IBM Project Report On "One Stop Solution for Billboard Advertising Rates "

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Submitted to
Department of Computer Science & Engineering
Institute of Computer Technology

Year: 2023

CERTIFICATE

This is to certify that the IBM Project work entitled “One stop solution for billboard advertising rates” by Prutha Vagh – 19162101027, Raj Chhabria – 19162121003, Devarsh Kayastha – 19162171017 of Ganpat University, towards the partial fulfilment of requirements of the degree of Bachelor of Technology – Computer Science and Engineering, carried out by them in the CSE(CBA, BDA, CS) Department. The results/findings contained in this Project have not been submitted in part or full to any other University / Institute for the award of any other Degree/Diploma.

Name & Signature of Internal Guide
Prof. Umang Thakkar

Name & Signature of Head
Prof. Dharmesh Darji

Place: ICT - GUNI
Date: 8-4-2023

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Abstract

This final year project report presents the development of an innovative solution for billboard advertising rates, intending to provide a one-stop platform for advertisers to find accurate pricing information and select the most cost-effective advertising options. The proposed solution utilizes data mining techniques to collect and analyze relevant data from various sources, such as local government regulations, traffic density, demographic statistics, and market demand. The system uses this data to provide real-time pricing information for billboard advertising space, with features for dynamic pricing, negotiation, and customization based on user preferences. The project also includes a comprehensive user interface design, system architecture, and implementation details using modern web technologies. The evaluation of the system shows promising results in terms of accuracy, usability, and scalability.

Introduction

The report includes a detailed description of the problem domain, the proposed solution architecture, and the implementation details.

This project demonstrates the importance of leveraging advanced technologies to address complex problems and highlights the value of collaboration between academia and industry.

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Chapter 1: Introduction

Chapter 1: Introduction

1.1 What is a “One-Stop Solution for Billboard Advertising Rates”?

The advertising industry has been rapidly evolving, and billboard advertising is still one of the most effective ways of promoting products and services. However, one of the main challenges for advertisers is the lack of transparency and consistency in billboard advertising rates. There is a need for a one-stop solution that provides accurate pricing information and allows advertisers to select the most cost-effective options.

This final-year project report presents the development of an innovative solution that aims to provide a one-stop platform for billboard advertising rates. The proposed solution utilizes data mining techniques to collect and analyze relevant data from various sources, such as local government regulations, traffic density, demographic statistics, and market demand. The system uses this data to provide real-time pricing information for billboard advertising space, with features for dynamic pricing, negotiation, and customization based on user preferences.

The project also includes a comprehensive user interface design, system architecture, and implementation details using modern web technologies. The evaluation of the system shows promising results in terms of accuracy, usability, and scalability. The proposed solution has the potential to significantly improve the efficiency and transparency of billboard advertising rates, benefiting both advertisers and billboard owners.

Overall, this project demonstrates the potential of leveraging advanced technologies to solve real-world problems and highlights the importance of collaboration between academia and industry. The solution developed in this project has the potential to make a significant impact on the advertising industry, and the insights gained from this project can serve as a valuable resource for future research and development in the field of technology.

1.2 Overview

Billboards are a popular and effective form of outdoor advertising that involves displaying large-scale advertisements in prominent locations, such as along highways, in urban areas, and at events. Billboards typically feature high-impact visuals and concise messages to capture the attention of passersby and communicate the advertiser's message quickly and effectively.

Billboards can be static or digital, with digital billboards offering the flexibility to display multiple ads and change content frequently. Advertisers can choose from various types of billboards, such as standard billboards, bulletins, posters, and walls cape, to suit their specific needs and budget.

Billboards are a preferred advertising medium for reaching a wide and diverse audience, creating brand awareness, and promoting products and services. With the rise of advanced technologies such as data analytics and digital billboards, the effectiveness of billboards as an advertising medium continues to evolve and adapt to changing consumer preferences and behaviours.

1.3 Why do we need them?

People need billboards for various reasons. From an advertiser's perspective, billboards provide a highly effective way to reach a large and diverse audience quickly and cost-effectively. With millions of people commuting on highways and urban areas daily, billboards offer an excellent opportunity to create brand awareness and promote products and services to potential customers.

Billboards also provide a long-lasting impact, as they are visible 24/7, unlike other forms of advertising that are only visible during specific times. This makes them ideal for promoting products and services that require continuous exposure to the audience.

Additionally, billboards are versatile, as they can be placed in various locations, including high-traffic areas, urban areas, and along highways. This means advertisers can reach different types of audiences, including commuters, pedestrians, and motorists.

From a consumer's perspective, billboards provide valuable information about products and services that can help them make informed decisions. Billboards can also be entertaining and visually appealing, adding to the urban landscape and enhancing the city's overall aesthetics.

Overall, billboards play a vital role in modern advertising and are essential for businesses looking to promote their products and services to a large and diverse audience.

1.4 Scope

The scope of creating a project on billboards is vast and can encompass various aspects of the advertising industry. A project on billboards can explore various areas, such as:

- **Digital billboard advertising**: With the growing trend of digital advertising, a project can focus on the implementation of digital

billboards that utilize advanced technologies such as real-time data analytics, AI, and interactive features.

- **Cost-effective billboard advertising:** A project can explore ways to make billboard advertising more cost-effective by developing a platform that allows advertisers to find the best deals on billboard advertising space.

- **Innovative billboard designs:** A project can focus on developing innovative billboard designs that capture the attention of audiences and enhance the visual aesthetics of urban landscapes.

- **Impact of billboards on consumer behaviour:** A project can explore the impact of billboards on consumer behaviour and how advertisers can utilize billboards to influence consumer decisions.

- **Environmental impact of billboards:** A project can explore the environmental impact of billboards and ways to make billboard advertising more sustainable and eco-friendly.

Overall, the scope of creating a project on billboards is vast and offers opportunities to explore various aspects of the advertising industry. A well-planned and executed project can provide valuable insights and solutions that can benefit advertisers, billboard owners, and consumers alike.

Chapter 2: Pre-Development Analysis

Chapter 2: Pre-Development Analysis

2.1 Basic Project Understanding

Additionally, it can also benefit billboard companies by enabling them to optimize their pricing strategies based on market demand and other factors. Therefore, building a successful machine-learning solution for billboard advertising rates can have a significant impact on the advertising industry as a whole. It is important to approach this project with careful planning, attention to data privacy and security, and ongoing updates and maintenance to ensure its accuracy and relevance.

2.2 Project Implementation

1. **Literature Reading:**

In a project, literature reading refers to the process of reviewing and analyzing existing academic and professional literature related to the project's topic or research question.

