AD Click Through Rate Analysis

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1 AD Click Through Rate Analysis

Name: Keerthan Kumar C Manipal Institue of Technology Click-through rate is the ratio of users who clicked on an ad/link to the number of total users who left impressions on the ad/link. In simple words, clicks ÷ impressions = CTR. Analyzing the click-through rate helps companies determine the types of people most likely to click on their ads. A high CTR gives validation to your advertising strategies.

Below are all the features in the dataset:

Daily Time Spent on Site: the daily timespan of the user on the website;

Age: the age of the user;

Area Income: the average income in the area of the user;

Daily Internet Usage: the daily internet usage of the user;

Ad Topic Line: the title of the ad;

City: the city of the user;

Gender: the gender of the user;

Country: the country of the user;

Timestamp: the time when the user visited the website;

Clicked on Ad: 1 if the user clicked on the ad, otherwise 0;

2 Importing Libraries

[38]:
```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
```

3 EDA

[39]:
```
df=pd.read_csv("ad_10000records.csv")
df
```

[39]:
```
      Daily Time Spent on Site   Age  Area Income  Daily Internet Usage  \
0                        62.26  32.0     69481.85                172.83
1                        41.73  31.0     61840.26                207.17
2                        44.40  30.0     57877.15                172.83
3                        59.88  28.0     56180.93                207.17
4                        49.21  30.0     54324.73                201.58
…                          …    …            …                     …
9995                     41.73  31.0     61840.26                207.17
9996                     41.73  28.0     51501.38                120.49
9997                     55.60  39.0     38067.08                124.44
9998                     46.61  50.0     43974.49                123.13
9999                     46.61  43.0     60575.99                198.45

                            Ad Topic Line             City  Gender  \
0            Decentralized real-time circuit         Lisafort    Male
1             Optional full-range projection  West Angelabury    Male
2       Total 5thgeneration standardization        Reyesfurt  Female
3               Balanced empowering success      New Michael  Female
4       Total 5thgeneration standardization     West Richard  Female
…                                       …              …     …
9995         Profound executive flexibility  West Angelabury    Male
9996         Managed zero tolerance concept      Kennedyfurt    Male
9997         Intuitive exuding service-desk      North Randy  Female
9998       Realigned content-based leverage   North Samantha  Female
9999  Optimized upward-trending productivity     Port Jeffrey    Male

                          Country            Timestamp  Clicked on Ad
0     Svalbard & Jan Mayen Islands  2016-06-09 21:43:05              0
1                        Singapore  2016-01-16 17:56:05              0
2                       Guadeloupe  2016-06-29 10:50:45              0
3                           Zambia  2016-06-21 14:32:32              0
4                            Qatar  2016-07-21 10:54:35              1
…                              …                  …            …
9995                     Singapore  2016-01-03 03:22:15              1
9996                    Luxembourg  2016-05-28 12:20:15              0
9997                         Egypt  2016-01-05 11:53:17              0
9998                        Malawi  2016-04-04 07:07:46              1
9999      Northern Mariana Islands  2016-04-03 21:13:46              1

[10000 rows x 10 columns]
```

[40]:
```
df.shape
```

[40]:
```
(10000, 10)
```

[41]:
```
df.isna().sum()
```

[41]:
```
Daily Time Spent on Site    0
Age                         0
Area Income                 0
Daily Internet Usage        0
Ad Topic Line               0
City                        0
Gender                      0
Country                     0
Timestamp                   0
Clicked on Ad               0
dtype: int64
```

[42]:
```
df.describe()
```

[42]:

	Daily Time Spent on Site	Age	Area Income	Daily Internet Usage	Clicked on Ad
count	10000.000000	10000.000000	10000.000000	10000.000000	10000.000000
mean	61.660757	35.940100	53840.047721	177.759831	0.491700
std	15.704142	8.572973	13343.708718	40.820951	0.499956
min	32.600000	19.000000	13996.500000	105.220000	0.000000
25%	48.860000	29.000000	44052.302500	140.150000	0.000000
50%	59.590000	35.000000	56180.930000	178.920000	0.000000
75%	76.580000	42.000000	61840.260000	212.670000	1.000000
max	90.970000	60.000000	79332.330000	269.960000	1.000000

