# project-3-hcl-guvi

September 10, 2025

## 1 Title-Counsel Mate–Smart Counselling for NITs & IIITs

[17]:
```
import pandas as pd
import matplotlib.pyplot as plt
import csv
import seaborn as sns
```

[3]:
```
import pandas as pd

# Load CSV file (replace with your file path or upload via Colab)
df = pd.read_csv("/content/drive/MyDrive/2024_Round_1.csv")

# Preview first 10 rows
df.head(10)
```

[3]:

| | Institute | Academic Program Name | Quota | Seat Type |
|---|---|---|---|---|
| 0 | Indian Institute of Technology Bhubaneswar | Civil Engineering (4 Years, Bachelor of Techno… | AI | OPEN |
| 1 | Indian Institute of Technology Bhubaneswar | Civil Engineering (4 Years, Bachelor of Techno… | AI | OPEN |
| 2 | Indian Institute of Technology Bhubaneswar | Civil Engineering (4 Years, Bachelor of Techno… | AI | EWS |
| 3 | Indian Institute of Technology Bhubaneswar | Civil Engineering (4 Years, Bachelor of Techno… | AI | EWS |
| 4 | Indian Institute of Technology Bhubaneswar | Civil Engineering (4 Years, Bachelor of Techno… | AI | OBC-NCL |
| 5 | Indian Institute of Technology Bhubaneswar | Civil Engineering (4 Years, Bachelor of Techno… | AI | OBC-NCL |
| 6 | Indian Institute of Technology Bhubaneswar | Civil Engineering (4 Years, Bachelor of Techno… | AI | SC |
| 7 | Indian Institute of Technology Bhubaneswar | Civil Engineering (4 Years, Bachelor of Techno… | AI | SC |
| 8 | Indian Institute of Technology Bhubaneswar | Civil Engineering (4 Years, Bachelor of Techno… | AI | ST |

```
9  Civil Engineering (4 Years, Bachelor of Techno…    AI        ST

                                  Gender Opening Rank Closing Rank
0                          Gender-Neutral         9106        13018
1  Female-only (including Supernumerary)        18286        20788
2                          Gender-Neutral         1755         1975
3  Female-only (including Supernumerary)         3122         3308
4                          Gender-Neutral         3573         4796
5  Female-only (including Supernumerary)         7450         8530
6                          Gender-Neutral         1680         2485
7  Female-only (including Supernumerary)         4031         4172
8                          Gender-Neutral          651          867
9  Female-only (including Supernumerary)         1521         1626
```

[4]:
```
df.info()
df.describe(include="all")
df.isnull().sum()  # Check missing values
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 11687 entries, 0 to 11686
Data columns (total 7 columns):
 #   Column                 Non-Null Count  Dtype
---  ------                 --------------  -----
 0   Institute              11687 non-null  object
 1   Academic Program Name  11687 non-null  object
 2   Quota                  11687 non-null  object
 3   Seat Type              11687 non-null  object
 4   Gender                 11687 non-null  object
 5   Opening Rank           11687 non-null  object
 6   Closing Rank           11687 non-null  object
dtypes: object(7)
memory usage: 639.3+ KB
```

[4]:
```
Institute                0
Academic Program Name    0
Quota                    0
Seat Type                0
Gender                   0
Opening Rank             0
Closing Rank             0
dtype: int64
```

## #TOP 10 COLLEGE CHOICE BASED ON RANK & CATEGORY

[13]:
```
# Clean column names
df.columns = df.columns.str.strip().str.lower().str.replace(" ", "_")
```

