online_education_system

March 17, 2024

1 Online Education System

1.0.1 This is the EDA for the online system which was conducted during the COVID-19 during early 2020s and mid 2021s.

The data was gathered from kaggle.com

[1]:
```
import pandas as pd
import numpy as np
from matplotlib import pyplot as plt
import matplotlib.patches as mpatches
import seaborn as sns
import warnings

# Ignore FutureWarnings
warnings.filterwarnings('ignore', category = FutureWarning)
warnings.filterwarnings('ignore', category = UserWarning)
```

[2]:
```
df = pd.read_csv("ONLINE EDUCATION SYSTEM.csv")
df
```

[2]:

	Gender	Home Location	Level of Education	Age(Years)	Number of Subjects	\
0	Male	Urban	Under Graduate	18	11	
1	Male	Urban	Under Graduate	19	7	
2	Male	Rural	Under Graduate	18	5	
3	Male	Urban	Under Graduate	18	5	
4	Male	Rural	Under Graduate	18	5	
...	...	...	...	...	...	
1028	Female	Rural	Under Graduate	19	3	
1029	Female	Rural	Under Graduate	20	6	
1030	Female	Rural	Under Graduate	20	3	
1031	Female	Rural	Under Graduate	19	6	
1032	Female	Urban	Under Graduate	20	6	

	Device type used to attend classes	Economic status	Family size	\
0	Laptop	Middle Class	4	
1	Laptop	Middle Class	4	
2	Laptop	Middle Class	5	

```
3                              Laptop    Middle Class            4
4                              Laptop    Middle Class            4
...                               ...             ...          ...
1028                           Mobile    Middle Class            6
1029                          Desktop    Middle Class            3
1030                           Mobile    Middle Class            3
1031                           Mobile    Middle Class            2
1032                           Laptop    Middle Class            4

      Internet facility in your locality Are you involved in any sports?  ...  \
0                                      5                              No  ...
1                                      1                             Yes  ...
2                                      2                              No  ...
3                                      4                             Yes  ...
4                                      3                              No  ...
...                                  ...                             ...  ...
1028                                   5                             Yes  ...
1029                                   1                              No  ...
1030                                   2                              No  ...
1031                                   3                             Yes  ...
1032                                   3                              No  ...

     Time spent on social media (Hours)  Interested in Gaming?  \
0                                     1                    No
1                                     1                   Yes
2                                     1                    No
3                                     2                    No
4                                     2                   Yes
...                                 ...                   ...
1028                                  4                   Yes
1029                                  2                   Yes
1030                                  3                    No
1031                                  2                   Yes
1032                                  1                   Yes

      Have separate room for studying?  Engaged in group studies?  \
0                                   No                        No
1                                  Yes                        No
2                                  Yes                        No
3                                   No                       yes
4                                  Yes                       yes
...                                ...                       ...
1028                               Yes                       yes
1029                               Yes                        No
1030                               Yes                       yes
1031                                No                        No
1032                               Yes                       yes
```

	Average marks scored before pandemic in traditional classroom	Your interaction in online mode	Clearing doubts with faculties in online mode	Interested in?	Performance in online	Your level of satisfaction in Online Education
0	91-100	1	1	Practical	6	Average
1	91-100	1	1	Theory	3	Bad
2	71-80	1	1	Both	6	Bad
3	91-100	1	2	Theory	4	Bad
4	81-90	3	3	Both	6	Average
...	...	...	...	...	...	...
1028	91-100	4	4	Theory	6	Average
1029	71-80	5	5	Theory	6	Average
1030	71-80	2	2	Theory	6	Average
1031	61-70	3	3	Both	6	Average
1032	81-90	5	4	Practical	6	Average

```
1028                      8                                  Average
1029                     10                                  Average
1030                      6                                  Average
1031                      6                                     Good
1032                     10                                  Average

[1033 rows x 23 columns]
```

[3]:
```
df.size
```

[3]:
```
23759
```

[4]:
```
df.shape
```

[4]:
```
(1033, 23)
```

[5]:
```
df.isnull().sum()
```

[5]:
```
Gender                                                          0
Home Location                                                   0
Level of Education                                              0
Age(Years)                                                      0
Number of Subjects                                              0
Device type used to attend classes                              0
Economic status                                                 0
Family size                                                     0
Internet facility in your locality                              0
Are you involved in any sports?                                 0
Do elderly people monitor you?                                  0
Study time (Hours)                                              0
Sleep time (Hours)                                              0
Time spent on social media (Hours)                              0
Interested in Gaming?                                           0
Have separate room for studying?                                0
Engaged in group studies?                                       0
Average marks scored before pandemic in traditional classroom   0
Your interaction in online mode                                 0
Clearing doubts with faculties in online mode                   0
Interested in?                                                  0
Performance in online                                           0
Your level of satisfaction in Online Education                  0
dtype: int64
```

[6]:
```
# dropping unnecessary columns.
df.drop(["Have separate room for studying?", "Your interaction in online mode"␣
 ↪], axis = 1, inplace = True)
```

[7]:
```
df
```

[7]:

	Gender	Home Location	Level of Education	Age(Years)	Number of Subjects	\
0	Male	Urban	Under Graduate	18	11	
1	Male	Urban	Under Graduate	19	7	
2	Male	Rural	Under Graduate	18	5	
3	Male	Urban	Under Graduate	18	5	
4	Male	Rural	Under Graduate	18	5	
...	...	...	...	...	...	
1028	Female	Rural	Under Graduate	19	3	
1029	Female	Rural	Under Graduate	20	6	
1030	Female	Rural	Under Graduate	20	3	
1031	Female	Rural	Under Graduate	19	6	
1032	Female	Urban	Under Graduate	20	6	

	Device type used to attend classes	Economic status	Family size	\
0	Laptop	Middle Class	4	
1	Laptop	Middle Class	4	
2	Laptop	Middle Class	5	
3	Laptop	Middle Class	4	
4	Laptop	Middle Class	4	
...	...	...	...	
1028	Mobile	Middle Class	6	
1029	Desktop	Middle Class	3	
1030	Mobile	Middle Class	3	
1031	Mobile	Middle Class	2	
1032	Laptop	Middle Class	4	

	Internet facility in your locality	Are you involved in any sports?	...	\
0	5	No	...	
1	1	Yes	...	
2	2	No	...	
3	4	Yes	...	
4	3	No	...	
...	...	...	...	
1028	5	Yes	...	
1029	1	No	...	
1030	2	No	...	
1031	3	Yes	...	
1032	3	No	...	

