Student_Depression_EDA

December 30, 2024

1 Introduction

The analysis investigates the prevalence and contributing factors to depression among students using a dataset that captures demographic, academic, and lifestyle variables. The study aims to identify key relationships between features such as academic pressure, sleep duration, dietary habits, and depression levels. This EDA provides insights into patterns, distributions, and potential factors associated with student mental health challenges.

[36]:

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

[37]:

```
df_student=pd.read_csv('Student_Depression_Dataset.csv')
```

[38]:

```
df_student.head()
```

[38]:

```
   id  Gender  Age           City Profession  Academic Pressure  \
0   2    Male   33  Visakhapatnam    Student                  5
1   8  Female   24      Bangalore    Student                  2
2  26    Male   31       Srinagar    Student                  3
3  30  Female   28       Varanasi    Student                  3
4  32  Female   25         Jaipur    Student                  4

   Work Pressure  CGPA  Study Satisfaction  Job Satisfaction  \
0              0  8.97                   2                 0
1              0  5.90                   5                 0
2              0  7.03                   5                 0
3              0  5.59                   2                 0
4              0  8.13                   3                 0

      Sleep Duration Dietary Habits   Degree  \
0          5-6 hours        Healthy  B.Pharm
1          5-6 hours       Moderate      BSc
2  Less than 5 hours        Healthy       BA
3          7-8 hours       Moderate      BCA
4          5-6 hours       Moderate   M.Tech
```

```
  Have you ever had suicidal thoughts ?  Work/Study Hours  Financial Stress  \
0                                   Yes                 3               1.0
1                                    No                 3               2.0
2                                    No                 9               1.0
3                                   Yes                 4               5.0
4                                   Yes                 1               1.0

  Family History of Mental Illness  Depression
0                               No           1
1                              Yes           0
2                              Yes           0
3                              Yes           1
4                               No           0
```

[39]:

```
df_student.describe()
```

[39]:

```
                   id           Age  Academic Pressure  Work Pressure  \
count   27901.000000  27901.000000       27901.000000   27901.000000
mean    70442.149421     25.822300           3.141214       0.000430
std     40641.175216      4.905687           1.381465       0.043992
min         2.000000     18.000000           0.000000       0.000000
25%     35039.000000     21.000000           2.000000       0.000000
50%     70684.000000     25.000000           3.000000       0.000000
75%    105818.000000     30.000000           4.000000       0.000000
max    140699.000000     59.000000           5.000000       5.000000

               CGPA  Study Satisfaction  Job Satisfaction  Work/Study Hours  \
count  27901.000000        27901.000000      27901.000000      27901.000000
mean       7.656104            2.943837          0.000681          7.156984
std        1.470707            1.361148          0.044394          3.707642
min        0.000000            0.000000          0.000000          0.000000
25%        6.290000            2.000000          0.000000          4.000000
50%        7.770000            3.000000          0.000000          8.000000
75%        8.920000            4.000000          0.000000         10.000000
max       10.000000            5.000000          4.000000         12.000000

       Financial Stress    Depression
count      27898.000000  27901.000000
mean           3.139867      0.585499
std            1.437347      0.492645
min            1.000000      0.000000
25%            2.000000      0.000000
50%            3.000000      1.000000
75%            4.000000      1.000000
max            5.000000      1.000000
```

[40]:

```
print('Dataset Shape :', df_student.shape)
print('Missing Data :', df_student.isna().sum().sum())
print('Duplicated Data :', df_student.duplicated().sum())
```

```
Dataset Shape : (27901, 18)
Missing Data : 3
Duplicated Data : 0
```

[41]:

```
df_student.info() # Checking non-null value counts and dtypes
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 27901 entries, 0 to 27900
Data columns (total 18 columns):
 #   Column                                 Non-Null Count  Dtype
---  ------                                 --------------  -----
 0   id                                     27901 non-null  int64
 1   Gender                                 27901 non-null  object
 2   Age                                    27901 non-null  int64
 3   City                                   27901 non-null  object
 4   Profession                             27901 non-null  object
 5   Academic Pressure                      27901 non-null  int64
 6   Work Pressure                          27901 non-null  int64
 7   CGPA                                   27901 non-null  float64
 8   Study Satisfaction                     27901 non-null  int64
 9   Job Satisfaction                       27901 non-null  int64
 10  Sleep Duration                         27901 non-null  object
 11  Dietary Habits                         27901 non-null  object
 12  Degree                                 27901 non-null  object
 13  Have you ever had suicidal thoughts ?  27901 non-null  object
 14  Work/Study Hours                       27901 non-null  int64
 15  Financial Stress                       27898 non-null  float64
 16  Family History of Mental Illness       27901 non-null  object
 17  Depression                             27901 non-null  int64
dtypes: float64(2), int64(8), object(8)
memory usage: 3.8+ MB
```

[42]:

```
# Unique values count
df_student.nunique()
```

[42]:

```
id                                       27901
Gender                                       2
Age                                         34
City                                        52
Profession                                  14
Academic Pressure                            6
Work Pressure                                3
CGPA                                       332
Study Satisfaction                           6
```

```
Job Satisfaction                              5
Sleep Duration                                5
Dietary Habits                                4
Degree                                       28
Have you ever had suicidal thoughts ?         2
Work/Study Hours                             13
Financial Stress                              5
Family History of Mental Illness              2
Depression                                    2
dtype: int64
```

[43]:

```
# Count of missing values
missing = df_student.isnull().sum()
missing
```

[43]:

```
id                                       0
Gender                                   0
Age                                      0
City                                     0
Profession                               0
Academic Pressure                        0
Work Pressure                            0
CGPA                                     0
Study Satisfaction                       0
Job Satisfaction                         0
Sleep Duration                           0
Dietary Habits                           0
Degree                                   0
Have you ever had suicidal thoughts ?    0
Work/Study Hours                         0
Financial Stress                         3
Family History of Mental Illness         0
Depression                               0
dtype: int64
```

[44]:

```
# Percentage of missing values
per =  (missing / len(df_student)) * 100
per
```

