Case Study: Advanced Analysis of Data Analyst Job Listings in India

Data Importing and Description

```
import pandas as pd
import numpy as np
import re
import matplotlib.pyplot as plt
import seaborn as sns
from scipy import stats
from sklearn.model_selection import train_test_split
from sklearn.ensemble import RandomForestRegressor
from sklearn.metrics import mean_absolute_error, mean_squared_error, r2_score
from sklearn.preprocessing import OneHotEncoder
```

```
# Load the dataset
df = pd.read_csv("/content/dataAnalystJobsIndia_7th_July_2024.csv")
```

```
df
```

	Unnamed: 0	job_title	company	experience	min exp	max exp	salary	base salary	max salary	location	jobListed(days ago)	pos
		JP Morgan Chase -										

```
df.describe()
```

	Unnamed: 0	min exp	max exp	base salary	max salary	jobListed(days ago)	rating	reviews count
count	1561.0000	1527.000000	1527.000000	3.430000e+02	3.430000e+02	1561.000000	1124.000000	1124.000000
mean	780.0000	3.131631	6.555337	5.649980e+05	1.859911e+06	223.814222	3.799377	959.846975
std	450.7662	2.191749	3.199266	6.992511e+05	2.018750e+06	650.077316	0.740237	4198.153851
min	0.0000	0.000000	1.000000	9.400000e+03	7.000000e+04	0.000000	1.000000	1.000000
25%	390.0000	2.000000	4.000000	1.650000e+05	7.000000e+05	16.000000	3.500000	7.000000
50%	780.0000	3.000000	6.000000	3.600000e+05	1.330000e+06	30.000000	3.900000	30.000000
75%	1170.0000	4.000000	8.000000	7.000000e+05	2.458500e+06	240.000000	4.200000	242.500000

```
print(df.columns.tolist())
```

```
['Unnamed: 0', 'job_title', 'company', 'experience', 'min exp', 'max exp', 'salary', 'base salary', 'max salary', 'location'
```

```
print(df.dtypes)
```

```
Unnamed: 0              int64
job_title              object
company                object
experience             object
min exp               float64
max exp               float64
salary                 object
base salary           float64
max salary            float64
location               object
jobListed(days ago)   float64
postedIn               object
rating                float64
reviews count         float64
details                object
salary data provide by object
dtype: object
```

```
missing = df.isnull().sum()
missing_percent = (df.isnull().sum() / len(df)) * 100
missing_summary = pd.DataFrame({
    "Missing Count": missing,
    "Missing %": missing_percent.round(2)
})
print(missing_summary)
```

```
                      Missing Count  Missing %
Unnamed: 0                        0       0.00
job_title                         0       0.00
company                           0       0.00
experience                       34       2.18
min exp                          34       2.18
max exp                          34       2.18
salary                         1218      78.03
base salary                    1218      78.03
max salary                     1218      78.03
location                         33       2.11
jobListed(days ago)               0       0.00
postedIn                          0       0.00
rating                          437      27.99
reviews count                   437      27.99
details                          33       2.11
salary data provide by         1218      78.03
```