	Study time (Hours)	Sleep time (Hours)	\
0	3	6	
1	7	5	
2	6	7	
3	3	6	
4	8	7	
...	...	...	
1028	4	8	

```
1029                  3                   7
1030                  3                   6
1031                  4                   6
1032                  5                   7

      Time spent on social media (Hours)  Interested in Gaming?  \
0                                      1                    No
1                                      1                   Yes
2                                      1                    No
3                                      2                    No
4                                      2                   Yes
...                                  ...                   ...
1028                                   4                   Yes
1029                                   2                   Yes
1030                                   3                    No
1031                                   2                   Yes
1032                                   1                   Yes

     Engaged in group studies?  \
0                           No
1                           No
2                           No
3                          yes
4                          yes
...                        ...
1028                       yes
1029                        No
1030                       yes
1031                        No
1032                       yes

     Average marks scored before pandemic in traditional classroom  \
0                                                 91-100
1                                                 91-100
2                                                  71-80
3                                                 91-100
4                                                  81-90
...                                                  ...
1028                                              91-100
1029                                               71-80
1030                                               71-80
1031                                               61-70
1032                                               81-90

     Clearing doubts with faculties in online mode  Interested in?  \
0                                                1       Practical
1                                                1          Theory
```

```
2                                                 1            Both
3                                                 2          Theory
4                                                 3            Both
...                                             ...             ...
1028                                              4          Theory
1029                                              5          Theory
1030                                              2          Theory
1031                                              3            Both
1032                                              4       Practical

     Performance in online  Your level of satisfaction in Online Education
0                        6                                         Average
1                        3                                             Bad
2                        6                                             Bad
3                        4                                             Bad
4                        6                                         Average
...                    ...                                             ...
1028                     8                                         Average
1029                    10                                         Average
1030                     6                                         Average
1031                     6                                            Good
1032                    10                                         Average

[1033 rows x 21 columns]
```

[8]:
```
df.corr(numeric_only = True)
```

[8]:
```
                                                Age(Years)  Number of Subjects  \
Age(Years)                                        1.000000           -0.011505
Number of Subjects                               -0.011505            1.000000
Family size                                       0.016893            0.035997
Internet facility in your locality                0.072625           -0.025915
Study time (Hours)                                0.005344            0.024280
Sleep time (Hours)                               -0.072031            0.051531
Time spent on social media (Hours)                0.005455            0.004833
Clearing doubts with faculties in online mode     0.125559           -0.008595
Performance in online                             0.114965            0.012740

                                                Family size  \
Age(Years)                                         0.016893
Number of Subjects                                 0.035997
Family size                                        1.000000
Internet facility in your locality                -0.020996
Study time (Hours)                                 0.060614
Sleep time (Hours)                                -0.015787
Time spent on social media (Hours)                 0.053512
Clearing doubts with faculties in online mode     -0.019461
```

```
Performance in online                                0.001549

                                                     Internet facility in your
locality  \
Age(Years)
0.072625
Number of Subjects
-0.025915
Family size
-0.020996
Internet facility in your locality
1.000000
Study time (Hours)
-0.011554
Sleep time (Hours)
0.051838
Time spent on social media (Hours)
0.082772
Clearing doubts with faculties in online mode
0.158990
Performance in online
0.257339

                                                     Study time (Hours)  \
Age(Years)                                                     0.005344
Number of Subjects                                             0.024280
Family size                                                    0.060614
Internet facility in your locality                            -0.011554
Study time (Hours)                                             1.000000
Sleep time (Hours)                                            -0.044385
Time spent on social media (Hours)                            -0.125986
Clearing doubts with faculties in online mode                  0.175169
Performance in online                                          0.134344

                                                     Sleep time (Hours)  \
Age(Years)                                                    -0.072031
Number of Subjects                                             0.051531
Family size                                                   -0.015787
Internet facility in your locality                             0.051838
Study time (Hours)                                            -0.044385
Sleep time (Hours)                                             1.000000
Time spent on social media (Hours)                             0.144587
Clearing doubts with faculties in online mode                  0.043402
Performance in online                                          0.065020

                                                     Time spent on social media
(Hours)  \
```

```
Age(Years)
0.005455
Number of Subjects
0.004833
Family size
0.053512
Internet facility in your locality
0.082772
Study time (Hours)
-0.125986
Sleep time (Hours)
0.144587
Time spent on social media (Hours)
1.000000
Clearing doubts with faculties in online mode
-0.101847
Performance in online
-0.086568
```

```
                                                Clearing doubts with faculties in
online mode  \
Age(Years)
0.125559
Number of Subjects
-0.008595
Family size
-0.019461
Internet facility in your locality
0.158990
Study time (Hours)
0.175169
Sleep time (Hours)
0.043402
Time spent on social media (Hours)
-0.101847
Clearing doubts with faculties in online mode
1.000000
Performance in online
0.561091
```

```
                                                Performance in online
Age(Years)                                                   0.114965
Number of Subjects                                           0.012740
Family size                                                  0.001549
Internet facility in your locality                           0.257339
Study time (Hours)                                           0.134344
Sleep time (Hours)                                           0.065020
```

```
Time spent on social media (Hours)                          -0.086568
Clearing doubts with faculties in online mode                0.561091
Performance in online                                        1.000000
```

