Analysis and Estimation of Popular Places in Online Tourism Based on Machine Learning Technology

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Abstract. This article discusses and compares some machine-learning regression methods for developing a prognostic model that predicts the daily number of visitors in different areas (tourist places) of India. Visitor reviews from holidayiq.com are used as data. The main features of the selected data set are described.

Keywords: Online Tourism, Popular Places, Machine Learning.

1 Introduction

The article is based on a set of data consisting of specific data obtained from user reviews posted on Holidayiq.com about different types of attractions in India [1-2]. This dataset is completed with feedback on appointments published by 249 Holidayiq.com reviewers by March 2020.

This paper discusses and compares some machine-learning regression methods for developing a prognostic model that predicts the daily number of visitors in different areas (tourist places) of India.

Implementation of strategic projects will allow for appropriate restructuring of the tourism industry in relation to the socio-economic life of the state [3-9]. It is focus on population, government, management and business structures and a comprehensive approach to ensuring the effective use of benefits and opportunities of domestic tourism sector due to climatic conditions and historical features [1-16], taking into account the requirements of environmental protection and preservation and enrichment of is heritage [17-25].

2 Main Part

Tourism in India is important for the country's economy and growing rapidly [1]. The World Travel and Tourism Council estimated that tourism in 2018 generated ($ 240 billion) or 9.2% of India's GDP and supported 42.673 million jobs, 8.1% of total employment [1]. It is projected that by 2028 this sector will grow from 6.9% to 32.05 GEL [1]. Tourism is one of the largest earners in foreign currency. The importance of tourism as a tool for economic development and employment, especially in remote and backward areas, has well recognized around the world. The benefits of tourism can be increased either by increasing the number of tourists or by increasing the length of stay of tourists in the country. Data on national length of stay are very important and useful for the purposeful promotion of tourism in the outgoing markets.

This paper uses a set of user data (feedback) on different types of attractions in India. The dataset contains 1743 data points collected from Holidayiq.com [2].

The main features of the selected data set:

1. User ID;
2. Number of inspections of stadiums, sports complexes;
3. Number of reviews of religious institutions;
4. Number of reviews about the beach, lake, river, etc .;
5. The number of reviews about theaters, exhibitions;
6. The number of reviews about shopping centers, shopping malls;
7. Number of reviews about parks, picnic areas, etc.

Column1	Column2	Column3	Column4	Column5	Column6	Column7
User 1	2	77	79	69	68	95
User 2	2	62	76	76	69	68
User 3	2	50	97	87	50	75
User 4	2	68	77	95	76	61
User 5	2	98	54	59	95	86
User 6	3	52	109	93	52	76
User 7	3	64	85	82	73	69
User 8	3	54	107	92	54	76
User 9	3	64	108	64	54	93
User 10	3	86	76	74	74	103
User 11	3	107	54	64	103	94
User 12	3	103	60	63	102	93
User 13	3	64	82	82	75	69
User 14	3	93	54	74	103	69
User 15	3	63	82	81	78	69
User 16	3	82	79	75	75	82
User 17	5	59	131	103	54	86
User 18	5	56	124	108	56	85
User 19	4	85	67	111	65	72
User 20	5	114	83	65	114	102

Fig. 1. Data set.

The method that will implemented in this work is the classification tree.

To implement this course work, we chose the Python programming language. Python is an easy-to-use yet full-fledged programming language that provides much more tools for structuring and supporting large applications [26-32].

The large selection of libraries is one of the main reasons that Python is the most popular programming language used for ML [33-45]. A library is a module or group of modules published from various sources, such as PyPi, that contains a pre-written piece of code that allows users to achieve certain functionality or perform various actions [46-51]. Python libraries provide basic-level elements, so you do not need to encode them from the beginning. ML requires constant data processing, and Python libraries allow you to access, process, and transform data [52-61].

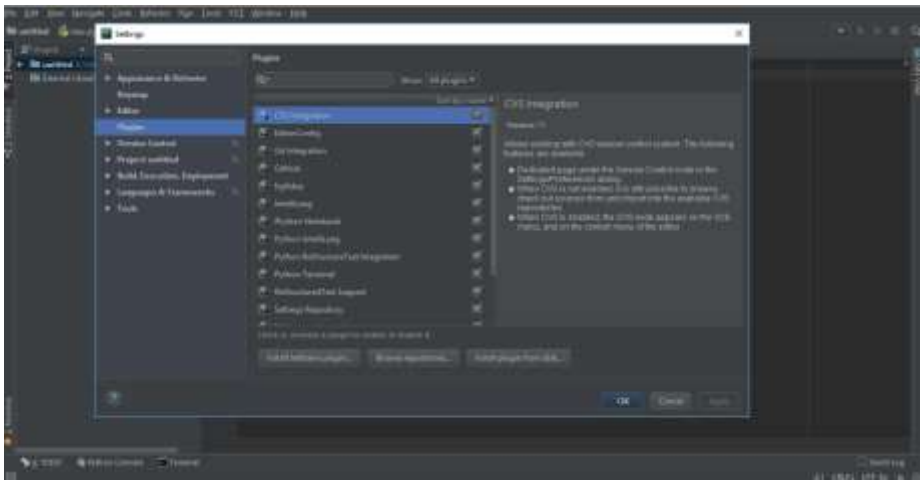

Fig. 2. PyCharm interface

First, we need to connect libraries to use their capabilities in the future

```
import pandas as pd
from sklearn.tree import DecisionTreeClassifier
from sklearn.model_selection import train_test_split
from sklearn import metrics
```

