Voice Call Quality Customer Experience Analysis

Introduction

This project involves analyzing customer feedback on voice call quality collected via the TRAI MyCall App. The dataset includes real-time ratings and network information provided by users across India. The goal of this analysis is to extract insights about the best telecom operators, correlations between variables, and trends in call quality across different scenarios.

Dataset Overview

The dataset consists of the following key columns:

1. **Operator**: Telecom operator used by the customer.
2. **Inout_travelling**: Whether the rating is for an indoor or outdoor scenario.
3. **Network_type**: Type of network (e.g., 4G).
4. **Rating**: User-provided rating for call quality.
5. **Calldrop_category**: Category describing the type of call drop.
6. **Latitude** and **Longitude**: User's geographical location.
7. **State_name**: State from which the feedback originated.

Data was consolidated from monthly files, resulting in a single unified dataset for analysis.

Tools Used

Python , Power BI

Business Questions and Insights

1. Best rated in each state overall and in terms of indoor and outdoor traveling?

- **Overall Best Operator**:
  - Using Python, average ratings calculated for each operator across all states. The operator with the highest rating in each state was identified And those are as follows :-

```
Best Overall Operators by State:
          state_name  operator    rating
2      Andhra Pradesh        VI  5.000000
4               Bihar      RJio  2.181818
6          Chandigarh      RJio  1.000000
8        Chhattisgarh      RJio  5.000000
9               Delhi    Airtel  5.000000
10                Goa        VI  5.000000
13            Gujarat        VI  3.640000
15            Haryana        VI  2.000000
16          Jharkhand    Airtel  4.783784
19          Karnataka      RJio  4.794702
21            Kashmir        VI  5.000000
23             Kerala      RJio  5.000000
25      Madhya Pradesh    Airtel  4.000000
30         Maharashtra        VI  3.838806
31                NCT    Airtel  5.000000
34             Odisha      RJio  5.000000
36             Punjab        VI  5.000000
38          Rajasthan      RJio  3.793651
41         Tamil Nadu      BSNL  5.000000
43          Telangana    Airtel  5.000000
46         Unnamed: 7        VI  3.000000
48      Uttar Pradesh      BSNL  5.000000
52         Uttarakhand      RJio  2.853731
55        West Bengal      RJio  4.090909
```

  - Among all opeartors the most occurred Best Overall oprator is 'RJio'.

```
[8]:  best_overall['operator'].value_counts()

[8]:  operator
      RJio      9
      VI        8
      Airtel    5
      BSNL      2
      Name: count, dtype: int64
```

  - Results indicate that certain operators "RJio", "VI", "Airtel" consistently outperform their competitors in specific states.
  - "BSNL" performs well in only two states "Uttar Pradesh" & "Tamil Nadu".

- **Best Operator for Indoor/Outdoor**:
  - o Ratings analyzed separately for indoor and outdoor travellings scenarios. Different operators performed better in different conditions

```
print(best_indoor)
```

state_name	operator	inout_travelling	rating
Andhra Pradesh	RJio	Indoor	2.000000
Bihar	RJio	Indoor	2.500000
Chandigarh	RJio	Indoor	1.000000
Chhattisgarh	Airtel	Indoor	5.000000
Goa	VI	Indoor	5.000000
Gujarat	VI	Indoor	4.052632
Haryana	RJio	Indoor	1.000000
Jharkhand	RJio	Indoor	1.000000
Karnataka	RJio	Indoor	4.800000
Kashmir	VI	Indoor	5.000000
Kerala	RJio	Indoor	5.000000
Madhya Pradesh	Airtel	Indoor	5.000000
Maharashtra	VI	Indoor	3.505618
NCT	Airtel	Indoor	5.000000
Odisha	RJio	Indoor	5.000000
Punjab	VI	Indoor	5.000000
Rajasthan	RJio	Indoor	3.801887
Tamil Nadu	RJio	Indoor	4.833333
Telangana	Airtel	Indoor	5.000000
Uttar Pradesh	BSNL	Indoor	5.000000
Uttarakhand	RJio	Indoor	2.886726
West Bengal	RJio	Indoor	4.500000

```
print(best_Outdoor)
```