[9]:
```
df
```

[9]:
```
      Gender Home Location Level of Education  Age(Years)  Number of Subjects  \
0       Male         Urban     Under Graduate          18                  11
1       Male         Urban     Under Graduate          19                   7
2       Male         Rural     Under Graduate          18                   5
3       Male         Urban     Under Graduate          18                   5
4       Male         Rural     Under Graduate          18                   5
...      ...           ...                ...         ...                 ...
1028  Female         Rural     Under Graduate          19                   3
1029  Female         Rural     Under Graduate          20                   6
1030  Female         Rural     Under Graduate          20                   3
1031  Female         Rural     Under Graduate          19                   6
1032  Female         Urban     Under Graduate          20                   6

     Device type used to attend classes Economic status  Family size  \
0                                Laptop    Middle Class            4
1                                Laptop    Middle Class            4
2                                Laptop    Middle Class            5
3                                Laptop    Middle Class            4
4                                Laptop    Middle Class            4
...                                 ...             ...          ...
1028                             Mobile    Middle Class            6
1029                            Desktop    Middle Class            3
1030                             Mobile    Middle Class            3
1031                             Mobile    Middle Class            2
1032                             Laptop    Middle Class            4

      Internet facility in your locality Are you involved in any sports?  ...  \
0                                      5                              No  ...
1                                      1                             Yes  ...
2                                      2                              No  ...
3                                      4                             Yes  ...
4                                      3                              No  ...
...                                  ...                             ...  ...
1028                                   5                             Yes  ...
1029                                   1                              No  ...
1030                                   2                              No  ...
1031                                   3                             Yes  ...
1032                                   3                              No  ...

     Study time (Hours)  Sleep time (Hours)  \
0                     3                   6
```

```
1                     7                   5
2                     6                   7
3                     3                   6
4                     8                   7
...                 ...                 ...
1028                  4                   8
1029                  3                   7
1030                  3                   6
1031                  4                   6
1032                  5                   7

      Time spent on social media (Hours)  Interested in Gaming?  \
0                                      1                    No
1                                      1                   Yes
2                                      1                    No
3                                      2                    No
4                                      2                   Yes
...                                  ...                   ...
1028                                   4                   Yes
1029                                   2                   Yes
1030                                   3                    No
1031                                   2                   Yes
1032                                   1                   Yes

     Engaged in group studies?  \
0                           No
1                           No
2                           No
3                          yes
4                          yes
...                        ...
1028                       yes
1029                        No
1030                       yes
1031                        No
1032                       yes

     Average marks scored before pandemic in traditional classroom  \
0                                                        91-100
1                                                        91-100
2                                                         71-80
3                                                        91-100
4                                                         81-90
...                                                         ...
1028                                                     91-100
1029                                                      71-80
1030                                                      71-80
```

```
1031                                                61-70
1032                                                81-90

     Clearing doubts with faculties in online mode  Interested in?  \
0                                                1       Practical
1                                                1          Theory
2                                                1            Both
3                                                2          Theory
4                                                3            Both
...                                            ...             ...
1028                                             4          Theory
1029                                             5          Theory
1030                                             2          Theory
1031                                             3            Both
1032                                             4       Practical

     Performance in online  Your level of satisfaction in Online Education
0                        6                                         Average
1                        3                                             Bad
2                        6                                             Bad
3                        4                                             Bad
4                        6                                         Average
...                    ...                                             ...
1028                     8                                         Average
1029                    10                                         Average
1030                     6                                         Average
1031                     6                                            Good
1032                    10                                         Average

[1033 rows x 21 columns]
```

1.1 Removing the string literal and calculating the average mid point.

[10]:
```
def calc_mid_point(x):
        try:
            start, end = map(int, x.split('-'))
            return (start + end) /2
        except ValueError:
            return None


df["Average marks scored before pandemic in traditional classroom"] =␣
 ↪df['Average marks scored before pandemic in traditional classroom'].
 ↪apply(calc_mid_point)
```

1.2 Removing the null values.

[11]:
```
df.dropna()
```

[11]:
```
      Gender Home Location Level of Education  Age(Years)  Number of Subjects  \
0       Male         Urban     Under Graduate          18                  11
1       Male         Urban     Under Graduate          19                   7
2       Male         Rural     Under Graduate          18                   5
3       Male         Urban     Under Graduate          18                   5
4       Male         Rural     Under Graduate          18                   5
...      ...           ...                ...         ...                 ...
1028  Female         Rural     Under Graduate          19                   3
1029  Female         Rural     Under Graduate          20                   6
1030  Female         Rural     Under Graduate          20                   3
1031  Female         Rural     Under Graduate          19                   6
1032  Female         Urban     Under Graduate          20                   6

     Device type used to attend classes Economic status  Family size  \
0                                Laptop    Middle Class            4
1                                Laptop    Middle Class            4
2                                Laptop    Middle Class            5
3                                Laptop    Middle Class            4
4                                Laptop    Middle Class            4
...                                 ...             ...          ...
1028                             Mobile    Middle Class            6
1029                            Desktop    Middle Class            3
1030                             Mobile    Middle Class            3
1031                             Mobile    Middle Class            2
1032                             Laptop    Middle Class            4

      Internet facility in your locality Are you involved in any sports?  ...  \
0                                      5                               No  ...
1                                      1                              Yes  ...
2                                      2                               No  ...
3                                      4                              Yes  ...
4                                      3                               No  ...
...                                  ...                              ...  ...
1028                                   5                              Yes  ...
1029                                   1                               No  ...
1030                                   2                               No  ...
1031                                   3                              Yes  ...
1032                                   3                               No  ...

     Study time (Hours)  Sleep time (Hours)  \
0                     3                   6
1                     7                   5
2                     6                   7
```

```
3                    3                    6
4                    8                    7
...                ...                  ...
1028                 4                    8
1029                 3                    7
1030                 3                    6
1031                 4                    6
1032                 5                    7

      Time spent on social media (Hours)  Interested in Gaming?  \
0                                      1                     No
1                                      1                    Yes
2                                      1                     No
3                                      2                     No
4                                      2                    Yes
...                                  ...                    ...
1028                                   4                    Yes
1029                                   2                    Yes
1030                                   3                     No
1031                                   2                    Yes
1032                                   1                    Yes

     Engaged in group studies?  \
0                           No
1                           No
2                           No
3                          yes
4                          yes
...                        ...
1028                       yes
1029                        No
1030                       yes
1031                        No
1032                       yes

     Average marks scored before pandemic in traditional classroom  \
0                                                             95.5
1                                                             95.5
2                                                             75.5
3                                                             95.5
4                                                             85.5
...                                                            ...
1028                                                          95.5
1029                                                          75.5
1030                                                          75.5
1031                                                          65.5
1032                                                          85.5
```

```
      Clearing doubts with faculties in online mode  Interested in?  \
0                                                 1       Practical
1                                                 1          Theory
2                                                 1            Both
3                                                 2          Theory
4                                                 3            Both
...                                             ...             ...
1028                                              4          Theory
1029                                              5          Theory
1030                                              2          Theory
1031                                              3            Both
1032                                              4       Practical

     Performance in online  Your level of satisfaction in Online Education
0                        6                                         Average
1                        3                                             Bad
2                        6                                             Bad
3                        4                                             Bad
4                        6                                         Average
...                    ...                                             ...
1028                     8                                         Average
1029                    10                                         Average
1030                     6                                         Average
1031                     6                                            Good
1032                    10                                         Average

[1027 rows x 21 columns]
```