After downloading the data, reading our data set, and building graphs. Next, we want to show you a chart that visualizes data according to user feedback about picnics and parks. As we see here, we have 2 local highs and 4 local lows. The same can be said for the next 2 graphs. These graphs determine whether to work with this data and allow you to determine whether to normalize it or not.

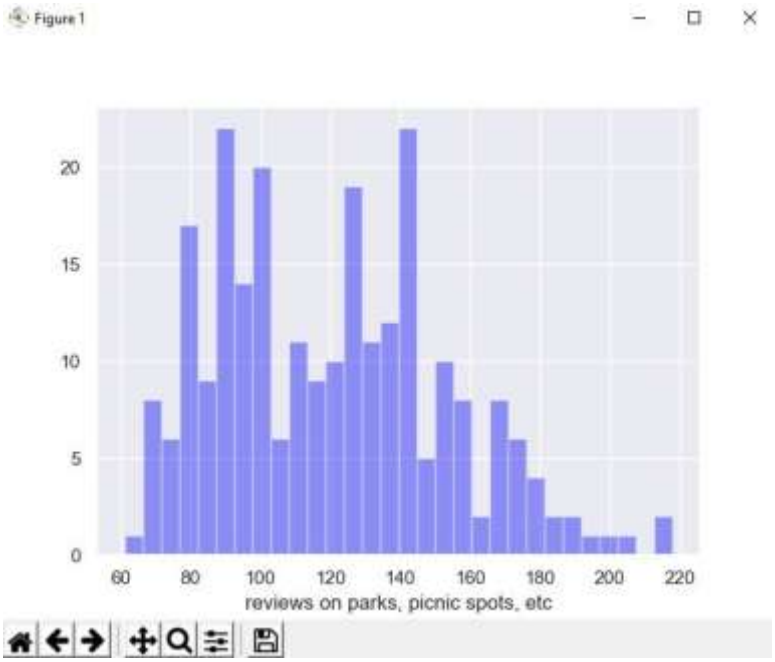

Fig. 3. Bar chart of reviews of parks and picnic areas.

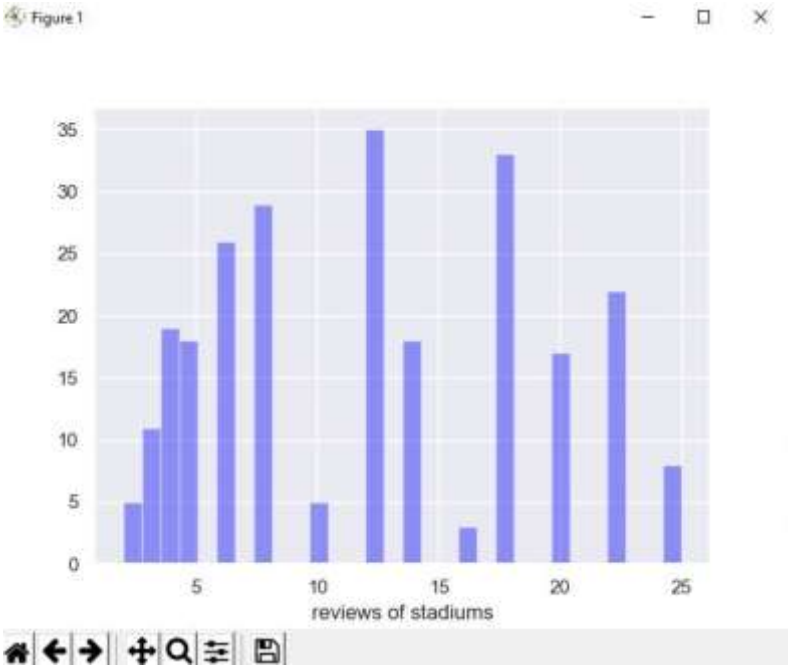

Fig. 4. Bar chart of feedback on stadiums.