Next steps: Generate code with df New interactive sheet

```
print(df.describe(include="number"))
```

```
       Unnamed: 0      min exp      max exp   base salary    max salary  \
count   1561.0000  1527.000000  1527.000000  3.430000e+02  3.430000e+02
mean     780.0000     3.131631     6.555337  5.649980e+05  1.859911e+06
std      450.7662     2.191749     3.199266  6.992511e+05  2.018750e+06
min        0.0000     0.000000     1.000000  9.400000e+03  7.000000e+04
25%      390.0000     2.000000     4.000000  1.650000e+05  7.000000e+05
```

```
50%      780.0000     3.000000     6.000000  3.600000e+05  1.330000e+06
75%     1170.0000     4.000000     8.000000  7.000000e+05  2.458500e+06
max     1560.0000    15.000000    30.000000  9.000000e+06  2.250000e+07

       jobListed(days ago)       rating  reviews count
count          1561.000000  1124.000000    1124.000000
mean            223.814222     3.799377     959.846975
std             650.077316     0.740237    4198.153851
min               0.000000     1.000000       1.000000
25%              16.000000     3.500000       7.000000
50%              30.000000     3.900000      30.000000
75%             240.000000     4.200000     242.500000
max           19710.000000     5.000000   41400.000000
```

```
print(df.describe(include="object"))
```

```
           job_title       company experience         salary  \
count           1561          1561       1527            343
unique           867          1073         95            255
top     Data Analyst  Diverse Lynx    2-5 Yrs  ₹ 10 - 20L/yr
freq             426            24        109              8

                     location postedIn       details    salary data provide by
count                    1528     1561          1528                       343
unique                    194        5          1257                         2
top     Bangalore / Bengaluru   Naukri  Data Analyst  Salary Listed by Company
freq                      336     1236            20                       177
```

```
print("Number of duplicate rows:", df.duplicated().sum())
```

```
Number of duplicate rows: 0
```

1. DATA CLEANING AND PREPROCESSING

```
# Clean salary columns
def extract_salary_number(x):
    if pd.isna(x):
        return np.nan
    nums = re.findall(r"\d+\.?\d*", str(x).replace(",", ""))
    return float(nums[0]) if nums else np.nan
```

```
df["base_salary_num"] = df["base salary"].apply(extract_salary_number)
df["max_salary_num"] = df["max salary"].apply(extract_salary_number)
```

```
# Fixing column name
if "jobListed(days ago" in df.columns:
    df.rename(columns={"jobListed(days ago": "jobListed(days ago)"}, inplace=True)
```

```
# Cleaning experience values
def clean_experience(x):
    if pd.isna(x):
        return np.nan
    x = str(x)
    match = re.findall(r"(\d+)", x)
    if len(match) == 1:
        return int(match[0])
    elif len(match) == 2:
        return (int(match[0]) + int(match[1])) / 2
    return np.nan
```

```
df["exp_span"] = df["experience"].apply(clean_experience)
```

```
# Cleaning experience column (e.g., "4-8 Yrs" → 4, 8)
def clean_exp(x):
    nums = re.findall(r"\d+", str(x))
    if len(nums) == 2:
        return int(nums[0]), int(nums[1])
    return np.nan, np.nan

df["min_exp_clean"], df["max_exp_clean"] = zip(*df["experience"].map(clean_exp))
df["exp_mid"] = df[["min_exp_clean", "max_exp_clean"]].mean(axis=1)
```

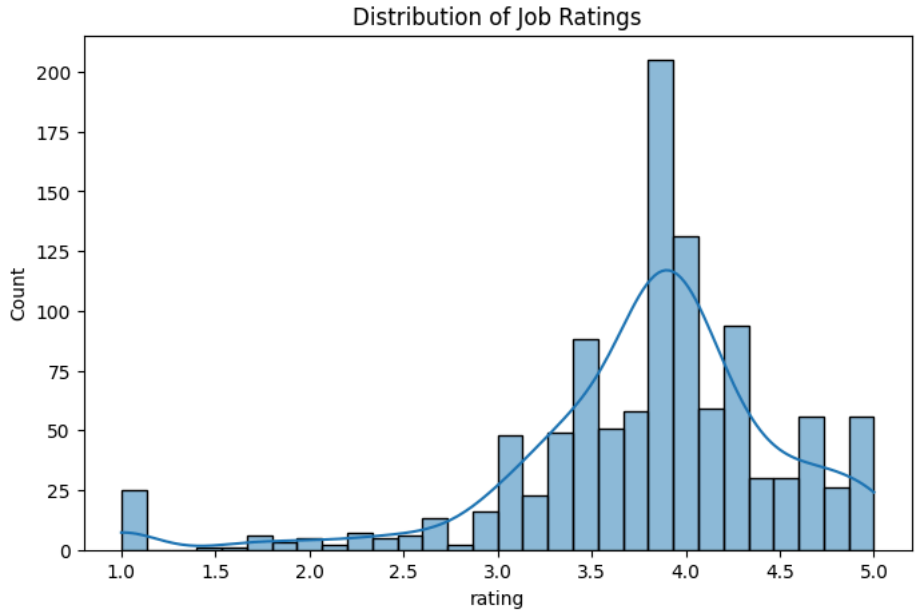
```
# Cleaning reviews count
df["reviews_count_num"] = df["reviews count"].apply(lambda x: extract_salary_number(x))
```

```
# Standardize location
df["location_clean"] = df["location"].str.split(",").str[0].str.strip()
```

