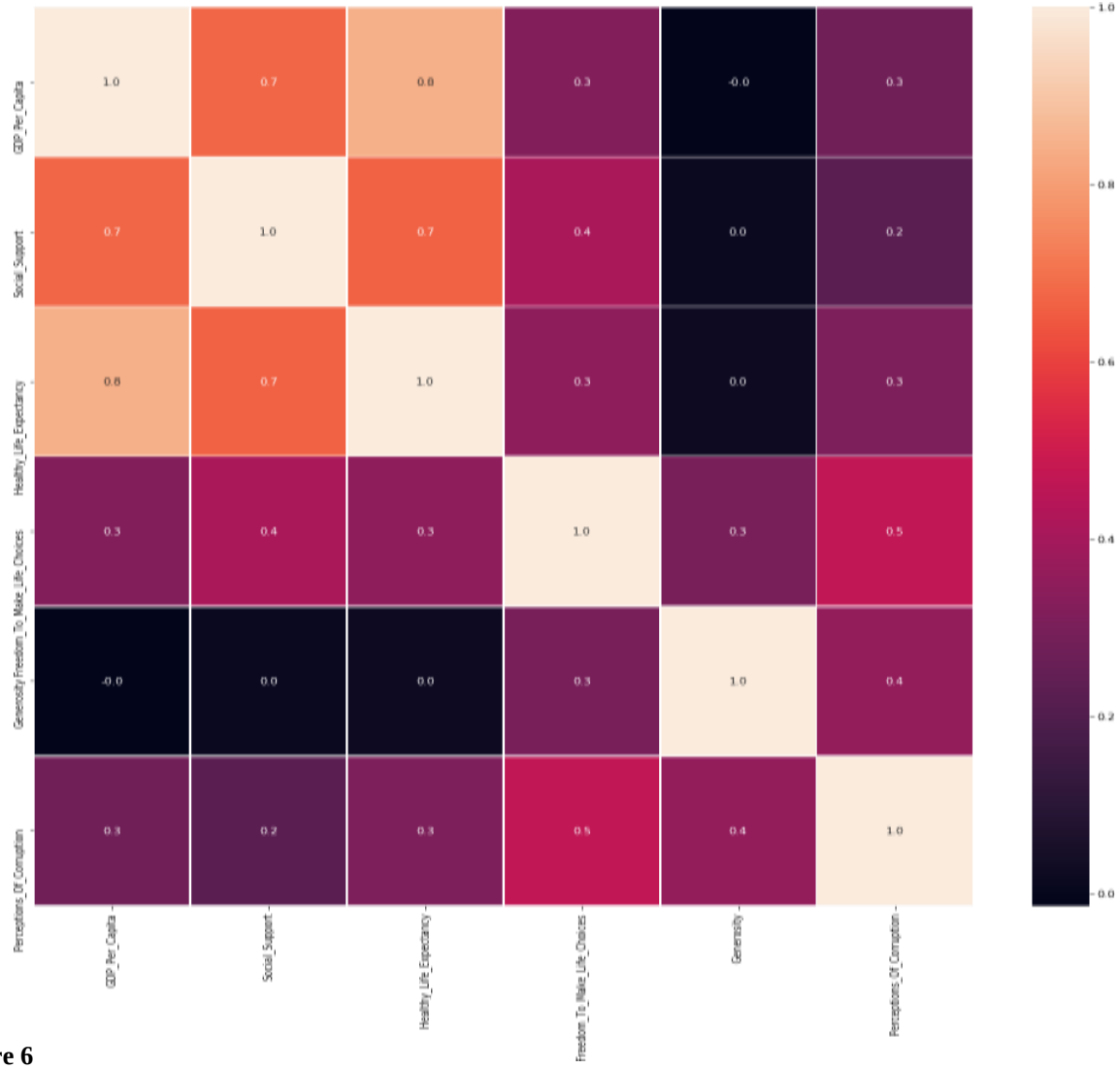


Figure 6
Visualization of Cluster (Datasets 2019)