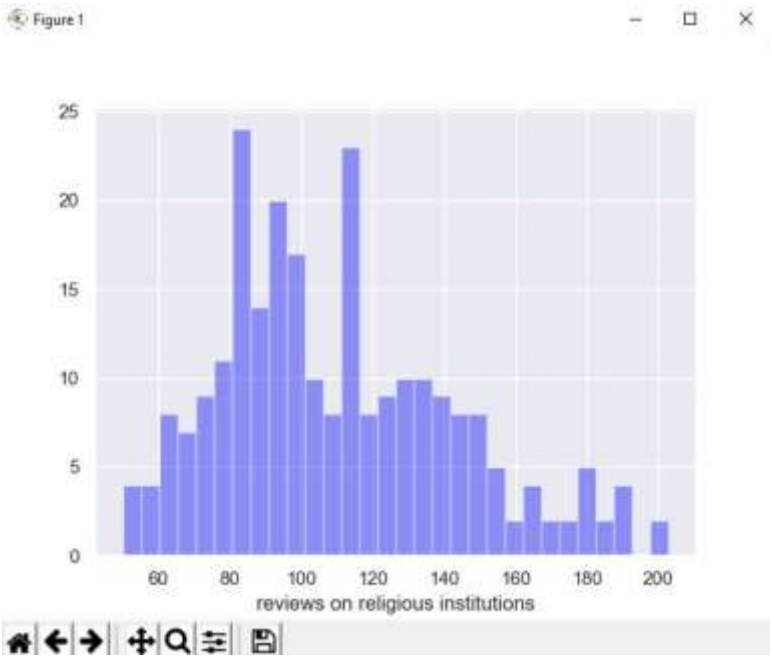

Fig. 5. Bar chart of reviews by religious places.

The following graph is also a chart, but it shows how feedback after visiting the theater affects the feedback of beaches, lakes, and we can see points from 0 to 10 here.

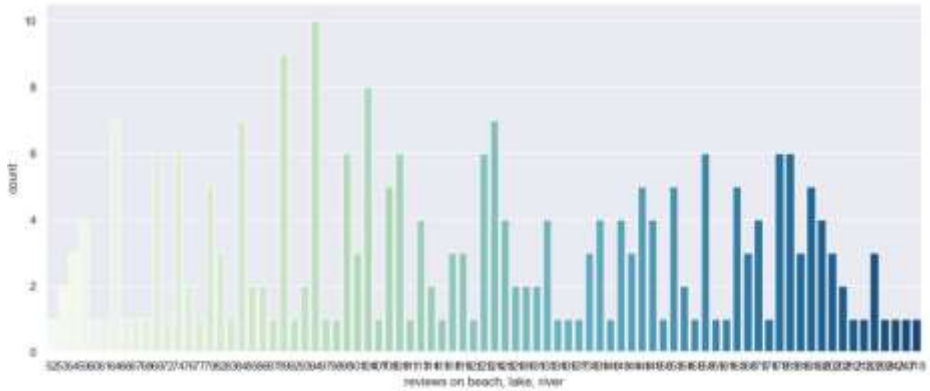

Fig. 6. Bar chart of reviews on blowing beaches, lakes, rivers.

The following graph is a scatter graph that shows us the distribution of attribute data relative to the data distribution of another attribute. We need this data in order to cluster it in the future.

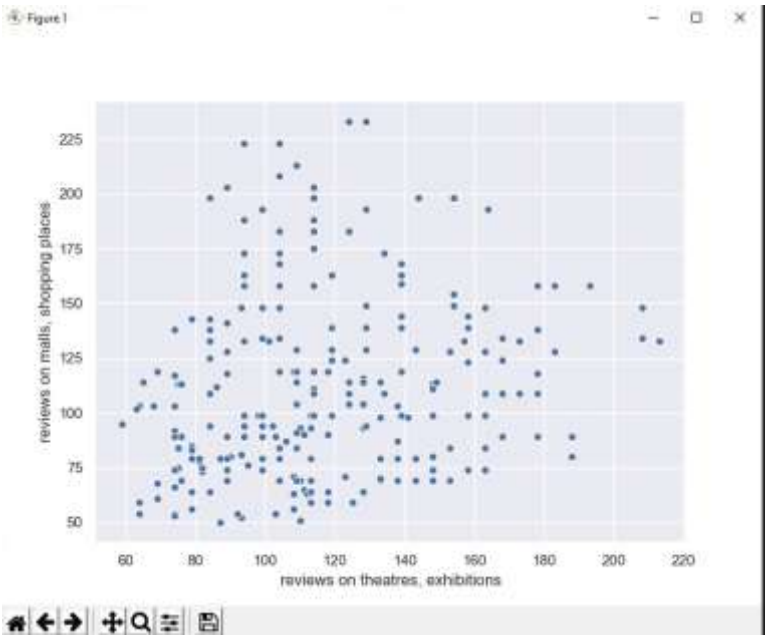

Fig. 7. Schedule of scattering visits to theaters in relation to shopping centers