[44]:

```
id                                       0.000000
Gender                                   0.000000
Age                                      0.000000
City                                     0.000000
Profession                               0.000000
Academic Pressure                        0.000000
Work Pressure                            0.000000
CGPA                                     0.000000
```

```
Study Satisfaction                       0.000000
Job Satisfaction                         0.000000
Sleep Duration                           0.000000
Dietary Habits                           0.000000
Degree                                   0.000000
Have you ever had suicidal thoughts ?    0.000000
Work/Study Hours                         0.000000
Financial Stress                         0.010752
Family History of Mental Illness         0.000000
Depression                               0.000000
dtype: float64
```

[45]:

```
# Dropping unnecessary column
df_student = df_student.drop(columns=['id'])
df_student.head()
```

[45]:

```
   Gender  Age           City Profession  Academic Pressure  Work Pressure  \
0    Male   33  Visakhapatnam    Student                  5              0
1  Female   24      Bangalore    Student                  2              0
2    Male   31       Srinagar    Student                  3              0
3  Female   28       Varanasi    Student                  3              0
4  Female   25         Jaipur    Student                  4              0

   CGPA  Study Satisfaction  Job Satisfaction     Sleep Duration  \
0  8.97                   2                 0          5-6 hours
1  5.90                   5                 0          5-6 hours
2  7.03                   5                 0  Less than 5 hours
3  5.59                   2                 0          7-8 hours
4  8.13                   3                 0          5-6 hours

  Dietary Habits   Degree Have you ever had suicidal thoughts ?  \
0        Healthy  B.Pharm                                   Yes
1       Moderate      BSc                                    No
2        Healthy       BA                                    No
3       Moderate      BCA                                   Yes
4       Moderate   M.Tech                                   Yes

   Work/Study Hours  Financial Stress Family History of Mental Illness  \
0                 3               1.0                               No
1                 3               2.0                              Yes
2                 9               1.0                              Yes
3                 4               5.0                              Yes
4                 1               1.0                               No

   Depression
0           1
1           0
```

```
2           0
3           1
4           0
```

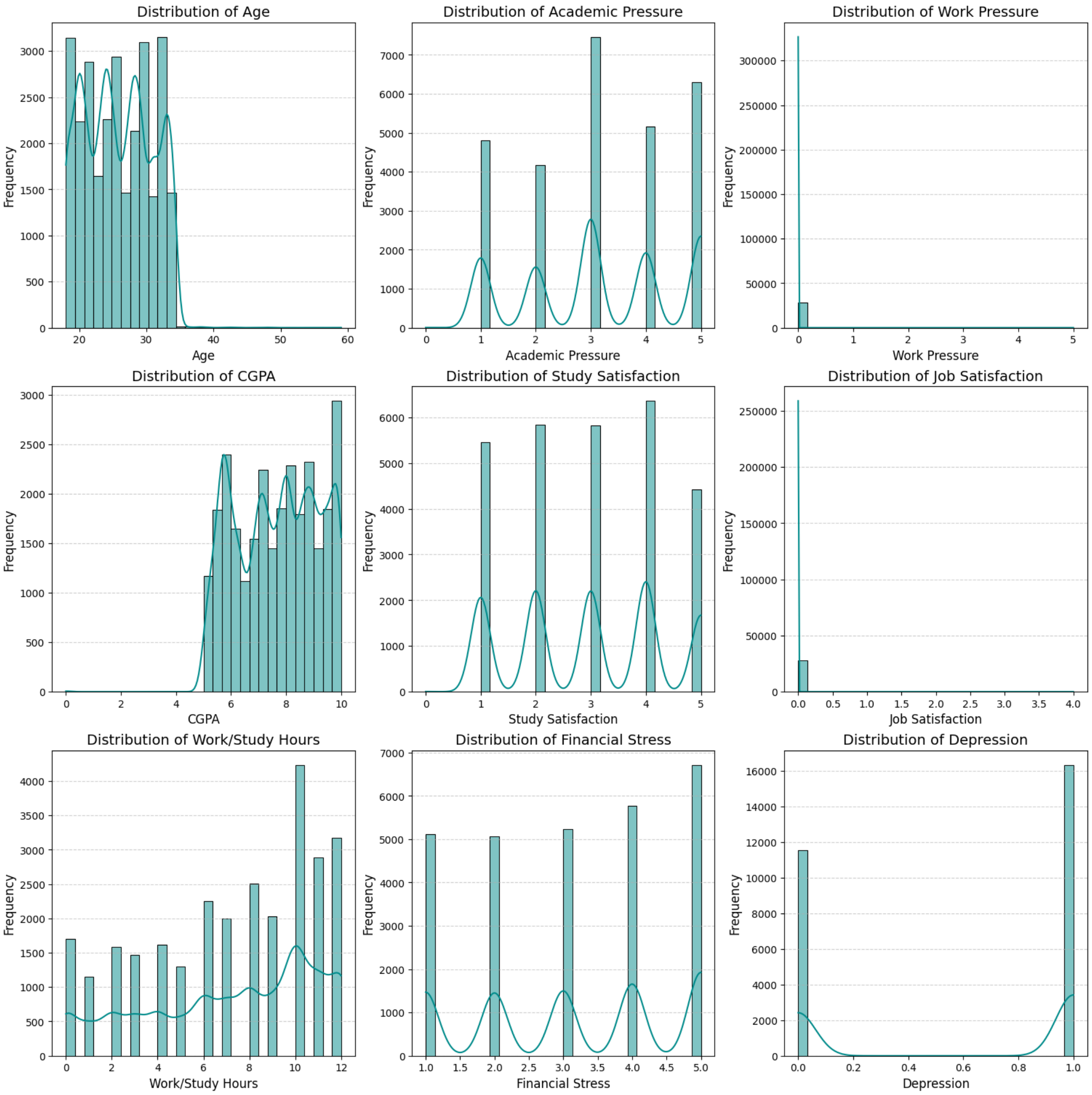
2 Dataset Overview

- **Shape:** The dataset comprises 27,901 rows and 18 columns.
- **Missing Data:** Only three missing values were identified, representing 0.01% of the `Financial Stress` column.
- **Duplicates:** No duplicate rows were detected.
- **Data Types:** The dataset contains numerical and categorical variables suitable for statistical and visual analysis.