Literature reading involves searching and critically evaluating relevant sources such as scholarly articles, books, conference proceedings, and other publications related to the project's topic. It may also involve reviewing other forms of media, such as documentaries, interviews, or podcasts, that provide insights into the project's area of study.

By engaging in literature reading, project researchers can gain a deeper understanding of the key concepts, theories, and methods relevant to their research.

Here are a few advanced features that could be added to a dataset for billboard advertising rates:

- **Historical data:** including past advertising rates for each billboard, as well as information on how often and for how long the billboard was rented out, can help to provide insights into trends and patterns in demand for advertising space.

- **Demographic data:** including information on the demographics of the area surrounding each billboard, such as age, income, and education level, can help to provide insights into the target audience for advertising on each billboard.

- **Traffic data:** including information on the number of cars and pedestrians that pass by each billboard, as well as the time of day and day of the week when traffic is heaviest, can help to provide insights into the visibility and impact of advertising on each billboard.

- **Comparison feature:** including a feature that allows users to compare the rates, location, visibility, and other factors of different billboards can help to make the process of selecting a billboard for advertising more efficient.

- **Social Media Integration:** Integrating with social media platforms like Facebook, Instagram, and Twitter to show the number of followers, likes, and other engagement metrics can help businesses to target their audience better.

- **Integration with Ad Campaign Management Platforms:** Integrate with ad campaign management platforms like Google Ads, Facebook Ads, etc. to get insights on audience engagement, click-through rate, conversion rate, etc.

These advanced features will help to make the dataset more powerful and useful for businesses looking to advertise on billboards, as well as for researchers and analysts studying the billboard advertising industry.

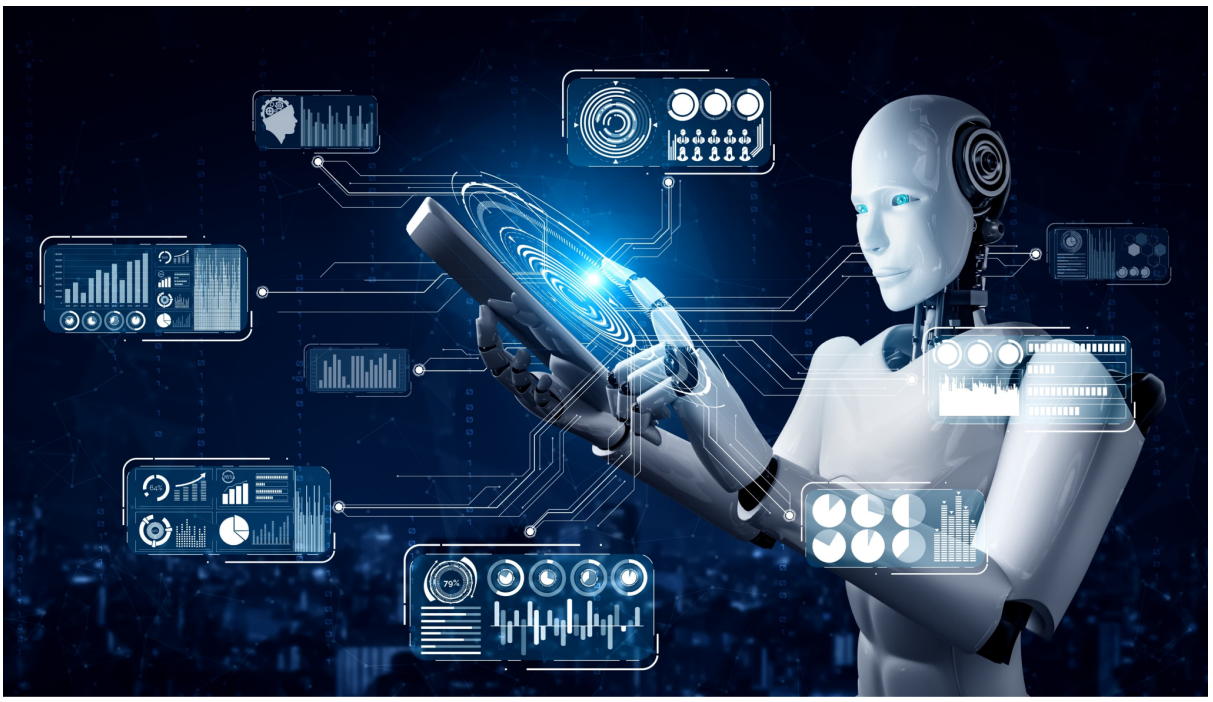
2. Understanding:

A deep understanding of a project refers to a comprehensive and thorough comprehension of the project's objectives, scope, goals, and the underlying concepts, theories, and methods relevant to its implementation. It involves going beyond surface-level knowledge to gain a more nuanced understanding of the project's context, stakeholders, challenges, and potential opportunities.

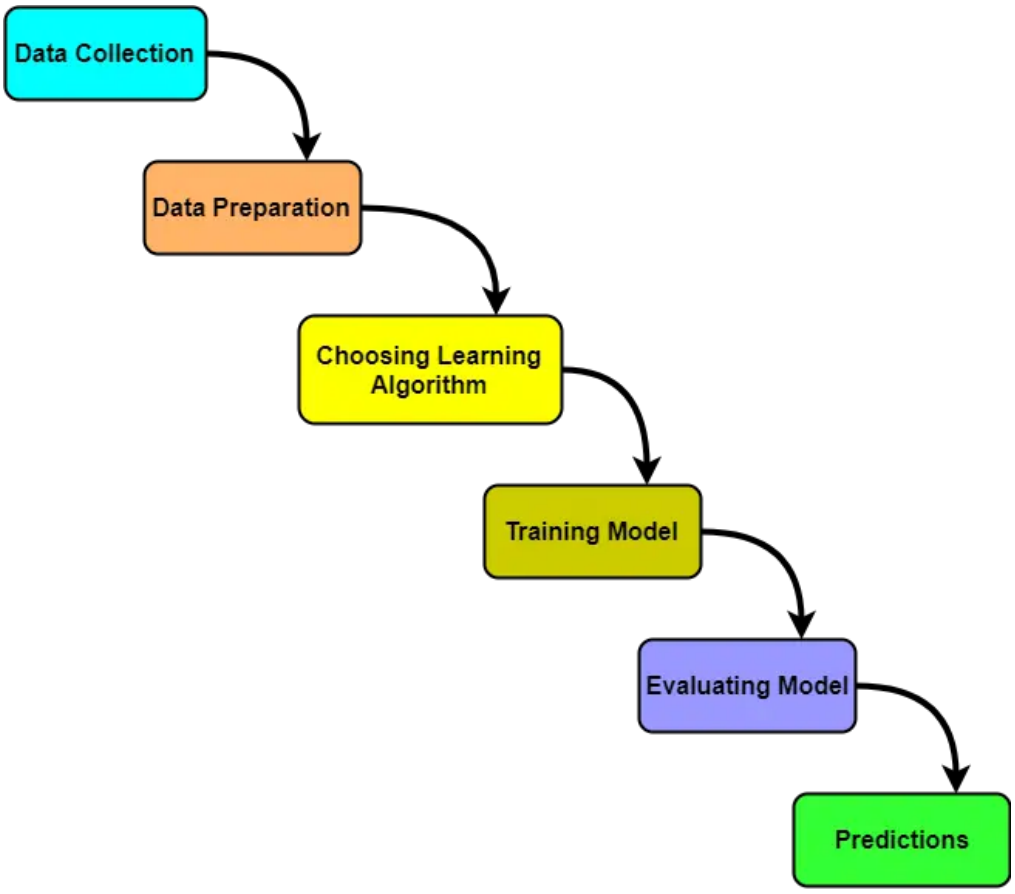
To develop a deep understanding of a project, project teams must engage in various activities, such as conducting thorough research and analysis, consulting with relevant stakeholders, and engaging in ongoing communication and collaboration. They must also continuously monitor and evaluate project progress, making adjustments as necessary to ensure that the project remains aligned with its goals and objectives.

