Assignment on ML DL

1. Internet Usage Analysis.

This project is about the Data of internet usage [in kb] by graduate student at an indian university.

Answer for the following questions using Data Analysis.

What is the most frequent internet activity time of the day ? How often the ip changes ? How often the device changed. What is the average usage per hour , per day and per month ?

Hint: internet_session.csv provided to students.

```
from google.colab import drive
drive.mount('/content/drive')
```

```
Mounted at /content/drive
```

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns

path ="/content/internet_session.csv"
internet_usage = pd.read_csv(path)

# Dataset is now stored i a Pandas Dataframe
internet_usage.describe
```

```
<bound method NDFrame.describe of       name      start_time  usage_time        IP          MAC \
0     user1  10-05-2022 02:59  00:00:36:28  10.55.14.222  48:E7:DA:58:22:E9
                                          49:56  10.55.2.253  48:E7:DA:58:22:E9
                                          35:00  10.55.2.253  48:E7:DA:58:22:E9
                                          26:00  10.55.2.253  48:E7:DA:58:22:E9
4     user1  11-05-2022 02:59  00:00:11:52  10.55.2.253  48:E7:DA:58:22:E9
...     ...               ...          ...          ...               ...
4707  user9  04-11-2022 01:11  00:06:54:32  10.55.4.189  DA:2F:97:0E:B7:D0
4708  user9  04-11-2022 10:26  00:00:23:49   10.55.4.59  DA:2F:97:0E:B7:D0
4709  user9  04-11-2022 20:41  00:01:24:13  10.55.15.186  DA:2F:97:0E:B7:D0
4710  user9  05-11-2022 00:21  00:08:49:43  10.55.4.159  DA:2F:97:0E:B7:D0
4711  user9  05-11-2022 20:55  00:01:06:20   10.55.2.33  DA:2F:97:0E:B7:D0

      upload   download  total_transfer seession_break_reason  Unnamed: 9  \
0    15861.76   333168.64      349030.40       Idle-Timeout       NaN
1    16957.44   212152.32      229109.76       Idle-Timeout       NaN
2       14080   195153.92      209233.92       Idle-Timeout       NaN
3     5242.88    40806.4       46049.28       Idle-Timeout       NaN
4     22067.2   10772.48       32839.68       Idle-Timeout       NaN
...       ...        ...            ...                ...       ...
4707  107960.32  2390753.28     2495610.88       Idle-Timeout       NaN
4708   11407.36   209674.24      221081.60       Idle-Timeout       NaN
4709    18995.2    373657.6      392652.80       Idle-Timeout       NaN
4710   46602.24    593766.4      640368.64       Idle-Timeout       NaN
4711   21237.76   298536.96      319774.72              NaN       NaN

     Unnamed: 10
0            NaN
1            NaN
2            NaN
3            NaN
4            NaN
...          ...
4707         NaN
4708         NaN
4709         NaN
4710         NaN
4711         NaN

[4712 rows x 11 columns]>
```

```
internet_usage.shape
```

```
(4712, 11)
```

```
internet_usage.columns
```

```
Index(['name', 'start_time', 'usage_time', 'IP', 'MAC', 'upload', 'download',
       'total_transfer', 'seession_break_reason', 'Unnamed: 9', 'Unnamed: 10'],
      dtype='object')
```

```
internet_usage.columns = internet_usage.columns.str.lower()
internet_usage.columns
```

```
Index(['name', 'start_time', 'usage_time', 'ip', 'mac', 'upload', 'download',
       'total_transfer', 'seession_break_reason', 'unnamed: 9', 'unnamed: 10'],
      dtype='object')
```

```
internet_usage.dtypes
```

```
name                 object
start_time           object
usage_time           object
ip                   object
mac                  object
upload               object
download             object
total_transfer       float64
seession_break_reason    object
unnamed: 9           float64
unnamed: 10          float64
dtype: object
```

```
internet_usage.isna().sum()
```

```
name                    0
start_time              0
usage_time              0
ip                      0
mac                     0
upload                  0
                        
                        
unnamed: 9           4712
unnamed: 10          4712
dtype: int64
```

Saving...