3 Univariate Analysis: Numeric Features Distribution

[46]:

```python
numerical_columns = df_student.select_dtypes(include=['number']).columns #Selecting Numerical Columns

#Grid Configuration
num_cols = len(numerical_columns)
cols = 3
rows = (num_cols + cols - 1) // cols

#Creating Subplots
fig, axes = plt.subplots(rows, cols, figsize=(15, rows * 5), constrained_layout=True)
axes = axes.flatten()

#Plotting Each Numerical Column
for i, j in enumerate(numerical_columns):
    sns.histplot(df_student[j], kde=True, bins=30,  color='darkcyan', ax=axes[i])
    axes[i].set_title(f"Distribution of {j}", fontsize=14)
    axes[i].set_xlabel(j, fontsize=12)
    axes[i].grid(axis='y', linestyle='--', alpha=0.6)
    axes[i].set_ylabel("Frequency", fontsize=12)

#Removing Unused Axes
for j in range(i + 1, len(axes)):
    fig.delaxes(axes[j])

plt.show()
```



4 Univariate Analysis: Categorical Features Distribution

[47]:

```
categorical_columns = df_student.select_dtypes(include=['object']).columns # Selecting Categorical Columns

# Grid Configuration
num_cols = len(categorical_columns)
cols = 2
rows = (num_cols + cols - 1) // cols

#Creating Subplots
```

```
fig, axes = plt.subplots(rows, cols, figsize=(15, rows * 6),␣
 ↪constrained_layout=True)
axes = axes.flatten()

#Plotting Each Categorical Column
for i, j in enumerate(categorical_columns):
    sns.countplot(data=df_student, y=j, order=df_student[j].value_counts().
 ↪index, palette="viridis", ax=axes[i])
    axes[i].set_title(f"Frequency of {j}", fontsize=14)
    axes[i].grid(axis='y', linestyle='--', alpha=0.6)
    axes[i].set_xlabel("Count", fontsize=12)
    axes[i].set_ylabel(j, fontsize=12)

#Removing Unused Axes
for j in range(i + 1, len(axes)):
    fig.delaxes(axes[j])

plt.show()
```

```
C:\Users\ASUS\AppData\Local\Temp\ipykernel_17596\2870923122.py:14:
FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in
v0.14.0. Assign the `y` variable to `hue` and set `legend=False` for the same
effect.

  sns.countplot(data=df_student, y=j, order=df_student[j].value_counts().index,
palette="viridis", ax=axes[i])
C:\Users\ASUS\AppData\Local\Temp\ipykernel_17596\2870923122.py:14:
FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in
v0.14.0. Assign the `y` variable to `hue` and set `legend=False` for the same
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C:\Users\ASUS\AppData\Local\Temp\ipykernel_17596\2870923122.py:14:
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palette="viridis", ax=axes[i])
C:\Users\ASUS\AppData\Local\Temp\ipykernel_17596\2870923122.py:14:
```

```
FutureWarning: 

Passing `palette` without assigning `hue` is deprecated and will be removed in
v0.14.0. Assign the `y` variable to `hue` and set `legend=False` for the same
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palette="viridis", ax=axes[i])
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palette="viridis", ax=axes[i])
C:\Users\ASUS\AppData\Local\Temp\ipykernel_17596\2870923122.py:14:
FutureWarning: 

Passing `palette` without assigning `hue` is deprecated and will be removed in
v0.14.0. Assign the `y` variable to `hue` and set `legend=False` for the same
effect.

  sns.countplot(data=df_student, y=j, order=df_student[j].value_counts().index,
palette="viridis", ax=axes[i])
C:\Users\ASUS\AppData\Local\Temp\ipykernel_17596\2870923122.py:14:
FutureWarning: 

Passing `palette` without assigning `hue` is deprecated and will be removed in
v0.14.0. Assign the `y` variable to `hue` and set `legend=False` for the same
effect.

  sns.countplot(data=df_student, y=j, order=df_student[j].value_counts().index,
palette="viridis", ax=axes[i])
```
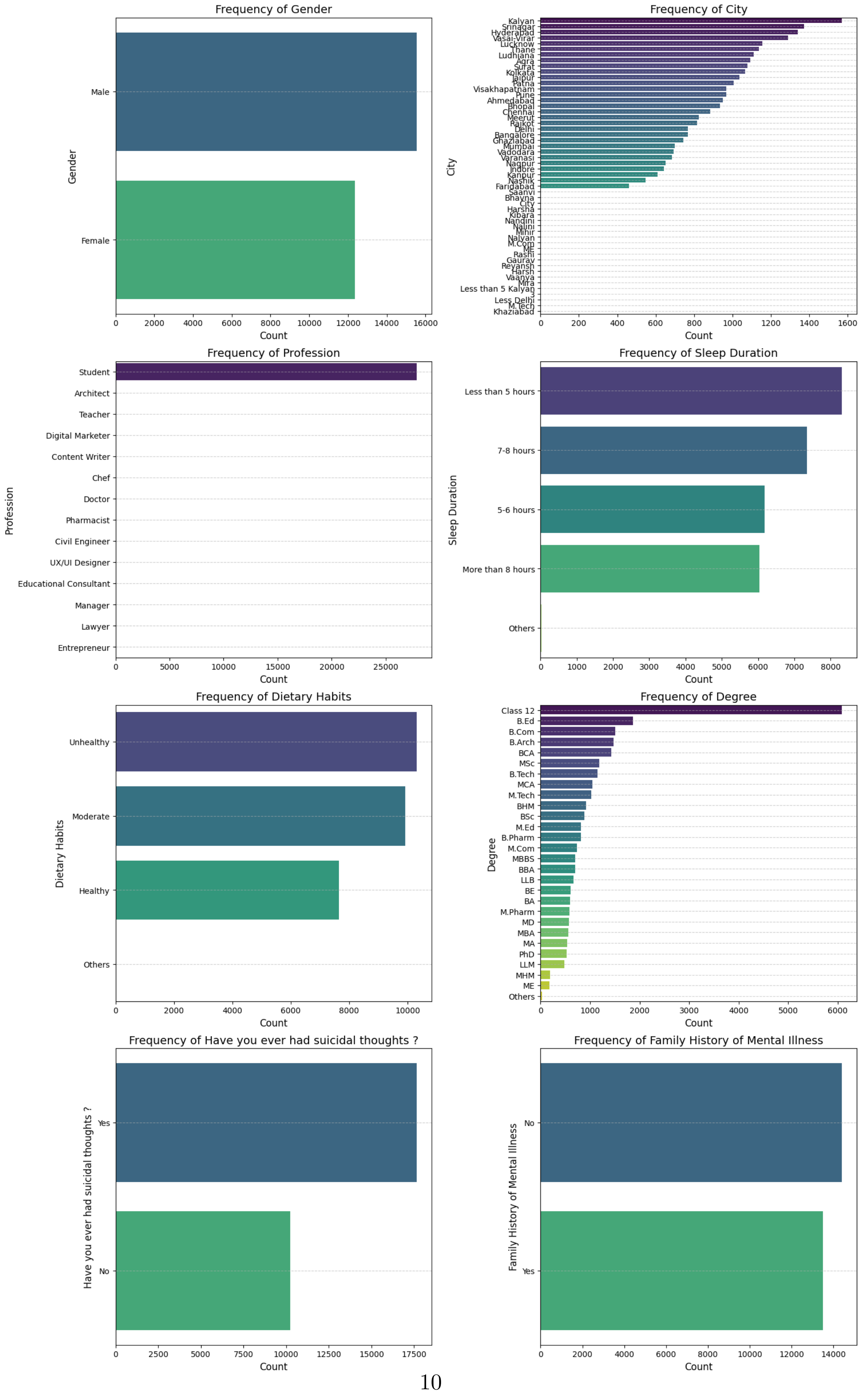