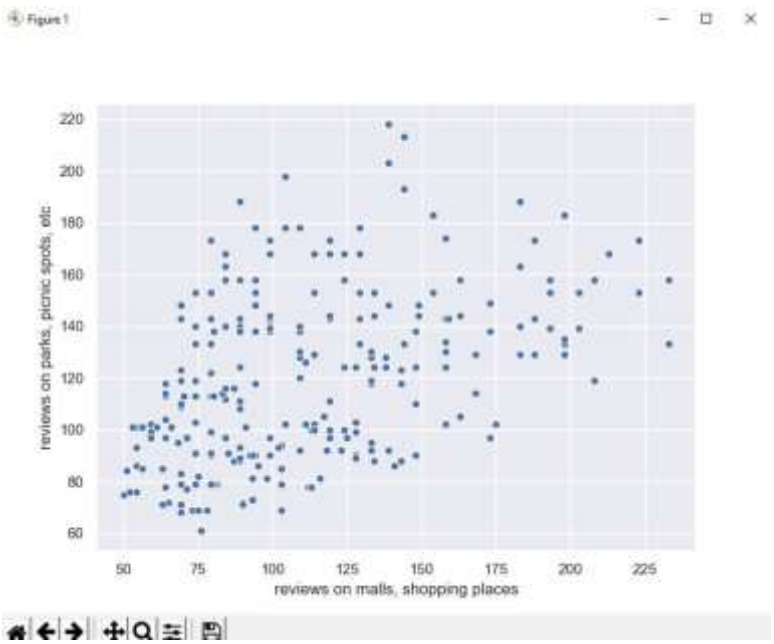

Fig. 8. Schedule of scattering visits to parks in relation to shopping centers.

3 Assigning Target and Feature Variables

```
feature_cols = ['picnic','religious','nature','theatre','shopping']
X = pima[feature_cols] # Features
y = pima.sports # Target variable
```

Feature selection is one of the core concept in order to affect the performance of the model. In the piece of code shown above, we have assigned the feature and target variables.

4 Splitting the Dataset into Training Set and Testing Set

We generally split the data we have into training and testing sets so that our model learns on this data. we use the test data to test how accurate our model is.

```
X_train, X_test, y_train, y_test = train_test_split (X, y, test_size=0.3, random_state=1) # 70% training and 30% test
```

Here we have to divide our data as 70% training and 30% testing.

5 Accuracy for the Training Data

```
### CART

clf = DecisionTreeClassifier()

# Train Decision Tree Classifer
clf = clf.fit(X_train,y_train)

#Predict the response for test dataset
y_pred = clf.predict(X_test)
print("Accuracy:",metrics.accuracy_score(y_test, y_pred))
```

```
Accuracy: 0.44
```

6 Accuracy of the Testing Data

```
clf = DecisionTreeClassifier(criterion="entropy", max_depth=3)

# Train Decision Tree Classifer
clf = clf.fit(X_train,y_train)

#Predict the response for test dataset
y_pred = clf.predict(X_test)

# Model Accuracy, how often is the classifier correct?
print("Accuracy:",metrics.accuracy_score(y_test, y_pred))
```

```
Accuracy: 0.3066666666666664
```

7 Data Visualization

```
from sklearn.externals.six import StringIO
from IPython.display import Image
from sklearn.tree import export_graphviz
import pydotplus
dot_data = StringIO()
export_graphviz(clf, out_file=dot_data,
                filled=True, rounded=True,
                special_characters=True, feature_names = feature_cols)
graph = pydotplus.graph_from_dot_data(dot_data.getvalue())
graph.write_png('fires.png')
Image(graph.create_png())
```

The entropy for each node in the decision tree is calculated and shown in the Fig. 9.