[12]:
```
df
```

[12]:
```
      Gender Home Location Level of Education  Age(Years)  Number of Subjects  \
0       Male         Urban     Under Graduate          18                  11
1       Male         Urban     Under Graduate          19                   7
2       Male         Rural     Under Graduate          18                   5
3       Male         Urban     Under Graduate          18                   5
4       Male         Rural     Under Graduate          18                   5
...      ...           ...                ...         ...                 ...
1028  Female         Rural     Under Graduate          19                   3
1029  Female         Rural     Under Graduate          20                   6
1030  Female         Rural     Under Graduate          20                   3
1031  Female         Rural     Under Graduate          19                   6
1032  Female         Urban     Under Graduate          20                   6

     Device type used to attend classes Economic status  Family size  \
0                                Laptop    Middle Class            4
1                                Laptop    Middle Class            4
```

```
2                                Laptop    Middle Class            5
3                                Laptop    Middle Class            4
4                                Laptop    Middle Class            4
...                                 ...             ...          ...
1028                             Mobile    Middle Class            6
1029                            Desktop    Middle Class            3
1030                             Mobile    Middle Class            3
1031                             Mobile    Middle Class            2
1032                             Laptop    Middle Class            4

      Internet facility in your locality Are you involved in any sports?  ...  \
0                                      5                              No  ...
1                                      1                             Yes  ...
2                                      2                              No  ...
3                                      4                             Yes  ...
4                                      3                              No  ...
...                                  ...                             ...  ...
1028                                   5                             Yes  ...
1029                                   1                              No  ...
1030                                   2                              No  ...
1031                                   3                             Yes  ...
1032                                   3                              No  ...

     Study time (Hours)  Sleep time (Hours)  \
0                     3                   6
1                     7                   5
2                     6                   7
3                     3                   6
4                     8                   7
...                 ...                 ...
1028                  4                   8
1029                  3                   7
1030                  3                   6
1031                  4                   6
1032                  5                   7

      Time spent on social media (Hours)  Interested in Gaming?  \
0                                      1                     No
1                                      1                    Yes
2                                      1                     No
3                                      2                     No
4                                      2                    Yes
...                                  ...                    ...
1028                                   4                    Yes
1029                                   2                    Yes
1030                                   3                     No
1031                                   2                    Yes
```

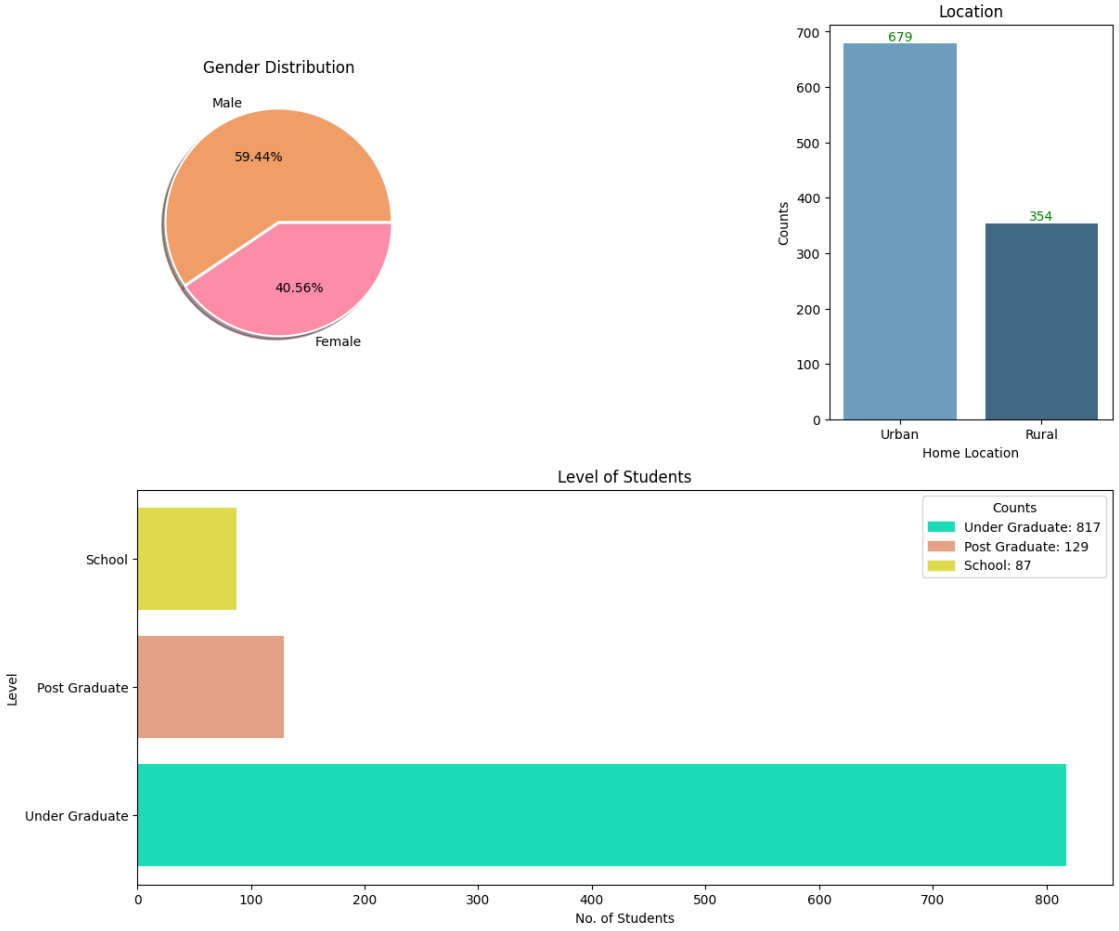
```
1032                                1                    Yes

     Engaged in group studies?  \
0                            No
1                            No
2                            No
3                           yes
4                           yes
...                         ...
1028                        yes
1029                         No
1030                        yes
1031                         No
1032                        yes

     Average marks scored before pandemic in traditional classroom  \
0                                                    95.5
1                                                    95.5
2                                                    75.5
3                                                    95.5
4                                                    85.5
...                                                   ...
1028                                                 95.5
1029                                                 75.5
1030                                                 75.5
1031                                                 65.5
1032                                                 85.5

      Clearing doubts with faculties in online mode  Interested in?  \
0                                                 1       Practical
1                                                 1          Theory
2                                                 1            Both
3                                                 2          Theory
4                                                 3            Both
...                                             ...             ...
1028                                              4          Theory
1029                                              5          Theory
1030                                              2          Theory
1031                                              3            Both
1032                                              4       Practical

     Performance in online  Your level of satisfaction in Online Education
0                        6                                         Average
1                        3                                             Bad
2                        6                                             Bad
3                        4                                             Bad
4                        6                                         Average
```

```
...                    ...                                        ...
1028                     8                                  Average
1029                    10                                  Average
1030                     6                                  Average
1031                     6                                     Good
1032                    10                                  Average

[1033 rows x 21 columns]
```

