

Data transformation using `.groupby().transform`

OPTIMIZING PYTHON CODE WITH PANDAS



Leonidas Souliotis
PhD Candidate

The restaurant dataset

```
| total_bill | tip | sex | smoker | day | time |
|-----|-----|-----|-----|-----|-----|
| 16.99 | 1.01 | Female | No | Sun | "Dinner" |
| 10.34 | 1.66 | Male | No | Sun | "Dinner" |
```

```
restaurant_grouped = restaurant.groupby('smoker')
```

```
print(restaurant_grouped.count())
```

```
| | total_bill | tip | sex | day | time |
|-----|-----|-----|-----|-----|-----|
| smoker | | | | | |
| No | 151 | 151 | 151 | 151 | 151 |
| Yes | 93 | 93 | 93 | 93 | 93 |
```

Data transformation

```
zscore = lambda x: (x - x.mean()) / x.std()
```

```
restaurant_grouped = restaurant.groupby('time')  
restaurant_transformed = restaurant_grouped.transform(zscore)
```

```
restaurant_transformed.head()
```

```
total_bill    tip    size  
0  -0.416446 -1.457045 -0.692873  
1  -1.143855 -1.004475  0.405737  
2   0.023282  0.276645  0.405737
```

Comparison with native methods

```
restaurant.groupby('sex').transform(zscore)

mean_female = restaurant.groupby('sex').mean()['total_bill']['Female']
mean_male = restaurant.groupby('sex').mean()['total_bill']['Male']
std_female = restaurant.groupby('sex').std()['total_bill']['Female']
std_male = restaurant.groupby('sex').std()['total_bill']['Male']

for i in range(len(restaurant)):
    if restaurant.iloc[i][2] == 'Female':
        restaurant.iloc[i][0] = (restaurant.iloc[i][0] - mean_female)/std_female
    else:
        restaurant.iloc[i][0] = (restaurant.iloc[i][0] - mean_male)/std_male
```

Results from the first operation calculated in 0.016291141 seconds

Results from the second operation calculated in 3.937326908 seconds

Difference in time: 24,068.5145%

Let's practice!

OPTIMIZING PYTHON CODE WITH PANDAS

Missing value imputation using `transform()`

OPTIMIZING PYTHON CODE WITH PANDAS



Leonidas Souliotis
PhD Candidate

Counting missing values

```
prior_counts = restaurant.groupby('time')  
['total_bill'].count()
```

```
missing_counts = restaurant_nan.groupby('time')  
['total_bill'].count()  
print(prior_counts - missing_counts)
```

```
time  
Dinner    32  
Lunch     13  
Name: total_bill, dtype: int64
```

Missing value imputation

```
missing_trans = lambda x: x.fillna(x.mean())
```

```
restaurant_nan_grouped = restaurant_nan.groupby('time')['total_bill']  
restaurant_nan_grouped.transform(missing_trans)
```

```
Results from the above operation calculated in 0.00368881225586 seconds
```

```
0    20.676573
```

```
1    10.340000
```

```
2    21.010000
```

```
3    23.680000
```

```
4    24.590000
```

```
5    25.290000
```

```
6    20.676573
```

```
Name: total_bill, dtype: float64
```


Comparison with native methods

```
start_time = time.time()
mean_din = restaurant_nan.loc[restaurant_nan.time ==
    'Dinner']['total_bill'].mean()
mean_lun = restaurant_nan.loc[restaurant_nan.time ==
    'Lunch']['total_bill'].mean()

for row in range(len(restaurant_nan)):
    if restaurant_nan.iloc[row]['time'] == 'Dinner':
        restaurant_nan.loc[row, 'total_time'] = mean_din
    else:
        restaurant_nan.loc[row, 'total_time'] = mean_lun
print("Results from the above operation calculated in %s seconds" % (time.time() - start_time))
```

```
Results from the above operation calculated in 0.172566890717 seconds
```

```
Difference in time: 4,578.115%
```

Let's do it!

OPTIMIZING PYTHON CODE WITH PANDAS

Data filtration using the filter() function

OPTIMIZING PYTHON CODE WITH PANDAS



Leonidas Souliotis
PhD Candidate

Purpose of filter()

Limit results based on an aggregate feature

- Number of missing values
- Mean of a specific feature
- Number of occurrences of the group

Filter using `groupby().filter()`

```
restaurant_grouped = restaurant.groupby('day')
filter_trans = lambda x : x['total_bill'].mean() > 20
restaurant_filtered = restaurant_grouped.filter(filter_trans)
```

Results from the above operation calculated in 0.00414085388184 seconds

```
print(restaurant_filtered['tip'].mean())
```

3.11527607362

```
print(restaurant['tip'].mean())
```

2.9982786885245902

Comparison with native methods

```
t=[restaurant.loc[df['day'] == i]['tip'] for i in restaurant['day'].unique()
    if restaurant.loc[df['day'] == i]['total_bill'].mean()>20]
restaurant_filtered = t[0]
for j in t[1:]:
    restaurant_filtered=restaurant_filtered.append(j,ignore_index=True)
```

Results from the above operation calculated in 0.00663900375366 seconds

```
print(restaurant_filtered.mean())
```

3.11527607362

Difference in time: 60.329341317157024%

Let's do it!

OPTIMIZING PYTHON CODE WITH PANDAS

Congratulations!

OPTIMIZING PYTHON CODE WITH PANDAS



Leonidas Souliotis

PhD Candidate

What you have learned

- Why and how to time operations
- Select targeted rows and columns efficiently
- Select random rows and columns efficiently
- Replace values of a DataFrame efficiently using `replace()`
 - Replace multiple values using lists
 - Replace multiple values using dictionaries

What you have learned

- Iterate on a DataFrame using the `.iterrows()` function
- Iterate on a DataFrame using the `.apply()` function
- Iterate on a DataFrame using pandas optimization
- Iterate on a DataFrame using numpy optimization
- Comparison of the `groupby()` function compared to native python code
 - When transforming the data group-wise
 - When imputing missing values group-wise
 - When filtering groups with specific characteristics

Congratulations!

OPTIMIZING PYTHON CODE WITH PANDAS