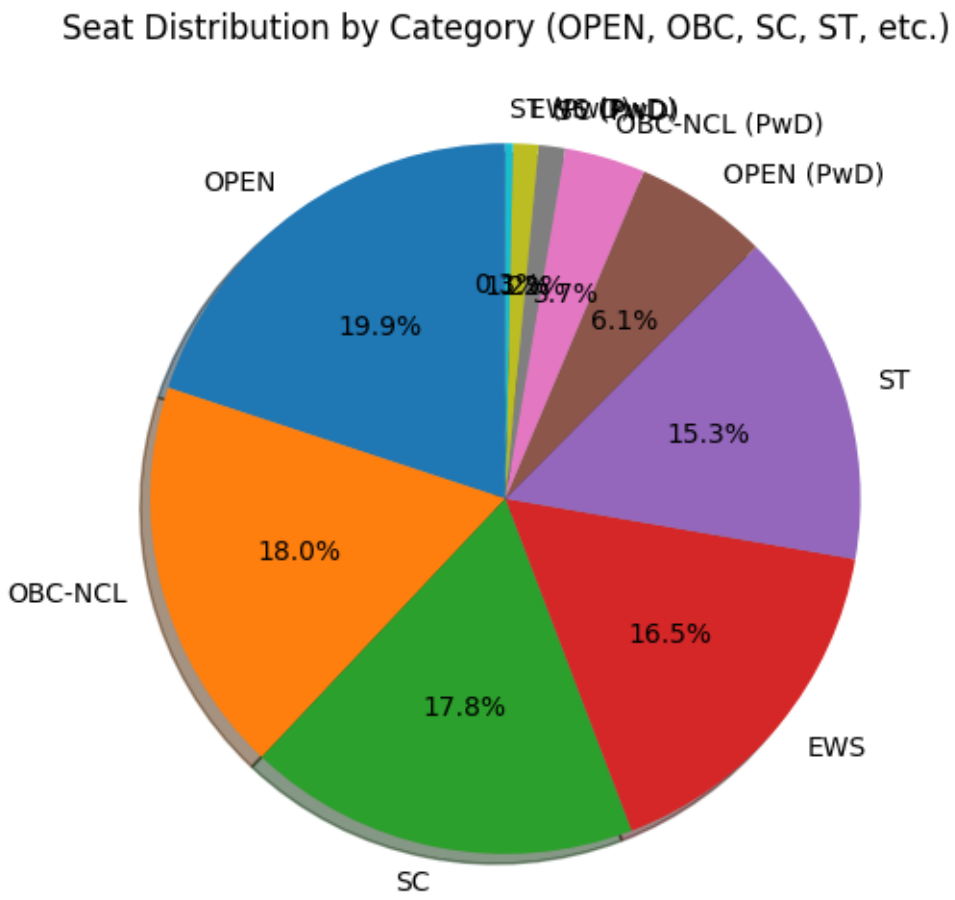
```python
# Convert closing_rank to numeric
df["closing_rank"] = pd.to_numeric(df["closing_rank"], errors="coerce")
df = df.dropna(subset=["closing_rank"])

# Function to suggest colleges
def suggest_colleges(rank, category, top_n=10):
    # Filter by category
    filtered = df[df["seat_type"].str.upper() == category.upper()]

    # Eligible colleges where student rank is within closing rank
    eligible = filtered[filtered["closing_rank"] >= rank]

    # Sort by closing rank (best options first)
    eligible_sorted = eligible.sort_values("closing_rank").head(top_n)

    return eligible_sorted[["institute", "academic_program_name", "quota",␣
 ↪"seat_type", "closing_rank"]]

# Example usage
user_rank = int(input("Enter your JEE Main rank: "))
user_category = input("Enter your category (e.g., OPEN, OBC-NCL, SC, ST, EWS):␣
 ↪")

top_choices = suggest_colleges(user_rank, user_category, 10)

print("\nTop 10 College-Branch Choices for Your Rank & Category:")
print(top_choices.to_string(index=False))
```

```
Enter your JEE Main rank: 50
Enter your category (e.g., OPEN, OBC-NCL, SC, ST, EWS): open

Top 10 College-Branch Choices for Your Rank & Category:
                                                    institute
academic_program_name quota seat_type  closing_rank
              National Institute of Technology, Tiruchirappalli
Architecture  (5 Years, Bachelor of Architecture)    HS      OPEN          50.0
                         Indian Institute  of Technology Bombay
Computer Science and Engineering (4 Years, Bachelor of Technology)    AI
OPEN          68.0
                          Indian Institute  of Technology Delhi
Computer Science and Engineering (4 Years, Bachelor of Technology)    AI
OPEN         116.0
                        National Institute of Technology Calicut
Architecture  (5 Years, Bachelor of Architecture)    HS      OPEN         138.0
                         Indian Institute  of Technology Madras
Computer Science and Engineering (4 Years, Bachelor of Technology)    AI
OPEN         159.0
```

```
                          Indian Institute  of Technology Delhi Computer Science
and Engineering (5 Years, Bachelor and Master of Technology (Dual Degree))    AI
OPEN         204.0
                    School of Planning & Architecture, New Delhi
Architecture  (5 Years, Bachelor of Architecture)    AI      OPEN         205.0
Indian Institute of Engineering Science and Technology, Shibpur
Architecture  (5 Years, Bachelor of Architecture)    HS      OPEN         219.0
               National Institute of Technology, Tiruchirappalli
Architecture  (5 Years, Bachelor of Architecture)    OS      OPEN         240.0
                         Indian Institute  of Technology Kanpur
Computer Science and Engineering (4 Years, Bachelor of Technology)    AI
OPEN         248.0
```