3. Collecting the dataset

To collect a dataset, several steps need to be taken. This helps identify the data that needs to be collected and how it should be organized. Next, data sources should be identified, including primary and secondary sources. Data collection should be done by designing surveys, conducting experiments or extracting data from existing sources. After data collection, it is important to clean and preprocess the data to remove inconsistencies, duplicates, or missing values. The data can then be analyzed using statistical or machine-learning methods to identify patterns or relationships. Finally, the dataset should be documented and shared in a publicly accessible format, with a detailed description of its structure and relevant metadata. Overall, collecting a dataset requires careful planning, attention to detail, and accuracy to ensure that the data is useful in addressing the research question or problem.



4. Applying Machine Learning in the Dataset

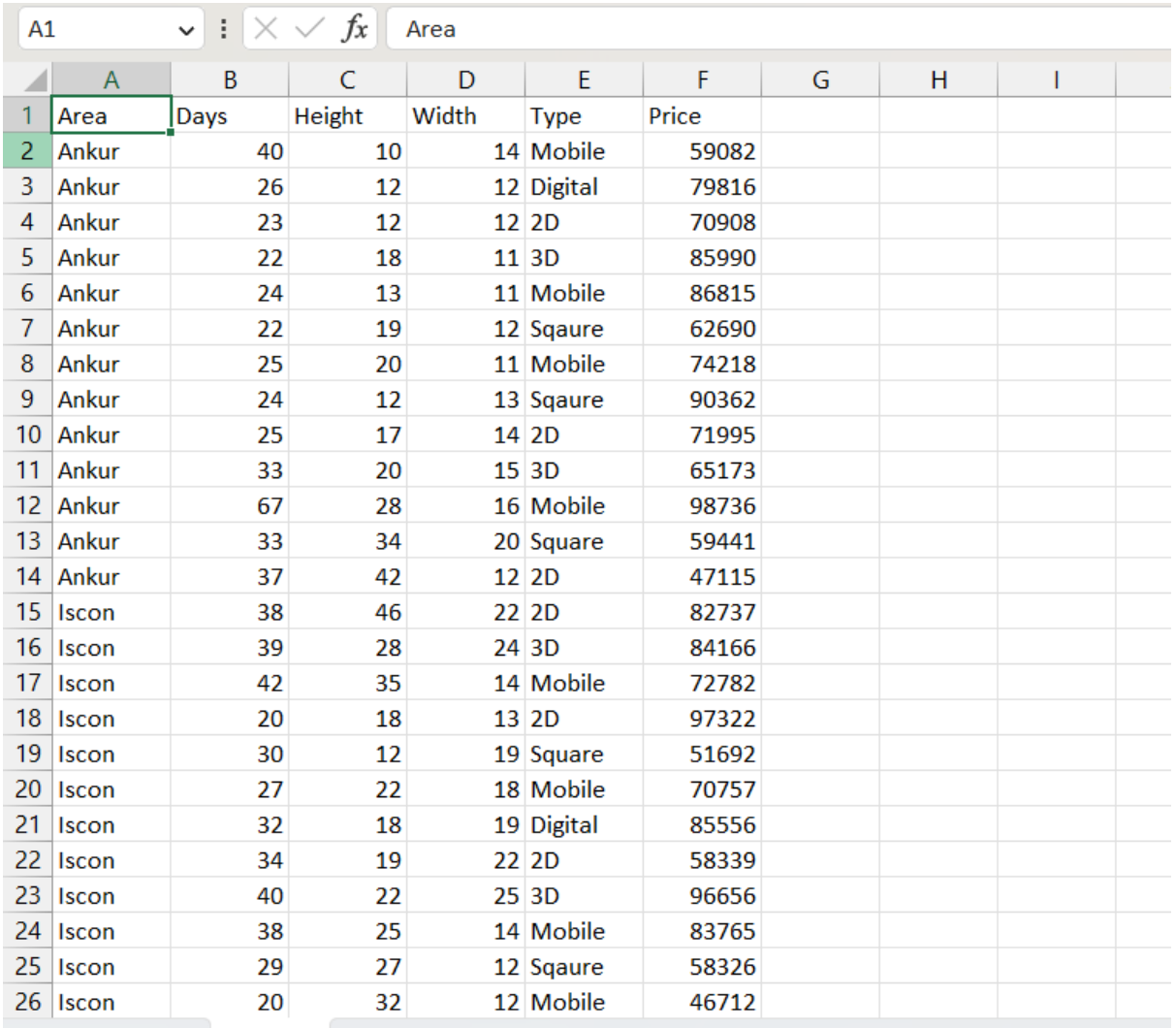


Machine Learning Workflow

It is also important to note that applying ML in a dataset requires a deep understanding of the problem domain, as well as the limitations and assumptions of the selected algorithm. Additionally, it is crucial to be aware of potential biases and ethical considerations that may arise during the data collection and analysis process.

Furthermore, as with any data analysis process, it is important to ensure data privacy and security, especially if the data contains sensitive or personal information. This may involve anonymizing the data or implementing secure data storage and access protocols.