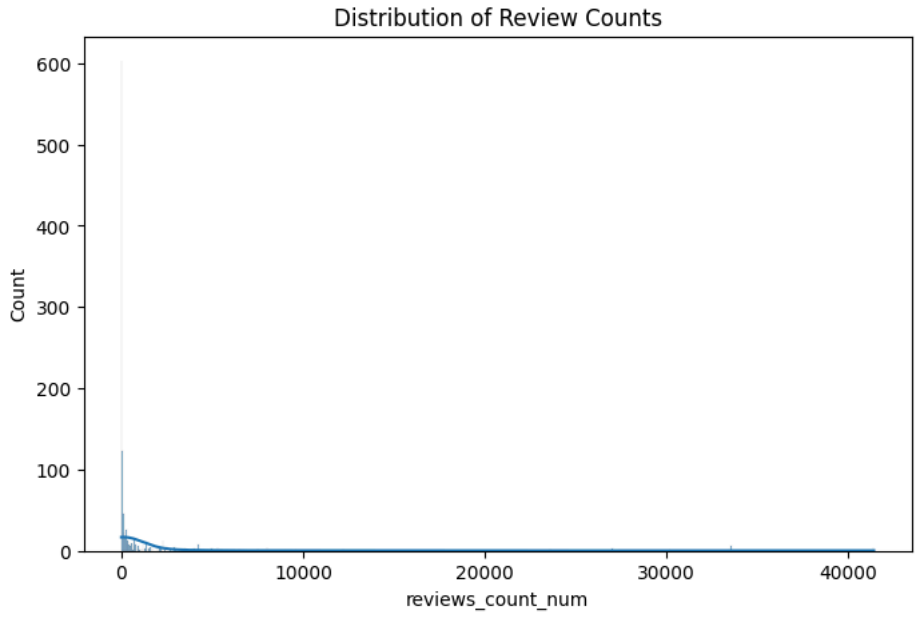
```
# Removeing rows where essential values are missing
df = df.dropna(subset=["rating", "reviews_count_num", "exp_mid"])
```