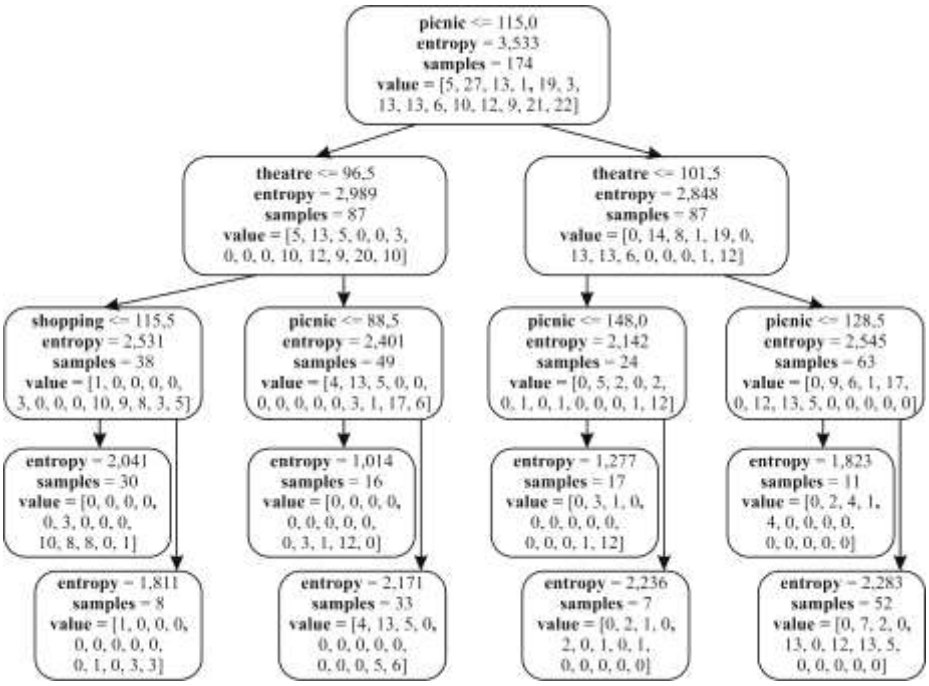

Fig. 9. Schedule of scattering visits to parks in relation to shopping centers

8 Perceptron

In machine learning, the perceptron is an algorithm for the controlled study of binary classifiers. A binary classifier is a function that can determine whether an input represented by a vector of numbers belongs to a particular class.

```
## PERCEPTRON

from sklearn.datasets import load_digits
from sklearn.linear_model import Perceptron


clf = Perceptron(tol=1e-3, random_state=0)
clf.fit(X_train, y_train)
```

```
Perceptron(alpha=0.0001, class_weight=None, early_stopping=False, eta0=1.0,
      fit_intercept=True, max_iter=None, n_iter=None, n_iter_no_change=5,
      n_jobs=None, penalty=None, random_state=0, shuffle=True, tol=0.001,
      validation_fraction=0.1, verbose=0, warm_start=False)
```

```
clf.score(X, y)
```

```
Accuracy=0.10441767068273092
```

9 Logistic Regression

```
from sklearn.datasets import make_classification
from matplotlib import pyplot as plt
from sklearn.linear_model import LogisticRegression
import seaborn as sns
sns.set()
from sklearn.model_selection import train_test_split
from sklearn.metrics import confusion_matrix
import pandas as pd
```

```
lr = LogisticRegression()
lr.fit(X_train, y_train)
```

output:

```
LogisticRegression(C=1.0, class_weight=None, dual=False, fit_intercept=True,
          intercept_scaling=1, max_iter=100, multi_class='warn',
          n_jobs=None, penalty='l2', random_state=None, solver='warn',
          tol=0.0001, verbose=0, warm_start=False)
```

print(lr.coef_)

print(lr.intercept_)

sample output:

```
[[-8.49404569e-02  5.16469451e-02  2.48202289e-03  1.18104794e-02
  -1.27710276e-02]
 [ 2.89249955e-02 -5.51763442e-02 -1.86653086e-02  1.22790928e-02
   2.35257238e-02]
 [-2.05658090e-02  1.71417984e-02  9.42921887e-03 -6.08477815e-03
  -7.92143354e-03]
 [ 4.53560770e-01 -2.79021366e-01 -4.91429069e-01  2.93507070e-01
  -1.97163855e-01]
 [ 2.59741521e-02 -2.85498651e-02 -1.09812649e-02  8.60207745e-03
   1.14739537e-02]
 [ 2.15453061e-02 -1.03351268e-01 -3.95121565e-02  3.74296296e-02
   2.55449044e-02]
 [ 1.17332597e-02 -1.65666531e-02  8.48390297e-04 -1.32744719e-02
   1.79161537e-02]]
```

```
y_pred = lr.predict(X_test)

confusion_matrix(y_test, y_pred)
```

output:

```
array([[5, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 1, 1],
       [1, 1, 0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 1],
       [0, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0],
       [7, 0, 0, 4, 0, 1, 0, 0, 0, 0, 0, 1, 1],
       [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 2],
       [1, 0, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0, 1],
       [1, 0, 0, 3, 0, 1, 2, 0, 0, 0, 0, 1, 1],
       [1, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0],
       [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1],
       [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 5, 2],
       [3, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 5],
       [1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 2, 2],
       [2, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 4]])
```

```
lr.predict_proba(X_test)
```

```
array([[0.01759831, 0.10586194, 0.11109021, ..., 0.05503375, 0.09055007,
        0.2099263 ],
       [0.00715771, 0.17353763, 0.10062811, ..., 0.0042734 , 0.05249792,
        0.05314821],
       [0.0003344 , 0.06946196, 0.11481669, ..., 0.06883516, 0.00566736,
        0.15503198],
       ...,
       [0.00039807, 0.17064512, 0.08468403, ..., 0.05611162, 0.00768824,
        0.10845564],
       [0.00077218, 0.05106608, 0.12836801, ..., 0.1136296 , 0.00901136,
        0.26679165],
       [0.0111637 , 0.24792246, 0.0560934 , ..., 0.0009219 , 0.05618635,
        0.04524343]])
```

```
clf.score(X_test, y_test)
```

Accuracy=0.08

Accuracy = 0.08 (accuracy for logistic regression)

10 Results

Decision tree: 44%. Perceptron: 10%. Logistic regression: 8%. Note: Since the dataset is small, we are getting low accuracy. Conclusion from the above results we can conclude that decision tree is the best method for this dataset with an accuracy of 44%.