[43]:
```
df.dtypes
```

[43]:
```
Daily Time Spent on Site    float64
Age                         float64
Area Income                 float64
Daily Internet Usage        float64
Ad Topic Line                object
City                         object
Gender                       object
Country                      object
```

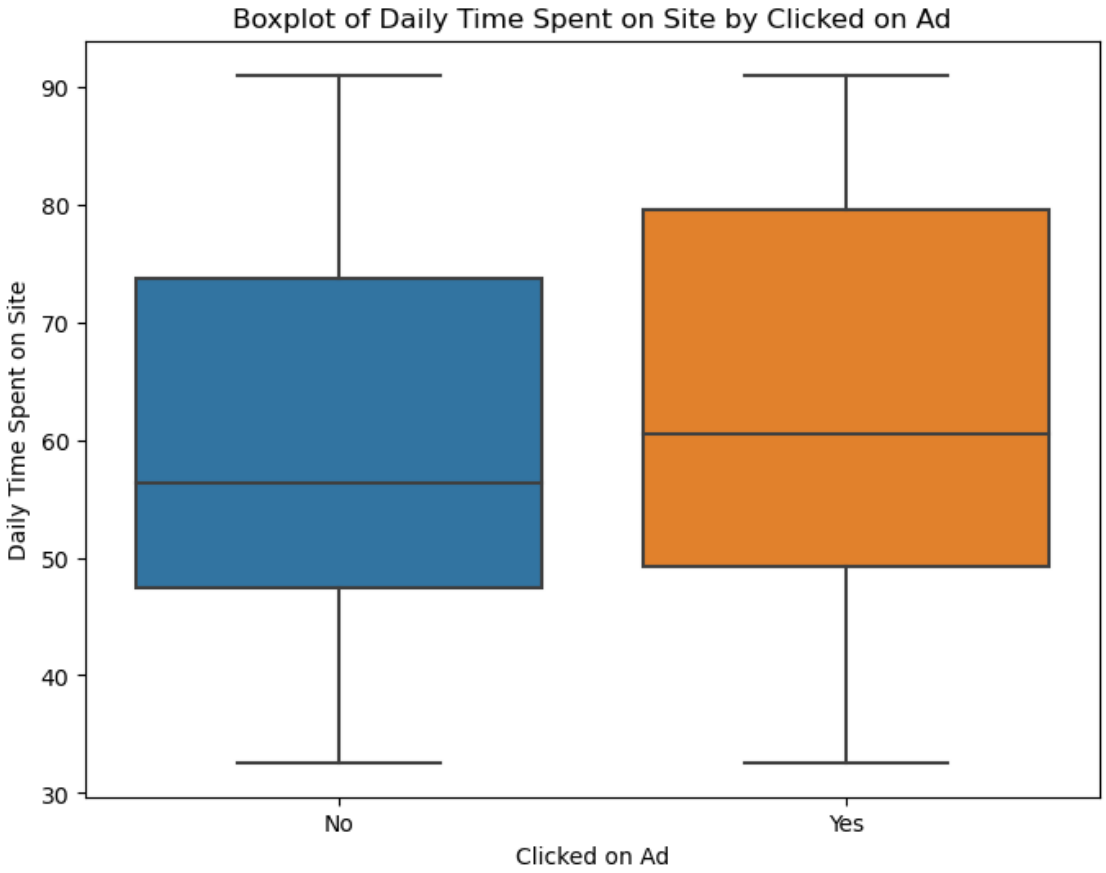
```
Timestamp                 object
Clicked on Ad              int64
dtype: object
```

[45]:
```
df["Clicked on Ad"]=df["Clicked on Ad"].map({1:"Yes",0:"No"})
```

4 Click Through Rate Analysis

[46]:
```
def boxplot_compare(df, col1):
    plt.figure(figsize=(8, 6))
    sns.boxplot(x='Clicked on Ad', y=col1, data=df)
    plt.title(f'Boxplot of {col1} by Clicked on Ad')
    plt.xlabel('Clicked on Ad')
    plt.ylabel(col1)
    plt.show()
```