```
internet_usage = internet_usage.dropna().copy()
internet_usage.isna().sum()
```

```
name                 0.0
start_time           0.0
usage_time           0.0
ip                   0.0
mac                  0.0
upload               0.0
download             0.0
total_transfer       0.0
seession_break_reason    0.0
unnamed: 9           0.0
unnamed: 10          0.0
dtype: float64
```

```
internet_usage.duplicated().sum()
```

```
0
```

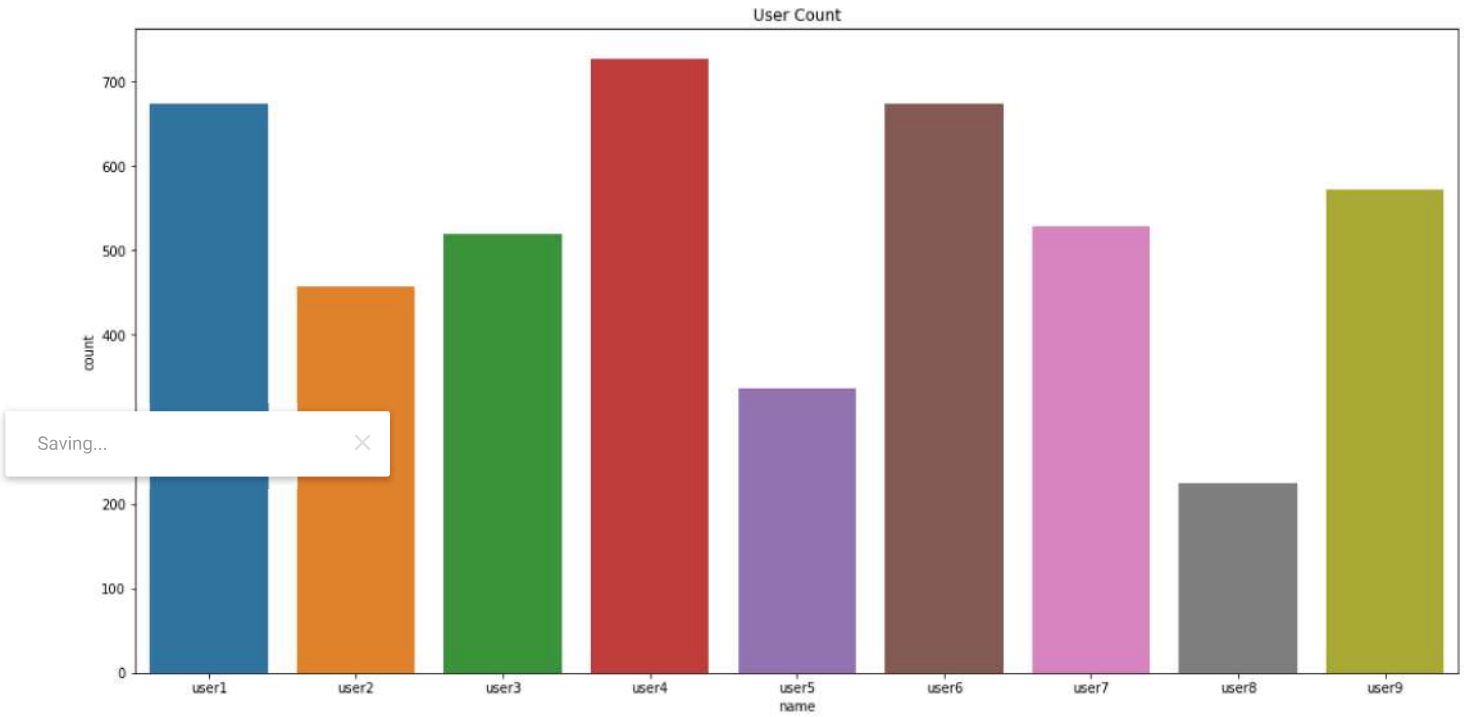
```
internet_usage.describe(include='all', datetime_is_numeric=True)
```

	name	start_time	usage_time	ip	mac	upload	download	total_transfer	seession_break_reason	unnamed: 9	unnamed: 10
count	0	0	0	0	0	0.0	0.0	0.0	0	0.0	0.0
unique	0	0	NaN	0	0	NaN	NaN	NaN	0	NaN	NaN
top	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
min	NaN	NaN	NaT	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN

```
internet_usage.name.value_counts()
```

```
Series([], Name: name, dtype: int64)
```

```
plt.figure(figsize=(18, 9))
ax = sns.countplot(x='name', data=internet_usage)
plt.title("User Count")
plt.show()
plt.clf()
```




```
<Figure size 432x288 with 0 Axes>
```

```
print('The earliest start time is:')
print(internet_usage.start_time.min())
print('The latest start time is:')
print(internet_usage.start_time.max())
```

```
The earliest start time is:
01-06-2022 00:30
The latest start time is:
31-10-2022 22:46
```

```
print('The minimum usage time is:')
print(internet_usage.usage_time.min())
print('The maximum usage time is:')
print(internet_usage.usage_time.max())
```