state_name	operator	inout_travelling	rating
Andhra Pradesh	Airtel	Outdoor	1.000000
Bihar	VI	Outdoor	3.000000
Chhattisgarh	RJio	Outdoor	5.000000
Delhi	Airtel	Outdoor	5.000000
Gujarat	VI	Outdoor	3.333333
Haryana	VI	Outdoor	2.000000
Jharkhand	Airtel	Outdoor	4.750000
Karnataka	RJio	Outdoor	4.714286
Kashmir	VI	Outdoor	5.000000
Kerala	Airtel	Outdoor	4.814815
Madhya Pradesh	Airtel	Outdoor	3.000000
Maharashtra	VI	Outdoor	4.396947
Punjab	RJio	Outdoor	5.000000
Rajasthan	RJio	Outdoor	3.500000
Tamil Nadu	RJio	Outdoor	3.400000
Telangana	RJio	Outdoor	1.000000
Unnamed: 7	VI	Outdoor	3.000000
Uttar Pradesh	Airtel	Outdoor	1.800000
Uttarakhand	RJio	Outdoor	2.673077
West Bengal	BSNL	Outdoor	3.600000

```
print(f"Best_Indoor_Operatoor")
print(best_indoor['operator'].value_counts())

print(f"Best_Odoor_Operatoor")
print(best_Outdoor['operator'].value_counts())
```
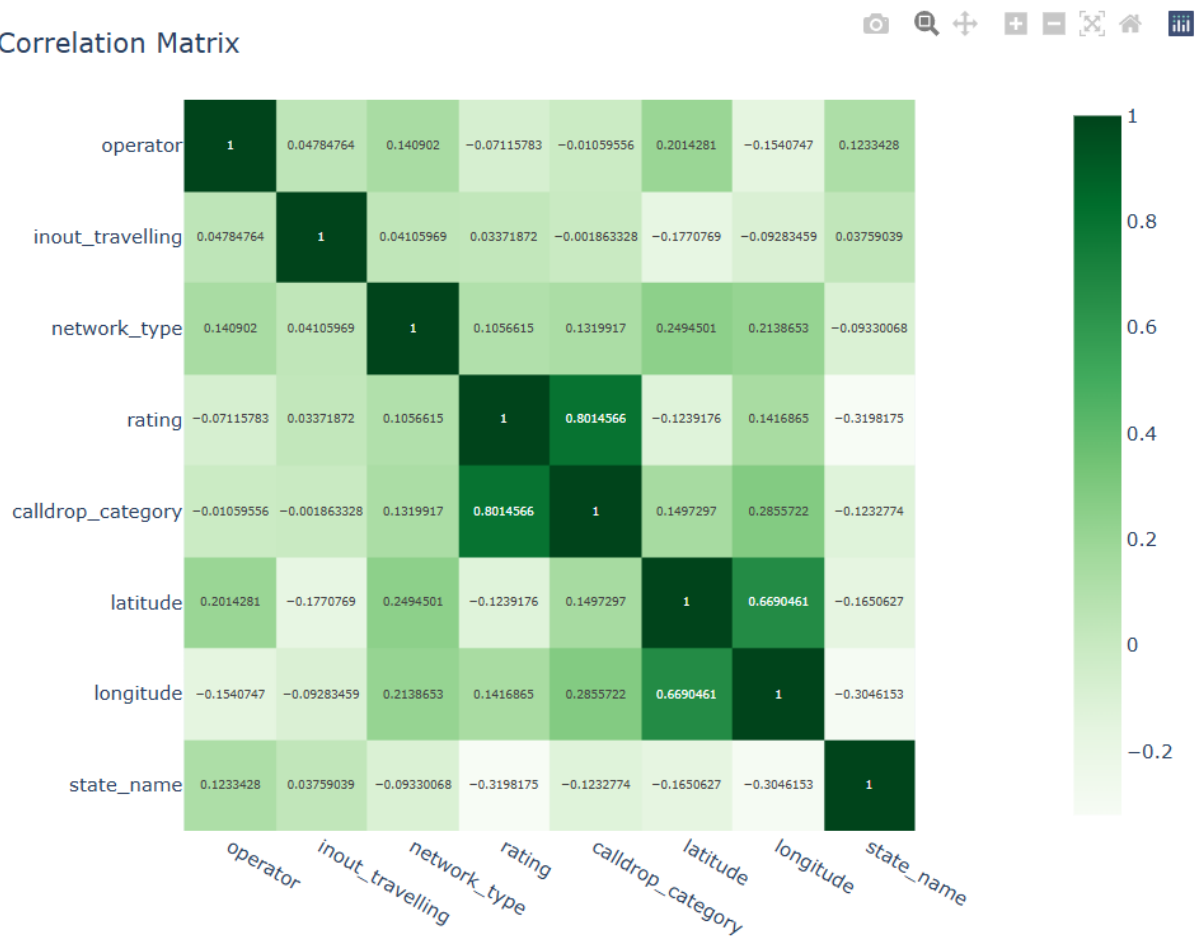
```
Best_Indoor_Operatoor
operator
RJio      12
VI         5
Airtel     4
BSNL       1
Name: count, dtype: int64
Best_Odoor_Operatoor
operator
RJio      7
Airtel    6
VI        6
BSNL      1
Name: count, dtype: int64
```