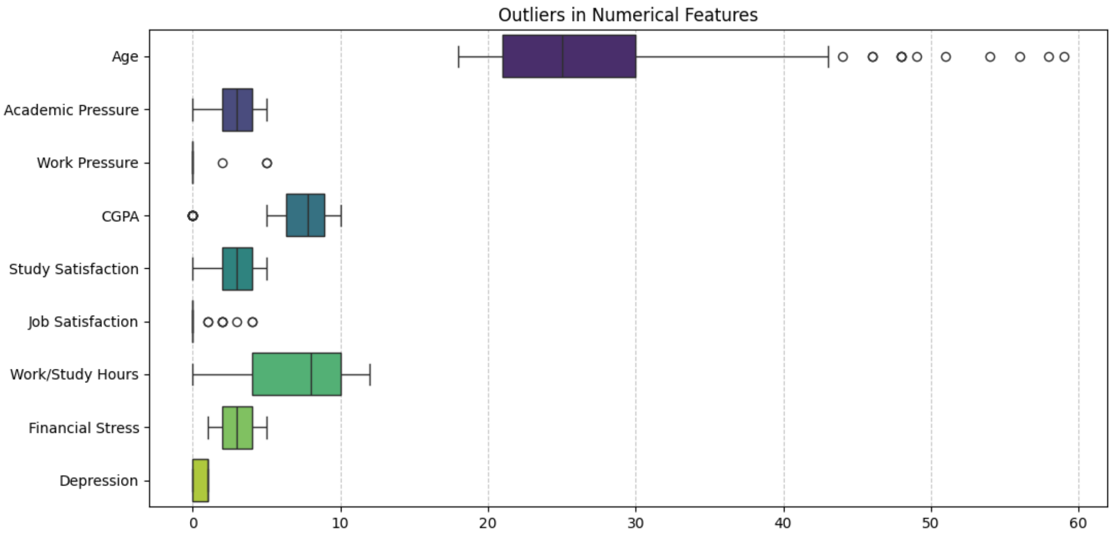
Frequency of Gender
Male
Female
Gender
0
2000
4000
6000
8000
10000
12000
14000
16000
Count
Frequency of City
Kalyan
Srinagar
Hyderabad
Vasai-Virar
Lucknow
Thane
Ludhiana
Agra
Surat
Kolkata
Jaipur
Patna
Visakhapatnam
Pune
Ahmedabad
Bhopal
Chennai
Meerut
Rajkot
Delhi
Bangalore
Ghaziabad
Mumbai
Vadodara
Varanasi
Nagpur
Indore
Kanpur
Nashik
Faridabad
Saanvi
Bhavna
City
Harsha
Kibara
Nandini
Nalini
Mihir
Nalyan
M.Com
ME
Rashi
Gaurav
Reyansh
Harsh
Vaanya
Mira
Less than 5 Kalyan
3
Less Delhi
M.Tech
Khaziabad
City
0
200
400
600
800
1000
1200
1400
1600
Count
Frequency of Profession
Student
Architect
Teacher
Digital Marketer
Content Writer
Chef
Doctor
Pharmacist
Civil Engineer
UX/UI Designer
Educational Consultant
Manager
Lawyer
Entrepreneur
Profession
0
5000
10000
15000
20000
25000
Count
Frequency of Sleep Duration
Less than 5 hours
7-8 hours
5-6 hours
More than 8 hours
Others
Sleep Duration
0
1000
2000
3000
4000
5000
6000
7000
8000
Count
Frequency of Dietary Habits
Unhealthy
Moderate
Healthy
Others
Dietary Habits
0
2000
4000
6000
8000
10000
Count
Frequency of Degree
Class 12
B.Ed
B.Com
B.Arch
BCA
MSc
B.Tech
MCA
M.Tech
BHM
BSc
M.Ed
B.Pharm
M.Com
MBBS
BBA
LLB
BE
BA
M.Pharm
MD
MBA
MA
PhD
LLM
MHM
ME
Others
Degree
0
1000
2000
3000
4000
5000
6000
Count
Frequency of Have you ever had suicidal thoughts ?
Yes
No
Have you ever had suicidal thoughts ?
0
2500
5000
7500
10000
12500
15000
17500
Count
Frequency of Family History of Mental Illness
No
Yes
Family History of Mental Illness
0
2000
4000
6000
8000
10000
12000
14000
Count

- **Numeric Features:** Distributions of variables such as `Age`, `Academic Pressure`, and `CGPA` were examined using histograms. Most distributions appeared symmetrical, though some showed variations in range and outliers.
- **Categorical Features:** Variables like `Gender`, `City`, and `Dietary Habits` were explored using count plots. Certain categories dominated the distribution, indicating trends in the dataset.