```
The minimum usage time is:
00:00:00:01
The maximum usage time is:
01:00:21:07
```

```
print('The minimum usage time per user:')
usage_time_minimum = internet_usage.groupby('name').usage_time.min()
usage_time_minimum
```

```
The minimum usage time per user:
name
user1    00:00:00:18
```

```
user2    00:00:00:08
user3    00:00:00:01
user4    00:00:00:45
user5    00:00:01:07
user6    00:00:00:18
user7    00:00:00:20
user8    00:00:00:20
user9    00:00:00:09
Name: usage_time, dtype: object
```

```
print('The maximum usage time per user:')
usage_time_maximum = internet_usage.groupby('name').usage_time.max()
usage_time_maximum
```

```
The maximum usage time per user:
name
user1    00:19:35:11
user2    00:20:39:52
user3    00:17:01:28
user4    01:00:21:07
user5    00:06:36:11
user6    00:19:35:11
user7    00:22:00:07
user8    00:17:24:26
user9    00:19:26:09
Name: usage_time, dtype: object
```

```
internet_usage.IP.value_counts()
```

```
10.55.0.89      80
10.55.14.148    64
10.55.15.221    55
10.55.1.50      48
10.55.10.46     44
                ..
10.55.14.67      1
10.55.12.190     1
10.55.2.33       1
Name: IP, Length: 1302, dtype: int64
```

Saving...

```
print('The minimum upload is: ' + str(internet_usage.upload.min()) + 'Kb')
print('The maximum upload is: ' + str(internet_usage.upload.max()) + 'Kb')
```

```
The minimum upload is: 10004.48Kb
The maximum upload is: 9994.24Kb
```

```
print('The minimum upload per user:')
internet_usage.groupby('name').upload.min()
```

```
The minimum upload per user:
name
user1     1006.74
user2    10117.12
user3    10055.68
user4    10147.84
user5    10076.16
user6     1006.74
user7     10035.2
user8    10004.48
user9   100720.64
Name: upload, dtype: object
```

```
print('The maximum upload per user:')
internet_usage.groupby('name').upload.max()
```

```
The maximum upload per user:
name
user1     9932.8
user2     9994.24
user3    99860.48
user4     9963.52
user5     9973.76
user6      9932.8
user7    99860.48
user8     9922.56
user9     9963.52
Name: upload, dtype: object
```

```
print('The minimum download is: ' + str(internet_usage.download.min()) + 'Kb')
print('The maximum download is: ' + str(internet_usage.download.max()) + 'Kb')
```

```
The minimum download is: 100014.08Kb
The maximum download is: 999393.28Kb
```

```
print('The minimum download per user:')
internet_usage.groupby('name').download.min()
```

```
The minimum download per user:
name
user1    100167.68
user2     10035.2
user3     100044.8
user4    100055.04
user5     10076.16
user6    100167.68
user7    100014.08
user8    101672.96
user9      1001216
Name: download, dtype: object
```

```
print('The maximum download per user:')
internet_usage.groupby('name').download.max()
```

```
The maximum download per user:
name
user1    999393.28
user2     99676.16
user3     99635.2
user4      9953.28
user5    990812.16
user6    999393.28
```

Saving...

```
Name: download, dtype: object
```

```
print('The minimum total transfer is: ' + str(internet_usage.total_transfer.min()) + 'Kb')
print('The maximum total transfer is: ' + str(internet_usage.total_transfer.max()) + 'Kb')
```

```
The minimum total transfer is: 1.12Kb
The maximum total transfer is: 28552724.48Kb
```

```
print('The minimum total transfer per user:')
internet_usage.groupby('name').total_transfer.min()
```

```
The minimum total transfer per user:
name
user1     75.34
user2     73.13
user3      1.12
user4     13.45
user5    924.40
user6     75.34
user7     15.25
user8     18.08
user9    102.64
Name: total_transfer, dtype: float64
```

