Bike_share

January 26, 2024

[1]:
```
# imports
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
import numpy as np
import random
from scipy.stats import ttest_1samp

%matplotlib inline
# load hourly data
hourly_data = pd.read_csv('hour.csv')
```

[2]:
```
hourly_data.head()
```

[2]:

	instant	dteday	season	yr	mnth	hr	holiday	weekday	workingday	\
0	1	2011-01-01	1	0	1	0	0	6	0	
1	2	2011-01-01	1	0	1	1	0	6	0	
2	3	2011-01-01	1	0	1	2	0	6	0	
3	4	2011-01-01	1	0	1	3	0	6	0	
4	5	2011-01-01	1	0	1	4	0	6	0	

	weathersit	temp	atemp	hum	windspeed	casual	registered	cnt
0	1	0.24	0.2879	0.81	0.0	3	13	16
1	1	0.22	0.2727	0.80	0.0	8	32	40
2	1	0.22	0.2727	0.80	0.0	5	27	32
3	1	0.24	0.2879	0.75	0.0	3	10	13
4	1	0.24	0.2879	0.75	0.0	0	1	1

[3]:
```
# print some generic statsitics about the data
print('shape of data :{}'.format(hourly_data.shape))
print('Numbers of missing values in the data :\
{}'.format(hourly_data.isnull().sum().sum()))
```

```
shape of data :(17379, 17)
Numbers of missing values in the data :0
```

[4]:
```
# get statistics on the numerical columns
hourly_data.describe().T
```

[4]:

	count	mean	std	min	25%	50%	\
instant	17379.0	8690.000000	5017.029500	1.00	4345.5000	8690.0000	
season	17379.0	2.501640	1.106918	1.00	2.0000	3.0000	
yr	17379.0	0.502561	0.500008	0.00	0.0000	1.0000	
mnth	17379.0	6.537775	3.438776	1.00	4.0000	7.0000	
hr	17379.0	11.546752	6.914405	0.00	6.0000	12.0000	
holiday	17379.0	0.028770	0.167165	0.00	0.0000	0.0000	
weekday	17379.0	3.003683	2.005771	0.00	1.0000	3.0000	
workingday	17379.0	0.682721	0.465431	0.00	0.0000	1.0000	
weathersit	17379.0	1.425283	0.639357	1.00	1.0000	1.0000	
temp	17379.0	0.496987	0.192556	0.02	0.3400	0.5000	
atemp	17379.0	0.475775	0.171850	0.00	0.3333	0.4848	
hum	17379.0	0.627229	0.192930	0.00	0.4800	0.6300	
windspeed	17379.0	0.190098	0.122340	0.00	0.1045	0.1940	
casual	17379.0	35.676218	49.305030	0.00	4.0000	17.0000	
registered	17379.0	153.786869	151.357286	0.00	34.0000	115.0000	
cnt	17379.0	189.463088	181.387599	1.00	40.0000	142.0000	

	75%	max
instant	13034.5000	17379.0000
season	3.0000	4.0000
yr	1.0000	1.0000
mnth	10.0000	12.0000
hr	18.0000	23.0000
holiday	0.0000	1.0000
weekday	5.0000	6.0000
workingday	1.0000	1.0000
weathersit	2.0000	4.0000
temp	0.6600	1.0000
atemp	0.6212	1.0000
hum	0.7800	1.0000
windspeed	0.2537	0.8507
casual	48.0000	367.0000
registered	220.0000	886.0000
cnt	281.0000	977.0000