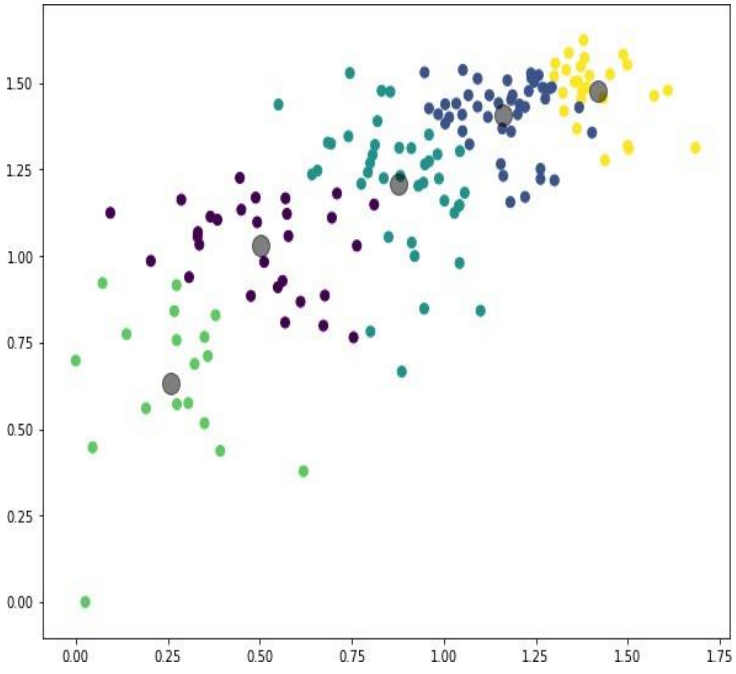


Figure 7
Visualization of Cluster (Datasets 2020)

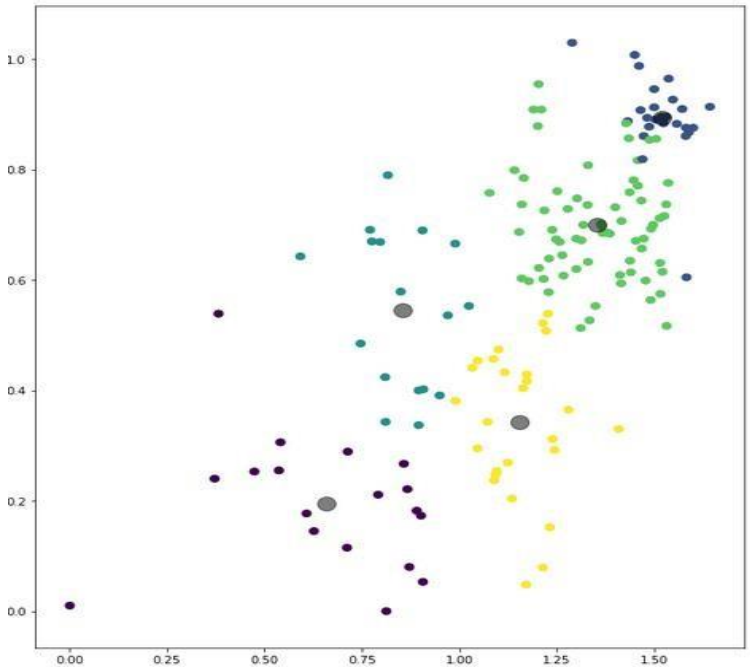
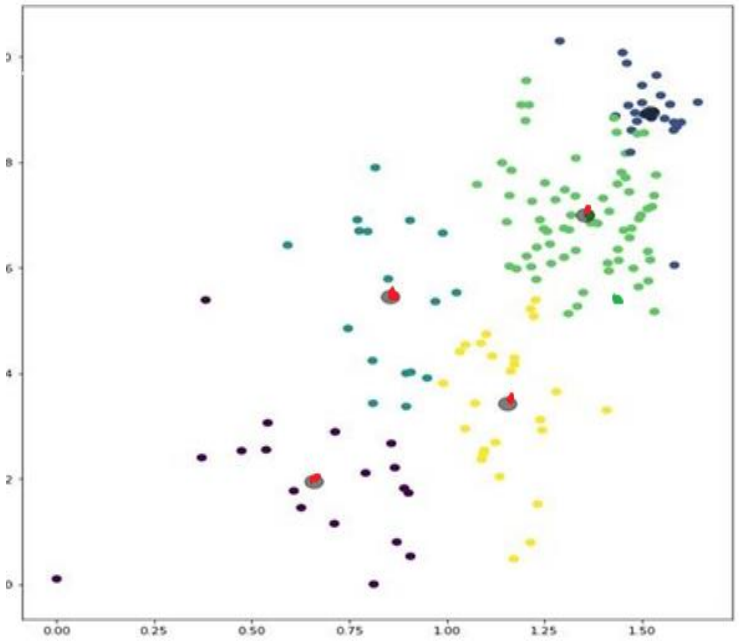


