

```
# Install necessary libraries
!pip install pandas plotly

# Import required libraries
import pandas as pd
import plotly.express as px

# Step 1: Load the dataset
# Upload the dataset to your Colab environment or mount Google Drive and provide the path
file_path = "/content/metadata.csv" # Replace with the correct path to your dataset
data = pd.read_csv(file_path)

# Display first few rows and dataset information
print("First few rows of the dataset:")
print(data.head())
print("\nDataset information:")
print(data.info())

# Step 2: Select columns of interest and clean the data
# Rename columns for clarity
data.rename(columns={'Re': 'Battery_impedance', 'Rct': 'Charge_transfer_resistance'}, inplace=True)

# Ensure 'test_id' is treated as cycle count for visualization
data['cycle_count'] = data['test_id']

# Filter only the relevant columns and drop rows with missing values
columns_of_interest = ['cycle_count', 'Battery_impedance', 'Charge_transfer_resistance']
data_filtered = data[columns_of_interest].dropna()

# Display the filtered data
print("\nFiltered data:")
print(data_filtered.head())

# Step 3: Create visualizations using Plotly
# Plot Battery Impedance vs. Cycle Count
fig1 = px.line(
    data_filtered,
    x='cycle_count',
    y='Battery_impedance',
    title='Battery Impedance vs. Cycle Count',
    labels={'cycle_count': 'Cycle Count', 'Battery_impedance': 'Battery Impedance (Ohms)'}
)
fig1.show()

# Plot Charge Transfer Resistance vs. Cycle Count
fig2 = px.line(
    data_filtered,
    x='cycle_count',
    y='Charge_transfer_resistance',
    title='Charge Transfer Resistance vs. Cycle Count',
    labels={'cycle_count': 'Cycle Count', 'Charge_transfer_resistance': 'Charge Transfer Resistance (Ohms)'}
)
fig2.show()
```

```

Requirement already satisfied: pandas in /usr/local/lib/python3.10/dist-packages (2.2.2)
Requirement already satisfied: plotly in /usr/local/lib/python3.10/dist-packages (5.24.1)
Requirement already satisfied: numpy>=1.22.4 in /usr/local/lib/python3.10/dist-packages (from pandas) (1.26.4)
Requirement already satisfied: python-dateutil>=2.8.2 in /usr/local/lib/python3.10/dist-packages (from pandas) (2.8.2)
Requirement already satisfied: pytz>=2020.1 in /usr/local/lib/python3.10/dist-packages (from pandas) (2024.2)
Requirement already satisfied: tzdata>=2022.7 in /usr/local/lib/python3.10/dist-packages (from pandas) (2024.2)
Requirement already satisfied: tenacity>=6.2.0 in /usr/local/lib/python3.10/dist-packages (from plotly) (9.0.0)
Requirement already satisfied: packaging in /usr/local/lib/python3.10/dist-packages (from plotly) (24.2)
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.10/dist-packages (from python-dateutil>=2.8.2->pandas) (1.17.0)
First few rows of the dataset:

```

```

      type      start_time \
0  discharge [2010.      7.      21.      15.      0.      ...
1  impedance [2010.      7.      21.      16.      53.      ...
2    charge [2010.      7.      21.      17.      25.      ...
3  impedance [2010      7      21      20      31      5]
4  discharge [2.0100e+03 7.0000e+00 2.1000e+01 2.1000e+01 2...

```

```

      ambient_temperature battery_id test_id uid filename \
0                4          B0047      0    1 00001.csv
1                24          B0047      1    2 00002.csv
2                4          B0047      2    3 00003.csv
3                24          B0047      3    4 00004.csv
4                4          B0047      4    5 00005.csv

```

```

      Capacity      Re      Rct
0  1.6743047446975208      NaN      NaN
1      NaN  0.05605783343888099  0.20097016584458333
2      NaN      NaN      NaN
3      NaN  0.05319185850921101  0.16473399914864734
4  1.5243662105099023      NaN      NaN

```

Dataset information:

```
<class 'pandas.core.frame.DataFrame'>
```

RangeIndex: 7565 entries, 0 to 7564

Data columns (total 10 columns):

#	Column	Non-Null Count	Dtype
0	type	7565 non-null	object
1	start_time	7565 non-null	object
2	ambient_temperature	7565 non-null	int64
3	battery_id	7565 non-null	object
4	test_id	7565 non-null	int64
5	uid	7565 non-null	int64
6	filename	7565 non-null	object
7	Capacity	2794 non-null	object
8	Re	1956 non-null	object
9	Rct	1956 non-null	object

dtypes: int64(3), object(7)

memory usage: 591.1+ KB

None

Filtered data:

	cycle_count	Battery_impedance	Charge_transfer_resistance
1	1	0.05605783343888099	0.20097016584458333
3	3	0.05319185850921101	0.16473399914864734
13	13	0.05963791501051059	0.21039872263834902
15	15	0.05512505361624278	0.1754882075917004
17	17	0.058878485312444453	0.19095687096090014

### Battery Impedance vs. Cycle Count

