

JNANA SANGAMA, BELAGAVI – 590 018



Predict The Price Of Books

by

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ESTD:2001

An Institute with a Difference

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RNS INSTITUTE OF TECHNOLOGY

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CERTIFICATE

Certified that the Internship work entitled *Predict The Price Of Books* has been successfully completed by **Vaishnavi S M (1RN18IS115)** bonafide student of **RNS Institute of Technology, Bengaluru** in partial fulfilment of the requirements of 7th semester for the award of degree in **Bachelor of Engineering in Information Science and Engineering of Visvesvaraya Technological University, Belagavi** during academic year **2021-2022**. The internship report has been approved as it satisfies the academic requirements in respect of internship work for the said degree.

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DECLARATION

I, **Vaishnavi S M [USN: 1RN18IS115]** student of VII Semester BE, in Information Science and Engineering, RNS Institute of Technology hereby declare that the Internship work entitled ***Predict The Price of Books*** has been carried out by us and submitted in partial fulfilment of the requirements for the *VII Semester degree of **Bachelor of Engineering in Information Science and Engineering** of Visvesvaraya Technological University, Belagavi* during academic year 2021-2022.

Place : Bengaluru

Date : 12-01-21

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ABSTRACT

As each and every sector of the market is growing, data is building up day by day, we need to keep the record of the data which can be helpful for the analytics and evaluation. Now we don't have data in gigabyte or terabyte but in zeta byte and petabyte and this data cannot be handled with the day to day software such as Excel or Matlab. Therefore, in this report we will be dealing with large data sets with the high-level programming language 'Python'.

The main goal of this project is to aggregate and analyze the data collected from the different data sets. This project mainly focuses on the usage of the python programming language in the field of data analysis and outcome prediction. This language has not only its application in the field of just analyzing the data but also for the prediction of the upcoming scenarios.

The purpose of using this specific language is due to its versatility, vast libraries (Pandas, Numpy, Matplotlib, etc.), speed limitations, and ease of learning. We will be analyzing large data sets in this project which cannot be easily analyzed in other tools as compared to python. Python does not have its limitation to only data analytics but also in many other fields such as Artificial intelligence, Machine learning, and many more.

ACKNOWLEDGMENT

At the very onset I would like to place our gratefulness to all those people who helped me in making the Internship a successful one.

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LIST OF ABBREVIATIONS

SQL	-	Structured Query Language
SAS	-	Static Analysis System
API	-	Application programming interface
XGboost	-	eXtreme Gradient Boosting
UI	-	User Interface
MATLAB	-	MATrix LABoratory
SDK	-	Software Development Kit

INTRODUCTION

1.1 Data Science

Data science is the field of data analytics and data visualization in which raw data or the unstructured data is cleaned and made ready for the analysis purpose. Data scientists use this data to get the required information for the future purpose. “Data science uses many processes and methods on the big data, the data may be structured or unstructured”. Data frames available on the internet is the raw data we get. It may be either in unstructured or semi structured format. This data is further filtered, cleaned and then number of required task are performed for the analysis with the use of the high programming language. This data is further analyzed and then presented for our better understanding and evaluation.

One must be clear that data science is not about making complicated models or making awesome visualization neither it is about writing code but about using the data to create an impact for your company, for this impact we need tools like complicated data models and data visualization. There are many tools used to handle the **big data available to us**. “Data scientists use programming tools such as Python, R, SAS, Java, Perl, and C/C++ to extract knowledge from prepared data”.

Data scientists use many algorithms and mathematical models on the data. Following are the stages and their cycle performed on the unstructured data.

- Identifying the problem.
- Identify available data sources
- Identify available data sources
- Identify if additional data sources are needed.
- Statistical analysis
- Implementation, development
- Communicate results
- Maintenance