1.3 Visual representation of the students' data

[13]:
```
gender_counts = df["Gender"].value_counts()
level_counts = df["Level of Education"].value_counts()
axd = plt.figure(layout="constrained", figsize=(12, 10)).subplot_mosaic(
    """
    A.B
    CCC
    """
)

ax1 = axd["A"]
ax2 = axd["B"]
ax3 = axd["C"]

ax1.pie(gender_counts,
        labels=gender_counts.index,
        autopct="%.2f%%",
        shadow = True,
        wedgeprops = { 'linewidth' : 1.5, 'edgecolor' : 'white' },
        explode = [0.0, 0.01],
        colors = ["#ef9e67", "#fb8da9"])
ax1.set_title("Gender Distribution")

bars = sns.countplot(data = df, x ="Home Location", ax = ax2,  palette='Blues_d')
for bar in bars.patches:  # bars.patches is the correct way to get the list of␣
 ↪rectangles representing the bars.
    height = bar.get_height()
    ax2.text(bar.get_x() + bar.get_width() / 2, height, int(height),
             ha='center', va='bottom', color='green', fontsize=10)

ax2.set_title("Location")
ax2.set_xlabel("Home Location")
ax2.set_ylabel("Counts")

bar_colors = ["#1cdbb6", "#e3a186", "#deda4b"]
ax3.barh(level_counts.index, level_counts.values, height=0.8, color=bar_colors)
ax3.set_title("Level of Students")
```

```
ax3.set_xlabel("No. of Students")
ax3.set_ylabel("Level")
legend_labels = [f"{level}: {count}" for level, count in zip(level_counts.index,␣
 ↪level_counts.values)]
legend_patches = [mpatches.Patch(color=color, label=label) for color, label in␣
 ↪zip(bar_colors, legend_labels)]
ax3.legend(handles=legend_patches, loc="upper right", title='Counts')

plt.show()
```

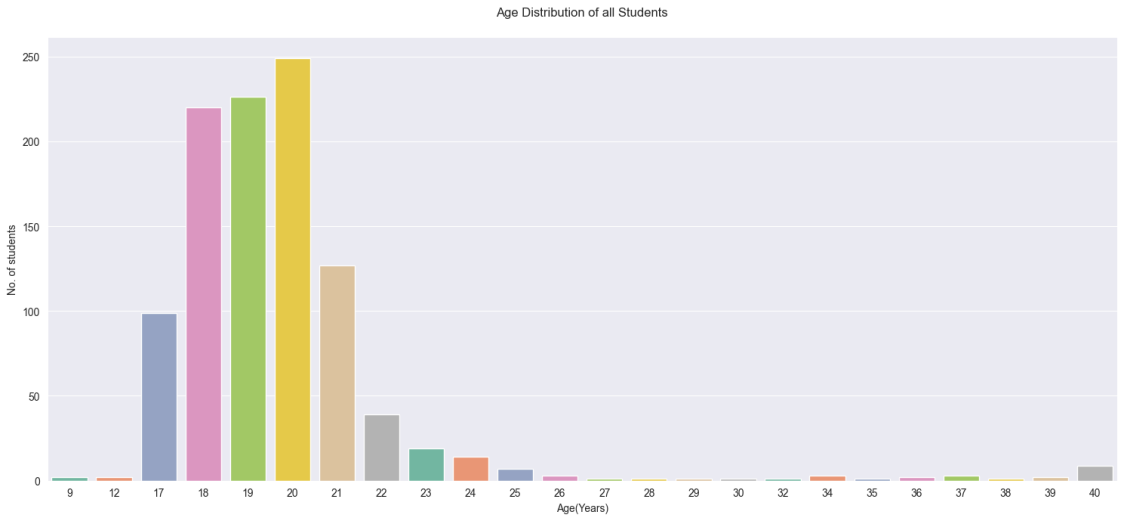


1.3.1 Insights:

1. Students are mostly male rather than female, in which majority of them belong to urban areas.
2. Undergraduate sstudents were found to use the online classes more frequently than other level students.

1.4 Visual representation of the student's age group.

[14]:
```
plt.figure(figsize = (15,7))
sns.set_style("darkgrid")
palette = sns.color_palette("Set2")
sns.countplot(data = df, x="Age(Years)", hue ='Age(Years)', legend = False,␣
↪palette = palette)
plt.title("Age Distribution of all Students", pad = 20)
plt.xlabel("Age(Years)")
plt.ylabel("No. of students")

plt.tight_layout()
plt.show()
```