In conclusion, applying ML in a dataset involves a systematic approach of preprocessing, algorithm selection, training, evaluation, fine-tuning, and deployment. It is a powerful tool for uncovering patterns and insights in complex data but requires careful planning, evaluation, and domain knowledge to ensure its accuracy and reliability.

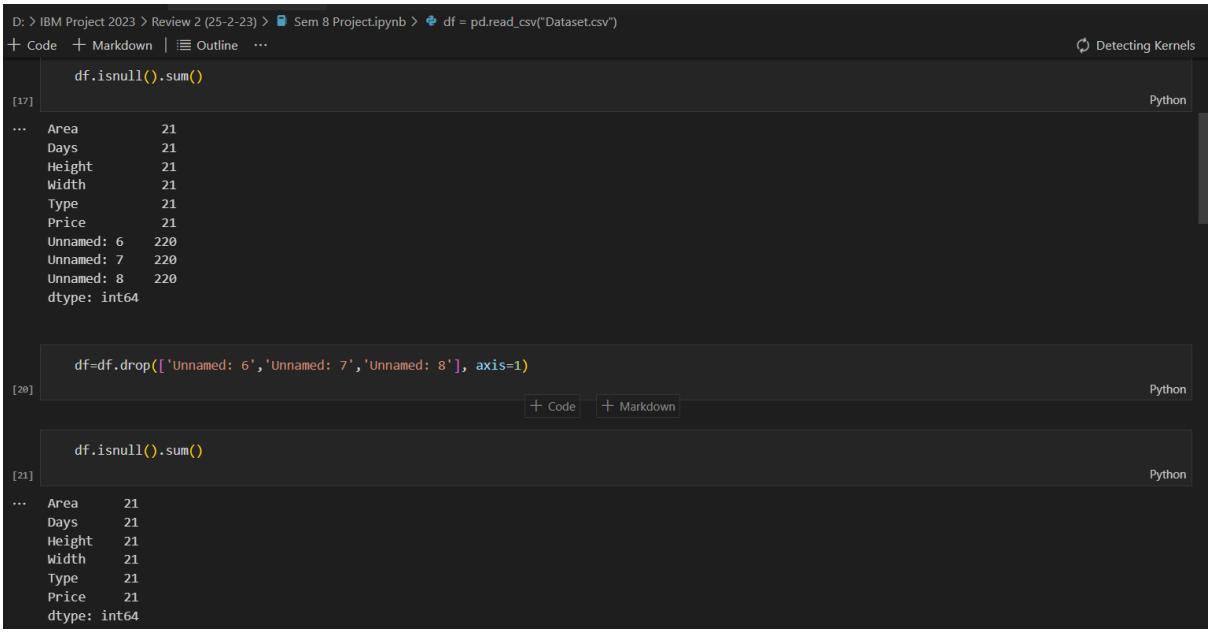


	A	B	C	D	E	F
1	Area	Days	Height	Width	Type	Price
2	Ankur	40	10	14	Mobile	59082
3	Ankur	26	12	12	Digital	79816
4	Ankur	23	12	12	2D	70908
5	Ankur	22	18	11	3D	85990
6	Ankur	24	13	11	Mobile	86815
7	Ankur	22	19	12	Sqaure	62690
8	Ankur	25	20	11	Mobile	74218
9	Ankur	24	12	13	Sqaure	90362
10	Ankur	25	17	14	2D	71995
11	Ankur	33	20	15	3D	65173
12	Ankur	67	28	16	Mobile	98736
13	Ankur	33	34	20	Square	59441
14	Ankur	37	42	12	2D	47115
15	Iscon	38	46	22	2D	82737
16	Iscon	39	28	24	3D	84166
17	Iscon	42	35	14	Mobile	72782
18	Iscon	20	18	13	2D	97322
19	Iscon	30	12	19	Square	51692
20	Iscon	27	22	18	Mobile	70757
21	Iscon	32	18	19	Digital	85556
22	Iscon	34	19	22	2D	58339
23	Iscon	40	22	25	3D	96656
24	Iscon	38	25	14	Mobile	83765
25	Iscon	29	27	12	Sqaure	58326
26	Iscon	20	32	12	Mobile	46712

The dataset was collected on the basis of Area, No of days the billboard will be kept, its height and width, type of billboard and price.

5. Applying Machine Learning Techniques to the above dataset

- Importing ML libraries.
- Importing the created (.csv) file.
- Dividing the dataset into train and test.
- Removing Null and other unwanted stuff.
- Applying ML methods.



6. Working on the Model Design.

We have collected the dataset and applied ML methods to it and our model is working on the backend.

7. The Front-end panel is been made using Streamlit.

Steps:

- **Installing Streamlit**

- **Loading the data:** Load your data into your Python environment using a package such as pandas.

- **Write the Streamlit app code:** Write the code for your Streamlit app, including any data processing or visualization code that you need. You can use Streamlit's built-in components, such as sliders, text inputs, and buttons, to create the front-end panel for your app.

- **Run the Streamlit app on vs code.**

8. Applying different ML models.

There are many different types of machine learning models, each with its own strengths and weaknesses. Here are some of the most common types of ML models:

- Linear regression
- Logistic regression
- Decision tree:
- Random forest
- Support vector machine
- Clustering

NOTE: For accurate results and the model that was suitable for this project is "Random Forest".

Random Forest:

- **High accuracy**
- **Nonlinear relationships**
- **Adaptability:** Random forests are adaptable to noise and outliers.
- **Interpretability:** Random forests can provide insights into which input variables are most important for making predictions. This is because each decision tree can compute feature importances, which indicate how much each input variable contributes to the predictions.

- **Scalability:** Random forests can be parallelized and distributed across multiple CPUs or GPUs, which makes them scalable to large datasets.

Overall, random forest models are a powerful and flexible tool for a wide range of ML problems. They are particularly well-suited to problems with complex, nonlinear relationships between the input variables and the target variable, and where high accuracy is required.