Data science finds its application in many fields. With the assistance of data science, it is easy to get the search query on search engines in plenty of time. A role of the data scientist is to have a deep understanding of the data as well as a good command on the programming language, he should also know how to work with the raw data extracted from the data source. Many programming languages are used to analyze and evaluate the data such as Python, Java, MATLAB, Scala, Julia, R., SQL and TensorFlow. Among which python is the most user friendly and vastly used programming language in the field of data science. This life cycle is applied in each and every field, in this project we will be considering all this seven stages of data science to analyze the data. The process will be starting from data collection, data preparation, data modeling and finally data evaluation. Data Science continues to be a hot topic among skilled professionals and organizations that are focusing on collecting data and drawing meaningful insights out of it to aid business growth. A lot of data is an asset to any organization, but only if it is processed efficiently. The need for storage grew multifold when we entered the age of big data. Until 2010, the major focus was towards building a state of the art infrastructure to store this valuable data, that would then be accessed and processed to draw business insights. With frameworks like Hadoop that have taken care of the storage part, the focus has now shifted towards processing this data. Let us see what is data science, and how it fits into the current state of big data and businesses. Broadly, Data Science can be defined as the study of data, where it comes from, what it represents, and the ways by which it can be transformed into valuable inputs and resources to create business and IT strategies.

1.2 Proposed System

The proposed system uses XGBoost for regression. Extreme Gradient Boosting (XGBoost) is an open-source library that provides an efficient and effective implementation of the gradient boosting algorithm. Shortly after its development and initial release, XGBoost became the go-to method and often the key component in winning solutions for a range of problems in machine learning competitions. Regression predictive modeling problems involve predicting a numerical value such as a dollar amount or a height. XGBoost can be used directly for regression predictive modeling.

Gradient boosting refers to a class of ensemble machine learning algorithms that can be used for classification or regression predictive modeling problems. Ensembles are constructed from decision tree models. Trees are added one at a time to the ensemble and fit to correct the prediction errors made by prior models. This is a type of ensemble machine learning model referred to as boosting. Models are fit using any arbitrary differentiable loss function and gradient descent optimization algorithm. This gives the technique its name, “gradient boosting,” as the loss gradient is minimized as the model is fit, much like a neural network. The two main reasons to use XGBoost are execution speed and model performance.

ANALYSIS

2.1 Introduction

“Python is an interpreted, object-oriented, high-level programming language with dynamic semantics”. This language consists of mainly data structures which make it very easy for the data scientists to analyze the data very effectively. It does not only help in forecasting and analysis it also helps in connecting the two different languages. Two best features of this programming language is that it does not have any compilation step as compared to the other programming language in which compilation is done before the program is being executed and other one is the reuse of the code, it consists of modules and packages due to which we can use the previously written code anywhere in between the program whenever is required. There are multiple languages for example R., Java, SQL, Julia, Scala, MATLAB available in market which can be used to analyze and evaluate the data, but due to some outstanding features python is the most famous language used in the field of data science.

Python is mostly used and easy among all other programming languages. Books are the most important friends in one’s life. The so-called paradoxes of an author, to which a reader takes exception, often exist not in the author’s book at all, but rather in the reader’s head. — Friedrich Nietzsche Books are open doors to the unimagined worlds which is unique to every person. It is more than just a hobby for many. There are many among us who prefer to spend more time with books than anything else. Here we explore a big database of books. Books of different genres, from thousands of authors. In this article, we will use the dataset to build a Machine Learning model to predict the price of books based on a given set of features.



Fig1.1 XGBoost Algorithm

2.2 XGBoost Regression

Extreme Gradient Boosting, or XGBoost for short, is an efficient open-source implementation of the gradient boosting algorithm. As such, XGBoost is an algorithm, an open-source project, and a Python library. It was initially developed by Tianqi Chen and was described by Chen and Carlos Guestrin in their 2016 paper titled “XGBoost: A Scalable Tree Boosting System.” It is designed to be both computationally efficient (e.g. fast to execute) and highly effective, perhaps more effective than other open-source implementations. The two main reasons to use XGBoost are execution speed and model performance. XGBoost dominates structured or tabular datasets on classification and regression predictive modeling problems. The evidence is that it is the go-to algorithm for competition winners on the Kaggle competitive data science platform.

Now XGboost owns the ability to handle both types of situations, whether you need to go with regression or classification modelling. So, we can consider XGboost both as a classification and regression algorithm.

2.3 XGBoost Features

- **Regularized Learning:** Regularization term helps to smooth the final learnt weights to avoid overfitting. The regularized objective will tend to select a model employing simple and predictive functions.
- **Gradient Tree Boosting:** The tree ensemble model cannot be optimized using traditional optimization methods in Euclidean space. Instead, the model is trained in an additive manner.
- **Shrinkage and Column Subsampling:** Besides the regularized objective, two additional techniques are used to further prevent overfitting. The first technique is shrinkage introduced by Friedman. Shrinkage scales newly added weights by a factor η after each step of tree boosting. Similar to a learning rate in stochastic optimization, shrinkage reduces the influence of each tree and leaves space for future trees to improve the model.