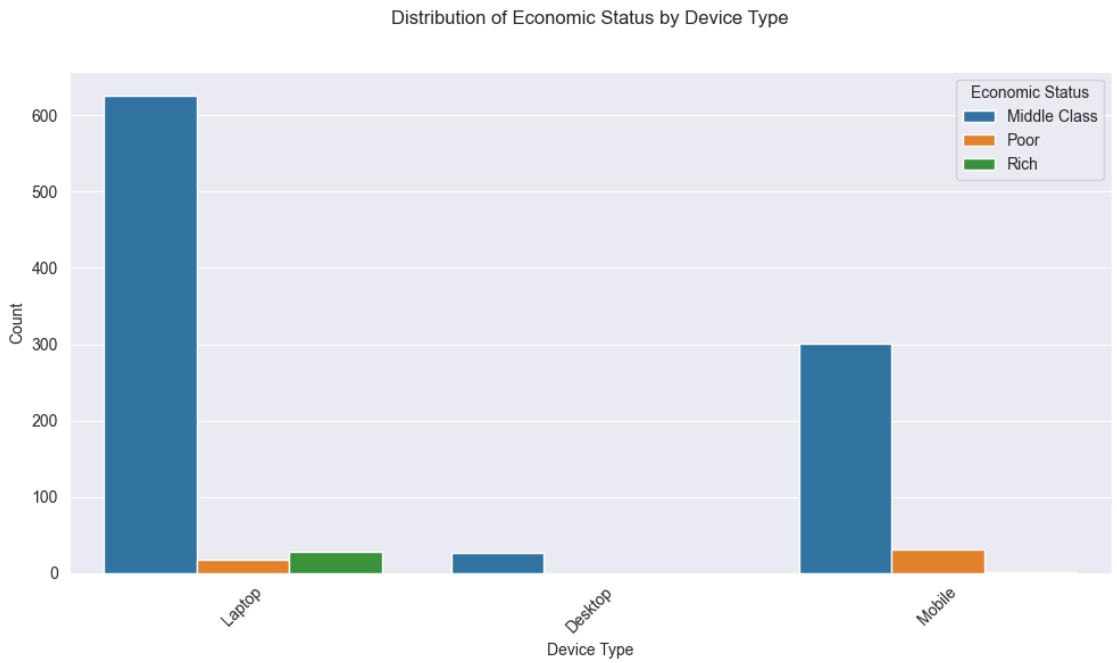
1.4.1 Insights:

1. Online classes are mostly taken by the undergraduate students whose age group is 19-24 at most.

1.5 Economical status of the students and the device uses.

[15]:
```
plt.figure(figsize = (10,6))

sns.countplot(data = df, x = "Device type used to attend classes", hue =␣
↪"Economic status")
plt.xticks(rotation = 45)
plt.title('Distribution of Economic Status by Device Type', pad = 30)
plt.xlabel('Device Type')
plt.ylabel('Count')
plt.legend(title='Economic Status')
```

```
plt.tight_layout()
plt.show()
```

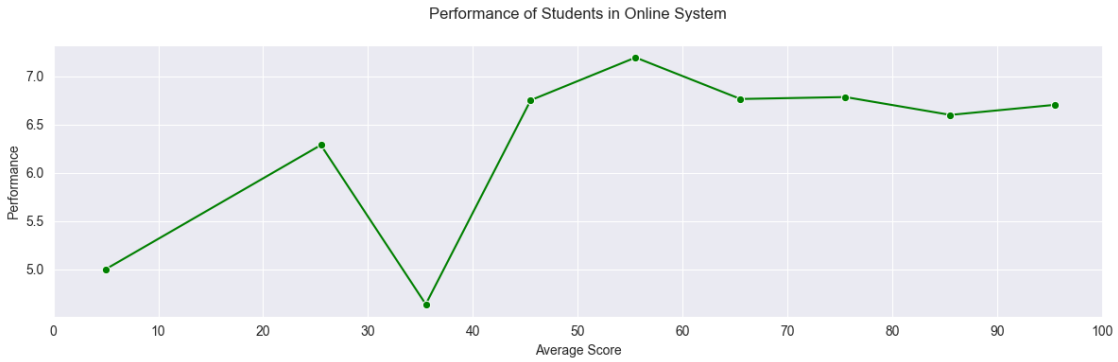


1.5.1 Insights:

1. Middle class students have the highest ratio of attending the online sessions.
2. Laptops are used by various students for their classes.

1.6 Line graph representing the performance of the students.

[16]:
```
plt.figure(figsize = (12,4))

sns.set_style("darkgrid")
sns.lineplot(data= df,
             x= "Average marks scored before pandemic in traditional classroom",
            y=  "Performance in online", errorbar=None, marker = 'o', color =␣
 ↪"green")
plt.title("Performance of Students in Online System", pad = 20)
plt.ylabel("Performance")
plt.grid(True)
plt.xlabel("Average Score")
plt.xticks(range(0, 101, 10))
plt.tight_layout()
plt.show()
```