11 Conclusions

This article discusses and compares some machine-learning regression methods for developing a prognostic model that predicts the daily number of visitors in different areas (tourist places) of India. Visitor reviews from holidayiq.com are used as data. The main features of the selected data set are described. Next, methods and means of implementation are described. To implement this course work, we chose the Python programming language. After downloading the data, reading our data set, and building graphs. This article demonstrates 6 graphs, namely 4 bar charts and two scatter plots. Three machine-learning methods are used. The first was the decision tree, which showed the best result of 44%. The second is the 10% perceptron, and the third is the logistic regression method. Because the sample of my dataset is small, that is why we got such accuracy of algorithms. In general, we can say that the algorithms are not very successful in their task, but this is because the data sample is too small.

References

1. Tourism survey in the State of Delhi, mode:http://tourism.gov.in/sites/default/files/Other/Delhi_0.pdf.
2. BuddyMove Data set, mode:https://archive.ics.uci.edu/ml/datasets/BuddyMove+Data+Set.
3. Su, J., Sachenko, A., Lytvyn, V., Vysotska, V., Dosyn, D.: Model of Touristic Information Resources Integration According to User Needs. In: Proceedings of the International Conference on Computer Sciences and Information Technologies, CSIT, 113-116. (2018)
4. Mathias Weske. Business Process Management. Springer-Verlag, Berlin-Heidelberg, (2008).
5. Varetskyy, Y., Rusyn, B., Molga, A., Ignatovych, A.: A new method of fingerprint key protection of grid credential. In: Advances in Intelligent and Soft Computing, 84, 99-103. (2010)
6. Bobby Woolf Exploring IBM SOA. Technology&Practice. Maximum press (2009).
7. IBM Redbook. Patterns: Implementing an SOA Using an Enterprise Service Bus, http://www.ibm.com/Index.cfm?ArticleID=22084, last accessed 2020/05/01.
8. Kravets, P.: Game method for coalitions formation in multi-agent systems. In: International Scientific and Technical Conference on Computer Sciences and Information Technologies, CSIT, 1-4. (2018)
9. IBM Redbook Patterns: Service-Oriented Architecture and Web Services, http://www.redbooks.ibm.com/abstracts/sg246303.html, last accessed 2020/05/01.
10. Berko, A.Y., Aliekseyeva, K.A.: Quality evaluation of information resources in web-projects. In: Actual Problems of Economics 136(10), 226-234. (2012)
11. SOA Development Using the IBM Rational Software Development Platform, http://www07.ibm.com/sg/soa/downloads/SOA_Development_using_Rational_Software, , last accessed 2020/05/01.
12. Lytvyn, V., Vysotska, V., Burov, Y., Demchuk, A.: Architectural ontology designed for intellectual analysis of e-tourism resources. In: Proceedings of the International Conference on Computer Sciences and Information Technologies, CSIT, 335-338. (2018)
13. Antonyuk, N., Vysotsky, A., Vysotska, V., Lytvyn, V., Burov, Y., Demchuk, A., Lyudkevych, I., Chyrun, L., Chyrun, S., Bobyk, I.: Consolidated Information Web Resource for Online Tourism Based on Data Integration and Geolocation. In: Proceedings of

the International Conference on Computer Sciences and Information Technologies, CSIT, 15-20. (2019)
14. Vysotsky, A., Lytvyn, V., Vysotska, V., Dosyn, D., Lyudkevych, I., Antonyuk, N., Naum, O., Vysotskyi, A., Chyrun, L., Slyusarchuk, O.: Online Tourism System for Proposals Formation to User Based on Data Integration from Various Sources. In: International Conference on Computer Sciences and Information Technologies, CSIT, 92-97. (2019)
15. Shakhovska, N., Shakhovska, K., Fedushko, S.: Some Aspects of the Method for Tourist Route Creation. In: Advances in Artificial Systems for Medicine and Education II, 902, 527-537. (2019)
16. Antonyuk, N., Medykovskyy, M., Chyrun, L., Dverii, M., Oborska, O., Krylyshyn, M., Vysotsky, A., Tsiura, N., Naum, O.: Online Tourism System Development for Searching and Planning Trips with User's Requirements. In: Advances in Intelligent Systems and Computing IV, Springer Nature Switzerland AG 2020, 1080, 831-863. (2020)
17. Lozynska, O., Savchuk, V., Pasichnyk, V.: Individual Sign Translator Component of Tourist Information System. In: Advances in Intelligent Systems and Computing IV, Springer Nature Switzerland AG 2020, Springer, Cham, 1080, 593-601. (2020)
18. Savchuk, V., Lozynska, O., Pasichnyk, V.: Architecture of the Subsystem of the Tourist Profile Formation. In: Advances in Intelligent Systems and Computing, 561-570. (2019)
19. Zhezhnych, P., Markiv, O.: Recognition of tourism documentation fragments from webpage posts. In: 14th International Conference on Advanced Trends in Radioelectronics, Telecommunications and Computer Engineering, TCSET, 948-951. (2018)
20. Zhezhnych, P., Markiv, O.: Linguistic comparison quality evaluation of web-site content with tourism documentation objects. In: Advances in Intelligent Systems and Computing 689, 656-667. (2018)
21. Zhezhnych, P., Markiv, O.: A linguistic method of web-site content comparison with tourism documentation objects. In: International Scientific and Technical Conference on Computer Sciences and Information Technologies, CSIT, 340-343. (2017)
22. Babichev, S.: An Evaluation of the Information Technology of Gene Expression Profiles Processing Stability for Different Levels of Noise Components. In: Data, 3 (4), 48. (2018)
23. Babichev, S., Durnyak, B., Pikh, I., Senkivskyy, V.: An Evaluation of the Objective Clustering Inductive Technology Effectiveness Implemented Using Density-Based and Agglomerative Hierarchical Clustering Algorithms. In: Advances in Intelligent Systems and Computing, 1020, 532-553. (2020)
24. Lytvyn, V., Vysotska, V.: Designing architecture of electronic content commerce system. In: Computer Science and Information Technologies. In: Proceedings of the International Conference on Computer Sciences and Information Technologies, CSIT, 115-119. (2015)
25. Rusyn, B., Vysotska, V., Pohreliuk, L.: Model and architecture for virtual library information system. In: Proceedings of the International Conference on Computer Sciences and Information Technologies, CSIT, 37-41. (2018)
26. Lytvyn, V., Kuchkovskiy, V., Vysotska, V., Markiv, O., Pabyrivskyy, V.: Architecture of system for content integration and formation based on cryptographic consumer needs. In: Proceedings of the International Conference on Computer Sciences and Information Technologies, CSIT, 391-395. (2018)
27. Lytvyn, V., Vysotska, V., Demchuk, A., Demkiv, I., Ukhanska, O., Hladun, V., Kovalchuk, R., Petruchenko, O., Dzyubyk, L., Sokulska, N.: Design of the architecture of an intelligent system for distributing commercial content in the internet space based on SEO-technologies, neural networks, and Machine Learning. In: Eastern-European Journal of Enterprise Technologies, 2(2-98), 15-34. (2019)