2.4 XGBoost Regression API

XGBoost can be installed as a standalone library and an XGBoost model can be developed using the scikitlearn API. The first step is to install the XGBoost library if it is not already installed. This can be achieved using the pip python package manager on most platforms; for example: `sudo pip install xgboost`

You can then confirm that the XGBoost library was installed correctly and can be used by running the following script.

```
import xgboost print(xgboost.__version__)
```

Running the script will print your version of the XGBoost library you have installed.

Your version should be the same or higher. If not, you must upgrade your version of the XGBoost library.

It is possible that you may have problems with the latest version of the library. It is not your fault.

Sometimes, the most recent version of the library imposes additional requirements or may be less stable. If you do have errors when trying to run the above script, I recommend downgrading to version 1.0.1 (or lower). This can be achieved by specifying the version to install to the pip command, as follows:

```
sudo pip install xgboost==1.0.1
```

The XGBoost library has its own custom API, although we will use the method via the scikit-learn wrapper classes: `XGBRegressor` and `XGBClassifier`. This will allow us to use the full suite of tools from the scikit-learn machine learning library to prepare data and evaluate models.

An XGBoost regression model can be defined by creating an instance of the `XGBRegressor` class; for example:

```
...  
# create an xgboost regression model model = XGBRegressor()
```

You can specify hyperparameter values to the class constructor to configure the model. Perhaps the most commonly configured hyperparameters are the following:

- `n_estimators`: The number of trees in the ensemble, often increased until no further improvements are seen.
- `max_depth`: The maximum depth of each tree, often values are between 1 and 10.

- eta: The learning rate used to weight each model, often set to small values such as 0.3, 0.1, 0.01, or smaller.
- subsample: The number of samples (rows) used in each tree, set to a value between 0 and 1, often 1.0 to use all samples.
- colsample_bytree: Number of features (columns) used in each tree, set to a value between 0 and 1, often 1.0 to use all features.

2.5 Software requirement specification

The best thing about using Flutter for creating cross-platform native mobile apps is the fact that you can build those on almost any OS.

Here are some System Requirements for Android Studio which is needed for running an Android simulator.

Windows:

- Microsoft® Windows® 7/8/10 (64-bit)
- 4 GB RAM minimum, 8 GB RAM recommended
- 2 GB of available disk space minimum,
- 4 GB Recommended (500 MB for IDE + 1.5 GB for Android SDK and emulator system image)
- 1280 x 800 minimum screen resolution

To install and run Jupyter, your development environment must meet these minimum requirements:

- **Operating Systems:** Windows 7 SP1 or later (64-bit), x86-64 based.
- **Disk Space:** 1.64 GB (does not include disk space for IDE/tools).
- With PySpark (Team Studio version 6.2 and later)
Memory and disk space required per user: 1GB RAM + 1GB of disk + .5 CPU core.
Server overhead: 2-4GB or 10% system overhead (whatever is larger), .5 CPU cores, 10GB disk space.
Port requirements: Port 8000 plus 5 unique, random ports per notebook.
- Without PySpark (Team Studio version 6.0 or 6.1)
Memory and disk space required per user: 512MB RAM + 1GB of disk + .5 CPU core.
Server overhead: 2-4GB or 10% system overhead (whatever is larger), .5 CPU cores, 10GB disk space.
Port requirements: Port 8000.SYSTEM DESIGN

SYSTEM DESIGN

3.1 Process Flow

Process Flow Diagrams (PFDs) are a **graphical way of describing a process, its constituent tasks, and their sequence**. A PFD helps with the brainstorming and communication of the process design. The following diagrams help us understand the algorithm and its working.