Preprocessing Temporal and Weather Features

[5]:
```
# create a copy of the original data
preprocessed_data = hourly_data.copy()
#transform seasons mapping
seasons_mapping = {1: 'winter',2: 'spring',3: 'summer',4:'fall'}
def rename(x):
    return seasons_mapping[x]
preprocessed_data['season'] = preprocessed_data['season'].apply(rename)
#transform yr mapping
yr_mapping = {0: 2011,1: 2012}
```

```
def rename_column(data, column, mapping):
    data[column] = data[column].map(mapping)

rename_column(preprocessed_data, 'yr', yr_mapping)
weekday_mapping = {0:'Sunday', 1: 'Monday', 2: 'Tuesday', 3: 'Wednesday', 4:␣
 ↪'Thursday', 5: 'Friday', 6:'Saturday'}
rename_column(preprocessed_data,'weekday',weekday_mapping)
#transform weathersit
weathersit_mapping = {1: 'clear', 2: 'cloudy', \
                      3:'light rain snow', 4: 'heavy rain snow'}
rename_column(preprocessed_data,'weathersit',weathersit_mapping)

#transform hum and windspeed
preprocessed_data['hum'] = preprocessed_data['hum'] * 100
preprocessed_data['windspeed'] = preprocessed_data['windspeed'] * 67
# visualize preprocessed columns
cols = ['season', 'yr', 'weekday', \
        'weathersit', 'hum', 'windspeed']
preprocessed_data[cols].sample(10)
```

[5]:

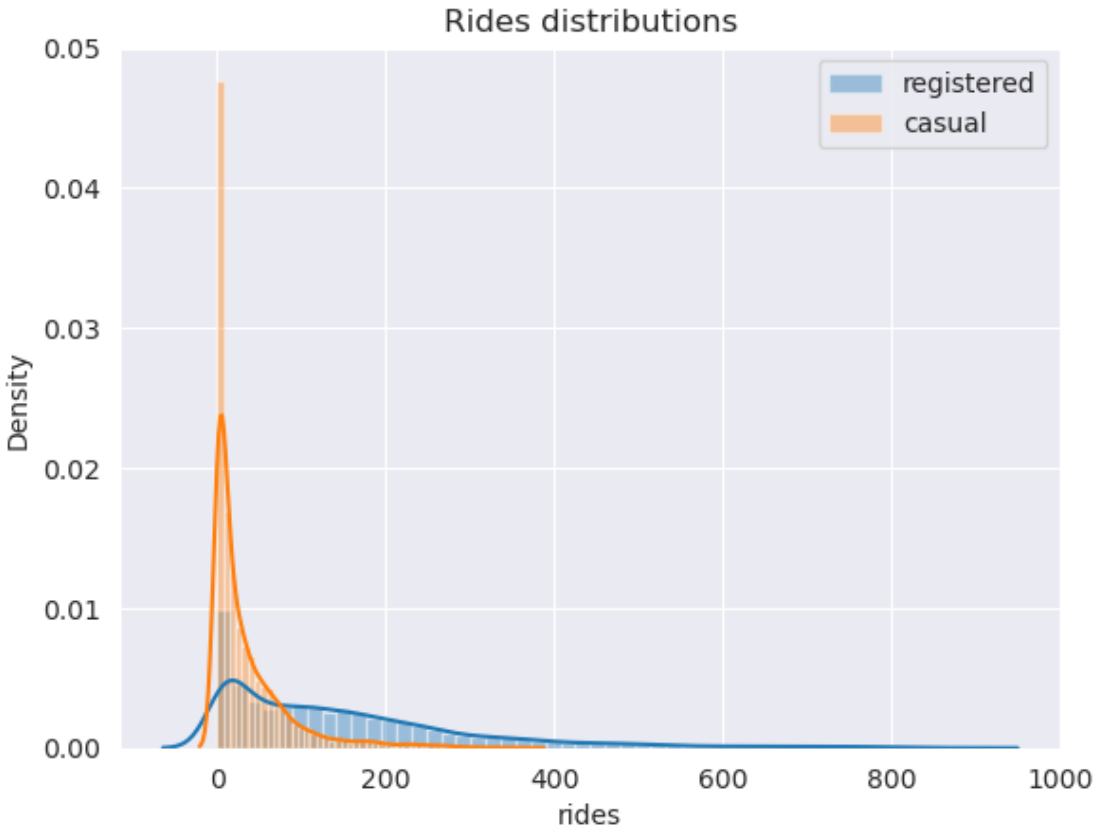
	season	yr	weekday	weathersit	hum	windspeed
8640	winter	2011	Saturday	clear	54.0	15.0013
607	winter	2011	Friday	light rain snow	93.0	7.0015
14047	summer	2012	Monday	clear	40.0	12.9980
12528	spring	2012	Monday	clear	78.0	8.9981
16643	fall	2012	Saturday	clear	87.0	8.9981
6399	fall	2011	Thursday	cloudy	88.0	7.0015
6163	summer	2011	Monday	cloudy	68.0	11.0014
3544	spring	2011	Wednesday	clear	37.0	16.9979
10818	spring	2012	Saturday	cloudy	71.0	22.0028
262	winter	2011	Wednesday	clear	59.0	22.0028