**#Pie Chart - Seat Distribution by Category**

[14]:
```
plt.figure(figsize=(6,6))
df["seat_type"].value_counts().plot.pie(autopct="%1.1f%%", startangle=90,␣
 ↪shadow=True)
plt.title("Seat Distribution by Category (OPEN, OBC, SC, ST, etc.)")
plt.ylabel("")
plt.show()
```

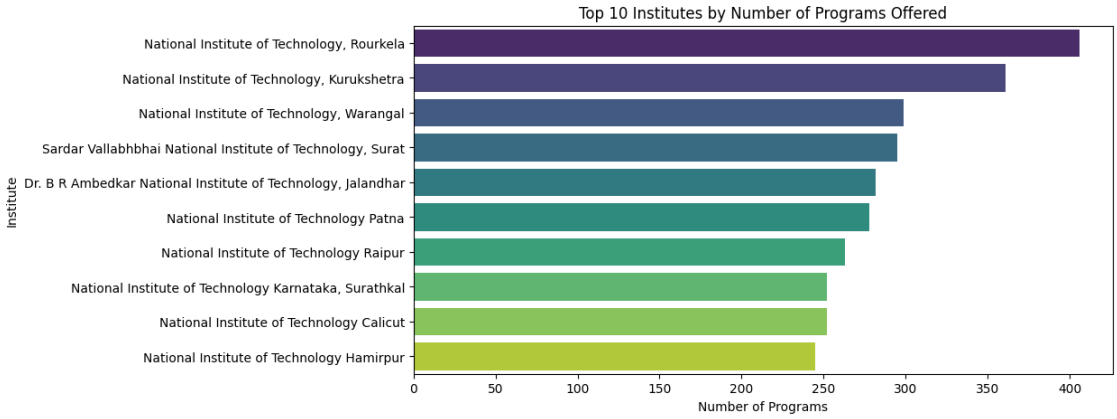



## 2 Bar Chart - Top 10 Institutes by Number of Programs

[18]:
```
plt.figure(figsize=(10,5))
top_institutes = df["institute"].value_counts().head(10)
sns.barplot(x=top_institutes.values, y=top_institutes.index, palette="viridis")
plt.title("Top 10 Institutes by Number of Programs Offered")
plt.xlabel("Number of Programs")
plt.ylabel("Institute")
plt.show()
```