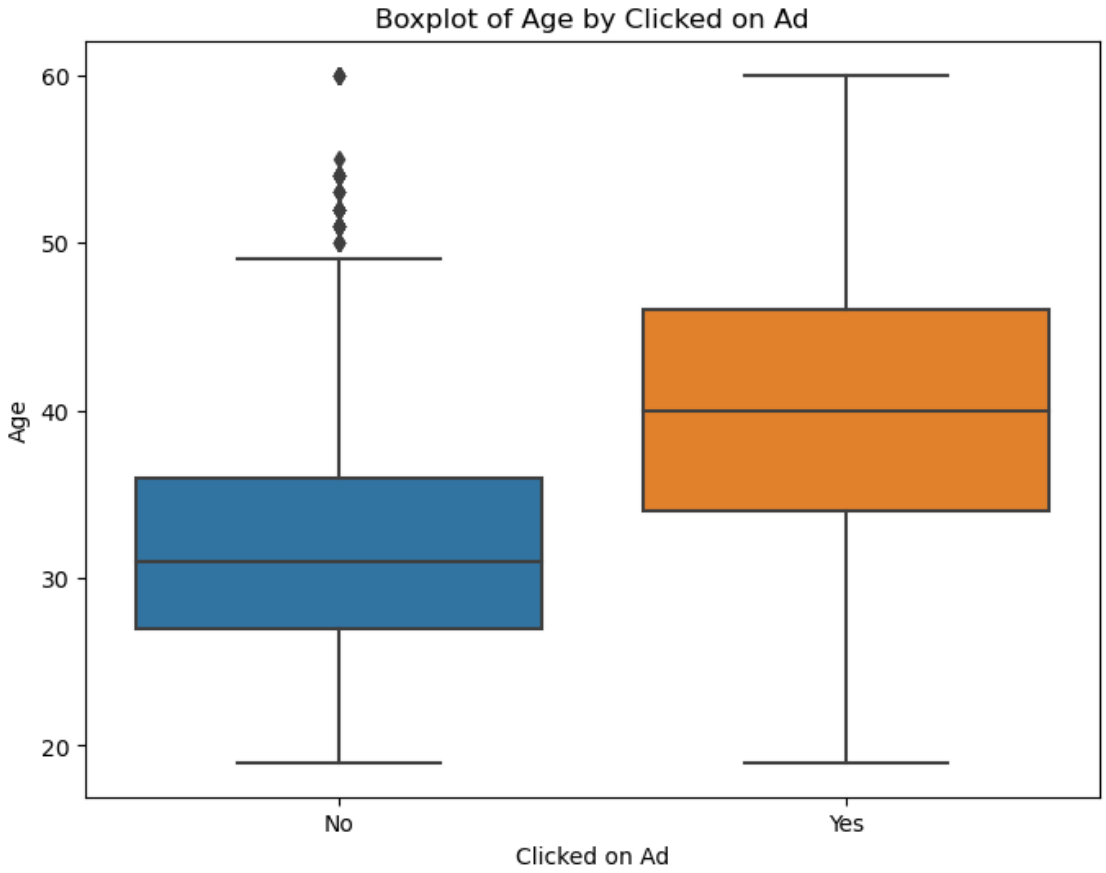
[47]:
```
boxplot_compare(df,"Daily Time Spent on Site")
```



From the above graph, we can see that the users who spend more time on the website click more