[6]:
```
#check that the total number of rides equal to the sum of number of rides for␣
 ↪casual useres and for registered users
(preprocessed_data.casual + preprocessed_data.registered == preprocessed_data.
 ↪cnt).all()
```

[6]: True

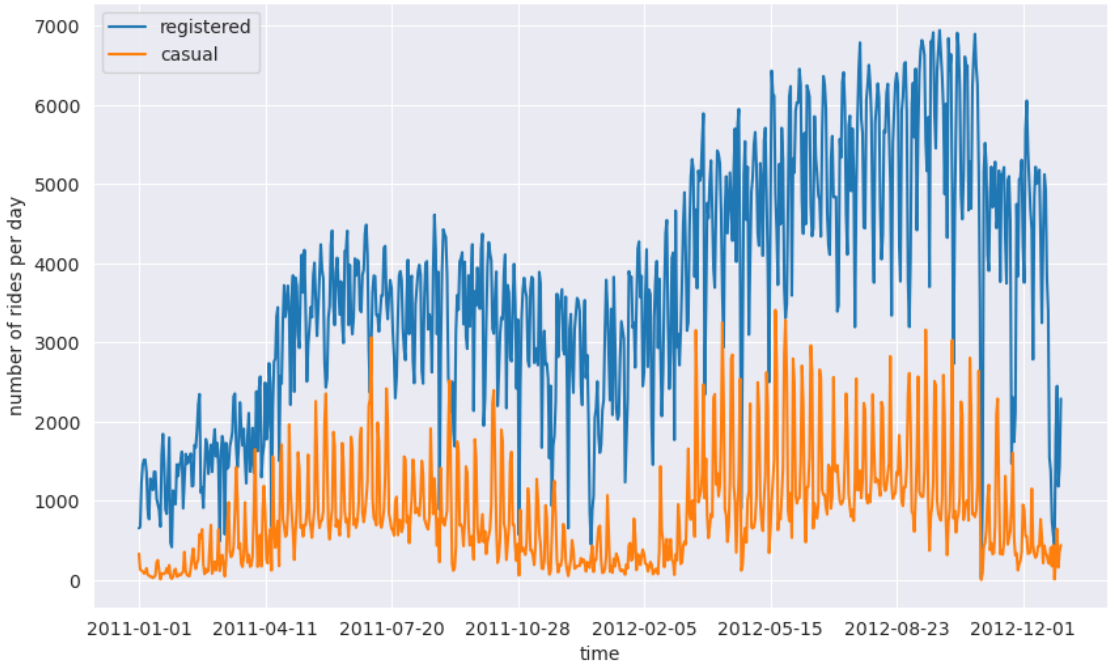
[20]:
```
#plot the distribution of registered and casual rides
import warnings
warnings.filterwarnings('ignore')
sns.distplot(preprocessed_data['registered'], label='registered')
sns.distplot(preprocessed_data['casual'], label='casual')
plt.legend()
plt.xlabel('rides')
plt.title("Rides distributions")
```