2. EXPLORATORY DATA ANALYSIS

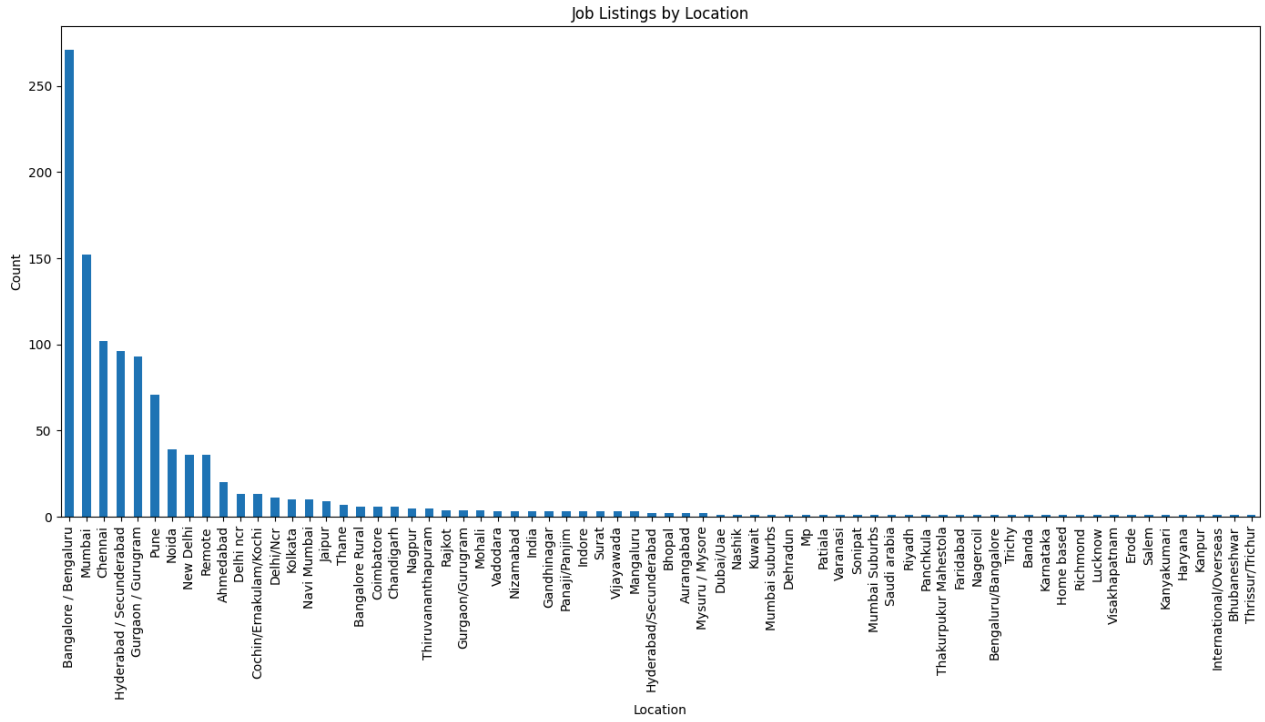
```
# Rating distribution
plt.figure(figsize=(8,5))
sns.histplot(df["rating"], kde=True)
plt.title("Distribution of Job Ratings")
plt.show()
```



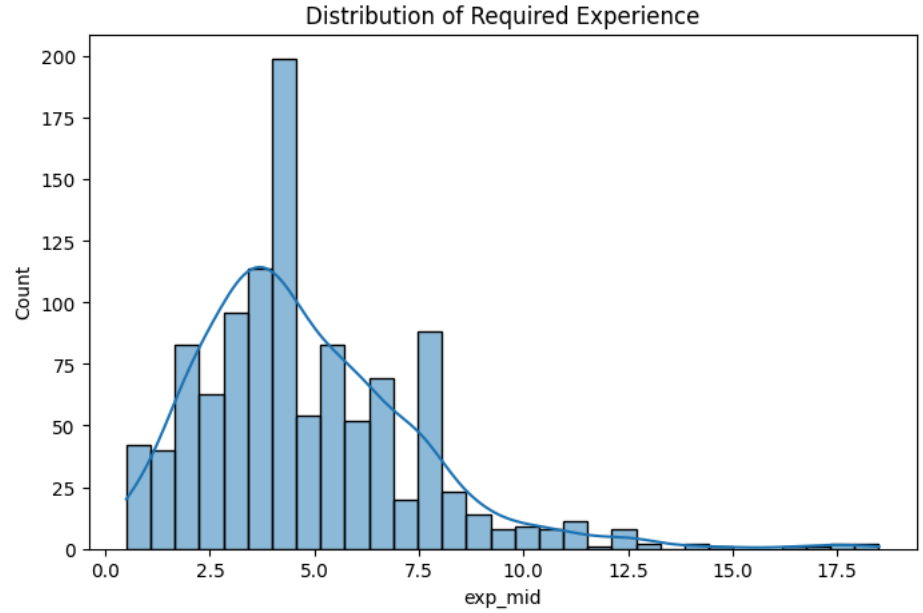

```
# Reviews count distribution
plt.figure(figsize=(8,5))
sns.histplot(df["reviews_count_num"], kde=True)
plt.title("Distribution of Review Counts")
plt.show()
```



```
# Jobs by location
plt.figure(figsize=(17,7))
df["location_clean"].value_counts().plot(kind="bar")
plt.title("Job Listings by Location")
plt.xlabel("Location")
plt.ylabel("Count")
plt.show()
```




```
# Experience mid value distribution
plt.figure(figsize=(8,5))
sns.histplot(df["exp_mid"], kde=True)
plt.title("Distribution of Required Experience")
plt.show()
```