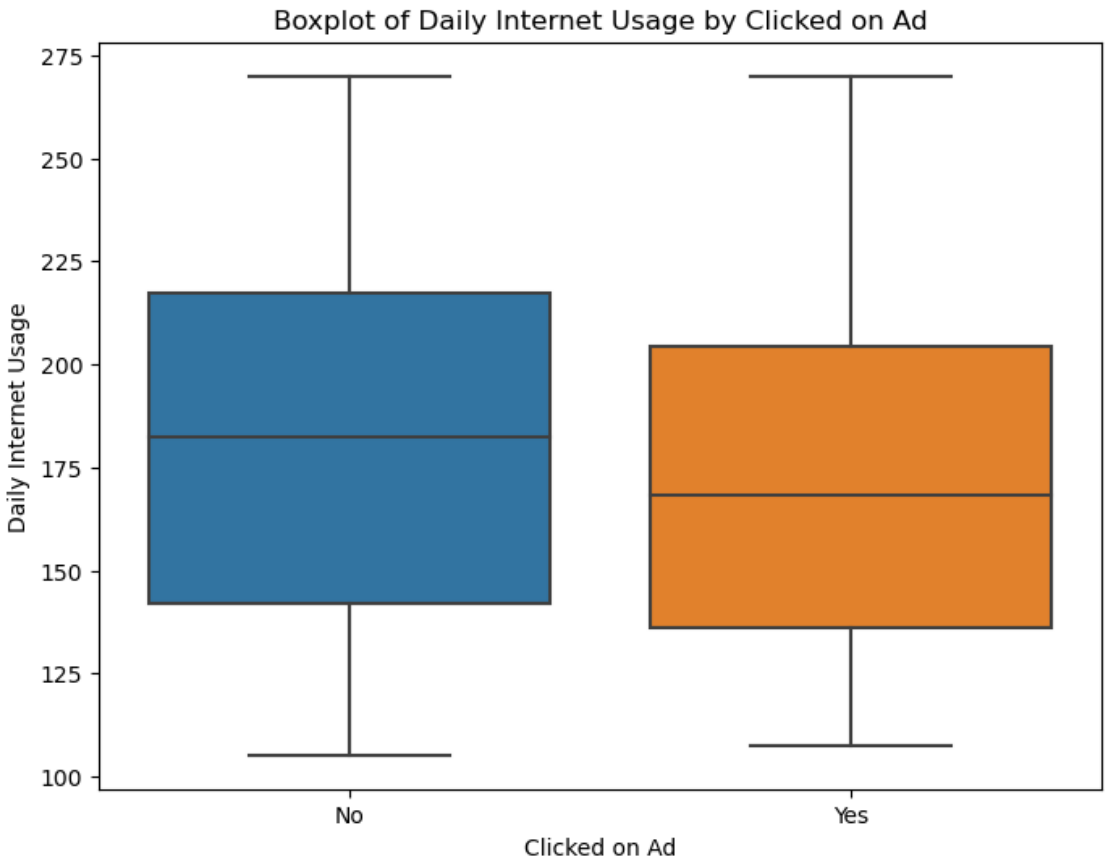
on ads.

[48]:
```
boxplot_compare(df,"Age")
```



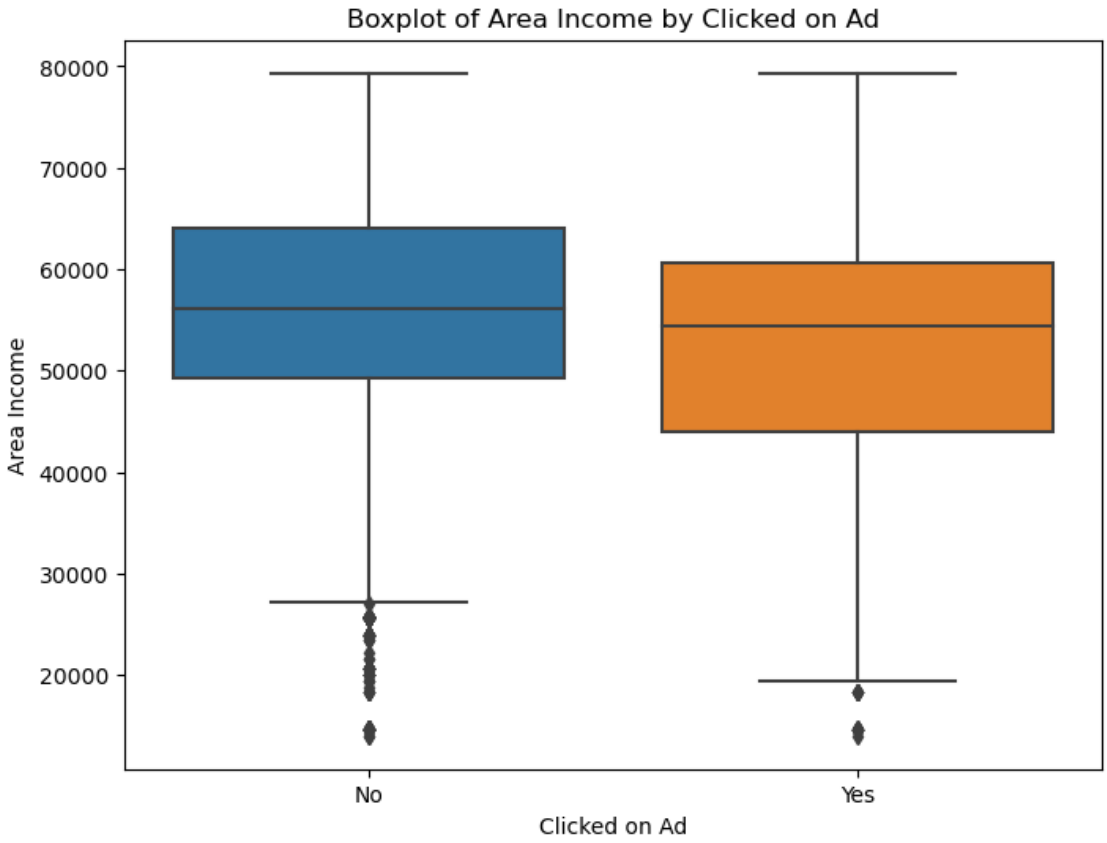
From the above graph, we can see that users around 40 years click more on ads compared to users around 27-36 years old.