[20]: Text(0.5, 1.0, 'Rides distributions')



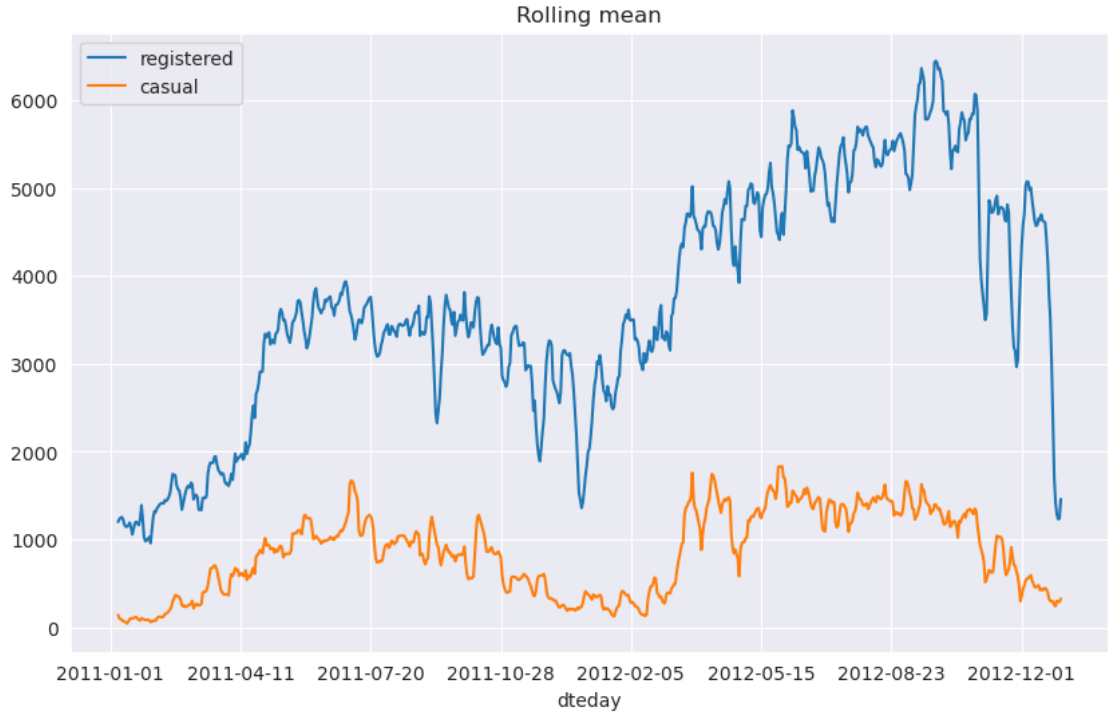
Calculating number of rides per day within the Two years

[8]:
```
plot_data= preprocessed_data[['registered', 'casual', 'dteday']].
 ↪groupby('dteday').sum()
ax = plot_data.plot(figsize = (10,6))
ax.set_xlabel("time");
ax.set_ylabel("number of rides per day");
```