```
print('The maximum total transfer per user:')
internet_usage.groupby('name').total_transfer.max()
```

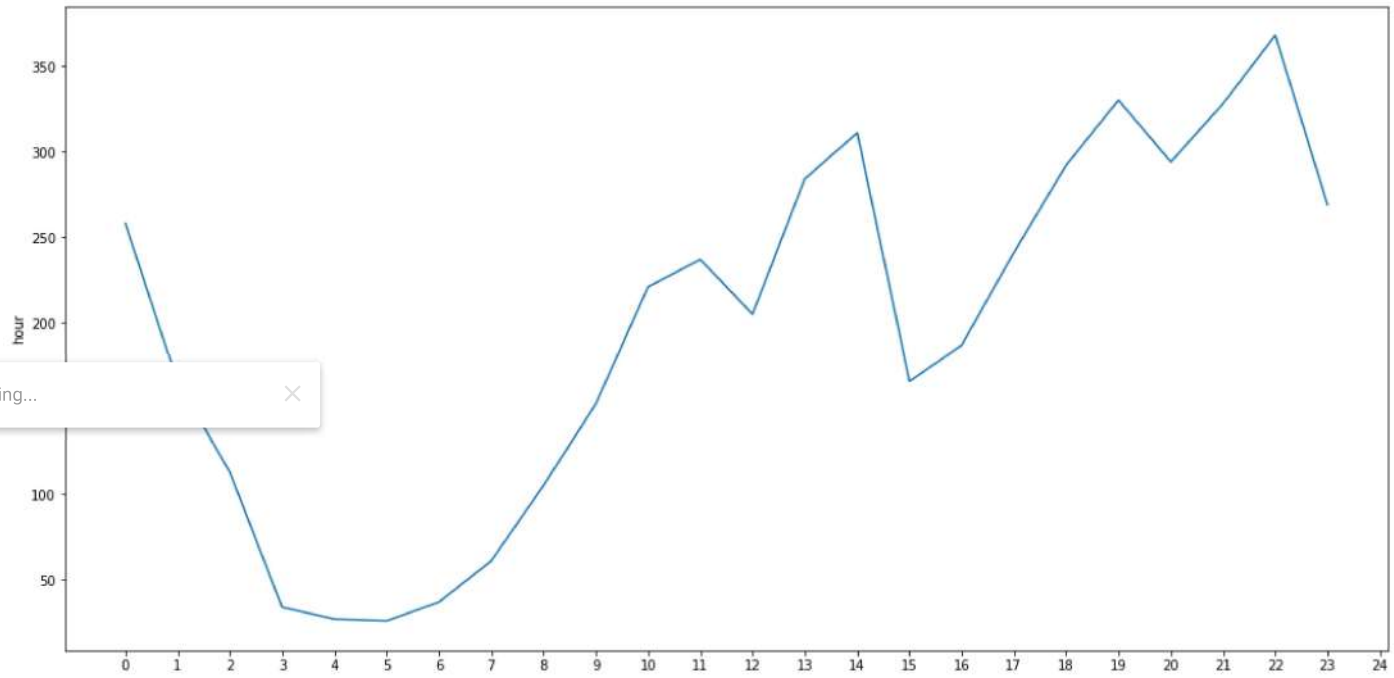
```
The maximum total transfer per user:
name
user1    24389877.76
user2    22051553.28
user3     3282042.88
user4     8524922.88
user5     5158993.92
user6    24389877.76
user7    28552724.48
user8     3166699.52
user9     6155141.12
Name: total_transfer, dtype: float64
```

```
internet_usage.seession_break_reason.value_counts()
```

```
Idle-Timeout    4350
Lost-Carrier     162
Lost-Service     124
User-Request      65
NAS-Reboot         2
Name: seession_break_reason, dtype: int64
```

What is the most frequent internet activity time of the day ?

```
internet_usage['hour'] = pd.to_datetime(internet_usage['start_time']).dt.hour
frequent_activity_time_of_day = internet_usage['hour'].value_counts().sort_index()
plt.figure(figsize=(18, 9))
sns.lineplot(data=frequent_activity_time_of_day)
plt.xticks(np.linspace(start=0, stop=24, num=25))
plt.show()
plt.clf()
```




```
<Figure size 432x288 with 0 Axes>
```

How often the ip changes ?

```
base_IP = '48:E7:DA:58:22:E9'
IP_count = 0
for i in range(1, internet_usage.shape[0]):
    if internet_usage.iloc[i]['IP'] != base_IP:
        IP_count +=1
        base_IP = internet_usage.iloc[i]['IP']

print('The IP Adress changed ' + str(IP_count) + ' times')
```

```
The IP Adress changed 2308 times
```

The dataset contains 9 users that used 1224 difference devices to connect to the internet while uploading 2841640.0Kb and downloading 27902607.0Kb with a total transfer of 28552724.48Kb during a period of 7 months

The most frequent internet activity time of the day is 22h or 10pm

The IP Adress changed 2303 times while the devices used changed 1223 times

The highest average usage per hour was 666590.76Kb around18h or 6pm, the highest average usage per day was 729857.65Kb around the 11th day of the month, while the highest average usage per month was during the month of October with 549467.63Kb total transfer of data

0s completed at 11:04 AM

Saving...