5 Outlier Detection

[48]:

```
plt.figure(figsize=(12, 6)) # Figure Setup
sns.boxplot(data=df_student[numerical_columns], orient='h', palette='viridis')␣
  ↪# Box Plot

plt.title('Outliers in Numerical Features')
plt.grid(True, axis='x', linestyle='--', alpha=0.7)
plt.show()
```

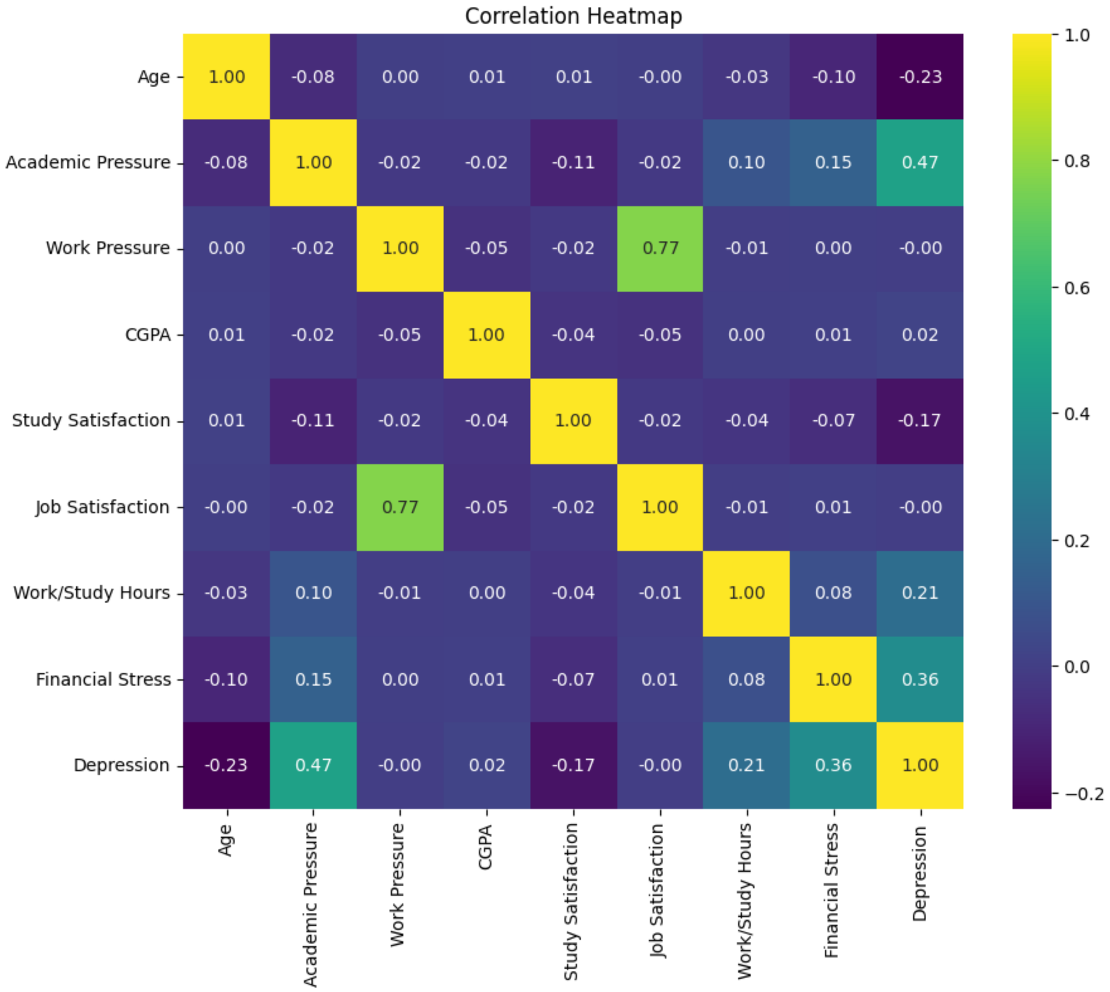


- Box plots were utilized to identify outliers in numerical columns such as `Work Pressure` and `Financial Stress`. A few extreme values were detected, which might influence statistical modeling.

6 Correlation Analysis

[49]:

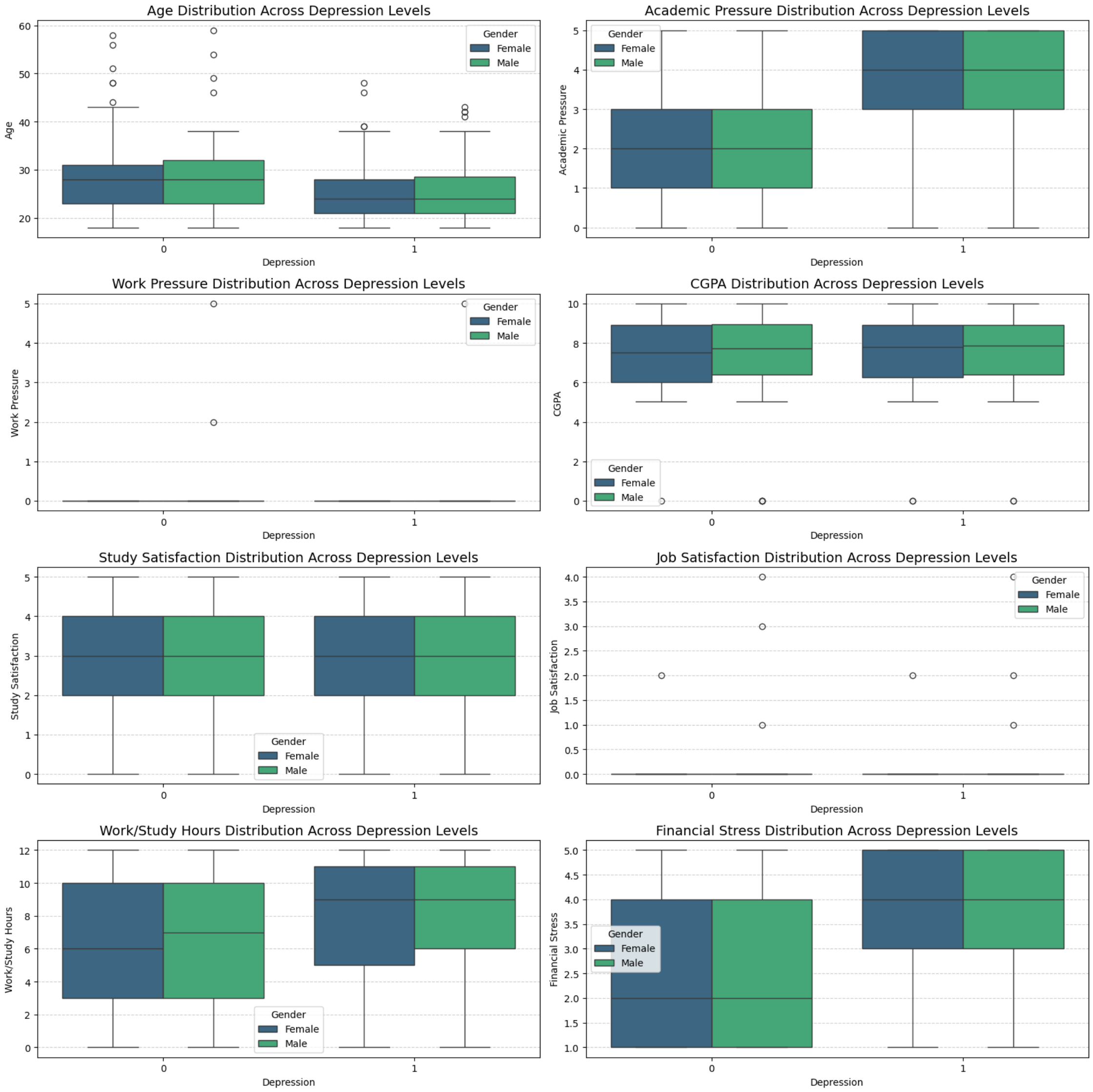
```
numeric_df = df_student.select_dtypes(include=['number'])
corr = numeric_df.corr()

plt.figure(figsize=(10, 8))
sns.heatmap(corr, annot=True, fmt='.2f', cmap='viridis')
plt.title('Correlation Heatmap')
plt.show()
```



- A heatmap revealed significant correlations among numerical variables. Academic pressure showed moderate correlations with `Financial Stress` and `Study Satisfaction`.

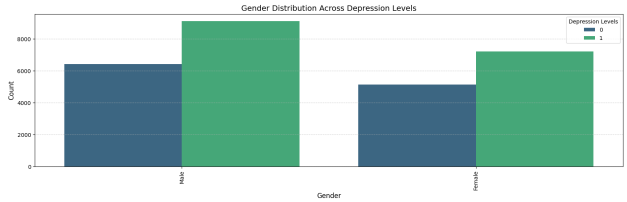
7 Bivariate Analysis: Numerical Feature Distribution

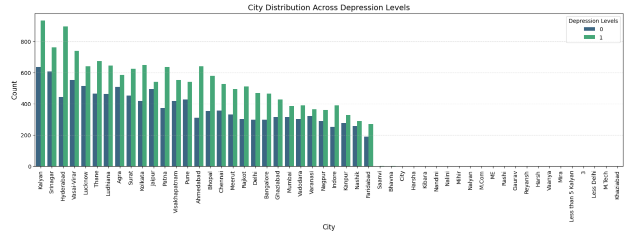
[50]:
```
n_cols = 2
n_rows = 4

fig, axes = plt.subplots(n_rows, n_cols, figsize=(16, 16))
axes = axes.flatten()

for i, j in enumerate([col for col in numerical_columns if col !=␣
 ↪'Depression']):
    sns.boxplot(x='Depression', y=j, data=df_student, hue='Gender',␣
 ↪palette='viridis', ax=axes[i])
    axes[i].set_title(f'{j} Distribution Across Depression Levels', fontsize=14)
    axes[i].set_xlabel('Depression')
    axes[i].set_ylabel(j)
    axes[i].grid(axis='y', linestyle='--', alpha=0.6)

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

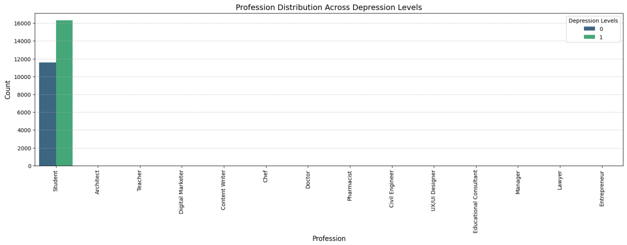


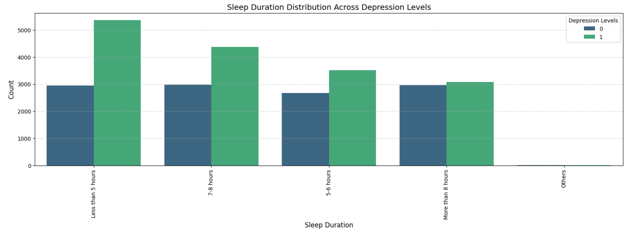
8 Bivariate Analysis: Categorical Feature Distribution

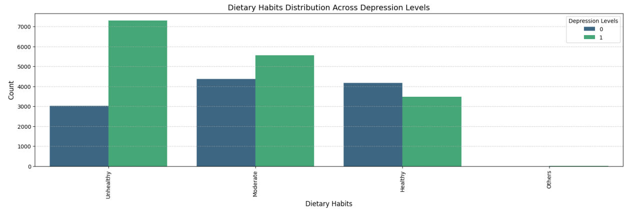
[51]:
```
n_cols = 1
n_rows = (len(categorical_columns) + 1) // n_cols