28. Rzheuskyi, A., Kutyuk, O., Vysotska, V., Burov, Y., Lytvyn, V., Chyrun, L.: The Architecture of Distant Competencies Analyzing System for IT Recruitment. In: Proceedings of the International Conference on Computer Sciences and Information Technologies, CSIT, 254-261. (2019)
29. Kazarian, A., Kunanets, N., Pasichnyk, V., Veretennikova, N., Rzheuskyi, A., Leheza, A., Kunanets, O.: Complex Information E-Science System Architecture based on Cloud Computing Model. In: CEUR Workshop Proceedings, Vol-2362, 366-377. (2019)
30. Lytvyn, V., Dosyn, D., Emmerich, M., Yevseyeva, I.: Content formation method in the web systems. In: CEUR Workshop Proceedings, 2136, 42-61. (2018)
31. Lytvyn, V., Rybchak, Z.: Design of airport service automation system. In: Proceedings of the International Conference on Computer Sciences and Information Technologies, CSIT, 195-197. (2015)
32. Lytvyn, V.V.: An approach to intelligent agent construction for determining the group of bank risk basing on ontology. In: Actual Problems of Economics (7), 314-320. (2011)
33. Dosyn, D., Lytvyn, V., Kovalevych, V., Oborska, O., Holoshchuk, R.: Knowledge discovery as planning development in knowledgebase framework. In: Modern Problems of Radio Engineering, Telecommunications and Computer Science, TCSET, 449-451. (2016)
34. Lypak, O.H., Lytvyn, V., Lozynska, O., (...), Rzheuskyi, A., Dosyn, D.: Formation of Efficient Pipeline Operation Procedures Based on Ontological Approach. In: Advances in Intelligent Systems and Computing, 871, 571-581. (2019)
35. Peleshchak, R., Lytvyn, V., Peleshchak, I., Olyvko, R., Korniak, J.: Decision making model based on neural network with diagonalized synaptic connections. In: Advances in Intelligent Systems and Computing, 853, 321-329. (2019)
36. Pasichnyk, V., Lytvyn, V., Kunanets, N., (...), Bolyubash, Y., Rzheuskyi, A.: Ontological approach in the formation of effective pipeline operation procedures. In: 13th International Scientific and Technical Conference on Computer Sciences and Information Technologies, CSIT, 80-83. (2018)
37. Lytvyn, V., Uhryn, D., Fityo, A.: Modeling of territorial community formation as a graph partitioning problem. In: Eastern-European Journal of Enterprise Technologies, 1(4), 47-52. (2016)
38. Lytvyn, V.: The similarity metric of scientific papers summaries on the basis of adaptive ontologies. In: Proceedings of 7th International Conference on Perspective Technologies and Methods in MEMS Design, MEMSTECH, 162. (2011)
39. Lytvyn, V.V., Tsmots, O.I.: The process of managerial decision making support within the early warning system. In: Actual Problems of Economics, 149(11), 222-229. (2013)
40. Kravets, P.: The control agent with fuzzy logic. In: Perspective Technologies and Methods in MEMS Design, MEMSTECH, 40-41. (2010)
41. Kravets, P.: The game method for orthonormal systems construction. In: The Experience of Designing and Application of CAD Systems in Microelectronics, , 296-298. (2007)
42. Kravets, P., Kyrkalo, R.: Fuzzy logic controller for embedded systems. In: International Conference on Perspective Technologies and Methods in MEMS Design, , 58-59. (2009)
43. Kravets, P., Prodanyuk, O.: Game task of resource allocation. In: Experience of Designing and Application of CAD Systems in Microelectronics, CADSM, 437-438. (2009)
44. Kravets, P.: Game methods of the stochastic boundary problem solution. In: Perspective Technologies and Methods in MEMS Design, MEMSTECH, 71-74. (2007)
45. Kravets, P.: Adaptive method of pursuit game problem solution. In: Modern Problems of Radio Engineering, Telecommunications and Computer Science Proceedings of International Conference, TCSET, 62-65. (2006)