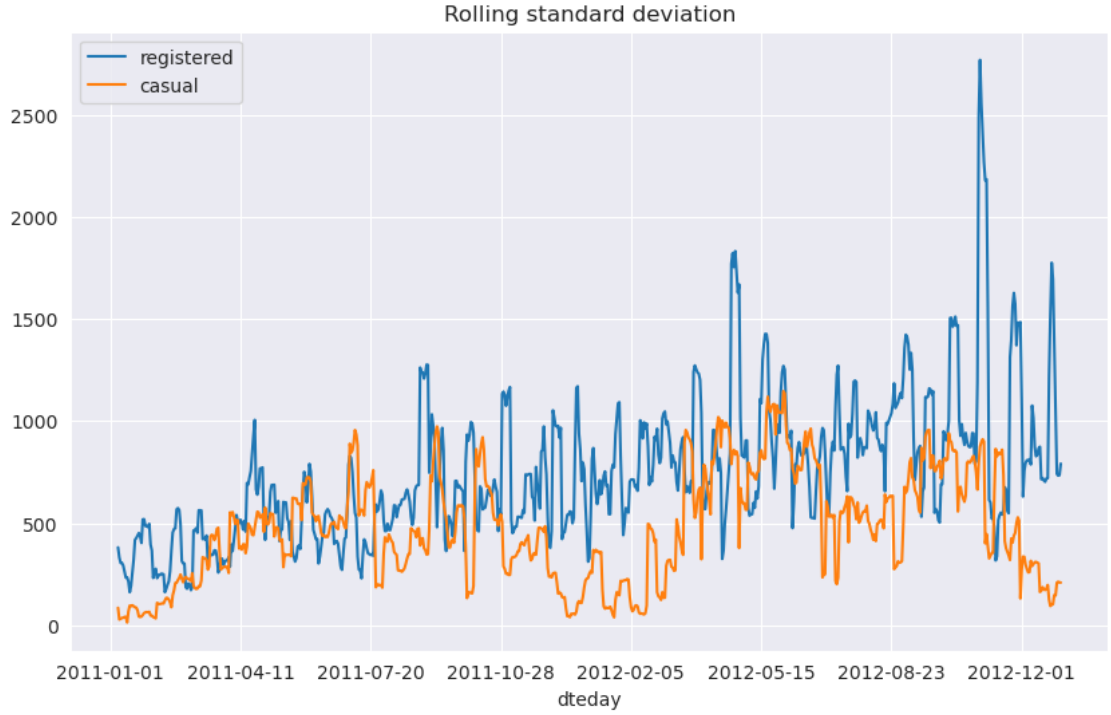


[9]:
```
plot_data = preprocessed_data[['registered', 'casual', 'dteday']]
plot_data = plot_data.groupby('dteday').sum()
plot_data
rolling_means = plot_data.rolling(7).mean()
rolling_std = plot_data.rolling(7).std()
```

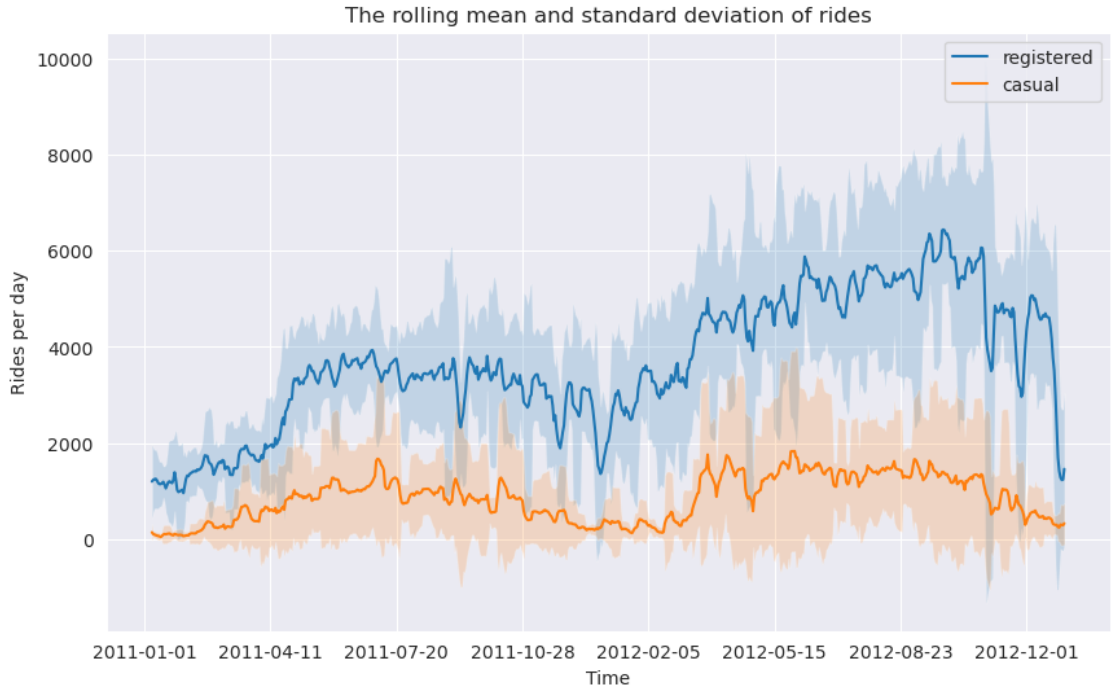
[10]:
```
ax = rolling_means.plot(figsize=(10,6))
ax.set_title('Rolling mean');
```