Figure 8
Visualization of Cluster (Datasets 2021)



Above clusters are created on the basis of happiness index rating, on this basis the countries are distributed in different clusters. Any of the country could be identified within the defined classes.

The designed machine learning model is applied on the data set of 2020, with the input parameters mentioned in above section. The clustering of the regions provides the accurate results with the prediction value of 0.5. The generalized model can be adopted for any timeframe to design an optimal classification of the countries.

Discussion

In this paper, we have proposed a model which is working on some of the few global parameters that can compute and provide overall happiness indexing. The statistical evaluation relates the growth with the happiness index and on the basis of happiness score retrieved the growth in terms of classes/cluster mentioned can be predicted. This model will help agencies responsible for the happiness index. It can be used to achieve the desired level by improving parameters which will positively impact the overall index. As we have compiled the dataset of 156 countries and possibly made the classification based on the important parameters effecting the happiness level of the country. From the last few years countries have started quantifying their state wise happiness level. Which will be helping the state/center government to

decide their action plans and policies for the people. Although in 2020 and 2021 there is drastic variation in the happiness index of the various countries due to COVID-19. Although, there were significant increases in average sadness and worries, we found that overall life evaluations, and happiness rankings, were surprisingly stable. The top countries before the pandemic remained the top countries in 2020, so there was little change in the overall rankings. The top countries already had higher levels of trust and lower levels of inequality, both of which helped them to keep death rates low and social cohesion high, and hence to maintain their favorable positions.

Conclusions

The proposed model is working with the total 156 countries of 2018 and 2019 dataset. The concept of happiness index and dimensions that effects the happiness index of the nations is always the matter of discussion and contradiction. There is no such comprehensive work done on the global parameters of happiness index in the machine learning field. Although there are various classification models available, which can be applied to train and test the dataset. But K-Means algorithm is also providing the optimal results without any overlapping.

Funding Source

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Conflicts of Interests

The authors declare that there is no conflict of interests.

References

Alba, C. (2019). A data analysis of the world happiness index and its relation to the north-south divide. *Undergraduate Economic Review*, *16*(1). https://digitalcommons.iwu.edu/uer/vol16/iss1/6

Bullen, E. (2016). *Simple machine learning prediction with the un world happiness data-set.* RStudio. http://rstudio-pubs-static.s3.amazonaws.com/201826_cab699be72ca47f99debadf16ee54c95.html

Burns, J. H., & Hart, H. L. A. (Eds). (1996). *The collected works of Jeremy Bentham: An introduction to the principles of morals and legislation.* Oxford University Press. https://doi.org/10.1093/oseo/instance.00077240

Diener, E., Lucas, R., Schimmack, U., & Helliwell, J. (2009). *Well-being for public policy.* Oxford University Press. https://doi.org/10.1093/acprof:oso/9780195334074.001.0001