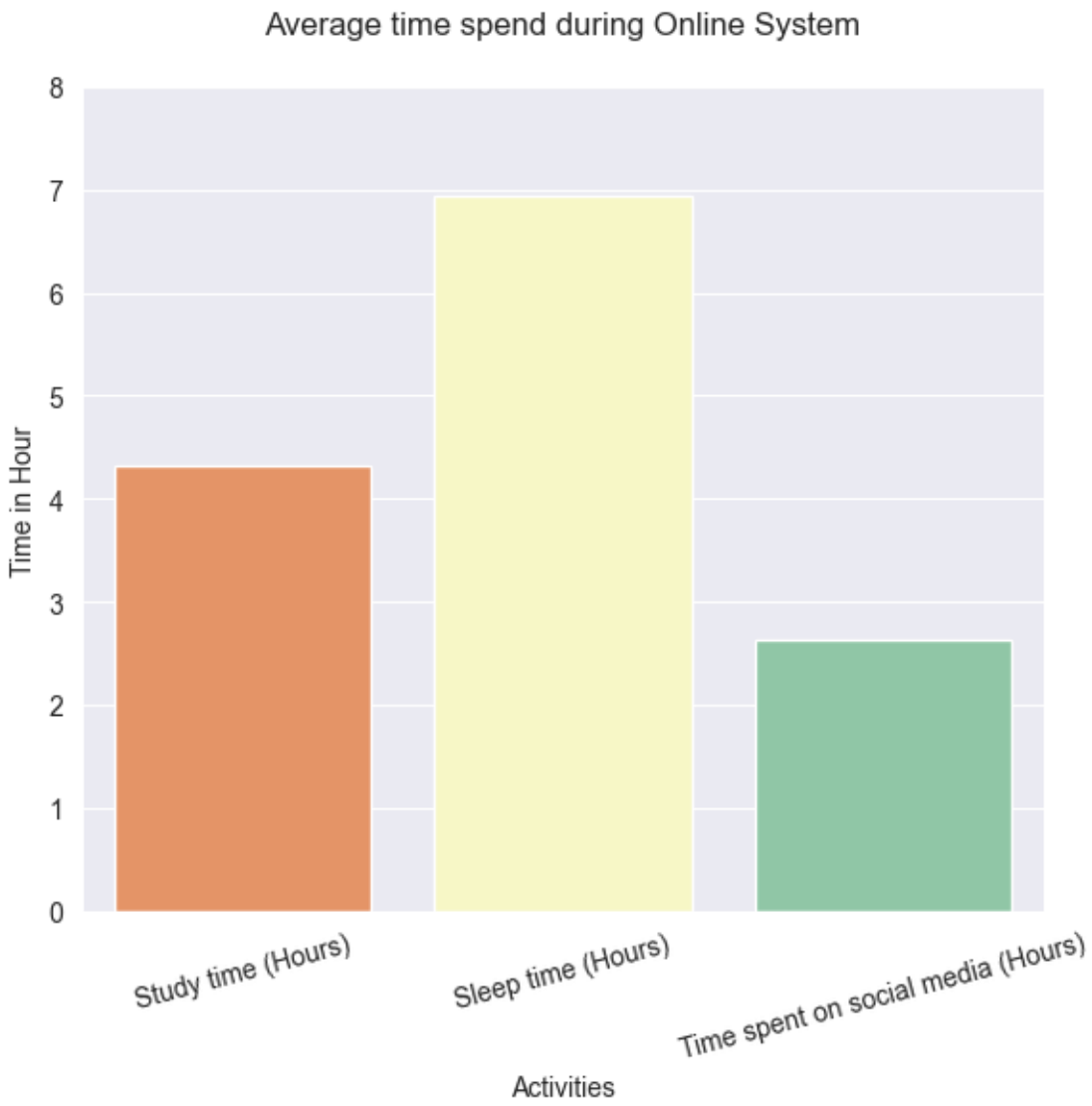
1.6.1 Insights:

1. Average scores of students is seen to increase in the online classes.
2. Performance is also seen to improve.

1.7 Bar graph for the average time spend during the online system.

[17]:
```
average_time={}
average_time= df[["Study time (Hours)",        "Sleep time (Hours)", "Time spent␣
↪on social media (Hours)"]].mean()
```

[18]:
```
plt.figure(figsize=(6,6))

palette = sns.color_palette("Spectral", len(average_time.index))
sns.barplot(x=average_time.index, y=average_time.values, palette=palette)

plt.xticks(rotation = 15)
plt.yticks(range(0,9,1))
plt.title("Average time spend during Online System", pad = 20)
plt.xlabel("Activities")
plt.ylabel("Time in Hour")
plt.tight_layout()
plt.show()
```



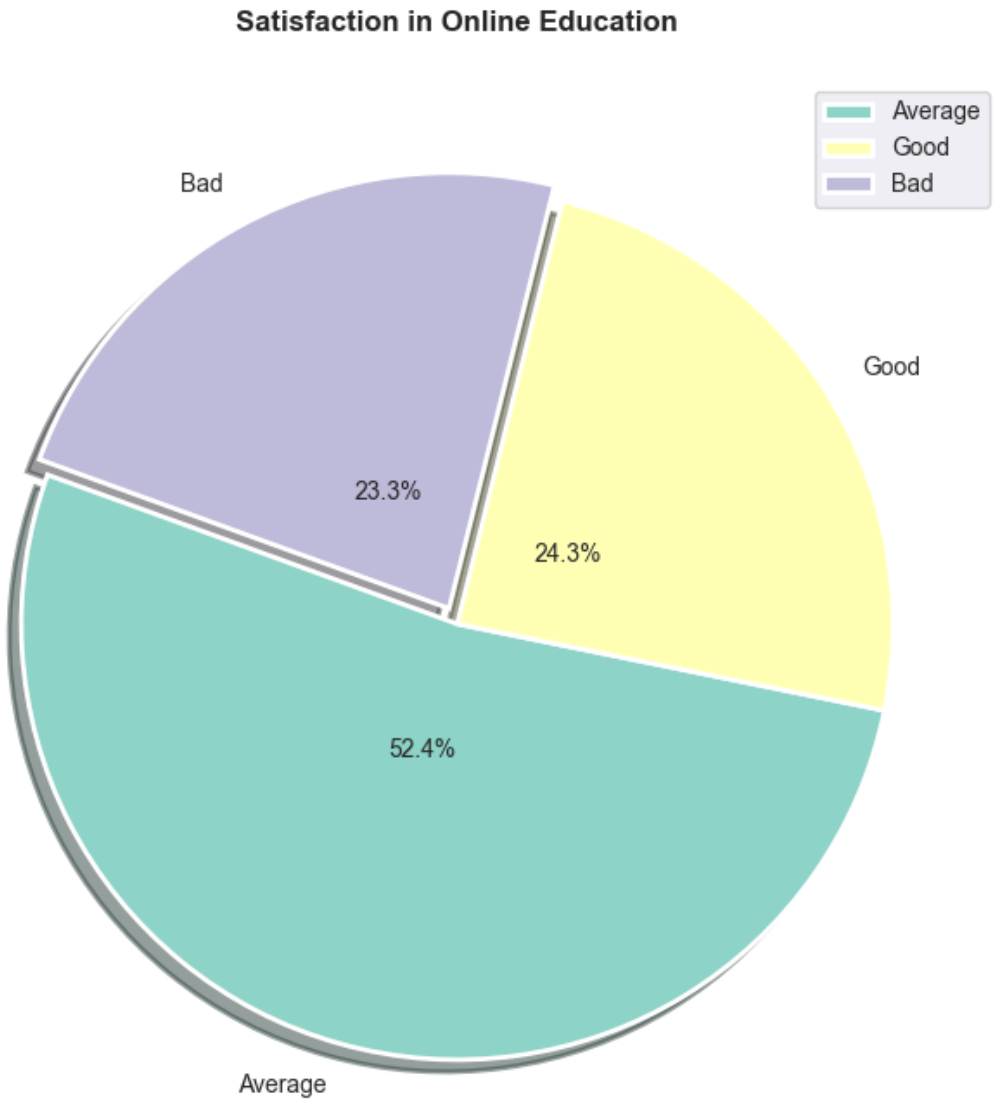
1.7.1 Insights:

Students are seen to spend their less time in social medias, and spend more on studies and resting.