[11]:
```
ax = rolling_std.plot(figsize = (10,6))
ax.set_title('Rolling standard deviation');
```



[12]:
```
ax = rolling_means.plot(figsize=(10,6))
ax.fill_between(rolling_means.index,rolling_means['registered'] +␣
 ↪2*rolling_std['registered'], \
                rolling_means['registered'] - 2 * rolling_std['registered'],␣
 ↪alpha = 0.2)
ax.fill_between(rolling_means.index, rolling_means['casual'] + 2␣
 ↪*rolling_std['casual'],\
                rolling_means['casual'] - 2 * rolling_std['casual'], alpha = .2)
ax.set_xlabel('Time')
ax.set_ylabel('Rides per day');
ax.set_title('The rolling mean and standard deviation of rides');
```



[13]:
```
plot_data = preprocessed_data[['hr', 'weekday', 'registered', 'casual']]
plot_data = plot_data.melt(id_vars=['hr', 'weekday'], \
                value_name='count')
plot_data
```

[13]:

	hr	weekday	variable	count
0	0	Saturday	registered	13
1	1	Saturday	registered	32
2	2	Saturday	registered	27
3	3	Saturday	registered	10

```
4       4  Saturday  registered      1
…     ..       …          …     …
34753  19    Monday      casual     11
34754  20    Monday      casual      8
34755  21    Monday      casual      7
34756  22    Monday      casual     13
34757  23    Monday      casual     12

[34758 rows x 4 columns]
```

[14]:
```
sns.catplot(x='hr', y='count', col='variable', row='weekday', kind='bar', \
            data=plot_data, height=2.5, aspect=2.5, col_order=['registered',␣
 ↪'casual'], \
            row_order=['Monday', 'Tuesday', 'Wednesday', 'Thursday', 'Friday', \
                       'Saturday', 'Sunday']);
plt.suptitle('Rides per weekday');
```


Rides per weekday
weekday = Monday | variable = registered
weekday = Monday | variable = casual
weekday = Tuesday | variable = registered
weekday = Tuesday | variable = casual
weekday = Wednesday | variable = registered
weekday = Wednesday | variable = casual
weekday = Thursday | variable = registered
weekday = Thursday | variable = casual
weekday = Friday | variable = registered
weekday = Friday | variable = casual
weekday = Saturday | variable = registered
weekday = Saturday | variable = casual
weekday = Sunday | variable = registered
weekday = Sunday | variable = casual
count
hr

