1 - DEFINE THE PROBLEM

We aim to build a classification model to predict whether a song play was the first time it was aired (`First?` column), based on data from U.S. radio classic rock airplays.

2 - IMPORT REQUIRED LIBRARIES

2.1 - Base Libraries

In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import sqlite3
```

2.2 - ML/DL Libraries

In [2]:
```
from sklearn.compose import ColumnTransformer
from sklearn.impute import SimpleImputer
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import classification_report, confusion_matrix
from sklearn.model_selection import train_test_split
from sklearn.pipeline import Pipeline
from sklearn.preprocessing import StandardScaler, OneHotEncoder
```

3 - LOAD THE DATA

In [3]:
```
conn = sqlite3.connect('../datasets/classic_rock.db')
df = pd.read_sql_query('SELECT * FROM rock_plays', conn)
```

4 - EDA (Exploratory Data Analysis)

In [4]:
```
df.head()
```

Out[4]:

	SONG RAW	Song Clean	ARTIST RAW	ARTIST CLEAN	CALLSIGN	TIME	UNIQUE_ID	COMBINED	First?	date_time	day_of_week
0	Caught Up In (live)	Caught Up in You	.38 Special	.38 Special	KGLK	1402943314	KGLK1536	Caught Up in You by .38 Special	1	2014-06-16 18:28:34	0
1	Caught Up In You	Caught Up in You	.38 Special	.38 Special	KGB	1403398735	KGB0260	Caught Up in You by .38 Special	0	2014-06-22 00:58:55	6
2	Caught Up In You	Caught Up in You	.38 Special	.38 Special	KGB	1403243924	KGB0703	Caught Up in You by .38 Special	0	2014-06-20 05:58:44	4
3	Caught Up In You	Caught Up in You	.38 Special	.38 Special	KGLK	1403470732	KGLK0036	Caught Up in You by .38 Special	0	2014-06-22 20:58:52	6
4	Caught Up In You	Caught Up in You	.38 Special	.38 Special	KGLK	1403380737	KGLK0312	Caught Up in You by .38 Special	0	2014-06-21 19:58:57	5

In [5]:
```
print(df.info())
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 37673 entries, 0 to 37672
Data columns (total 11 columns):
 #   Column        Non-Null Count  Dtype 
---  ------        --------------  ----- 
 0   SONG RAW      37673 non-null  object
 1   Song Clean    37647 non-null  object
 2   ARTIST RAW    37668 non-null  object
 3   ARTIST CLEAN  37665 non-null  object
 4   CALLSIGN      37673 non-null  object
 5   TIME          37673 non-null  int64 
 6   UNIQUE_ID     37673 non-null  object
 7   COMBINED      37673 non-null  object
 8   First?        37673 non-null  int64 
 9   date_time     37673 non-null  object
 10  day_of_week   37673 non-null  int64 
dtypes: int64(3), object(8)
memory usage: 3.2+ MB
None
```

In [6]:
```
print(df.isnull().sum())
```