Algorithm 1: XGboost algorithm

Data: Dataset and hyperparameters

Initialize $f_0(x)$;

for $k = 1, 2, \dots, M$ **do**

 Calculate $g_k = \frac{\partial L(y, f)}{\partial f}$;

 Calculate $h_k = \frac{\partial^2 L(y, f)}{\partial f^2}$;

 Determine the structure by choosing splits with maximized gain

$\mathbf{A} = \frac{1}{2} \left[\frac{G_L^2}{H_L} + \frac{G_R^2}{H_R} - \frac{G^2}{H} \right]$;

 Determine the leaf weights $w^* = -\frac{G}{H}$;

 Determine the base learner $\hat{b}(x) = \sum_{j=1}^T w I_j$;

 Add trees $f_k(x) = f_{k-1}(x) + \hat{b}(x)$;

end

Result: $f(x) = \sum_{k=0}^M f_k(x)$

Fig3.1 Basic XGboost Algorithm mathematically represented

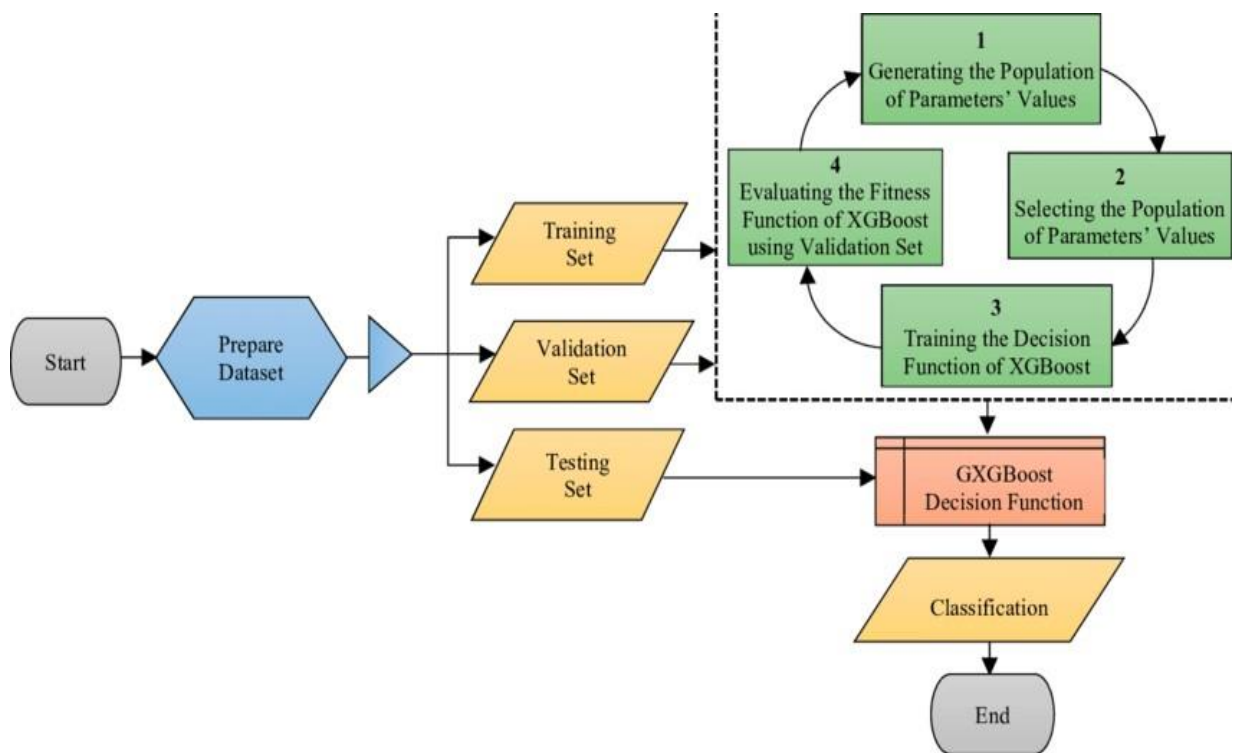


Fig3.2 Flowchart for XGboost Algorithm

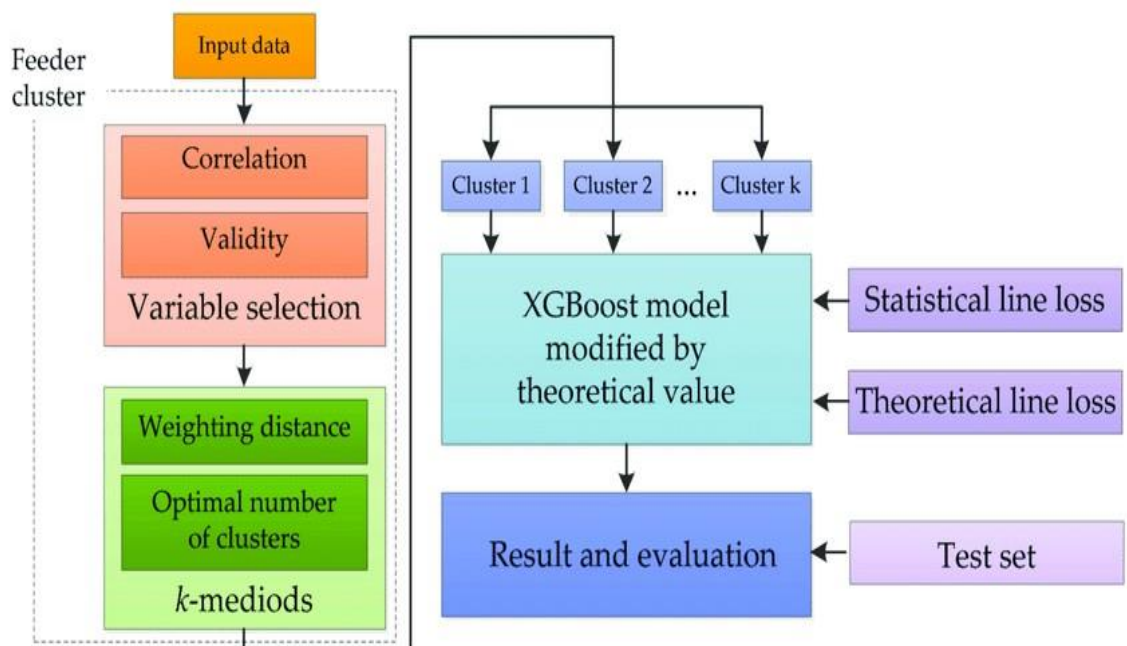


Fig3.3 Flowchart for XGboost model

IMPLEMENTATION DETAILS

4.1 Implementation

Project implementation (or project execution) is **the phase where visions and plans become reality**. This is the logical conclusion, after evaluating, deciding, visioning, planning, applying for funds and finding the financial resources of a project. The following set of snippets help us understand the working of the project in a better way:

```
train = pd.read_excel("C:/Users/RAMANA MURTHY/Downloads/Participants_Data/Data_Train.xlsx")
test = pd.read_excel("C:/Users/RAMANA MURTHY/Downloads/Participants_Data/Data_Test.xlsx")
```

Fig4.1

The above snippet is used to import the training and test data sets.

```
#A method to clean and restructure the Edition column

def split_edition(data):
    edition = list(data)
    ed_type = [i.split(", - ")[0].strip().upper() for i in edition]
    edit_date = [i.split(", - ")[1].strip() for i in edition]