3. STATISTICAL ANALYSIS

```
print("Top locations:\n", df["location"].value_counts())
print("\nTop companies:\n", df["company"].value_counts())
```

```
Top locations:
 location
Bangalore / Bengaluru                                                                  251
Mumbai                                                                                 128
Gurgaon / Gurugram                                                                      92
Hyderabad / Secunderabad                                                                88
Chennai                                                                                 60
                                                                                      ...
Kanyakumari                                                                              1
International/Overseas, Saudi arabia                                                    1
Bhubaneshwar                                                                             1
New Delhi, Gurgaon/Gurugram                                                              1
Thrissur/Trichur, Thiruvananthapuram, Calicut/Kozhikode\n\t\t\t\t\t\t\t\t\t\t\t\t+1 more      1
Name: count, Length: 150, dtype: int64

Top companies:
 company
HuQuo Consulting Pvt. Ltd.               13
Essenware Private Limted                 11
RIGHT STEP CONSULTING PRIVATE LIMITED    10
Huquo Consulting                         10
IDFC FIRST Bank                          10
                                         ..
Pcura Consulting pvt ltd.                 1
SAP Labs India Pvt. Ltd.                  1
Pfizer                                    1
Vixplor Analytics                         1
Fam                                       1
Name: count, Length: 783, dtype: int64
```

```
# Correlation tests
clean_corr = df[["base salary", "reviews count"]].dropna()

if len(clean_corr) >= 2:
    pearson_r, pearson_p = stats.pearsonr(
        clean_corr["base salary"], clean_corr["reviews count"]
    )
    spearman_rho, spearman_p = stats.spearmanr(
        clean_corr["base salary"], clean_corr["reviews count"]
    )

    print("\nPearson:", pearson_r, pearson_p)
    print("Spearman:", spearman_rho, spearman_p)
```

```
Pearson: -0.056602251561984986 0.5240390644700293
Spearman: 0.09986305090907503 0.2601639763732011
```

```
# Comparing ratings on Naukri vs iimjobs
naukri = df[df["postedIn"] == "Naukri"]["rating"]
iim = df[df["postedIn"] == "iimjobs"]["rating"]
```

```
print("\nT-test: Naukri vs iimjobs ratings")
print(stats.ttest_ind(naukri, iim, nan_policy="omit"))
```

```
T-test: Naukri vs iimjobs ratings
TtestResult(statistic=np.float64(0.0004702643650056894), pvalue=np.float64(0.9996248840803188), df=np.float64(931.0))
```

```
# Correlation (ratings vs reviews count)
print("\nCorrelation (ratings vs reviews count)")
print(stats.pearsonr(df["rating"], df["reviews_count_num"]))
```

```
Correlation (ratings vs reviews count)
PearsonRResult(statistic=np.float64(0.019944431027834907), pvalue=np.float64(0.5095167744732034))
```