46. Kravets, P.: Game methods of construction of adaptive grid areas. In: The Experience of Designing and Application of CAD Systems in Microelectronics, , 513-516. (2003)
47. Shakhovska, N., Veres, O., Bolubash, Y., Bychkovska-Lipinska, L.: Data space architecture for Big Data managering. In: Proceedings of the International Conference on Computer Sciences and Information Technologies, CSIT, 184-187. (2015)
48. Vysotska, V., Hasko, R., Kuchkovskiy, V.: Process analysis in electronic content commerce system. In: Proceedings of the International Conference on Computer Sciences and Information Technologies, CSIT, 120-123. (2015)
49. Lytvyn, V., Vysotska, V., Veres, O., Rishnyak, I., Rishnyak, H.: The Risk Management Modelling in Multi Project Environment.. In: Proceedings of the International Conference on Computer Sciences and Information Technologies, CSIT, 32-35. (2017)
50. Kanishcheva, O., Vysotska, V., Chyrun, L., Gozhyj, A.: Method of Integration and Content Management of the Information Resources Network. In: Advances in Intelligent Systems and Computing, 689, Springer, 204-216. (2018)
51. Vysotska, V., Fernandes, V.B., Emmerich, M.: Web content support method in electronic business systems. In: CEUR Workshop Proceedings, Vol-2136, 20-41. (2018)
52. Vysotska, V., Lytvyn, V., Burov, Y., Gozhyj, A., Makara, S.: The consolidated information web-resource about pharmacy networks in city. In: CEUR Workshop Proceedings, 239-255. (2018)
53. Gozhyj, A., Kalinina, I., Vysotska, V., Gozhyj, V.: The method of web-resources management under conditions of uncertainty based on fuzzy logic. In: Proceedings of the International Conference on Computer Sciences and Information Technologies, CSIT, 343-346. (2018)
54. Gozhyj, A., Vysotska, V., Yevseyeva, I., Kalinina, I., Gozhyj, V.: Web Resources Management Method Based on Intelligent Technologies. In: Advances in Intelligent Systems and Computing, 871, 206-221. (2019)
55. Rzheuskyi, A., Kutyuk, O., Voloshyn, O., Kowalska-Styczen, A., Voloshyn, V., Chyrun, L., Chyrun, S., Peleshko, D., Rak, T.: The Intellectual System Development of Distant Competencies Analyzing for IT Recruitment. In: Advances in Intelligent Systems and Computing IV, Springer, Cham, 1080, 696-720. (2020)
56. Rusyn, B., Pohreliuk, L., Rzheuskyi, A., Kubik, R., Ryshkovets Y., Chyrun, L., Chyrun, S., Vysotskyi, A., Fernandes, V. B.: The Mobile Application Development Based on Online Music Library for Socializing in the World of Bard Songs and Scouts' Bonfires. In: Advances in Intelligent Systems and Computing IV, Springer, 1080, 734-756. (2020)
57. Vysotska, V., Rishnyak, I., Chyrun L.: Analysis and evaluation of risks in electronic commerce. In: CAD Systems in Microelectronics, International Conference, 332-333. (2007)
58. Vysotska, V., Chyrun, L.: Analysis features of information resources processing. In: Proceedings of the International Conference on Computer Sciences and Information Technologies, CSIT, 124-128. (2015)
59. Andrunyk, V., Chyrun, L., Vysotska, V.: Electronic content commerce system development. In: Proceedings of 13th International Conference: The Experience of Designing and Application of CAD Systems in Microelectronics, CADSM 2015-February. (2015)
60. Alieksieieva, K., Berko, A., Vysotska, V.: Technology of commercial web-resource processing. In: Proceedings of 13th International Conference: The Experience of Designing and Application of CAD Systems in Microelectronics, CADSM 2015-February. (2015)
61. Vysotska, V., Chyrun, L.: Methods of information resources processing in electronic content commerce systems. In: Proceedings of 13th International Conference: The Experience of Designing and Application of CAD Systems in Microelectronics, CADSM. (2015)