    m_y = [i.split()[-2:] for i in edit_date]

    for i in range(len(m_y)):
        if len(m_y[i]) == 1:
            m_y[i].insert(0, 'NA')

    # Based on the given dataset below is the list of possible values for Months
    months = ['Apr', 'Aug', 'Dec', 'Feb', 'Jan', 'Jul', 'Jun', 'Mar', 'May', 'NA', 'Nov', 'Oct', 'Sep']

    ed_month = [m_y[i][0].upper() if m_y[i][0] in months else 'NA' for i in range(len(m_y))]
    ed_year = [int(m_y[i][1].strip()) if m_y[i][1].isdigit() else 0 for i in range(len(m_y))]

    return ed_type, ed_month, ed_year
```

Fig4.2

The above snippet is used to clean and restructure the edition column.

```

#Identifying the maximum number of authors for a single book from the given datasets
authors_1 = list(train['Author'])
authors_2 = list(test['Author'])

authors_1.extend(authors_2)

authorslis = [i.split(",") for i in authors_1]

max = 1
for i in authorslis:
    if len(i) >= max:
        max = len(i)
print("Max. number of authors for a single boook = ",max)

for i in range(len(authorslis)):
    if len(authorslis[i]) == max:
        print(i)

all_authors = [author.strip().upper() for listin in authorslis for author in listin]

```

Fig4.3

The above snippet is used to identify the maximum number of authors for a single book from given data set.

```

#Identifying the maximum number of Genres for a single book from the given datasets

genre_1 = list(train['Genre'])
genre_2 = list(test['Genre'])

genre_1.extend(genre_2)

genre_lis = [i.split(",") for i in genre_1]

max = 1
for i in genre_lis:
    if len(i) >= max:
        max = len(i)
print("Max. number of genres for a single boook = ",max)

all_genres = [genre.strip().upper() for listin in genre_lis for genre in listin]