4. MACHINE LEARNING MODEL

```
# Keeping only rows where salary exists
ml_df = df.dropna(subset=["base_salary_num"])
```

```
if len(ml_df) < 5:
    print("\n❌ Not enough salary data to train ML model (need ≥ 5 rows).")
```

```
else:
    # Selecting features
    X = ml_df[["exp_mid", "rating", "reviews_count_num", "jobListed(days ago)"]]
    y = ml_df["base_salary_num"]

    # Handle remaining NaN
    X = X.fillna(X.mean())

    # Train-test splitting
    X_train, X_test, y_train, y_test = train_test_split(
        X, y, test_size=0.3, random_state=42
    )

    model = RandomForestRegressor(random_state=42)
    model.fit(X_train, y_train)

    y_pred = model.predict(X_test)
```

```
    print("\nMODEL RESULTS")
    print("MAE:", mean_absolute_error(y_test, y_pred))
    print("RMSE:", np.sqrt(mean_squared_error(y_test, y_pred)))
    print("R²:", r2_score(y_test, y_pred))
```

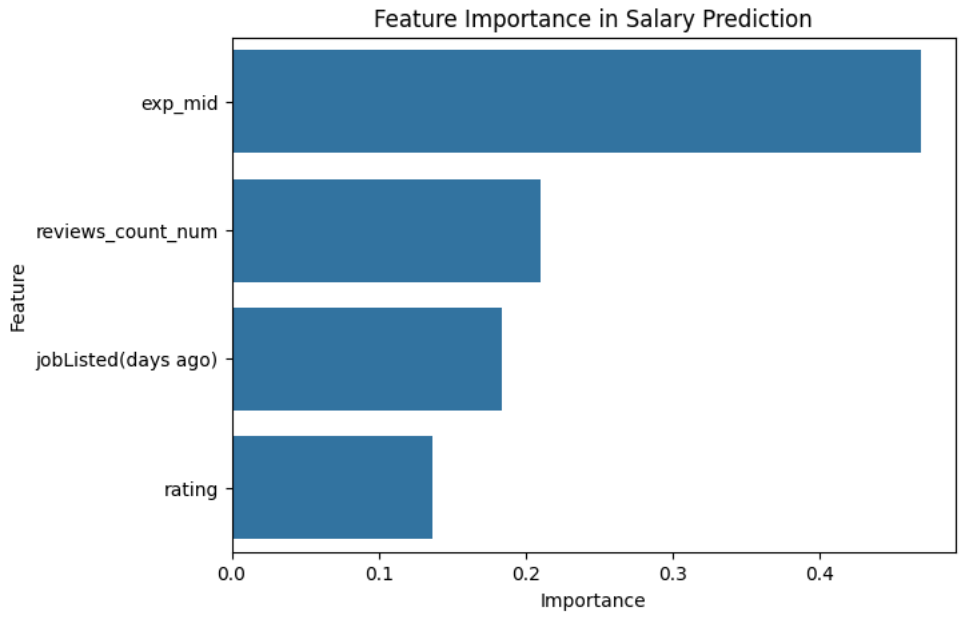
```
MODEL RESULTS
MAE: 293894.0
RMSE: 523202.39631273155
R²: 0.06289312512706535
```

```
    # Feature Importance
    feat_imp = pd.DataFrame({
        "Feature": X.columns,
        "Importance": model.feature_importances_
    }).sort_values(by="Importance", ascending=False)

    print("\nFEATURE IMPORTANCE")
    print(feat_imp)
```

```
FEATURE IMPORTANCE
               Feature  Importance
0             exp_mid    0.469268
2    reviews_count_num    0.210463
3  jobListed(days ago)    0.183646
1               rating    0.136624
```

```
    # Plot feature importance
    plt.figure(figsize=(7,5))
    sns.barplot(data=feat_imp, x="Importance", y="Feature")
    plt.title("Feature Importance in Salary Prediction")
    plt.show()
```




```
# ANALYSIS BY MD RIYAZ UDDIN.
```

ANALYSIS BY MD RIYAZ UDDIN.

THANK YOU...