fig, axes = plt.subplots(n_rows, n_cols, figsize=(16, n_rows * 6))
axes = axes.flatten()

for i, j in enumerate(categorical_columns):
    sns.countplot(data=df_student, x=j, hue='Depression', palette='viridis',␣
 ↪order=df_student[j].value_counts().index, ax=axes[i])
    axes[i].set_title(f'{j} Distribution Across Depression Levels', fontsize=14)
    axes[i].set_xlabel(j, fontsize=12)
    axes[i].set_ylabel('Count', fontsize=12)
    axes[i].tick_params(axis='x', rotation=90)
    axes[i].grid(axis='y', linestyle='--', alpha=0.6)
    axes[i].legend(title='Depression Levels', fontsize=10)

for i in range(len(categorical_columns), len(axes)):
    fig.delaxes(axes[i])

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

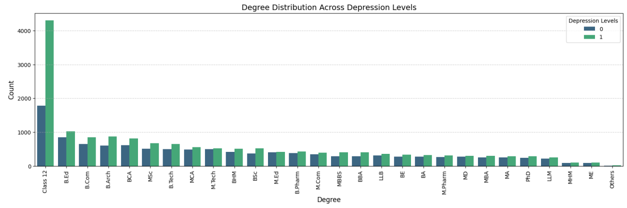

Gender Distribution Across Depression Levels
Count
0
2000
4000
6000
8000
Male
Female
Gender
Depression Levels
0
1

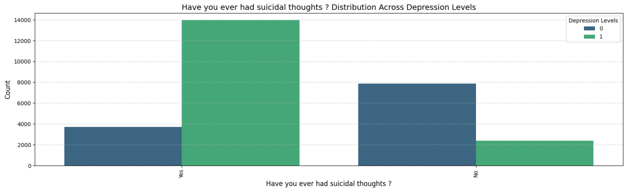

City Distribution Across Depression Levels
Count
0
200
400
600
800
Kalyan
Srinagar
Hyderabad
Vasai-Virar
Lucknow
Thane
Ludhiana
Agra
Surat
Kolkata
Jaipur
Patna
Visakhapatnam
Pune
Ahmedabad
Bhopal
Chennai
Meerut
Rajkot
Delhi
Bangalore
Ghaziabad
Mumbai
Vadodara
Varanasi
Nagpur
Indore
Kanpur
Nashik
Faridabad
Saanvi
Bhavna
City
Harsha
Kibara
Nandini
Nalini
Mihir
Nalyan
M.Com
ME
Rashi
Gaurav
Reyansh
Harsh
Vaanya
Mira
Less than 5 Kalyan
3
Less Delhi
M.Tech
Khaziabad
City
Depression Levels
0
1

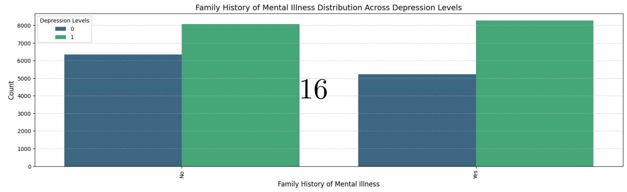

Profession Distribution Across Depression Levels
Count
0
2000
4000
6000
8000
10000
12000
14000
16000
Student
Architect
Teacher
Digital Marketer
Content Writer
Chef
Doctor
Pharmacist
Civil Engineer
UX/UI Designer
Educational Consultant
Manager
Lawyer
Entrepreneur
Profession
Depression Levels
0
1


Sleep Duration Distribution Across Depression Levels
Count
0
1000
2000
3000
4000
5000
Less than 5 hours
7-8 hours
5-6 hours
More than 8 hours
Others
Sleep Duration
Depression Levels
0
1


Dietary Habits Distribution Across Depression Levels
Count
0
1000
2000
3000
4000
5000
6000
7000
Unhealthy
Moderate
Healthy
Others
Dietary Habits
Depression Levels
0
1


Degree Distribution Across Depression Levels
Count
0
1000
2000
3000
4000
Class 12
B.Ed
B.Com
B.Arch
BCA
MSc
B.Tech
MCA
M.Tech
BHM
BSc
M.Ed
B.Pharm
M.Com
MBBS
BBA
LLB
BE
BA
M.Pharm
MD
MBA
MA
PhD
LLM
MHM
ME
Others
Degree
Depression Levels
0
1