```

Fig4.4

The above snippet is used to identify the maximum number of genres for a single book from given data set.

```
# A method to split the Genre column in to 7 new columns
```

```
def split_genres(data):  
    genres = list(data)  
  
    G1 = []  
    G2 = []  
  
    for i in genres:  
        try :  
            G1.append(i.split(',')[0].strip().upper())  
  
        except :  
            G1.append('NONE')  
  
        try :  
            G2.append(i.split(',')[1].strip().upper())  
        except :  
            G2.append('NONE')  
  
    return G1,G2  
all_genres.append('NONE')
```

Fig4.5

The above snippet is implemented to split the genre column into 7 new columns.

```

# A method to clean and restructure the datasets

import re

def restructure(data):

    #Cleaning Title Column
    titles = list(data['Title'])
    titles = [title.strip().upper() for title in titles]

    #Cleaning & Restructuring Author Column
    a1,a2,a3,a4,a5,a6,a7 = split_authors(data['Author'])

    #Cleaning & Restructuring Edition Column
    ed_type, ed_month, ed_year = split_edition(data['Edition'])

    #Cleaning Ratings Column
    ratings = list(data['Reviews'])
    ratings = [float(re.sub(" out of 5 stars", "", i).strip()) for i in ratings]

    #Cleaning Reviews Column
    reviews = list(data['Reviews'])
    plu = ' customer reviews'
    reviews = [re.sub(" customer reviews", "", i) if plu in i else re.sub(" customer review", "", i) for i in reviews ]
    reviews = [int(re.sub(",", "", i).strip()) for i in reviews ]

    #Cleaning & Restructuring Genre Column
    g1, g2 = split_genres(data['Genre'])

    #Cleaning & Restructuring BookCategory Column
    c1,c2 = split_categories(data['BookCategory'])

    # Forming the Structured dataset
    structured_data = pd.DataFrame({'Title': titles,
                                   'Author1': a1,
                                   'Author2': a2,
                                   'Author3': a3,
                                   'Author4': a4,
                                   'Author5': a5,
                                   'Author6': a6,
                                   'Author7': a7,
                                   'Edition_Type': ed_type,
                                   'Edition_Month': ed_month,
                                   'Edition_Year': ed_year,
                                   'Ratings': ratings,
                                   'Reviews': reviews,
                                   'Genre1': g1,
                                   'Genre2': g2,
                                   'Category1': c1,
                                   'Category2': c2

                                   })

    return structured_data

```

Fig4.6

The above snippet is used to clean and restructure the datasets.

```
pip install xgboost
```

Fig4.7

The above snippet is used to install xgboost.

```
!pip install bayesian-optimization
```

Fig4.8

The above snippet is used to install bayesian optimization.

```
#Extracting the best parameters
params = xgb_bo.max['params']

print(params)

#Converting the max_depth and n_estimator values from float to int
params['max_depth'] = int(round(params['max_depth']))
params['n_estimators'] = int(round(params['n_estimators']))

print(params)
```

Fig4.9

The above snippet is used to extract the best parameters.

```
#Initialize an XGB with the tuned parameters and fit the training data
from xgboost import XGBRegressor
reg = XGBRegressor(**params).fit(X_train,Y_train)

y_pred_reg = sc.inverse_transform(reg.predict(X_test))
```

Fig 4.9.1

The above snippet to initialize an XGB with the tuned parameters and fit the raining data.

TESTING

5.1 Testing and Training

Testing is the process of evaluating and verifying that a software product or application does what it is supposed to do. In machine learning, a common task is the study and construction of algorithms that can learn from and make predictions on data. Such algorithms function by making data-driven predictions or decisions, through building a mathematical model from input data.

A validation dataset is a sample of data held back from training your model that is used to give an estimate of model skill while tuning model's hyperparameters. The validation dataset is different from the test dataset that is also held back from the training of the model, but is instead used to give an unbiased estimate of the skill of the final tuned model when comparing or selecting between final models. There is much confusion in applied machine learning about what a validation dataset is exactly and how it differs from a test dataset.