According to analysis, Best_Indoor_Operator & Best_Outdoor_Operator is "RJio".

2. Is there any correlation between network type and rating?

- There is no significant correlation was found between network type and rating. Correlation between **network type and rating** is 0.1056615.

3. Is call drop correlated with the rating?

- For Correlation analysis, Correlation matrix" created and it revealed a moderate positive relationship between network types and better ratings which is about 0.8014566. However, user perception also plays a significant role, so network type alone does not fully explain call quality ratings. More frequent call drops resulted in lower ratings.

4. Where do we see more call drops: outside or inside?

```
# Filter data for "Call Dropped" category to check  Where do we see more 'call drops'- outside or inside?
call_dropped = data[data['calldrop_category'] == 'Call Dropped']

# Group by inout_travelling and count occurrences
call_dropped_counts = call_dropped.groupby('inout_travelling').size().reset_index(name='count')

print(call_dropped_counts)
```

```
  inout_travelling  count
0            Indoor    201
1           Outdoor    127
2         Travelling     24
```

- **Findings**:
    - Call drops were observed more frequently in **indoor scenarios** than outdoors.

To determine whether there are statistically significant differences in the number of call drops inside versus outside (and while traveling), **conducted a Chi-Square Test for Independence.** This test checks if the observed differences in call drop counts across categories (indoor, outdoor, traveling) are statistically significant.

Note:- Here need to testing a single array of observed counts against expected values hence, Calculated expected counts assuming equal distribution

- **Hypothesis Testing**:
    - A hypothesis test confirmed that, There is a significant difference in call drops inside versus outside.

Visualization and Dashboard

Using Power BI, an interactive Summary dashboard designed to visualize key metrics:

1. **KPI's** :- Created KPI's for "Average Rating" & "CallDropCatFeq" for having Call drop category frequency. Which accessed according to requirements of different features like Inout travelling, operator, State name, network type.
2. **Stacked bar chart** :- Created for Average rating by state name and operator
3. **Line chart**: For tracking performance of operator, and its network type by Call_drop frequency.
4. **Donut Chart(Indoor vs. Outdoor vs Travelling Ratings)**: Compared call drop frequency for indoor and outdoor vs Travelling scenarios.
5. **Stacked bar chart** :- Created for Average rating by inout_travelling and operator
6. **Bubble chart**: Displayed call drops frequency as size of bubble indicating for inout travelling and operator.

Conclusion

- Certain operators dominate in specific states, but no single operator excels nationwide.
- Network type positively impacts user ratings, with higher-quality networks (e.g., 4G) receiving better ratings.
- Call drops significantly affect user perception, with indoor scenarios being more problematic.
- These insights can help telecom operators identify improvement areas, especially in outdoor network coverage.

Recommendations

1. **For Telecom Operators**:
   - Focus on improving network coverage in indoor areas.
   - Invest in advanced technologies (e.g., 5G) to enhance customer experience.
2. **For TRAI**:
   - Use the insights to collaborate with operators to prioritize states with poor ratings.
   - Expand the MyCall App's functionality to gather more granular data.