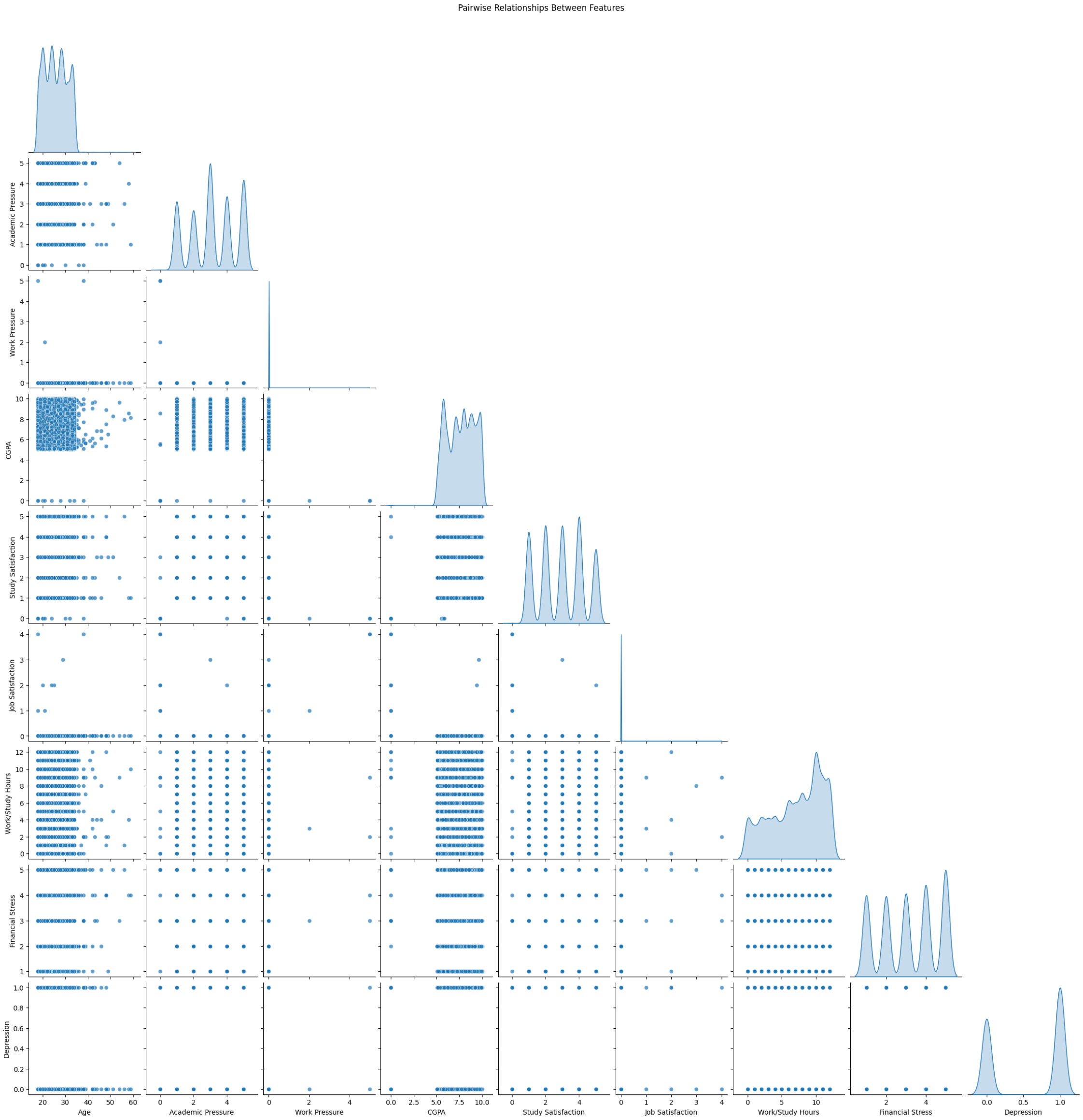

Have you ever had suicidal thoughts ? Distribution Across Depression Levels
Count
0
2000
4000
6000
8000
10000
12000
14000
Yes
No
Have you ever had suicidal thoughts ?
Depression Levels
0
1


Family History of Mental Illness Distribution Across Depression Levels
Count
0
1000
2000
3000
4000
5000
6000
7000
8000
No
Yes
Family History of Mental Illness
Depression Levels
0
1

- Examined how depression levels varied across demographic and lifestyle factors.
- Boxplots indicated gender-based differences in depression levels related to `Academic Pressure` and `Work/Study Hours`.
- Count plots explored categorical features like `Degree` and `City` across depression levels.

9 Pairwise Analysis

[52]:
```
sns.pairplot(df_student[numerical_columns], diag_kind='kde', corner=True,␣
 ↪plot_kws={'alpha': 0.7})
plt.suptitle('Pairwise Relationships Between Features', y=1.02)
plt.show()
```



- A pairplot demonstrated relationships among numerical features, highlighting clusters and patterns.

10 Grouped Aggregations

[53]:

```
# Gender level
gender = df_student.groupby('Gender')[numerical_columns].mean().
↪sort_values(by='Depression', ascending=False)
gender
```

[53]:

```
              Age  Academic Pressure  Work Pressure      CGPA  \
Gender
Male    25.861967           3.113848       0.000772  7.703352
Female  25.772381           3.175652       0.000000  7.596645

        Study Satisfaction  Job Satisfaction  Work/Study Hours  \
Gender
Male              2.924680          0.000965          7.199974
Female            2.967946          0.000324          7.102882

        Financial Stress  Depression
Gender
Male            3.132832    0.586287
Female          3.148721    0.584507
```

[54]:

```
# Suicidal thoughts level
suicide = df_student.groupby('Have you ever had suicidal thoughts ?
↪')[numerical_columns].mean().sort_values(by='Depression', ascending=False)
suicide
```

[54]:

```
                                             Age  Academic Pressure  \
Have you ever had suicidal thoughts ?
Yes                                    25.398165           3.416402
No                                     26.553245           2.666959

                                       Work Pressure     CGPA  \
Have you ever had suicidal thoughts ?
Yes                                         0.000396  7.66564
No                                          0.000488  7.63967

                                       Study Satisfaction  Job Satisfaction  \
Have you ever had suicidal thoughts ?
Yes                                              2.857272          0.000566
No                                               3.093021          0.000878
```

```
                                       Work/Study Hours  Financial Stress  \
Have you ever had suicidal thoughts ?
Yes                                            7.499604          3.368826
No                                             6.566520          2.745167

                                       Depression
Have you ever had suicidal thoughts ?
Yes                                      0.790496
No                                       0.232211
```

- Aggregated statistics showed higher academic pressure and financial stress among those who reported suicidal thoughts compared to those who did not.

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11 Interpretation

11.1 Prevalence of Depression

- Approximately 58.5% of students exhibited signs of depression based on the binary classification in the dataset.

11.2 Key Observations

- Students with high academic and financial stress had higher depression levels.
- Sleep duration and dietary habits correlated with depression, with "healthy" habits associated with lower depression rates.
- Gender disparities emerged in study satisfaction and stress levels, although depression levels were comparable.

11.3 Outliers and Anomalies

- While outliers were minimal, they occurred in financial stress and work pressure, likely due to varying personal circumstances.

11.4 Correlations

- Academic performance (CGPA) did not have a direct link with depression levels, suggesting external factors played a larger role.

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12 Conclusion

This EDA highlights the multifaceted nature of student mental health. The findings emphasize the importance of addressing academic and financial stress and promoting healthy lifestyle choices to improve student well-being. Further research and predictive modeling can build on these insights to develop targeted interventions and support mechanisms.