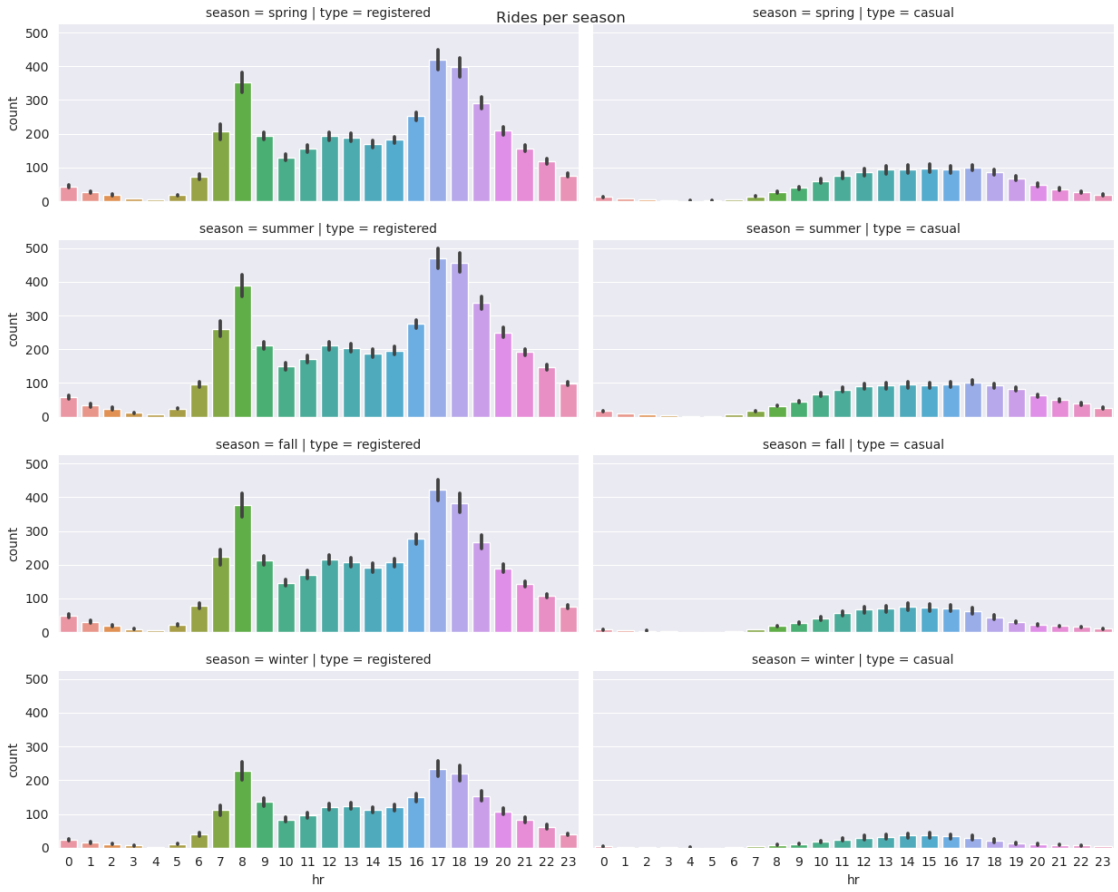
[15]:
```
plot_data = preprocessed_data[['hr','season','registered','casual']]
# unpivot data from wide to long format
plot_data = plot_data.melt(id_vars=['hr','season'],var_name='type',␣
 ↪value_name='count')
plot_data
```

[15]:

	hr	season	type	count
0	0	winter	registered	13
1	1	winter	registered	32
2	2	winter	registered	27
3	3	winter	registered	10
4	4	winter	registered	1
…	..	…	…	…
34753	19	winter	casual	11
34754	20	winter	casual	8
34755	21	winter	casual	7
34756	22	winter	casual	13
34757	23	winter	casual	12