Diener, E. (2000). Subjective well-being: The science of happiness and a proposal for a national index. *American Psychologist*, *55*(1), 34–43. https://doi.org/10.1037/0003-066X.55.1.34

Dolan, P., & White, M. P. (2007). How can measures of subjective well-being be used to inform public policy? *Perspectives on Psychological Science*, *2*(1), 71–85. https://doi.org/10.1111/j.1745-6916.2007.00030.x

Faik, L. (2020). *Understanding happiness dynamics with machine learning (part 2): In-depth analysis of happiness drivers*. Towards Data Science. https://towardsdatascience.com/understanding-happiness-dynamics-with-machine-learning-part-2-4df36e52486

Gudmundsdottir, D. G. (2013). The impact of economic crisis on happiness. *Social indicators research*, *110*, 1083–1101. https://doi.org/10.1007/s11205-011-9973-8

Han, Y., Li, V. O. K., Lam, J. C. K., & Lu, Zh. (2018). UMeAir: Predicting momentary happiness towards air quality via machine learning. *Proceedings of the 2018 ACM International Joint Conference and 2018 International Symposium on Pervasive and Ubiquitous Computing and Wearable Computers* (pp. 702–705). Association for Computing Machinery. https://doi.org/10.1145/3267305.3267694

Jassmi, H. Al., Ahmed, S., Philip, B., Mughairbi, F. A., Ahmad, M. Al. (2019). E-happiness physiological indicators of construction workers' productivity: A machine learning approach. *Journal of Asian Architecture and Building Engineering*, *18*(6), 517–526, https://doi.org/10.1080/13467581.2019.1687090

Kaggle. (n.d.). *The world happiness report.* https://www.kaggle.com/mathurinache/world-happiness-report

Laconic Machine Learning. (2019). *How to build a machine learning model that predicts people's happiness index based on the money they earn*. https://laconicml.com/predict-happiness-index-using-machine-learning-model

Malhotra, R., & Jain, A. (2011). Software effort prediction using statistical and machine learning methods. *International Journal of Advanced Computer Science and Applications*, *2*(1), 145–152. https://doi.org/10.14569/IJACSA.2011.020122

Myers, D. G. (2000). The funds, friends, and faith of happy people. *American Psychologist*, *55*(1), 56–67. https://doi.org/10.1037/0003-066X.55.1.56

Nagpal, S., Athavale, V. A., Saini, A. K., & Sharma, R. (2020). Indian health care system is ready to fight against COVID-19 a machine learning tool for forecast the number of beds. *PDGC 2020 – 2020 6th International Conference on Parallel, Distributed and Grid Computing* (pp. 61–65). https://doi.org/10.1109/PDGC50313.2020.9315825

Pérez-Benito, F. J., Villacampa-Fernández, P., Conejero, J. A., Garcia-Gomez, J. M., Navarro-Pardo, E. (2019). A happiness degree predictor using the conceptual data structure for deep learning architectures. *Computer Methods and Programs in Biomedicine*, *168*, 59–68. https://doi.org/10.1016/j.cmpb.2017.11.004

Roobaert, D., Karakoulas, G., & Chawla, N. V. (2006). Information gain, correlation and support vector machines. In I. Guyon, M. Nikravesh, S. Gunn, & L. A. Zadeh (Eds.), *Feature Extraction: Vol. 207. Studies in Fuzziness and Soft Computing* (pp. 463–470). Springer. https://doi.org/10.1007/978-3-540-35488-8_23

Schyns, P. (1998). Cross national differences in happiness: Economic and Cultural factors explored. *Social Indicators Research, 43*(1), 3–26. https://doi.org/10.1023/A:1006814424293

Seligman, M. E. P., & Csikszentmihalyi, M. (2000). Positive psychology: An introduction. *American Psychologist, 55*(1), 5–14. https://doi.org/10.1037/0003-066X.55.1.5

Stannard, M. (2018). *How AI & machine learning will revolutionize HR*. The happiness Index. https://thehappinessindex.com/tech/ai-machine-learning-revolutionises-hr/

Tucker, L. R., & MacCallum, R. C. (1997). *Exploratory factor analysis* [Unpublished manuscript]. http://www.ffzg.unizg.hr/psihologija/phm/nastava/Book_Exploratory%20Factor%20Analysis.PDF

Viinamäki, H., Kontula, O., Niskanen, L., & Koskela, K. (1995). The association between economic and social factors and mental health in Finland. *Acta Psychiatrica Scandinavica, 92*(3), 208–213. https://doi.org/10.1111/j.1600-0447.1995.tb09570.x

Анотація

Вступ: *Проведено кілька досліджень для вивчення ролі різних психологічних факторів для прогнозування щастя. Терміни щастя, благополуччя, якість життя вживаються як синоніми. Універсального визначення щастя не існує, оскільки для різних людей щастя означає різні речі. Воно змінюється з часом, віком, місцем тощо. Деякі країни почали вимірювати темпи зростання на основі індексу щастя населення своєї країни.*

Мета: *Дослідити взаємозв'язок між різними параметрами індексу щастя та розробити модель класифікації для різних країн на основі їхнього щастя.*

Матеріали і Методи: *У цій дослідницькій роботі ми застосували модель машинного навчання до наборів даних, доступних за 2018–2020 роки, щоб знайти кореляцію між різними глобальними параметрами, адаптованими для визначення впливу цих параметрів на індекс щастя для 156 країн.*

Результати: *За допомогою методу K-середніх ми можемо проаналізувати важливість різних параметрів і віднести країну до такого класу/кластеру: відмінний, помірний, середній або нижче середнього. Ці класи означають розміщення країни та точну класифікацію за різними параметрами. Алгоритм K-середніх забезпечує оптимальні результати без будь-яких накладень.*

Висновки: *У статті обговорюються поточні фактори, які впливають на індекс щастя в країні. Концепція індексу щастя та параметри, що впливають на індекс щастя націй, завжди є предметом дискусій та протиріч. У галузі машинного навчання такої комплексної роботи за глобальними параметрами індексу щастя не проводиться.*

Ключові слова: *машинне навчання, класифікація, метод K-середніх, щастя, світовий рекорд.*

Аннотация

Введение: *Проведено несколько исследований, чтобы изучить роль различных психологических факторов в предсказании счастья. Термины счастье, благополучие, качество жизни используются как синонимы. Универсального определения счастья не существует, так как счастье означает разные вещи для разных людей. Оно меняется со временем, возрастом, местом и т. д. Некоторые страны начали измерять темпы роста на основе индекса счастья населения своей страны.*

Цель: *Исследовать взаимосвязь между разными параметрами индекса счастья и разработать модель классификации для разных стран на основе их счастья.*

Материалы и Методы: *В этой исследовательской работе мы применили модель машинного обучения к наборам данных за 2018–2020 годы, чтобы найти корреляцию между различными глобальными параметрами, адаптированными для определения влияния этих параметров на индекс счастья для 156 стран.*

Результаты: *С помощью метода K-средних мы можем проанализировать важность различных параметров и отнести страну к такому классу/кластеру: отличный, умеренный, средний или ниже среднего. Эти классы означают размещение страны и точную классификацию по разным параметрам. Алгоритм K-средних обеспечивает оптимальные результаты без каких-либо наложений.*

Выводы: *В этой статье обсуждаются текущие факторы, влияющие на индекс счастья в стране. Концепция индекса счастья и параметры, влияющие на индекс счастья наций, всегда являются предметом дискуссий и противоречий. В области машинного обучения такой комплексной работы по глобальным параметрам индекса счастья не проводится.*

Ключевые слова: *машинное обучение, классификация, метод K-средних, счастье, мировой рекорд.*

The electronic version of this article is complete. It can be found online in the IJES Archive https://ijes.world/en/archive and in the KRPOCH Publishing Repository https://ekrpoch.culturehealth.org/handle/lib/58