

Recommender System Study Case



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BACKGROUND



BUSINESS GOAL

- 👍 Implement a recommender system.
- 👍 Cold start problem: offer relevant products to new customers.

SUCCESS CRITERIA

- 👍 Increase on sales
- 👍 Improve customer satisfaction

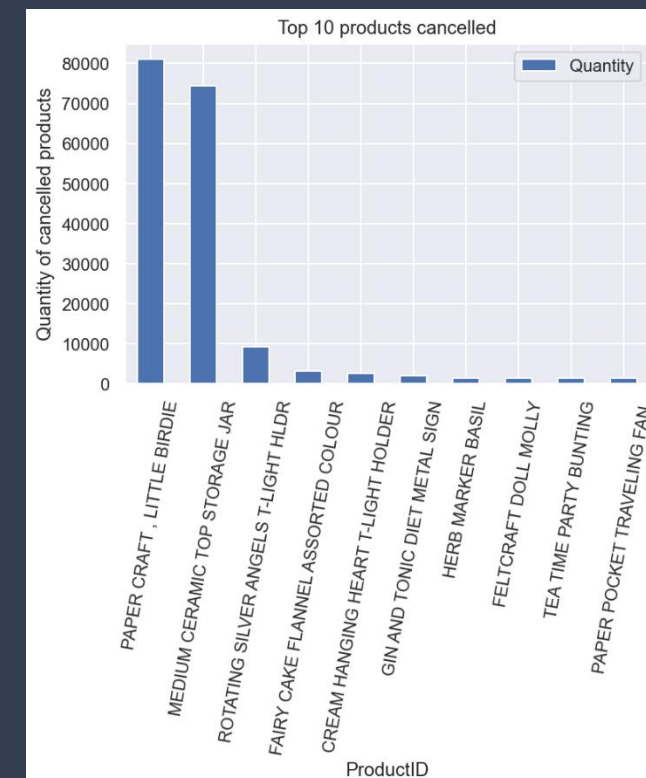
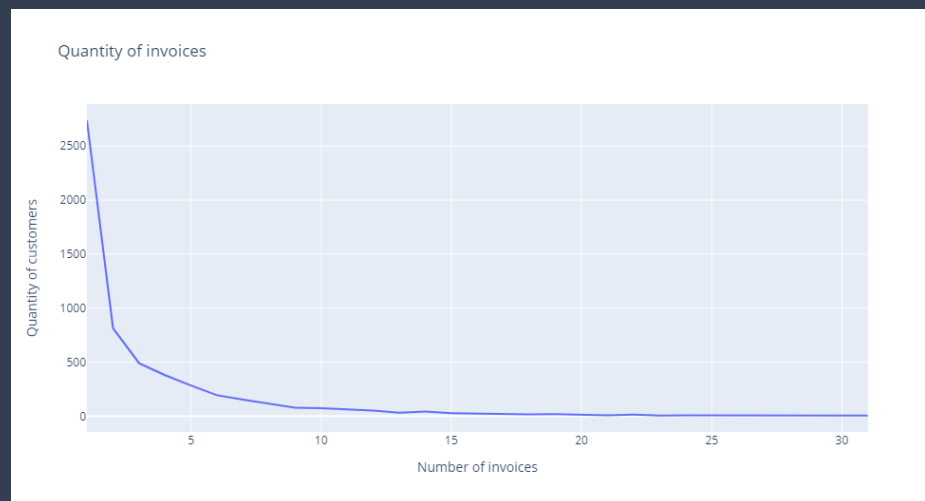
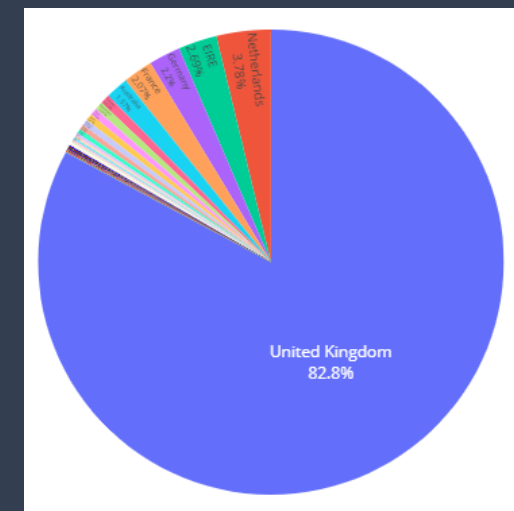
KEY FINDINGS

👍 The period with most purchased is from September-November

👍 UK represents more than 80% of the sales volume

👍 The most canceled item is PaperCraft followed by Medium Ceramic

👍 Most customers buy only one order and few of them bought more than 15 times.



