Statistics and distance based features

This video is dedicated to the following advanced feature engineering techniques. Calculating various statistics of one feature grouped by another and features derived from neighborhood analysis of a given point.

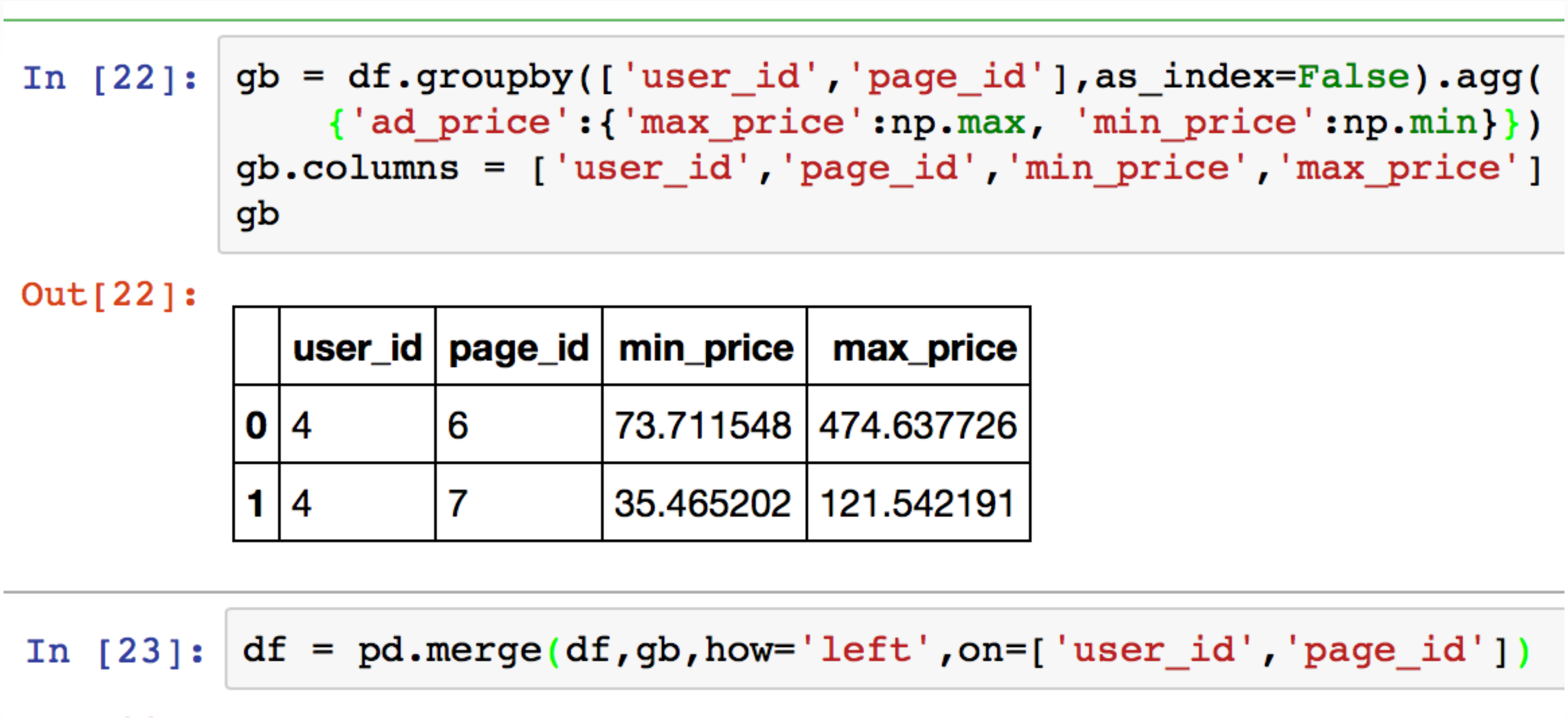
Some data for CTR task

	User_id	Page_id	Ad_price	Ad_position
0	4	6	165.977125	Bottom_right
1	4	6	34.5395640	Bottom_right
2	4	6	29.1963786	Bottom_left
3	4	6	79.4373729	Bottom_left
4	4	6	290.534595	Bottom_right
5	4	6	314.412660	Bottom_right
6	4	6	138.9007639	Bottom_right
7	4	6	107.4711914	Bottom_right
8	4	6	242.1089786	Bottom_left
9	4	7	27.16719836	Bottom_left
10	4	7	413.5421978	Bottom_right

Useful features

	User_id	Page_id	Ad_price	Ad_position	Max_price	min_price	Min_price _position
0	4	6	95.874252	Bottom_right	474.63772	73.711548	Bottom_left
1	4	6	215.751007	Bottom_right	474.63772	73.711548	Bottom_left
2	4	6	474.637726	Bottom_left	474.63772	73.711548	Bottom_left
3	4	6	73.711548	Bottom_left	474.63772	73.711548	Bottom_left
4	4	6	79.288841	Bottom_right	474.63772	73.711548	Bottom_left
5	4	6	271.391785	Bottom_right	474.63772	73.711548	Bottom_left
6	4	6	296.529053	Bottom_right	474.63772	73.711548	Bottom_left
7	4	6	96.030029	Bottom_right	474.63772	73.711548	Bottom_left
8	4	6	130.175064	Bottom_left	474.63772	73.711548	Bottom_left
9	4	7	35.465202	Bottom_left	121.54219	35.465202	Bottom_left
10	4	7	121.542191	Bottom_right	121.54219	35.465202	Bottom_left

Useful features: implementation



In [22]:

```
gb = df.groupby(['user_id','page_id'],as_index=False).agg(
        {'ad_price':{'max_price':np.max, 'min_price':np.min}})
gb.columns = ['user_id','page_id','min_price','max_price']
gb
```

Out[22]:

	user_id	page_id	min_price	max_price
0	4	6	73.711548	474.637726
1	4	7	35.465202	121.542191

In [23]:

```
df = pd.merge(df,gb,how='left',on=['user_id','page_id'])
```

More features

- How many pages user visited
- Standard deviation of prices
- Most visited page
- Many, many more

Neighbors

- Explicit group is not needed
- More flexible
- Much harder to implement

Neighbors

- Number of houses in 500m, 1000m,..
- Average price per square meter in 500m, 1000m,..
- Number of schools/supermarkets/parking lots in 500m, 1000m,..
- Distance to closest subway station

Neighbors

- Explicit group is not needed
- More flexible
- Much harder to implement

KNN features in Springleaf

- Mean encode all the variables
- For every point, find 2000 nearest neighbors using

Bray-Curtis metric

$$\sum |u_i - v_i| / \sum |u_i + v_i|$$

- Calculate various features from those 2000 neighbors

KNN features in Springleaf

- Mean target of nearest 5,10,15,500, 2000 neighbors
- Mean distance to 10 closest neighbors
- Mean distance to 10 closest neighbors with target 1
- Mean distance to 10 closest neighbors with target 0

Thank you