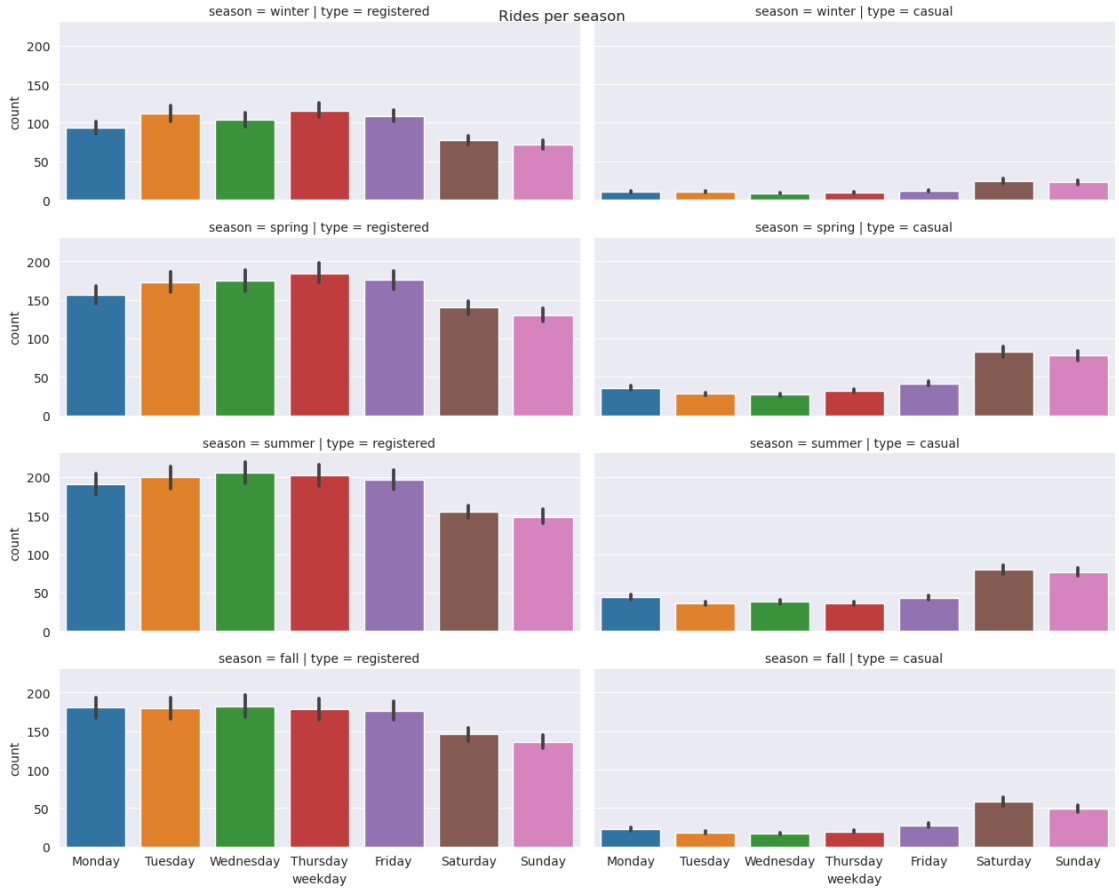
[34758 rows x 4 columns]

[16]:
```
sns.catplot(x='hr', y='count',row='season',col='type', kind='bar', \
            data=plot_data, height=2.5, aspect=2.5, \
            row_order=['spring', 'summer', 'fall','winter'], \
            col_order=['registered', 'casual'])
plt.suptitle('Rides per season');
```



[17]:
```
plot_data = preprocessed_data[['season','weekday','registered','casual']]
plot_data = plot_data.melt(id_vars=['season','weekday'], var_name='type',␣
 ↪value_name='count')
sns.catplot(x='weekday', y='count',row='season', col='type',\
            kind='bar', data=plot_data, height=2.55, aspect=2.5,\
            order=['Monday', 'Tuesday','Wednesday','Thursday',\
                   'Friday','Saturday','Sunday'])
plt.suptitle('Rides per season')
```

[17]:
```
Text(0.5, 0.98, 'Rides per season')
```


Rides per season
season = winter | type = registered
season = winter | type = casual
season = spring | type = registered
season = spring | type = casual
season = summer | type = registered
season = summer | type = casual
season = fall | type = registered
season = fall | type = casual
count
0
50
100
150
200
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday
weekday

[17]: