Organizing Meal Product

September 13, 2025

1 Organizing Meal Product per Shop

This notebook extends the previous meal deal optimization by creating **multiple meal deals** per shop using:
- Top N **best-selling** products - Bottom M **least-selling** products

Each deal has a **suggested price** based on historical prices.

Benefits:
- Promote several least-selling items alongside popular ones.
- Provide variety for customers.
- Increase overall order value.

1.1 Step 1: Import Libraries

[1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import itertools

sns.set(style="whitegrid")
```

1.2 Step 2: Create Sample Dataset

[2]:
```
# Simulated dataset with price information
np.random.seed(42)

shops = ['Pizza Hub', 'Sushi World', 'Burger Town', 'Healthy Bites']
foods = {
    'Pizza Hub': ['Margherita', 'Pepperoni', 'BBQ Chicken', 'Veggie Pizza'],
    'Sushi World': ['Salmon Roll', 'Tuna Sashimi', 'California Roll', 'Miso␣
 ↪Soup'],
    'Burger Town': ['Cheeseburger', 'Chicken Burger', 'Fries', 'Onion Rings'],
    'Healthy Bites': ['Vegan Salad', 'Avocado Toast', 'Smoothie Bowl', 'Quinoa␣
 ↪Wrap']
}
```

```
# Random price for each item
food_prices = {shop: {food: round(np.random.uniform(5,15),2) for food in items}␣
↪for shop, items in foods.items()}

rows = []
order_id = 1
for _ in range(1000):
    shop = np.random.choice(shops)
    food = np.random.choice(foods[shop])
    customer = np.random.randint(1, 200)
    qty = np.random.randint(1, 4)
    price = food_prices[shop][food] * qty
    rows.append([order_id, shop, customer, food, qty, price])
    order_id += 1

data = pd.DataFrame(rows,␣
↪columns=['order_id','shop_id','customer_id','food_item','quantity','price'])
data.head()
```

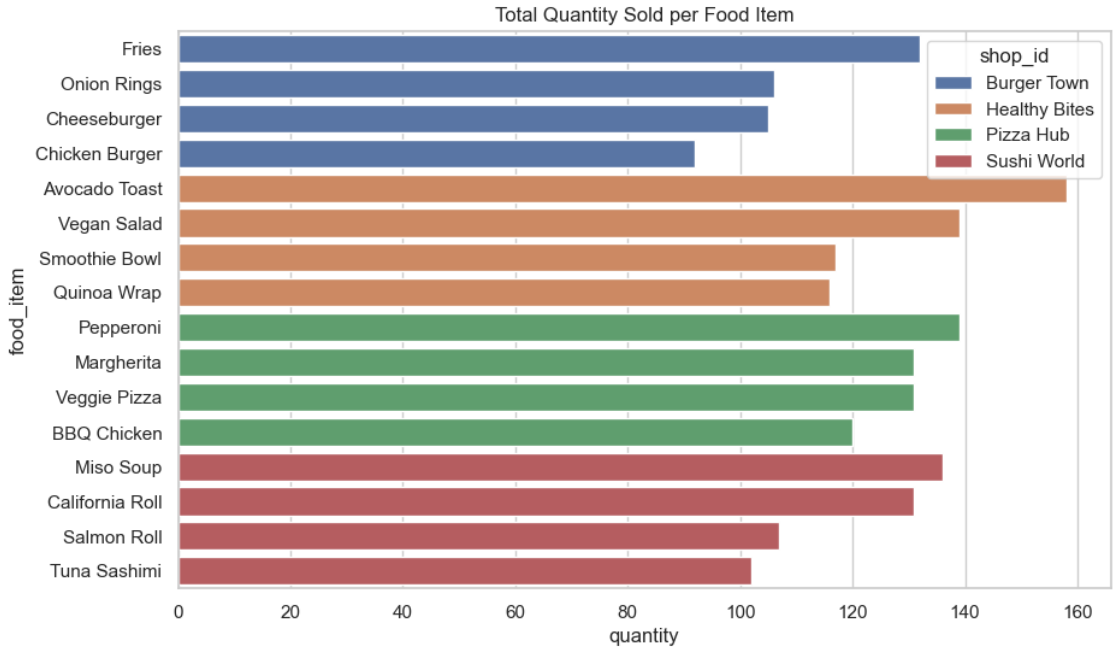
[2]:

	order_id	shop_id	customer_id	food_item	quantity	price
0	1	Healthy Bites	22	Avocado Toast	1	7.12
1	2	Healthy Bites	49	Vegan Salad	3	39.96
2	3	Burger Town	170	Fries	3	15.63
3	4	Sushi World	175	Tuna Sashimi	2	13.12
4	5	Burger Town	55	Onion Rings	1	14.70

1.3 Step 3: Exploratory Data Analysis

[3]:
```
# Total quantity per item
item_sales = data.groupby(['shop_id','food_item'])['quantity'].sum().
↪reset_index()
item_sales.sort_values(['shop_id','quantity'], ascending=[True, False],␣
↪inplace=True)

# Plot total quantity per shop
plt.figure(figsize=(10,6))
sns.barplot(data=item_sales, x='quantity', y='food_item', hue='shop_id',␣
↪dodge=False)
plt.title("Total Quantity Sold per Food Item")
plt.show()
```



1.4 Step 4: Top N & Bottom M Items per Shop

[4]:
```
N = 2  # Top 2 best-selling items
M = 2  # Bottom 2 least-selling items

# Create best-selling and least-selling item lists per shop
best_items = item_sales.groupby('shop_id').apply(lambda x: x.nlargest(N,␣
↪'quantity')).reset_index(drop=True)
least_items = item_sales.groupby('shop_id').apply(lambda x: x.nsmallest(M,␣
↪'quantity')).reset_index(drop=True)

best_items.rename(columns={'food_item':'best_item','quantity':'best_qty'},␣
↪inplace=True)
least_items.rename(columns={'food_item':'least_item','quantity':'least_qty'},␣
↪inplace=True)

best_items, least_items
```

```
C:\Users\SPINO SHOP\AppData\Local\Temp\ipykernel_22656\2911934708.py:5:
DeprecationWarning: DataFrameGroupBy.apply operated on the grouping columns.
This behavior is deprecated, and in a future version of pandas the grouping
columns will be excluded from the operation. Either pass `include_groups=False`
to exclude the groupings or explicitly select the grouping columns after groupby
to silence this warning.
  best_items = item_sales.groupby('shop_id').apply(lambda x: x.nlargest(N,
'quantity')).reset_index(drop=True)
```

```
C:\Users\SPINO SHOP\AppData\Local\Temp\ipykernel_22656\2911934708.py:6:
DeprecationWarning: DataFrameGroupBy.apply operated on the grouping columns.
This behavior is deprecated, and in a future version of pandas the grouping
columns will be excluded from the operation. Either pass `include_groups=False`
to exclude the groupings or explicitly select the grouping columns after groupby
to silence this warning.
  least_items = item_sales.groupby('shop_id').apply(lambda x: x.nsmallest(M,
'quantity')).reset_index(drop=True)
```

[4]:
```
(         shop_id        best_item  best_qty
 0    Burger Town            Fries       132
 1    Burger Town      Onion Rings       106
 2  Healthy Bites    Avocado Toast       158
 3  Healthy Bites      Vegan Salad       139
 4      Pizza Hub        Pepperoni       139
 5      Pizza Hub       Margherita       131
 6    Sushi World        Miso Soup       136
 7    Sushi World  California Roll       131,
          shop_id      least_item  least_qty
 0    Burger Town  Chicken Burger         92
 1    Burger Town    Cheeseburger        105
 2  Healthy Bites     Quinoa Wrap        116
 3  Healthy Bites   Smoothie Bowl        117
 4      Pizza Hub     BBQ Chicken        120
 5      Pizza Hub      Margherita        131
 6    Sushi World    Tuna Sashimi        102
 7    Sushi World     Salmon Roll        107)
```

1.5 Step 5: Meal Deal Creation

[5]:
```
meal_deals_list = []

for shop in shops:
    best_list = best_items[best_items['shop_id']==shop]
    least_list = least_items[least_items['shop_id']==shop]

    # Create all combinations of best + least items
    for b, l in itertools.product(best_list.itertuples(index=False), least_list.
 ↪itertuples(index=False)):
        meal_deals_list.append({
            'shop_id': shop,
            'best_item': b.best_item,
            'best_qty': b.best_qty,
            'least_item': l.least_item,
            'least_qty': l.least_qty
        })
```

```
meal_deals = pd.DataFrame(meal_deals_list)
meal_deals.head()
```

[5]:

	shop_id	best_item	best_qty	least_item	least_qty
0	Pizza Hub	Pepperoni	139	BBQ Chicken	120
1	Pizza Hub	Pepperoni	139	Margherita	131
2	Pizza Hub	Margherita	131	BBQ Chicken	120
3	Pizza Hub	Margherita	131	Margherita	131
4	Sushi World	Miso Soup	136	Tuna Sashimi	102

1.6 Step 6: Suggested Meal Deal Price

[6]:
```
# Average price per item
avg_prices = data.groupby(['shop_id','food_item'])['price'].sum()/data.
 ↪groupby(['shop_id','food_item'])['quantity'].sum()

def get_price(row):
    best_price = avg_prices.loc[row['shop_id'], row['best_item']]
    least_price = avg_prices.loc[row['shop_id'], row['least_item']]
    # Suggested price: 90% of sum of individual prices
    return round(0.9*(best_price + least_price),2)

meal_deals['suggested_price'] = meal_deals.apply(get_price, axis=1)
meal_deals
```

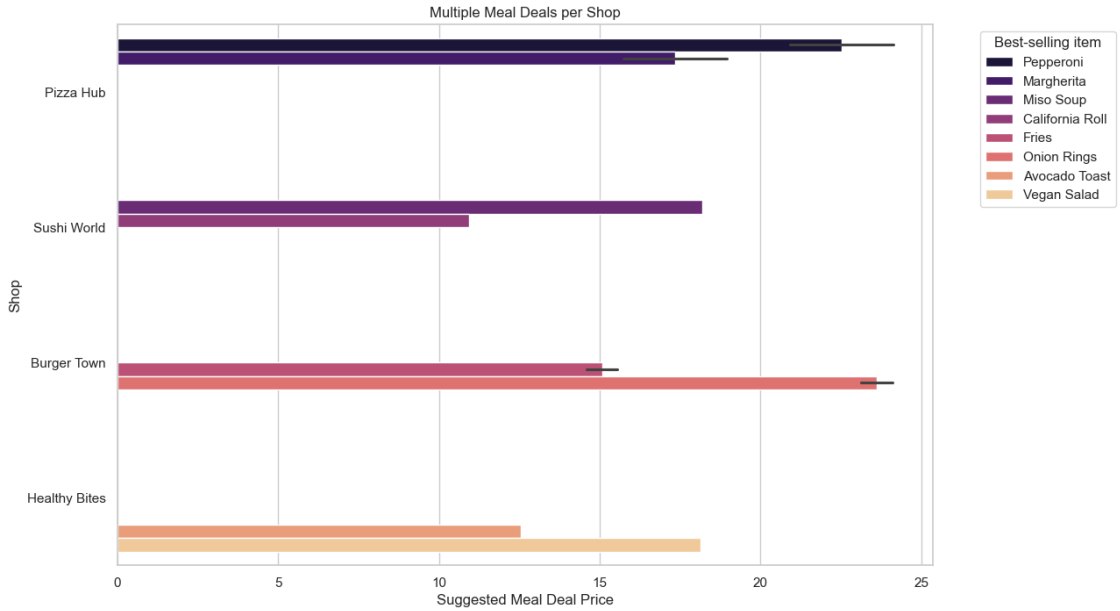
[6]:

	shop_id	best_item	best_qty	least_item	least_qty	suggested_price
0	Pizza Hub	Pepperoni	139	BBQ Chicken	120	24.15
1	Pizza Hub	Pepperoni	139	Margherita	131	20.93
2	Pizza Hub	Margherita	131	BBQ Chicken	120	18.96
3	Pizza Hub	Margherita	131	Margherita	131	
4	Sushi World	Miso Soup	136	Tuna Sashimi	102	
5	Sushi World	Miso Soup	136	Salmon Roll	107	
6	Sushi World	California Roll	131	Tuna Sashimi	102	
7	Sushi World	California Roll	131	Salmon Roll	107	
8	Burger Town	Fries	132	Chicken Burger	92	
9	Burger Town	Fries	132	Cheeseburger	105	
10	Burger Town	Onion Rings	106	Chicken Burger	92	
11	Burger Town	Onion Rings	106	Cheeseburger	105	
12	Healthy Bites	Avocado Toast	158	Quinoa Wrap	116	
13	Healthy Bites	Avocado Toast	158	Smoothie Bowl	117	
14	Healthy Bites	Vegan Salad	139	Quinoa Wrap	116	
15	Healthy Bites	Vegan Salad	139	Smoothie Bowl	117	

```
3              15.75
4              18.20
5              18.20
6              10.93
7              10.93
8              15.56
9              14.60
10             24.10
11             23.14
12             12.56
13             12.55
14             18.14
15             18.13
```

1.7 Step 7: Visualize Multiple Meal Deals

[7]:
```
plt.figure(figsize=(12,8))
sns.barplot(data=meal_deals, x='suggested_price', y='shop_id', hue='best_item',␣
↪dodge=True, palette='magma')
plt.xlabel("Suggested Meal Deal Price")
plt.ylabel("Shop")
plt.title("Multiple Meal Deals per Shop")
plt.legend(title='Best-selling item', bbox_to_anchor=(1.05, 1), loc='upper left')
plt.show()
```



1.8 Step 8: Conclusion & Business Use Case

- We created **multiple meal deals** per shop using several top-selling and least-selling items.
- Suggested **prices** for each meal deal with a discount strategy.
- Variety in deals can help promote less popular items while maintaining appeal of best-sellers.

Next Steps:
- Use real Provider order and price data.
- Experiment with different discount rates for meal deals.
- Automate the creation of new meal deals weekly or monthly.