```
SONG RAW        0
Song Clean     26
ARTIST RAW      5
ARTIST CLEAN    8
CALLSIGN        0
TIME            0
UNIQUE_ID       0
COMBINED        0
First?          0
date_time       0
day_of_week     0
dtype: int64
```

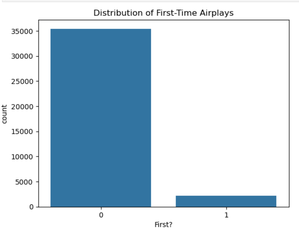
In [7]:
```
df.describe(include='all')
```

Out[7]:

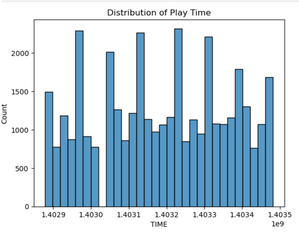
	SONG RAW	Song Clean	ARTIST RAW	ARTIST CLEAN	CALLSIGN	TIME	UNIQUE_ID	COMBINED	First?	date_time	day_of_week
count	37673	37647	37668	37665	37673	3.767300e+04	37673	37673	37673.000000	37673	37673.000000
unique	3710	2158	867	476	25	NaN	37673	2231	NaN	3599	NaN
top	Dream On	Dream On	Led Zeppelin	Led Zeppelin	KSEG	NaN	KGLK1536	Dream On by Aerosmith	NaN	2014-06-19 23:54:25	NaN
freq	126	142	1363	1556	1821	NaN	1	142	NaN	267	NaN
mean	NaN	NaN	NaN	NaN	NaN	1.403187e+09	NaN	NaN	0.059273	NaN	3.009928
std	NaN	NaN	NaN	NaN	NaN	1.730484e+05	NaN	NaN	0.236138	NaN	1.976652
min	NaN	NaN	NaN	NaN	NaN	1.402878e+09	NaN	NaN	0.000000	NaN	0.000000
25%	NaN	NaN	NaN	NaN	NaN	1.403049e+09	NaN	NaN	0.000000	NaN	1.000000
50%	NaN	NaN	NaN	NaN	NaN	1.403194e+09	NaN	NaN	0.000000	NaN	3.000000
75%	NaN	NaN	NaN	NaN	NaN	1.403330e+09	NaN	NaN	0.000000	NaN	5.000000
max	NaN	NaN	NaN	NaN	NaN	1.403482e+09	NaN	NaN	1.000000	NaN	6.000000

5 - VISUALIZE THE DATA

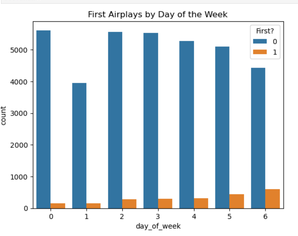
In [8]:
```
sns.countplot(x='First?', data=df)
plt.title('Distribution of First-Time Airplays')
plt.show()
```



In [9]:
```
sns.histplot(df['TIME'], bins=30)
plt.title('Distribution of Play Time')
plt.show()
```



In [10]:
```
sns.countplot(x='day_of_week', hue='First?', data=df)
plt.title('First Airplays by Day of the Week')
plt.show()
```



6 - PREPROCESS THE DATA

In [11]:
```
# Drop irrelevant or leak-prone columns
X = df[['Song Clean', 'ARTIST CLEAN', 'CALLSIGN', 'day_of_week']].copy()
y = df['First?']

categorical_features = X.columns.tolist()

preprocessor = ColumnTransformer(transformers=[
    ('cat', OneHotEncoder(handle_unknown='ignore'), categorical_features)
])

X_processed = preprocessor.fit_transform(X)
print(f'✅ Processed features shape: {X_processed.shape}')
```

```
✅ Processed features shape: (37673, 2668)
```

7 - SPLIT THE DATA

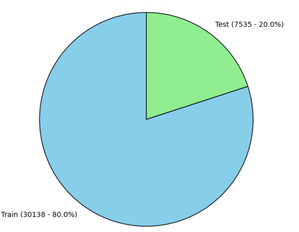
In [12]:
```
X_train, X_test, y_train, y_test = train_test_split(X_processed, y, test_size=0.2, random_state=42)
print(f'Train shape: {X_train.shape}, Test shape: {X_test.shape}')
```

```
Train shape: (30138, 2668), Test shape: (7535, 2668)
```

In [13]:
```
# Pie chart with custom labels showing both count and percentage
train_rows = X_train.shape[0]
test_rows = X_test.shape[0]
total_rows = train_rows + test_rows

labels = [
    f'Train ({train_rows} - {100 * train_rows / total_rows:.1f}%)',
    f'Test ({test_rows} - {100 * test_rows / total_rows:.1f}%)'
]
sizes = [train_rows, test_rows]

plt.figure(figsize=(6, 6))
plt.pie(
    sizes,
    labels=labels,
    startangle=90,
    colors=['skyblue', 'lightgreen'],
    wedgeprops={'edgecolor': 'black'}
)
plt.title('Train/Test Split')
plt.axis('equal')
plt.show()
```



In [ ]:
```
```