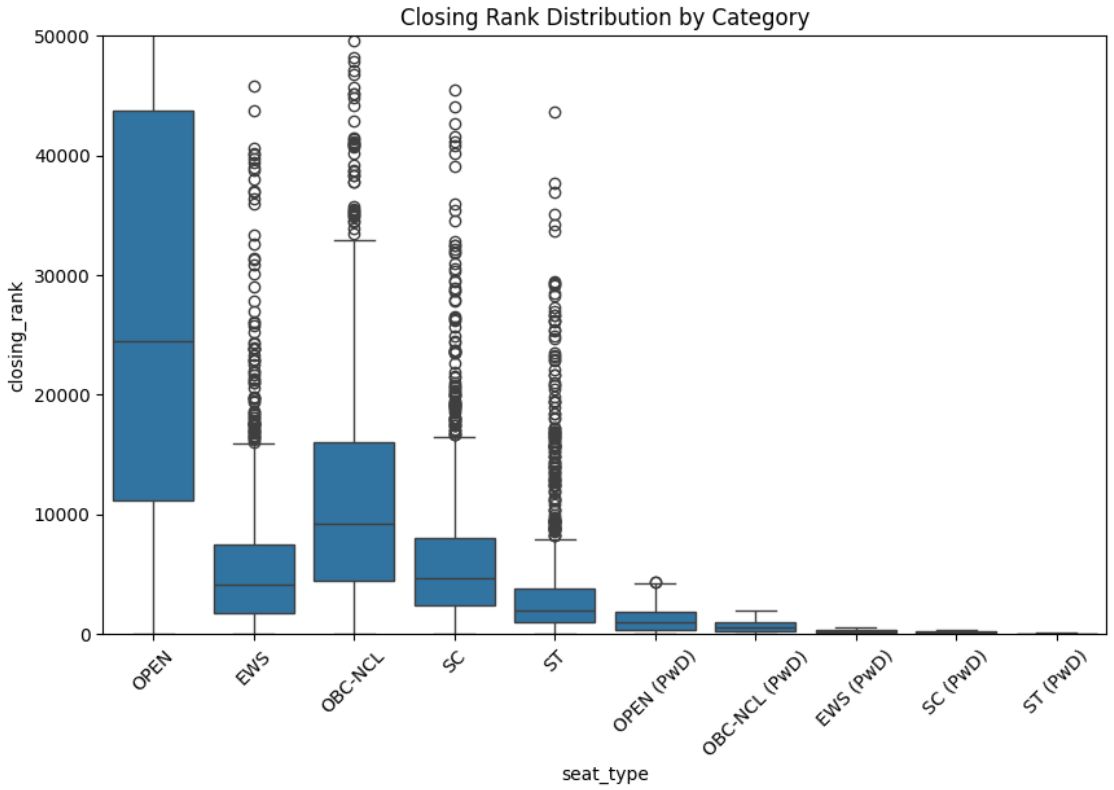
```
/tmp/ipython-input-1342979104.py:3: FutureWarning:

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.barplot(x=top_institutes.values, y=top_institutes.index,
palette="viridis")
```




## 3 Boxplot - Closing Rank Distribution by Category

[19]:
```
plt.figure(figsize=(10,6))
sns.boxplot(x="seat_type", y="closing_rank", data=df)
plt.title("Closing Rank Distribution by Category")
plt.xticks(rotation=45)
plt.ylim(0, 50000)  # adjust limit for clarity
plt.show()
```