A simple evaluation method is a train test dataset where the dataset is divided into a train and a test dataset, then the learning model is trained using the train data and performance is measured using the test data. In a more sophisticated approach, the entire dataset is used to train and test a given model. After the model is built, testing data once again validates that it can make accurate predictions. If training and validation data include labels to monitor performance metrics of the model, the testing data should be unlabeled. Test data provides a final, real-world check of an unseen dataset to confirm that the XGBoost algorithm was trained effectively.

	A	B	C	D	E	F	G	H	I	J	K
1	Title	Author	Edition	Reviews	Ratings	Synopsis	Genre	BookCategory			
2	The Comp	Sir Arthur Mass	Marl	4.4 out of	960	custor	A collectic	Short Stor	Crime, Thriller & Mystery		
3	Learn Doc	Gabriel N.	Paperback	5.0 out of	1	custome	Enhance y	Operating	Computing, Internet & Digital Media		
4	Big Girl	Danielle S	Paperback	5.0 out of	4	custome	Watch ou	Romance	Romance		
5	Think Pyt	Allen B. D.	Paperback	4.1 out of	11	custom	If you war	Programm	Computing, Internet & Digital Media		
6	Oxford Wi	Redman G	Paperback	4.4 out of	9	custome	Learn and	Linguistic	Language, Linguistics & Writing		
7	Understar	John Berg	Paperback	5.0 out of	2	custome	John Berg	Arts Histo	Arts, Film & Photography		
8	Dance Mu	Rick Snom	Paperback	5.0 out of	1	custome	Dance Mu	Music Boc	Computing, Internet & Digital Media		
9	A Clash of	George R.	Paperback	4.3 out of	117	custor	The secon	Action & /	Crime, Thriller & Mystery		
10	An Era of	Shashi Thi	Hardcover	4.4 out of	550	custor	In 1930, th	Asian Hist	Politics		
11	Doing Just	Preet Bha	Paperback	4.4 out of	6	custome	A Guardia	True Acco	Action & Adventure		
12	Courtney	Wilbur Sm	Paperback	3.3 out of	12	custom	The brand	Action & /	Romance		
13	A Ring For	Melanie N	Paperback	5.0 out of	1	custome	From no-s	Romance	Romance		
14	Alice's Ad	Lewis Cari	Paperback	4.2 out of	39	custom	Original,	eShort Stor	Action & Adventure		
15	The Natya	Adya Rang	Hardcover	5.0 out of	1	custome	Classical v	Humour (t	Humour		
16	Green Hill	Ernest Hei	Paperback	3.0 out of	2	custome	Green Hill	Hunting (t	Sports		
17	Anatomy	Chris Lega	Paperback	4.3 out of	5	custome	Anatomy	Sculpture	Computing, Internet & Digital Media		
18	If Truth Be	Om Swam	Hardcover	4.7 out of	558	custor	In the 199	Biographi	Biographies, Diaries & True Accounts		
19	D&AD. Thi	D&AD	Hardcover	5.0 out of	1	custome	In 1995, th	Design	Arts, Film & Photography		
20	Three Bill	Martin Mc	Paperback	3.0 out of	1	custome	After mon	Theatre &	Humour		
21	Thirty Day	Norman Li	Mass Marl	4.0 out of	2	custome	What you	Speech	Language, Linguistics & Writing		
22	When Hitl	Judith Ker	Paperback	5.0 out of	2	custome	This semi-	Children's	Biographies, Diaries & True Accounts		
23	The Peng	J. A. Cudd	Paperback	4.6 out of	45	custom	'An indisp	Dictionari	Language, Linguistics & Writing		