PROJECT PLAN



Data Preparation:

- Remove duplicates observations
- Eliminate *StockCode* items which didn't fit the proposed format
- Remove items which price were equal 0
- 2% removed of total data



Feature Engineering:

- Only one new variable created: Month-Year.
- For missing *CustomerID* there were created a fake customer id number, according the invoice number to analyse the sales. To recommendations, they were treated as a new customer.

```
Raw dataset info
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Number of users: 4362
Number of items: 3676
Sparsity: 2.492%
Limited dataset info
-----
Number of iterations until convergence: 2
Number of users: 4120
Number of items: 3196
Sparsity: 3.023%
```



Modelling:

- Reduce sparsity
- Grouped the data according with the quantity (Level confidence) and removed items/users with quantity = 0
- Create 2 sparse matrices
- Split training and test data (20%) – Masked data.
- Fit the models: ALS, LMF and BPR
- HyperParameter tuning



Evaluation:

- AUC Metric
- Analysis of recommendations

RESULTS

Algorithm

Final: AlternatingLeastSquares



Alternating Least Squares

- Best score: 0.817
- Best parameters: alpha: 15, factors: 50, regulation: 0.1, interactions: 40

Recommendations

A user's most purchased products

	Description	Quantity
132309	GLASS APOTHECARY BOTTLE TONIC	12.0
132310	GLASS TWIST BON BON JAR	12.0
132308	GLASS BEURRE DISH	8.0
132311	GLASS SONGBIRD STORAGE JAR	8.0
132312	SET OF 16 VINTAGE ROSE CUTLERY	1.0
132313	SET OF 16 VINTAGE PISTACHIO CUTLERY	1.0
132314	SET OF 16 VINTAGE RED CUTLERY	1.0
132315	SET OF 16 VINTAGE BLACK CUTLERY	1.0
132316	SET OF 16 VINTAGE SKY BLUE CUTLERY	1.0

Recommended products

	Descriptions	score
0	LARGE CERAMIC TOP STORAGE JAR	0.776905
1	REGENCY CAKE FORK	0.752191
2	PARISIENNE JEWELLERY DRAWER	0.741099
3	SILVER PLATE CANDLE BOWL SMALL	0.739686
4	PARISIENNE CURIO CABINET	0.732049
5	PACK OF SIX LED TEA LIGHTS	0.731849
6	MEDIUM CERAMIC TOP STORAGE JAR	0.698534
7	RED ENCHANTED FOREST PLACEMAT	0.696665
8	PARISIENNE SEWING BOX	0.693496
9	HAIRCLIPS FORTIES FABRIC ASSORTED	0.692437

Finding similar items

Most similar products to: SMALL MARSHMALLOWS PINK BOWL :

SMALL CHOCOLATES PINK BOWL
SMALL DOLLY MIX DESIGN ORANGE BOWL
BISCUITS SMALL BOWL LIGHT BLUE
RED PUDDING SPOON
PACK OF 20 SKULL PAPER NAPKINS
PACK OF 6 SKULL PAPER PLATES
PACK OF 6 SKULL PAPER CUPS
DOG BOWL CHASING BALL DESIGN
RED RETROSPOT BOWL
EDWARDIAN DROP EARRINGS JET BLACK

Cold Start – New users

['POPCORN HOLDER',
'RABBIT NIGHT LIGHT',
"PAPER CHAIN KIT 50'S CHRISTMAS ",
'JUMBO BAG RED RETROSPOT',
'ASSORTED COLOUR BIRD ORNAMENT',
'WOODEN STAR CHRISTMAS SCANDINAVIAN',
'DISCO BALL CHRISTMAS DECORATION',
'WORLD WAR 2 GLIDERS ASSTD DESIGNS',
'WOODEN HEART CHRISTMAS SCANDINAVIAN',
'CREAM HANGING HEART T-LIGHT HOLDER']

KEY TAKEAWAYS



Results: The model presents an AUC of 80%, that means the model properly predicts recommendations 80% of the times.



Cold Start Problem: Recommendations will be made according to the location of the customer.



Next Step: Implement the recommender system on the website.



Suggestions:

- Collect customer preferences to improve the recommendations of new customers
- More data about products attributes.