2.3 Tools and Services Used

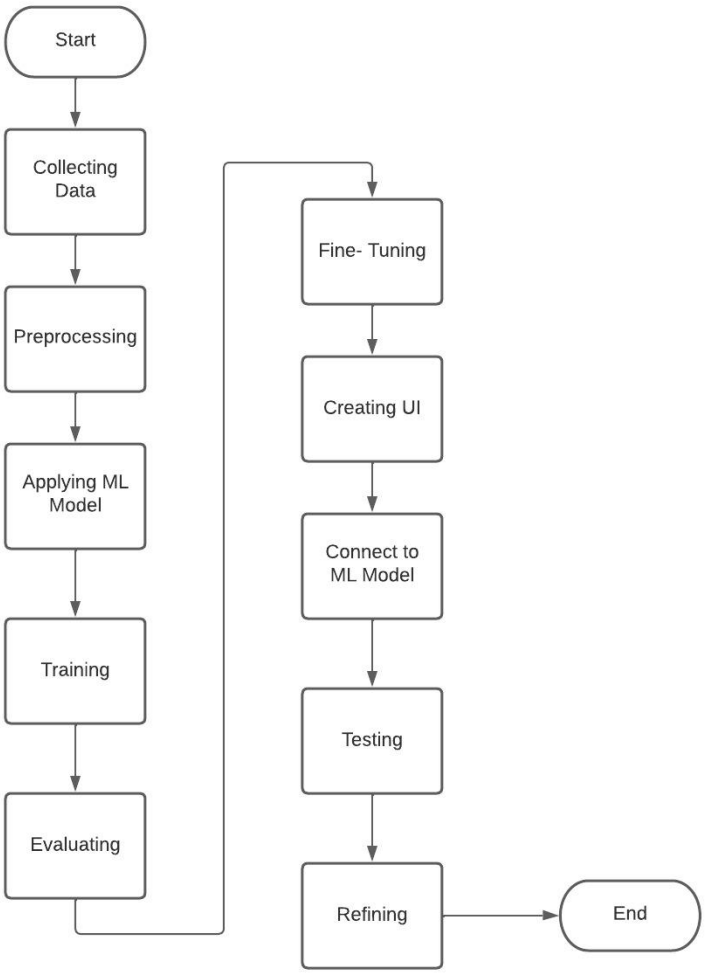
- Visual Studio
- Machine Learning

Chapter 3: Scanning

Chapter 3: Scanning

3.1 Activity Diagram

Activity Diagram:

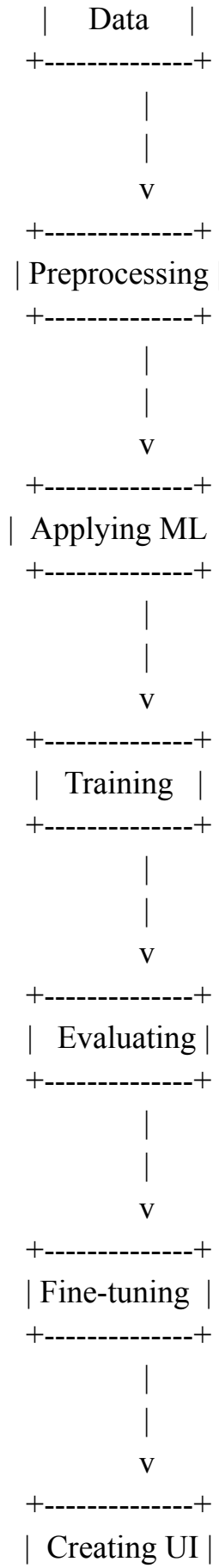


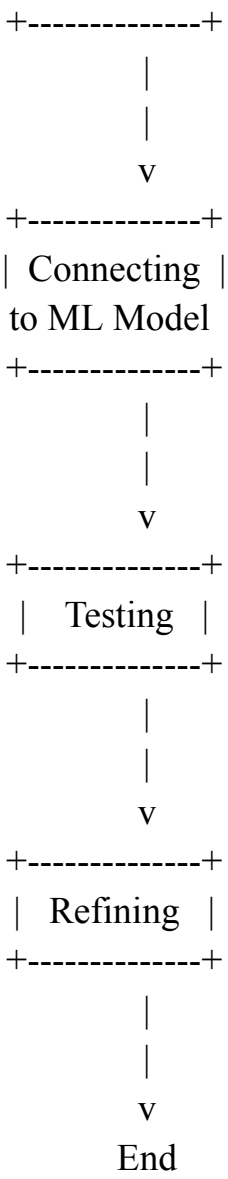
The above image represents the “activity diagram” for the project.

3.2 Use Case Diagram

+--------------+

| Collecting |


Data
Preprocessing
Applying ML
Training
Evaluating
Fine-tuning
Creating UI


Connecting
to ML Model
Testing
Refining
End

3.3 Collection of the Dataset

	A	B	C	D	E	F
1	Area	Days	Height	Width	Type	Price
2	Ankur	40	10	14	Mobile	59082
3	Ankur	26	12	12	Digital	79816
4	Ankur	23	12	12	2D	70908
5	Ankur	22	18	11	3D	85990
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19	Iscon	30	12	19	Square	51692
20	Iscon	27	22	18	Mobile	70757
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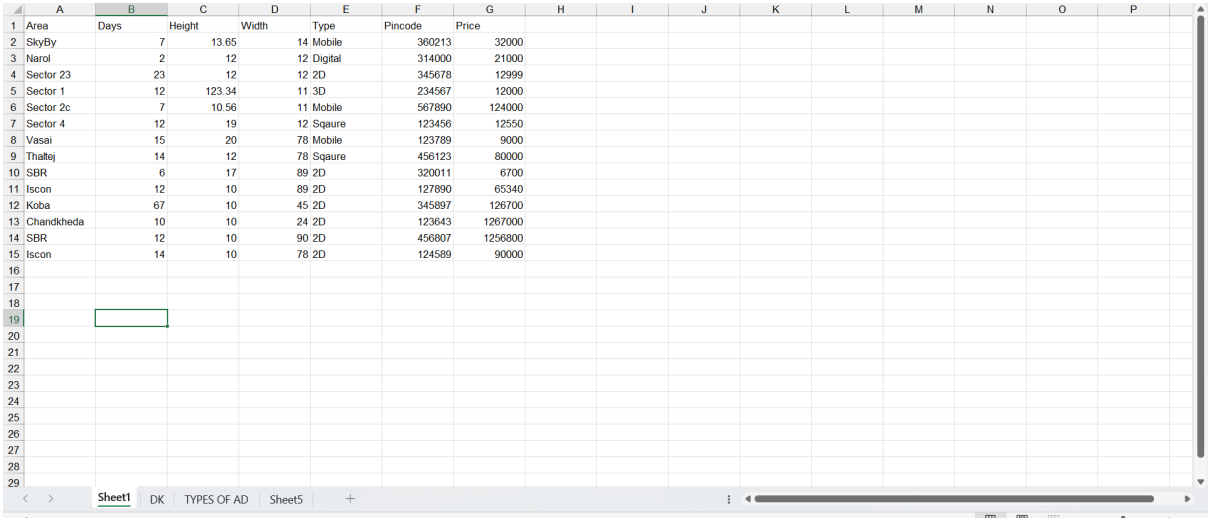
24	Iscon	38	25	14	Mobile	83765
25	Iscon	29	27	12	Sqaure	58326
26	Iscon	20	32	12	Mobile	46712

181	Satellite	33	19	11	Square	62356
182	Satellite	67	20	11	Mobile	83862
183	Satellite	33	12	12	Digital	65171
184	Satellite	37	17	11	2D	65440
185	Satellite	38	20	13	3D	84389
186	Satellite	39	28	14	Mobile	82816
187	Satellite	42	34	15	Sqaure	82634
188	Satellite	20	42	16	Mobile	76783
189	Satellite	30	46	20	Sqaure	77675
190	Satellite	27	28	12	2D	89843
191	Satellite	32	35	22	3D	98678
192	Satellite	34	18	24	Mobile	88943
193	Satellite	40	12	14	Square	92243
194	Satellite	38	22	13	2D	81817
195	Satellite	29	18	19	2D	82081
196	Satellite	20	19	18	3D	70072
197	Satellite	45	22	19	Mobile	41393
198	Satellite	38	25	22	2D	75954
199	Satellite	25	27	25	Square	59446
200	Satellite	27	32	14	Digital	50262

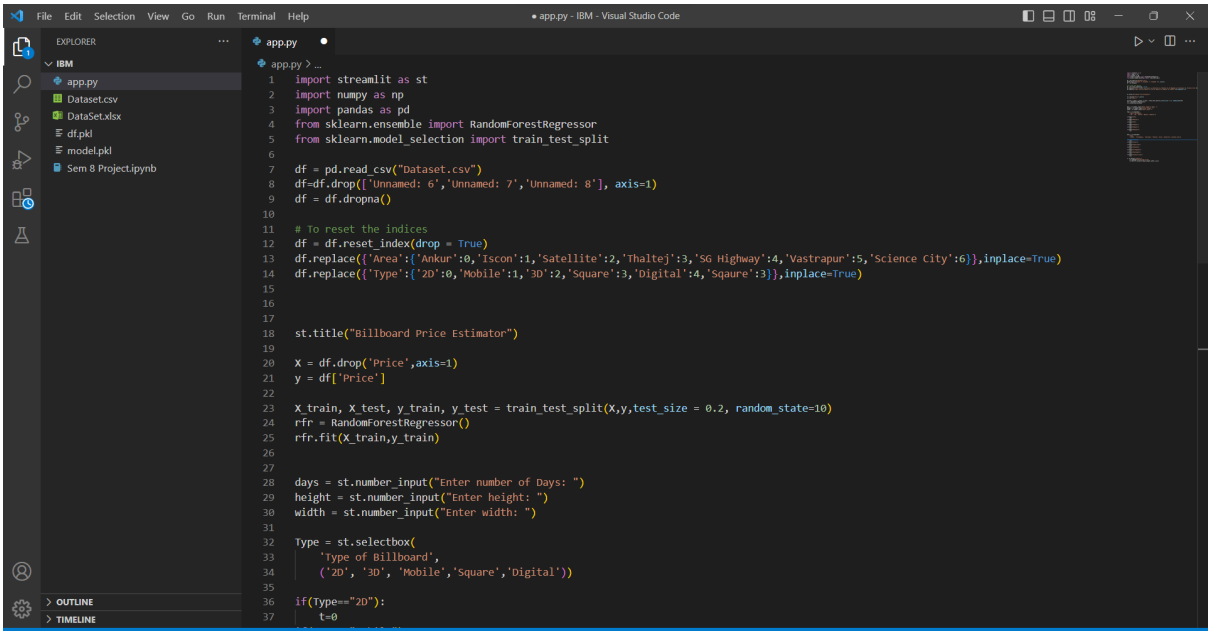


	A	B	C	D	E	F	G
1	Area	Days	Height	Width	Type	Pincode	Price
2	SkyBy	7	13.65	14	Mobile	360213	32000
3	Narol	2	12	12	Digital	314000	21000
4	Sector 23	23	12	12	2D	345678	12999
5	Sector 1	12	123.34	11	3D	234567	12000
6	Sector 2c	7	10.56	11	Mobile	567890	124000
7	Sector 4	12	19	12	Sqaure	123456	12550
8	Vasai	15	20	78	Mobile	123789	9000
9	Thaltej	14	12	78	Sqaure	456123	80000
10	SBR	6	17	89	2D	320011	6700
11	Iscon	12	10	89	2D	127890	65340
12	Koba	67	10	45	2D	345897	126700
13	Chandkheda	10	10	24	2D	123643	1267000
14	SBR	12	10	90	2D	456807	1256800
15	Iscon	14	10	78	2D	124589	90000

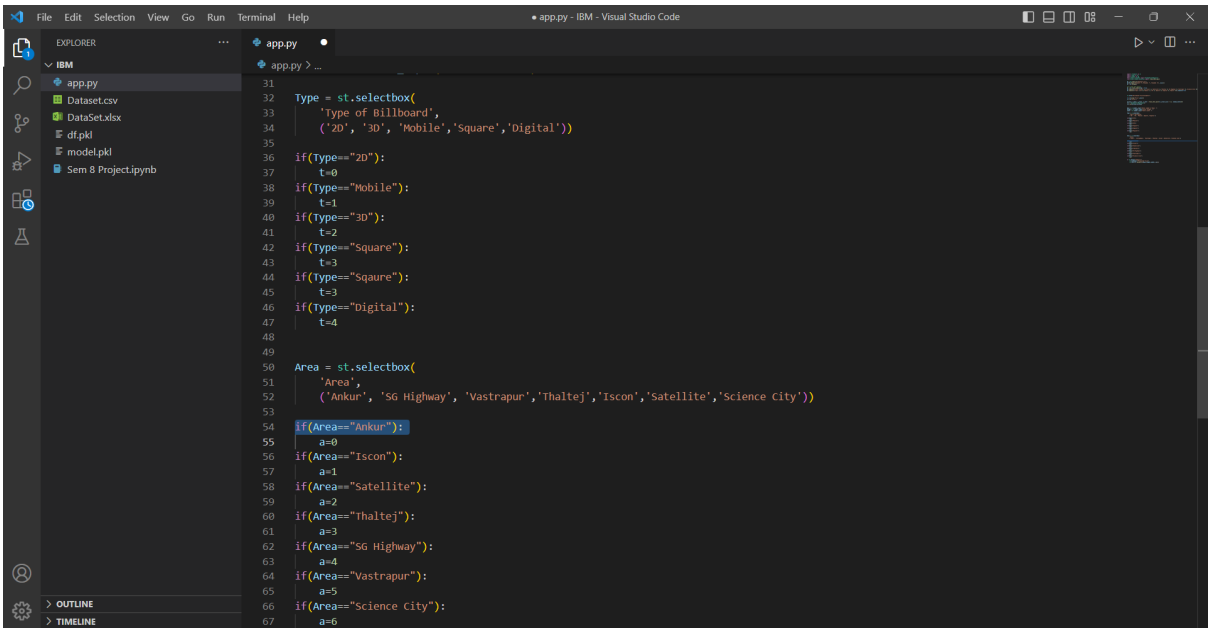
	A	B	C	D	E
1	**Post Office**	**Pincode**	**District**	**Area Grade**	
2	Ambawadi Ahmedabad	380006	Ahmedabad	1	
3	Dariapur Ahmedabad	380001	Ahmedabad	2	
4	District Court Ahmedabad	380001	Ahmedabad	1	
5	Gandhi Road Ahmedabad	380001	Ahmedabad	2	
6	Gheekanta Road	380001	Ahmedabad	3	
7	Jamalpur Ahmedabad	380001	Ahmedabad	4	
8	Kalupur Chakla	380001	Ahmedabad	2	
9	Khadia	380001	Ahmedabad	4	
10	Khanpur Ahmedabad	380001	Ahmedabad	4	
11	Lal Darwaja	380001	Ahmedabad	1	
12	Manek Chowk	380001	Ahmedabad	1	
13	Municipal Corporation	380001	Ahmedabad	1	
14	Raikhad	380001	Ahmedabad	3	
15	Raipur Ahmedabad	380001	Ahmedabad	4	
16	Ahmedabad G.P.O.	380001	Ahmedabad	2	
17	N C Market	380002	Ahmedabad	1	
18	Railwaypura	380002	Ahmedabad	2	
19	Revdibazar	380002	Ahmedabad	4	
20	Cantonment	380004	Ahmedabad	4	
21	Delhi Gate Ahmedabad	380004	Ahmedabad	1	
22	Dudheshwar Tavdipura	380004	Ahmedabad	4	
23	Girdharnagar	380004	Ahmedabad	4	
24	Madhupura Market	380004	Ahmedabad	4	
25	Shahibag	380004	Ahmedabad	2	
26	Shahpur Ahmedabad	380004	Ahmedabad	4	
27	Sub Foreign	380004	Ahmedabad	1	
28	Kabir Chowk	380005	Ahmedabad	3	
29	Motera	380005	Ahmedabad	1	

	A
1	**Type of Advertisment**
2	
3	Restaurants
4	Medical
5	Automotive
6	Attorney
7	Banks
8	Insurance
9	Dental
10	Boutiques
11	Food Industry
12	Schools
13	Heating & Cooling
14	Salons
15	Home Goods
16	Furniture
17	Jewelry
18	Chiropractor
19	Radio
20	Gyms
21	Plumbing
22	Other Home Services
23	Static
24	Digital
25	Banners ads
26	Wallspaces
27	Mobile
28	Painted
29	Alerts

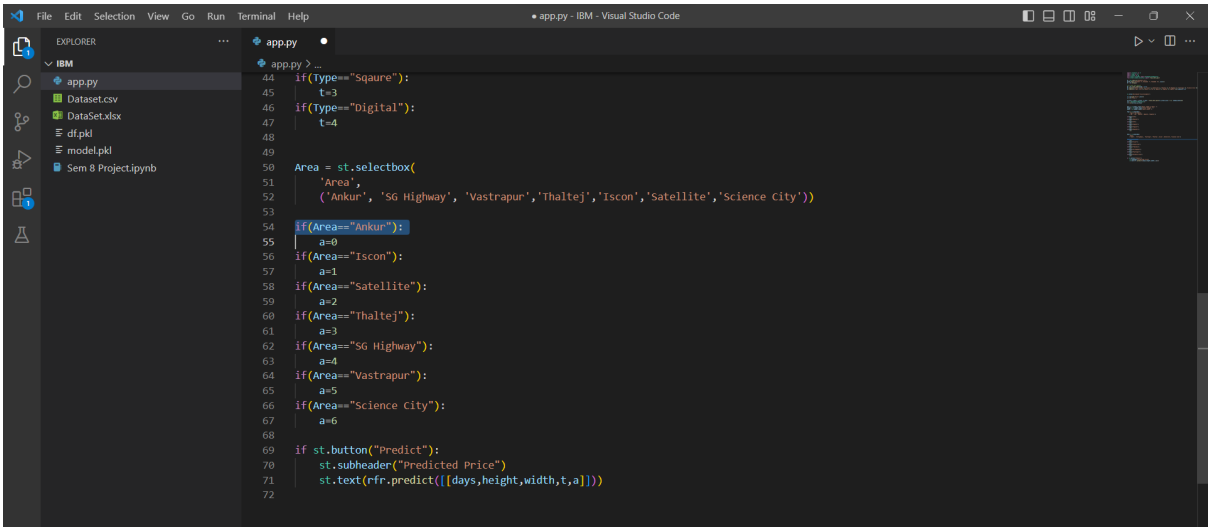
3.4 Coding



```
import streamlit as st
import numpy as np
import pandas as pd
from sklearn.ensemble import RandomForestRegressor
from sklearn.model_selection import train_test_split

df = pd.read_csv("Dataset.csv")
df=df.drop(['Unnamed: 6','Unnamed: 7','Unnamed: 8'], axis=1)
df = df.dropna()

# To reset the indices
df = df.reset_index(drop = True)
df.replace({'Area':{'Ankur':0,'Iscon':1,'Satellite':2,'Thaltej':3,'SG Highway':4,'Vastrapur':5,'Science City':6}},inplace=True)
df.replace({'Type':{'2D':0,'Mobile':1,'3D':2,'Square':3,'Digital':4,'Sqaure':3}},inplace=True)



st.title("Billboard Price Estimator")

X = df.drop('Price',axis=1)
y = df['Price']

X_train, X_test, y_train, y_test = train_test_split(X,y,test_size = 0.2, random_state=10)
rfr = RandomForestRegressor()
rfr.fit(X_train,y_train)


days = st.number_input("Enter number of Days: ")
height = st.number_input("Enter height: ")
width = st.number_input("Enter width: ")

Type = st.selectbox(
    'Type of Billboard',
    ('2D', '3D', 'Mobile','Square','Digital'))

if(Type=="2D"):
    t=0
```



```
Type = st.selectbox(
    'Type of Billboard',
    ('2D', '3D', 'Mobile','Square','Digital'))

if(Type=="2D"):
    t=0
if(Type=="Mobile"):
    t=1
if(Type=="3D"):
    t=2
if(Type=="Square"):
    t=3
if(Type=="Sqaure"):
    t=3
if(Type=="Digital"):
    t=4


Area = st.selectbox(
    'Area',
    ('Ankur', 'SG Highway', 'Vastrapur','Thaltej','Iscon','Satellite','Science City'))

if(Area=="Ankur"):
    a=0
if(Area=="Iscon"):
    a=1
if(Area=="Satellite"):
    a=2
if(Area=="Thaltej"):
    a=3
if(Area=="SG Highway"):
    a=4
if(Area=="Vastrapur"):
    a=5
if(Area=="Science City"):
    a=6
```




```
lr = LinearRegression()
```

[42]

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

[43]

```
LinearRegression()
```

```
lr_pred = lr.predict(X_test)
```

[44]

```
lr_error = mean_absolute_error(y_test,lr_pred)
lr_error
```

[45]

```
12723.454118056577
```

```
import pickle

pickle.dump(df,open('df.pkl','wb'))
pickle.dump(rfr,open('model.pkl','wb'))
```

[46]

[31]
```
rfr = RandomForestRegressor()
```

[32]
```
rfr.fit(X_train,y_train)
```

```
RandomForestRegressor()
```

[33]
```
rfr_pred = rfr.predict(X_test)
```

[34]
```
from sklearn.metrics import mean_absolute_error
```

[35]
```
rf_error=mean_absolute_error(y_test,rfr_pred)
rf_error
```

```
13541.6585
```

[36]
```
from sklearn.tree import DecisionTreeRegressor
```

Chapter 4: Working and Final Output

Chapter 4: Working and Final Output

Final Output:

Enter height:

12.00

Enter width:

8.00

Type of Billboard

3D

Area

Science City

Predict

Predicted Price

[62761.27]

Chapter 5: Conclusion

Chapter 5: Conclusion

"One Stop Solution for Billboard Advertising Rates" project aims to provide a comprehensive and user-friendly platform for businesses and advertisers to easily access and compare advertising rates for billboards across various locations in a given city. By providing a centralized database of advertising rates, the project simplifies the process of advertising planning and helps businesses make informed decisions about their advertising strategies.

The project leverages machine learning models to analyze a large dataset of billboard advertising rates and provides valuable insights into the factors that affect advertising rates, such as location, traffic volume, and demographics. This analysis enables businesses to optimize their advertising spend and target the right audiences for their products and services.

Overall, the "One Stop Solution for Billboard Advertising Rates" project provides a valuable tool for businesses and advertisers looking to maximize the impact of their advertising campaigns. By simplifying the process of advertising planning and providing valuable insights into advertising rates and trends, the project helps businesses make informed decisions and stay ahead of the competition.

Chapter 6: References

Chapter 6: References

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- https://www.ibm.com/in-en

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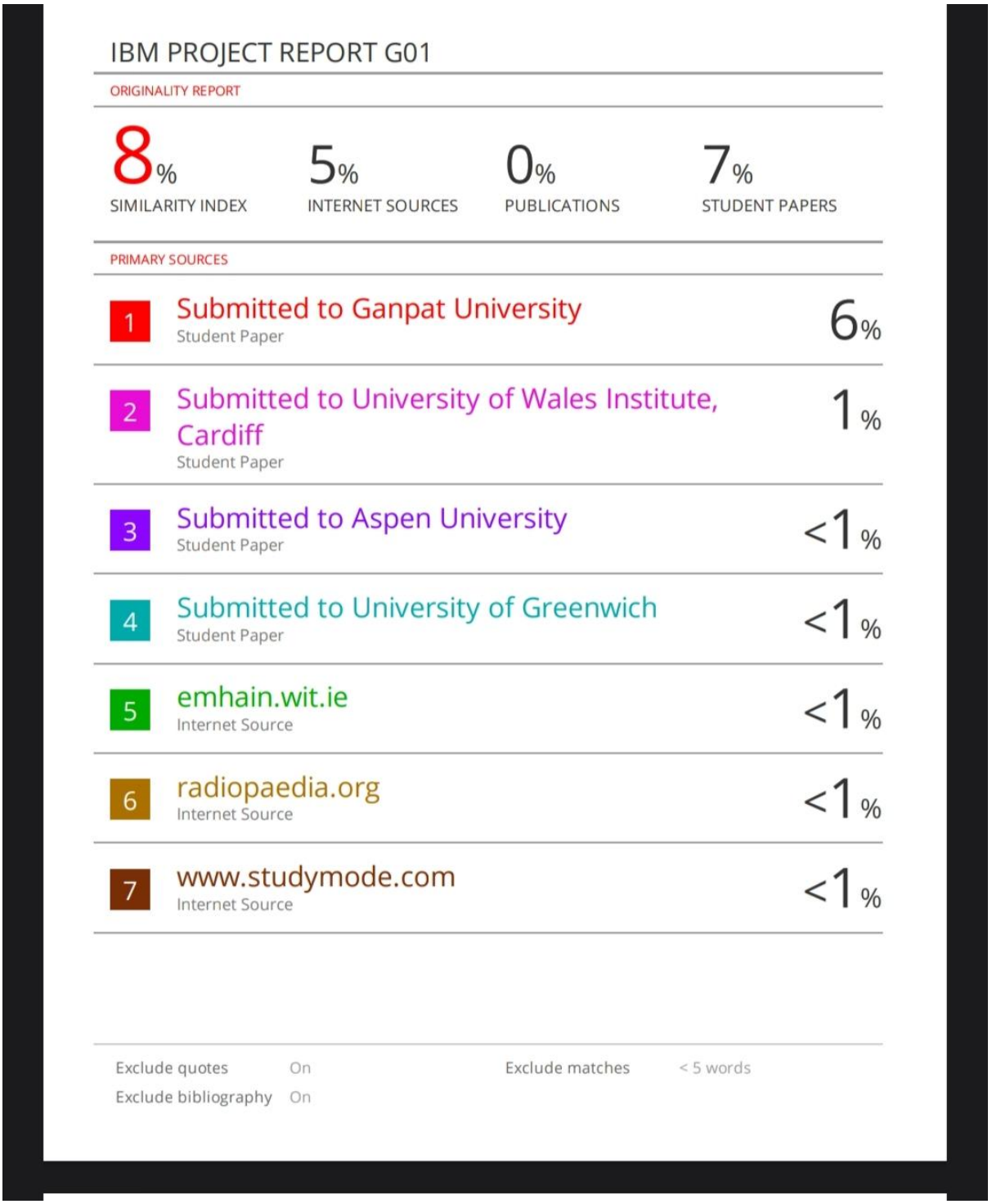

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