Fig5.1 Testing Dataset

	A	B	C	D	E	F	G	H	I	J	K
1540	Chinese G	Bruce Lee	Paperback	3.0 out of	2	custome	Originally	Martial Ar	Sports		
1541	Learning J	Eriko Sato	Paperback	5.0 out of	1	custome	The quick	Alphabet	Computing, Internet & Digital Media		
1542	Deadpool	Cullen Bui	Paperback	5.0 out of	2	custome	Dadpool h	Humour (t	Humour		
1543	Cartoonin	Ivan Hisse	Paperback	3.0 out of	1	custome	A compre	Handicraf	Computing, Internet & Digital Media		
1544	The Anatc	Bhupen P.	Paperback	4.6 out of	16	custom	Bhupen P.	True Acco	Language, Linguistics & Writing		
1545	The Natio	Minhaz M	Hardcover	3.9 out of	27	custom	This is the	Biographi	Biographies, Diaries & True Accounts		
1546	Amphigor	Edward Gi	Paperback	3.8 out of	2	custome	An illustr	Anthologi	Comics & Mangas		
1547	The Messy	Scott Bels	Paperback	4.2 out of	6	custome	Silicon Val	Computer	Computing, Internet & Digital Media		
1548	The Secre	Sudeep N	Paperback	4.6 out of	172	custor	If your pa	Romance	Romance		
1549	You Don't	Kyle Simp	Paperback	4.1 out of	7	custome	It's easy	tc	Programm	Computing, Internet & Digital Media	
1550	Kari The	E. Dhan	Gop	Paperback	5.0 out of	1	custome	Kari, the	lAction & /	Action & Adventure	
1551	How to Te	Janet Don	Paperback	3.3 out of	5	custome	"As the fo	Language,	Language, Linguistics & Writing		
1552	A Song of	George R	Paperback	4.5 out of	296	custor	HBO's hit	Action & /	Action & Adventure		
1553	Goodbye,	Fumio Sas	Hardcover	4.8 out of	13	custom	The best-	Home & H	Sports		
1554	Five Comi	Anton Pav	Paperback	5.0 out of	1	custome	One of the	Plays (Boc	Humour		
1555	Left Politi	Monobina	Paperback	4.0 out of	1	custome	This rema	Governme	Politics		
1556	Guardians	Eckhart Tc	Paperback	3.6 out of	6	custome	A noted ai	Mental &	Humour		
1557	100 Thing	Susan We	Paperback	5.0 out of	4	custome	We desigr	Design	Computing, Internet & Digital Media		
1558	Modern Li	ARUN SAC	Paperback	3.6 out of	13	custom	A 30-day c	Children's	Biographies, Diaries & True Accounts		
1559	The Kite R	Khaled Hc	Paperback	4.0 out of	5	custome	The peren	Humour (t	Humour		
1560	Panzer Lei	Heinz Gud	Paperback	3.5 out of	3	custome	Heinz Gud	United St	Biographies, Diaries & True Accounts		
1561	Complete	Barbara Br	Paperback	4.5 out of	2	custome	Learn Spa	Dictionari	Language, Linguistics & Writing		
1562											

Fig5.2 Testing Dataset showing maximum number of data input

RESULTS

Project results are **the changes or effects expected to take place after implementing the project**. The results are generally positive improvements to the lives of the beneficiaries. XGBoost is a decision-tree-based ensemble Machine Learning algorithm that uses a gradient boosting framework. ... The algorithm differentiates itself in the following ways: A wide range of applications: Can be used to solve regression, classification, ranking, and user-defined prediction problems.

The XGBoost library implements **the gradient boosting decision tree algorithm**. This algorithm goes by lots of different names such as gradient boosting, multiple additive regression trees, stochastic gradient boosting or gradient boosting machines.

The dataset will help us determine the prediction of book prices as much as possible. The dataset contains Title, Author, Edition, Review, Synopsis, Genre and Category.

In the following figure we can notice the 10 book prices being predicted as the output for the respective input.

	Price
0	227.955902
1	1925.048828
2	286.947144
3	1020.582458
4	351.452637
5	546.595825
6	610.366028
7	310.343689
8	361.530396
9	444.550079

Fig6.1

The predicted prices of the books.

CONCLUSION AND FUTURE ENHANCEMENT

7.1 Conclusion

XGBoost is an optimized distributed gradient boosting library designed to be highly efficient, flexible and portable. This project can be used to predict the price of books with the help of XGboost algorithm in the field of Data Science and in the later stages, its accuracy can be increased eventually. The dataset being used in this project is huge and hence it takes a long time for showing the output as it analyzes a lot of combinations.

All in all the project is very helpful and makes use of Machine Learning with Data Science to give us the required outputs.

7.2 Future Enhancement

The project has a very vast scope in future. The project **can be implemented on intranet in future**. Project can be updated in near future as and when requirement for the same arises, as it is very flexible in terms of expansion. In particular, we can:

- Further increase the efficiency of the algorithm.
- Improve the accuracy of prediction.
- Try to decrease the execution time.

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