1.8 Satisfaction for Online system.

[19]:
```
count_satisfy = df['Your level of satisfaction in Online Education'].
 ↪value_counts()

plt.figure(figsize = (7,7))
palette = sns.color_palette("Set3")
plt.pie(count_satisfy.values,
        labels = count_satisfy.index,
```

```
        autopct = "%.1f%%",
        pctdistance = 0.3,
        colors = palette,
        shadow = True,
        explode = [0,0, 0.04],
        wedgeprops = { 'linewidth' : 2, 'edgecolor' : 'white' },
        startangle = 160
       )
plt.title("Satisfaction in Online Education", pad = 20, fontweight = 'bold')
plt.legend()
plt.tight_layout()
plt.show()
```



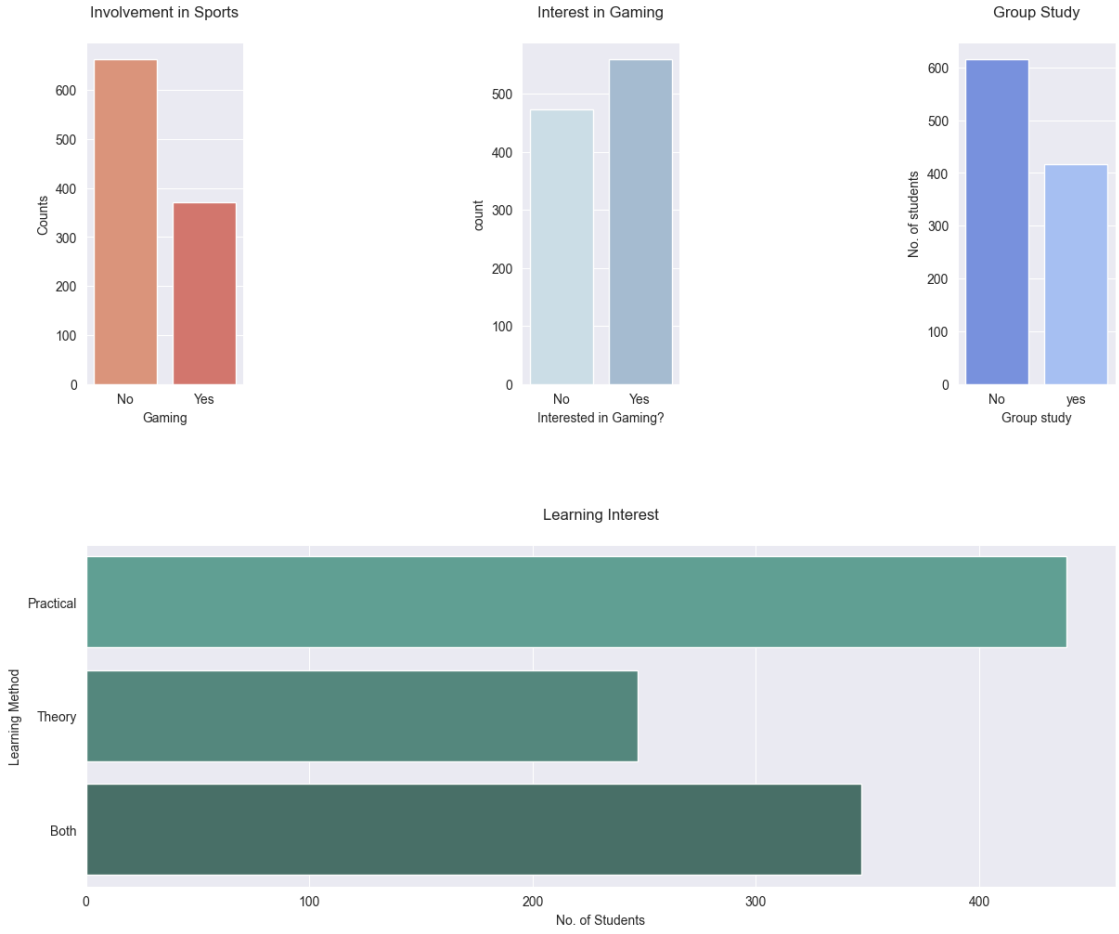
1.8.1 Insights:

1. Majority of the students were satisfied with the online sessions with 52.4%.
2. Some students of 23.3% had negative response towards the online education system.

1.9 Invlovement of students during Online System

[20]:
```
axd = plt.figure(layout="constrained", figsize=(12,10)).subplot_mosaic(
    """
    A.B.D
    .....
    CCCCC
    """,
    height_ratios = [4,0.89,4]
)

ax1 = axd["A"]
ax2 = axd["B"]
ax3 = axd["C"]
ax4 = axd["D"]

palette1 = sns.color_palette("flare")
sns.countplot(data = df, x="Are you involved in any sports?", ax = ax1, palette␣
 ↪= palette1)
ax1.set_title("Involvement in Sports", pad = 20)
ax1.set_xlabel("Sports")
ax1.set_ylabel("Counts")

palette2 = sns.color_palette("ch:s=.25,rot=-.25")
sns.countplot(data = df, x="Interested in Gaming?", ax = ax2, palette = palette2)
ax2.set_title("Interest in Gaming", pad = 20)
ax1.set_xlabel("Gaming")
ax1.set_ylabel("Counts")

palette3 = sns.color_palette("dark:#5A9_r")
sns.countplot(data = df, y="Interested in?", ax = ax3, palette = palette3)
ax3.set_title("Learning Interest", pad = 20)
ax3.set_xlabel("No. of Students")
ax3.set_ylabel("Learning Method")

palette4 = sns.color_palette("coolwarm")
sns.countplot(data = df, x="Engaged in group studies?", ax = ax4, palette =␣
 ↪palette4)
ax4.set_title("Group Study", pad = 20)
ax4.set_xlabel("Group study")
ax4.set_ylabel("No. of students")
```

```
plt.show()
```



1.9.1 Insights:

1. Students had less interests in sports and more in online gaming.
2. Students are less involved in group studies.
3. Most students prefered practical learning.