🛴 Scooter Rental Data Analysis

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Description: This notebook explores a dataset of scooter rentals. We'll analyze how weather and time-related features affect ridership, visualize trends, and build a simple linear regression model to predict scooter demand.

=== 1. Import Libraries ===

```
# Import the appropriate Python libraries.
import pandas as pd
```

=== 2. Load Dataset ===

```
# Load the CSV file into a dataframe.
scooter_data = pd.read_csv('https://bit.ly/scooter-rentals')
```

=== 3. Data Exploration ===

```
# Calculate the dimensions of the dataset.
scooter_data.shape # 731 records, 14 columns
```

```
(731, 14)
```

```
# List the columns in the dataset along with their data types.
scooter_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 731 entries, 0 to 730
Data columns (total 14 columns):
 #   Column        Non-Null Count  Dtype
---  ------        --------------  -----
 0   ID            731 non-null    int64
 1   date          731 non-null    object
 2   yr            731 non-null    int64
 3   mnth          731 non-null    int64
 4   weekday       731 non-null    int64
 5   workday       731 non-null    int64
 6   season        731 non-null    int64
 7   holiday       731 non-null    int64
 8   temp          731 non-null    float64
 9   atemp         731 non-null    float64
 10  hum           731 non-null    float64
 11  wind          731 non-null    float64
 12  unregistered  731 non-null    int64
 13  registered    731 non-null    int64
dtypes: float64(4), int64(9), object(1)
memory usage: 80.1+ KB
```

=== 4. Rename Columns ===

```
# Change the following field names to make them easier to understand:

# Change “yr” to “year”
# Change “mnth” to “month”
# Change “hum” to “humidity_norm”
# Change “temp” to “temp_norm”
# Change “atemp” to “temp_felt_norm”
# “Change “wind” to “wind_norm”
# Change “registered” to “rentals_registered”
# Change “unregistered” to “rentals_unregistered”
# Relist all the columns to confirm the changes above were completed successfully.
scooter_data = scooter_data.rename(columns={'yr': 'year',
                             'mnth': 'month',
```

```
                                    'hum': 'humidity_norm',
                                    'temp': 'temp_norm',
                                    'atemp': 'temp_felt_norm',
                                    'wind': 'wind_norm',
                                    'registered': 'rentals_registered',
                                    'unregistered': 'rentals_unregistered'})
```

```
# Preview the first 5 records in the dataset.
scooter_data.head()
```

	ID	date	year	month	weekday	workday	season	holiday	temp_norm	temp_felt_norm	humidity_norm	wind_norm	rentals_unregistered
0	1	1/1/2011	0	1	6	0	1	0	0.344167	0.363625	0.805833	0.160446	331
1	2	1/2/2011	0	1	0	0	1	0	0.363478	0.353739	0.696087	0.248539	131
2	3	1/3/2011	0	1	1	1	1	0	0.196364	0.189405	0.437273	0.248309	120
3	4	1/4/2011	0	1	2	1	1	0	0.200000	0.212122	0.590435	0.160296	108
4	5	1/5/2011	0	1	3	1	1	0	0.226957	0.229270	0.436957	0.186900	82

Next steps: Generate code with scooter_data | View recommended plots | New interactive sheet

=== 5. Replace Data (Seasons) ===

```
# In the "season" field, replace the numbers (1, 2, 3, 4) with the following season names:

# 1 = "winter"
# 2 = "spring"
# 3 = "summer"
# 4 = "fall"
scooter_data['season'] = scooter_data['season'].replace([1, 2, 3, 4], ['winter', 'spring', 'summer', 'fall'])
scooter_data.head()
```

	ID	date	year	month	weekday	workday	season	holiday	temp_norm	temp_felt_norm	humidity_norm	wind_norm	rentals_unregistered
0	1	1/1/2011	0	1	6	0	winter	0	0.344167	0.363625	0.805833	0.160446	331
1	2	1/2/2011	0	1	0	0	winter	0	0.363478	0.353739	0.696087	0.248539	131
2	3	1/3/2011	0	1	1	1	winter	0	0.196364	0.189405	0.437273	0.248309	120
3	4	1/4/2011	0	1	2	1	winter	0	0.200000	0.212122	0.590435	0.160296	108
4	5	1/5/2011	0	1	3	1	winter	0	0.226957	0.229270	0.436957	0.186900	82

Next steps: Generate code with scooter_data | View recommended plots | New interactive sheet

=== 6. Feature Engineering ===

```
# Creating a new column called "rentals_total" that sums registered and unregistered rentals.
scooter_data['rentals_total'] = scooter_data['rentals_registered'] + scooter_data['rentals_unregistered']
scooter_data.head()
```

	ID	date	year	month	weekday	workday	season	holiday	temp_norm	temp_felt_norm	humidity_norm	wind_norm	rentals_unregistered
0	1	1/1/2011	0	1	6	0	winter	0	0.344167	0.363625	0.805833	0.160446	331
1	2	1/2/2011	0	1	0	0	winter	0	0.363478	0.353739	0.696087	0.248539	131
2	3	1/3/2011	0	1	1	1	winter	0	0.196364	0.189405	0.437273	0.248309	120
3	4	1/4/2011	0	1	2	1	winter	0	0.200000	0.212122	0.590435	0.160296	108
4	5	1/5/2011	0	1	3	1	winter	0	0.226957	0.229270	0.436957	0.186900	82

Next steps: Generate code with scooter_data | View recommended plots | New interactive sheet

```
# Descriptive stats for the numeric columns in the dataset.
scooter_data.describe()
```

	ID	year	month	weekday	workday	holiday	temp_norm	temp_felt_norm	humidity_norm	wind_norm	rental
count	731.000000	731.000000	731.000000	731.000000	731.000000	731.000000	731.000000	731.000000	731.000000	731.000000	
mean	366.000000	0.500684	6.519836	2.997264	0.683995	0.028728	0.495385	0.474354	0.627894	0.190486	
std	211.165812	0.500342	3.451913	2.004787	0.465233	0.167155	0.183051	0.162961	0.142429	0.077498	
min	1.000000	0.000000	1.000000	0.000000	0.000000	0.000000	0.059130	0.079070	0.000000	0.022392	
25%	183.500000	0.000000	4.000000	1.000000	0.000000	0.000000	0.337083	0.337842	0.520000	0.134950	
50%	366.000000	1.000000	7.000000	3.000000	1.000000	0.000000	0.498333	0.486733	0.626667	0.180975	
75%	548.500000	1.000000	10.000000	5.000000	1.000000	0.000000	0.655417	0.608602	0.730209	0.233214	
max	731.000000	1.000000	12.000000	6.000000	1.000000	1.000000	0.861667	0.840896	0.972500	0.507463	

=== 7. Missing Values & Duplicates ===

```
# Seeing if there are any missing values in the dataset.
scooter_data.isnull().sum()
```

	0
ID	0
date	0
year	0
month	0
weekday	0
workday	0
season	0
holiday	0
temp_norm	0
temp_felt_norm	0
humidity_norm	0
wind_norm	0
rentals_unregistered	0
rentals_registered	0
rentals_total	0

dtype: int64

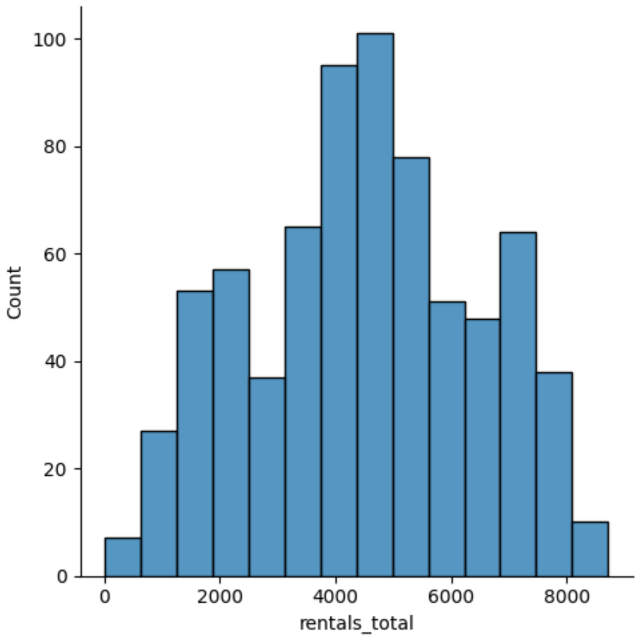
```
sum(scooter_data.duplicated(scooter_data.columns))
```

```
0
```

=== 8. Visualizations & Correlation ===

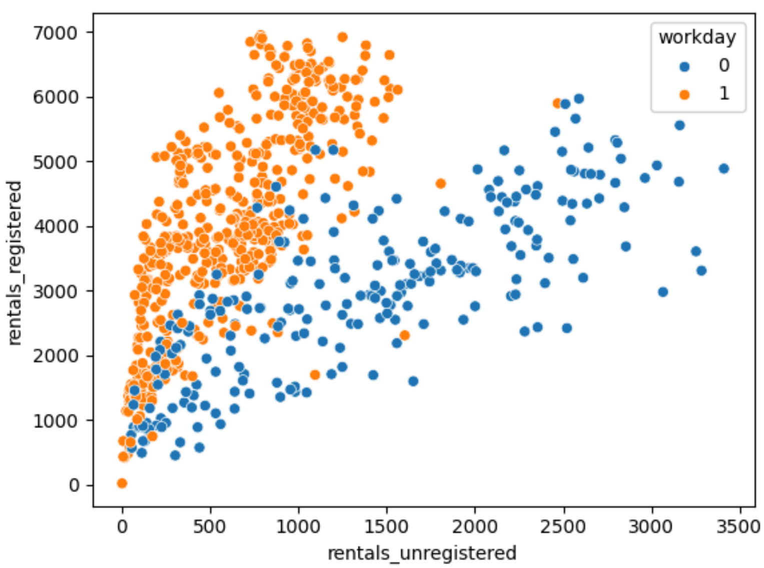
```
import seaborn as sns
# Generating a histogram to visualize the distribution of "rentals_total" column.
sns.displot(scooter_data['rentals_total'])
```

```
<seaborn.axisgrid.FacetGrid at 0x7816e772b990>
```




```
# Generating a scatterplot that has "rentals_unregistered" on the x-axis and "rentals_registered" on the y-axis.
# Then, I colored the datapoints based on whether or not it was a workday.
# This was to help me understand the types of scooter rentals on weekdays versus weekends.
# (As a note, when “workday” is 0, it is a weekend – Saturday or Sunday.)
sns.scatterplot(data=scooter_data, x='rentals_unregistered', y='rentals_registered', hue='workday')
```

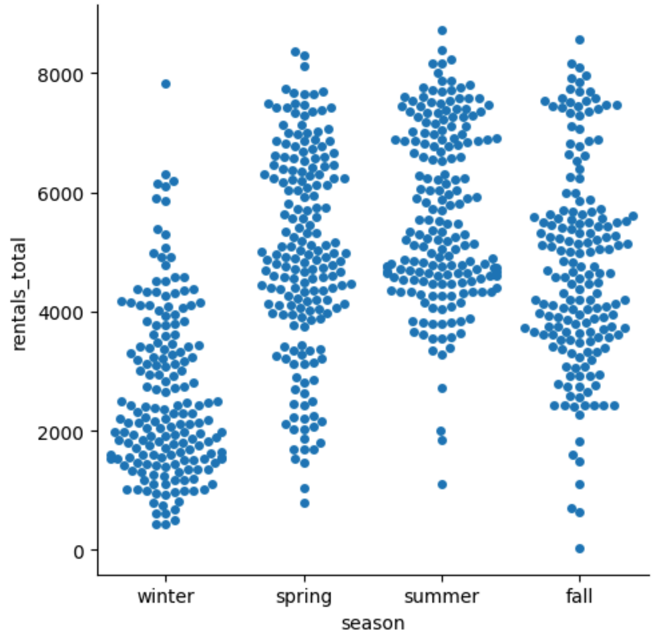
```
<Axes: xlabel='rentals_unregistered', ylabel='rentals_registered'>
```




```
# Based on the scatterplot, we have more registered rentals on weekdays and more unregistered rentals on weekends.
```

```
# Generating a swarmplot to explore the total rentals by season.  The "season" is on the x-asis and "rentals_total" on the y-axis.
sns.catplot(data=scooter_data, x='season', y='rentals_total', kind='swarm')
```

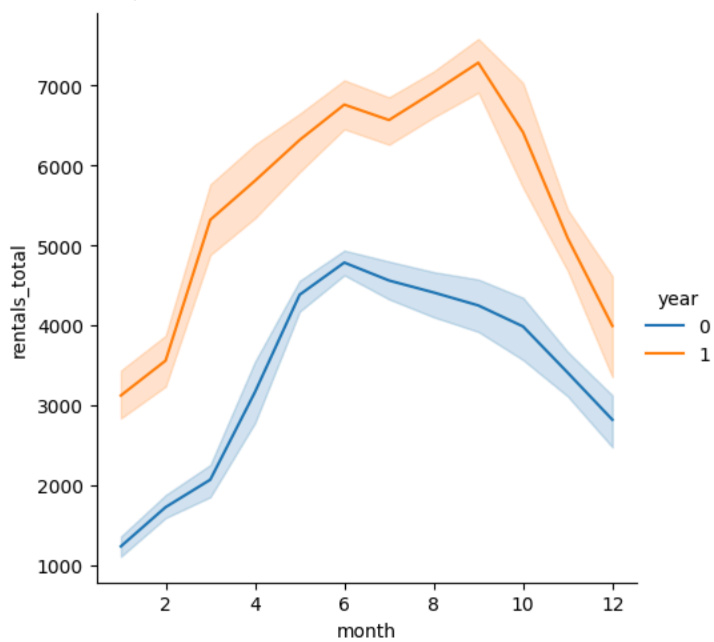
<seaborn.axisgrid.FacetGrid at 0x781727782250>




```
# Based on the swarmplot, it appears that winter has the lowest average daily rentals.
```

```
# Generating a line plot that shows average daily rentals by month with the lines split by year.
# The "month" should on the x-axis, the "rentals_total" on the y-axis, and there should be a line for each value in the "year" column.
sns.relplot(data=scooter_data, x='month', y='rentals_total', hue='year', kind='line')
```