[49]:
```
boxplot_compare(df,"Daily Internet Usage")
```



From the above graph, we can see that the users with high internet usage click less on ads compared to the users with low internet usage.

[50]:
```
boxplot_compare(df,"Area Income")
```



There's not much difference, but people from high-income areas click less on ads.

[54]:
```
a=pd.crosstab(df["Gender"],df["Clicked on Ad"])
a["Gender CTR"]=(a["Yes"]/(a["Yes"]+a["No"]))*100
a
```

[54]:
```
Clicked on Ad    No   Yes  Gender CTR
Gender
Female         2609  2767   51.469494
Male           2474  2150   46.496540
```

We See that Female generelly Have a High CTR than Men(we know why :))

5 Calculating CTR of Ads

Now let's calculate the overall Ads click-through rate. Here we need to calculate the ratio of users who clicked on the ad to users who left an impression on the ad.

[60]:
```
x=df["Clicked on Ad"].value_counts()[1]
ctr=(x/df.shape[0])*100
print("CTR is:",ctr)
```

```
CTR is: 49.17
```

6 Click Through Rate Prediction Model

Now let's move on to training a Machine Learning model to predict click-through rate. I'll start by dividing the data into training and testing sets:

[55]:
```
df["Gender"] = df["Gender"].map({"Male": 1,
                                 "Female": 0})

x=df.iloc[:,0:7]
x=x.drop(['Ad Topic Line','City'],axis=1)
y=df.iloc[:,9]

from sklearn.model_selection import train_test_split
xtrain,xtest,ytrain,ytest=train_test_split(x,y,
                                           test_size=0.2,
                                           random_state=4)
```

Now let's train the model using the random forecast classification algorithm:

[56]:
```
from sklearn.ensemble import RandomForestClassifier
model = RandomForestClassifier()
model.fit(x, y)
```

[56]:
```
RandomForestClassifier()
```

Now let's have a look at the accuracy of the model:

[61]:
```
from sklearn.metrics import accuracy_score
y_pred=model.predict(xtest)
print("The accuracy is: ",(accuracy_score(ytest,y_pred))*100)
```

```
The accuracy is:  95.7
```

7 Now let's test the model by making predictions:

[58]:
```
print("Ads Click Through Rate Prediction : ")
a = float(input("Daily Time Spent on Site: "))
b = float(input("Age: "))
c = float(input("Area Income: "))
d = float(input("Daily Internet Usage: "))
e = input("Gender (Male = 1, Female = 0) : ")

features = np.array([[a, b, c, d, e]])
print("Will the user click on ad = ", model.predict(features))
```

```
Ads Click Through Rate Prediction :
Daily Time Spent on Site: 70.20
```

```
Age: 35
Area Income: 40000
Daily Internet Usage: 220
Gender (Male = 1, Female = 0) : 1
Will the user click on ad =  ['No']
```

```
C:\ProgramData\anaconda3\lib\site-packages\sklearn\base.py:420: UserWarning: X
does not have valid feature names, but RandomForestClassifier was fitted with
feature names
  warnings.warn(
```

8 Summary

Ads CTR means predicting whether the user will click on the ad. In this task, we need to train a Machine Learning model to find relationships between the characteristics of all the users who click on ads.