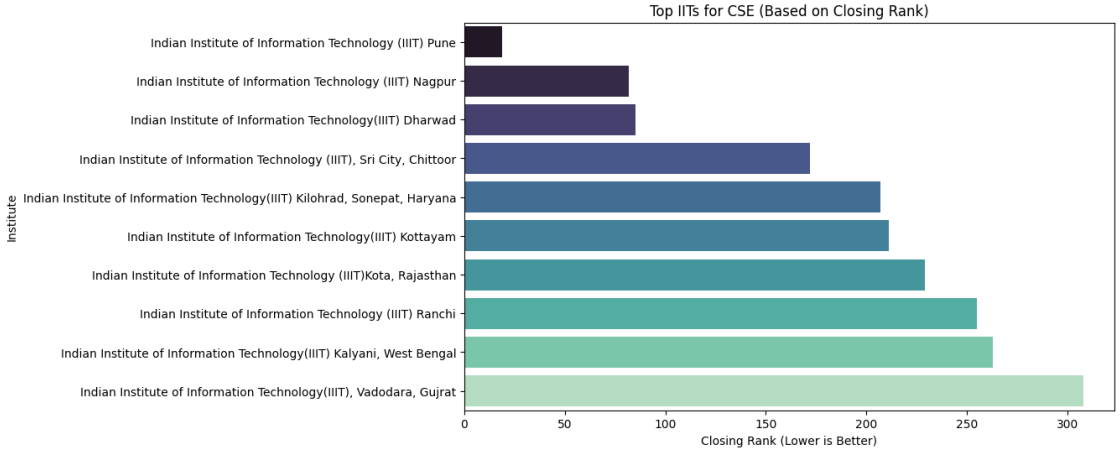

## 4 Line Chart - Round-wise Closing Rank Trend for CSE at IIIT

[22]:
```
# Example: Closing rank comparison for CSE across top IITs
iit_cse = df[(df["institute"].str.contains("IIT", case=False)) &
             (df["academic_program_name"].str.contains("Computer Science",␣
 ↪case=False))]

# Take best closing rank per IIT
iit_cse_grouped = iit_cse.groupby("institute")["closing_rank"].min().
 ↪sort_values().head(10)

plt.figure(figsize=(10,6))
sns.barplot(x=iit_cse_grouped.values, y=iit_cse_grouped.index, palette="mako")
plt.title("Top IITs for CSE (Based on Closing Rank)")
plt.xlabel("Closing Rank (Lower is Better)")
plt.ylabel("Institute")
plt.show()
```

```
/tmp/ipython-input-1283690946.py:9: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in
```

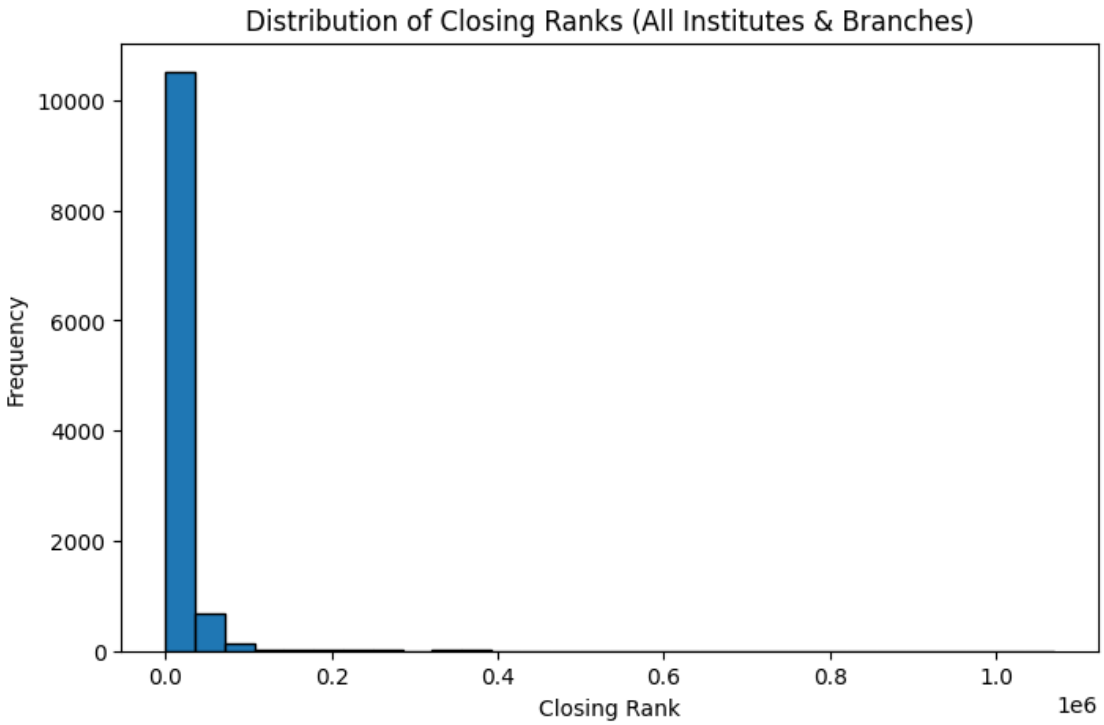
v0.14.0. Assign the `y` variable to `hue` and set `legend=False` for the same effect.

```
  sns.barplot(x=iit_cse_grouped.values, y=iit_cse_grouped.index, palette="mako")
```




### #Histogram - Closing Rank Distribution

[23]:
```
plt.figure(figsize=(8,5))
plt.hist(df["closing_rank"], bins=30, edgecolor="black")
plt.title("Distribution of Closing Ranks (All Institutes & Branches)")
plt.xlabel("Closing Rank")
plt.ylabel("Frequency")
plt.show()
```


Distribution of Closing Ranks (All Institutes & Branches)
Frequency
10000
8000
6000
4000
2000
0
0.0
0.2
0.4
0.6
0.8
1.0
1e6
Closing Rank