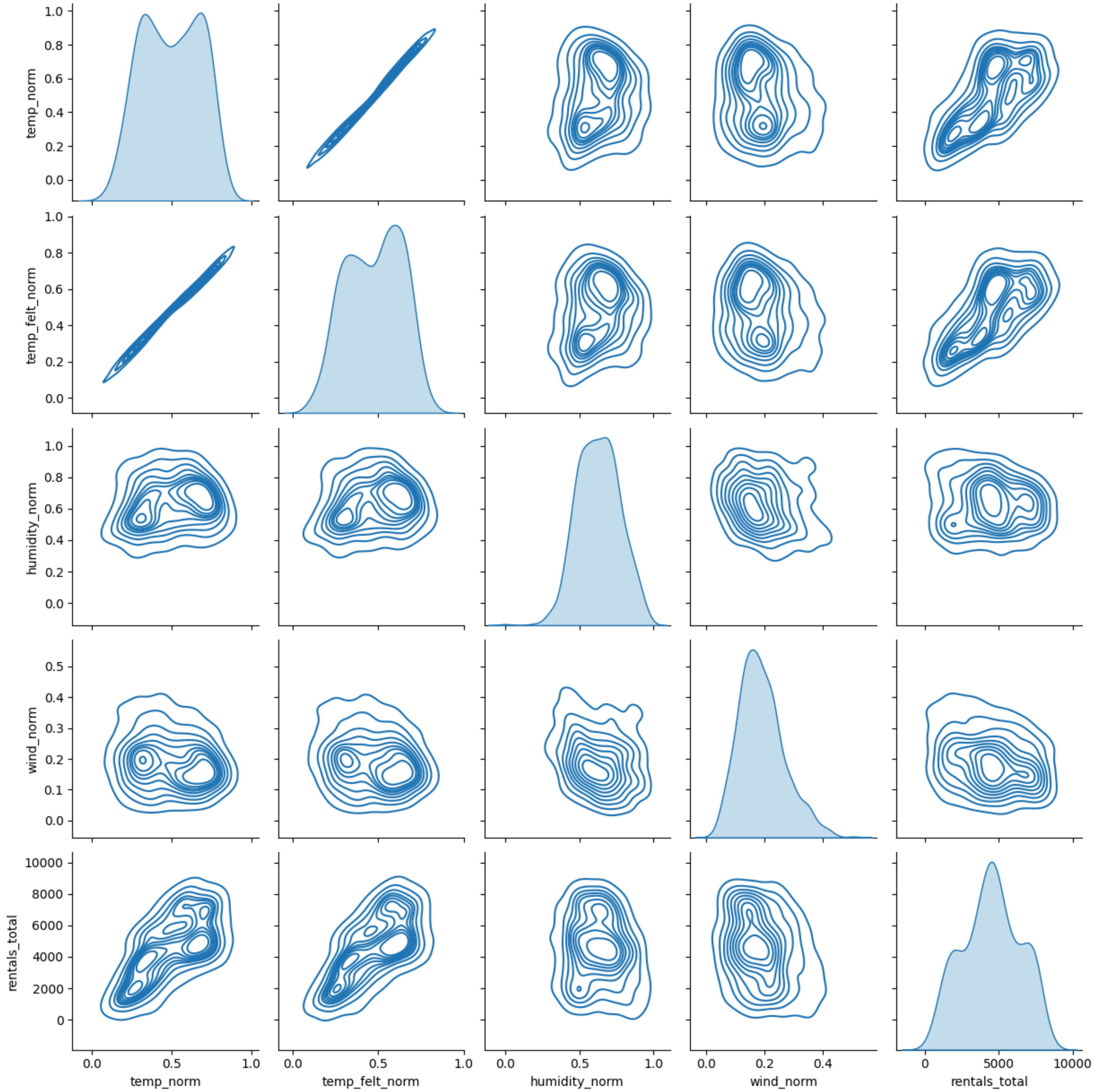
<seaborn.axisgrid.FacetGrid at 0x7816e7552390>




```
# Based on the lineplot, the average daily rentals increased between the first year in the data ("year" = 0) and the second year ("year" = 1
```

```
# Generating a pairplot to show the relationship between "rentals_total" and the weather indicators ("temp_norm", "temp_felt_norm", "humidit
sns.pairplot(scooter_data, vars=['temp_norm', 'temp_felt_norm', 'humidity_norm', 'wind_norm', 'rentals_total'], kind='kde')
```

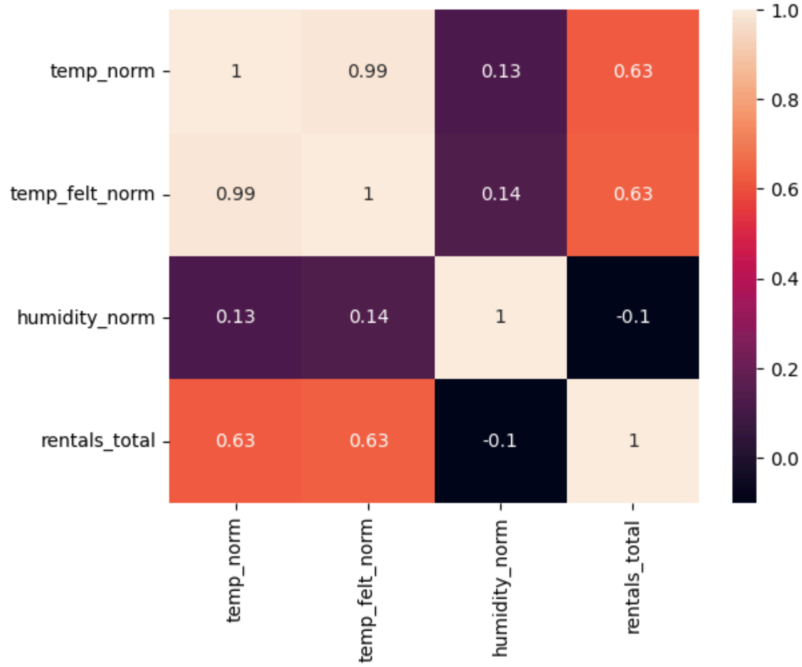
```
<seaborn.axisgrid.PairGrid at 0x7816e388b910>
```




```
# As "temp_norm" decreases, "rentals_total" tends to decrease.
```

```
# Generating a heatmap to visualize the correlation between "rentals_total" and the weather indicators mentioned in the pairplot with their
scooter_data_dp = scooter_data.drop(columns=['ID', 'date', 'year', 'month', 'weekday', 'workday', 'season', 'holiday', 'wind_norm', 'rentals
sns.heatmap(scooter_data_dp.corr(), annot=True)
```

```
<Axes: >
```




```
# The correlation coefficient (r) that quantifies the strength of the relationship between "rentals_total" and "temp_norm" is 0.63
```

```
scooter_data_dp.corr() # double-checking
```

	temp_norm	temp_felt_norm	humidity_norm	rentals_total
temp_norm	1.000000	0.991702	0.126963	0.627494
temp_felt_norm	0.991702	1.000000	0.139988	0.631066
humidity_norm	0.126963	0.139988	1.000000	-0.100659
rentals_total	0.627494	0.631066	-0.100659	1.000000

=== 9. Modeling Preparation ===

```
from sklearn.linear_model import LinearRegression
from sklearn.model_selection import train_test_split
from sklearn import metrics
```

```
# Separate the dependent variable (use "rentals_total") (y) and the independent variable (use "temp_norm") (X).
X = scooter_data[['temp_norm']]
y = scooter_data['rentals_total']
```

```
# Split the data into training and test sets.  (I put 25% into the test set.)
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.25, random_state=0)
```

=== 10. Model Building & Evaluation ===

```
# Train ("fit") the linear regression model using the training data.
model = LinearRegression()
model.fit(X_train, y_train)
```

```
▾ LinearRegression
LinearRegression()
```

Model Building

```
# The intercept of my regression equation
print(model.intercept_) # 1,327.93
```

```
1327.930810368468
```

```
# The coefficient for the "temp_norm" variable within my regression equation
print(model.coef_) # 6,463.97
```

```
[6463.96764523]
```

```
# Using my regression equation, I predicted the "rentals_total" when "temp_norm" = 0.30.
new_X = [[0.30]]
print(model.predict(new_X)) # Answer is 3,267.12 rentals
```