

***Sentiment-Based Product Recommendation System
using PySpark***

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Problem & Objective

Problem: Customers need help finding similar and good quality products

Objective: Building a scalable recommendation system that learns from customer sentiments through reviews and makes appropriate recommendations

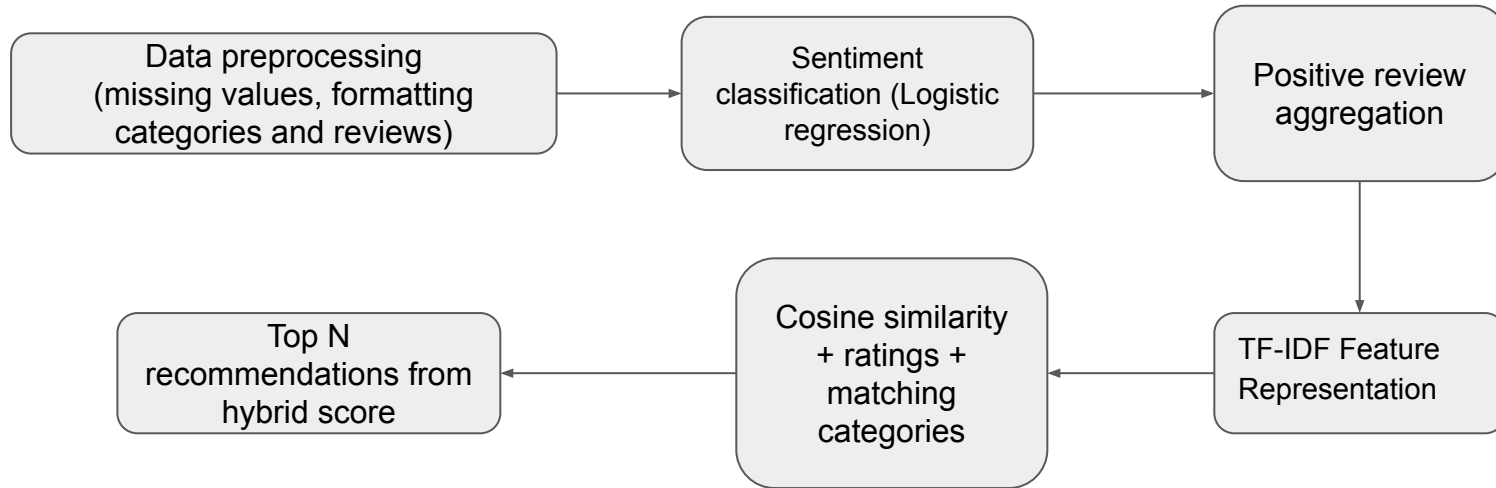
Main data used:

- Product name
- Product categories
- User rating
- User review/feedback
- User predefined sentiment

name	categories	reviews_text	user_sentiment	reviews_rating	reviews_username
Pink Friday: Roma...	Movies, Music & B...	i love this album...	Positive	5	joshua
Lundberg Organic ...	Food, Packaged Foo...	Good flavor. This...	Positive	5	dorothy w
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K-Y Love Sensuali...	Personal Care, Med...	I read through th...	Negative	1	rebecca
K-Y Love Sensuali...	Personal Care, Med...	My husband bought...	Negative	1	walker557
K-Y Love Sensuali...	Personal Care, Med...	My boyfriend and ...	Negative	1	samantha
K-Y Love Sensuali...	Personal Care, Med...	Bought this earli...	Negative	1	raeanne
K-Y Love Sensuali...	Personal Care, Med...	I bought this pro...	Negative	1	kimmie
K-Y Love Sensuali...	Personal Care, Med...	My husband and I ...	Negative	1	cassie
K-Y Love Sensuali...	Personal Care, Med...	Got as a surprise...	Positive	1	moore222
K-Y Love Sensuali...	Personal Care, Med...	tried it with my ...	Negative	1	jds1992
K-Y Love Sensuali...	Personal Care, Med...	Purchased this th...	Positive	1	bre234
K-Y Love Sensuali...	Personal Care, Med...	Bought this to en...	Negative	1	jds1992
K-Y Love Sensuali...	Personal Care, Med...	I bought this aft...	Negative	1	gordy313
K-Y Love Sensuali...	Personal Care, Med...	First time purcha...	Positive	1	nicole
K-Y Love Sensuali...	Personal Care, Med...	I bought this and...	Negative	1	cvperez
K-Y Love Sensuali...	Personal Care, Med...	I bought this pro...	Negative	1	beccagrl532
K-Y Love Sensuali...	Personal Care, Med...	I bought this to ...	Negative	1	sanchez
K-Y Love Sensuali...	Personal Care, Med...	I bought this bec...	Positive	3	1124
K-Y Love Sensuali...	Personal Care, Med...	It was my first t...	Negative	3	browns fan

only showing top 20 rows

Flowchart



Hybrid Recommendation Model

Two Main Components:

1. **Text Similarity:** TF-IDF + Cosine Similarity between aggregated reviews
2. **Product quality:** Normalized average rating

$$\text{Final hybrid score} = x * \text{cosine_similarity} + (1-x) * (\text{average_rating}/5)$$

Sentiment Classification

Metric	Score
Accuracy	0.91
Precision(label 1)	0.96
Recall (label 1)	0.94
F1 Score (label 1)	0.95
AUC	0.895

Sample product recommendation

```
product Iman Luxury Moisturizing Lipstick, Black Brandy 006
mean_similarity 0.23799439473196732
mean_rating 4.828540229885058
```

name	categories	average_rating	similarity	final_score
Burt's Bees Lip Shimmer, Raisin	Personal Care,Makeup,Lipstick, Lip Gloss, & Lip Balm,Lip Gloss,Beauty,Lips,Beauty & Personal Care,Skin Care,Lip Care,Lip Balms & Treatments	4.851034482758621	0.3195174741562711	0.5147243008749071
L'oreal Paris Colour Caresse Wet Shine Stain, Pink Resistance	Personal Care,Makeup,Lipstick, Lip Gloss, & Lip Balm,Lip Gloss,Beauty,Lips	4.666666666666667	0.31774895696132555	0.5024242698729279
Burt's Bees Lip Shimmer, Watermelon	Personal Care,Makeup,Lipstick, Lip Gloss, & Lip Balm,Lip Balm,beauty,Lips,Lip Glosses,Cosmetics	4.625	0.23015430559856023	0.43860801391899223
Weleda Everon Lip Balm	Personal Care,Makeup,Lipstick, Lip Gloss, & Lip Balm,Lip Balm,Beauty,Lip Care	5.0	0.18882657586134532	0.43217860310294176
Soothing Touch Lemon Cardamom Vegan Lip Balm .25 Oz	Personal Care,Makeup,Lipstick, Lip Gloss, & Lip Balm,Lip Balm,Balms & Moisturizers,Beauty,Skin Care,Lip Care,Lips,Balms	5.0	0.13372466100233455	0.39360726275763425

Discussion & Conclusion

Outcome:

- high ratings, low cosine similarity, matching categories

Limitations:

- No ground truth for comparison, limited products, mixed reviews

Improvements:

- Contextual embeddings for reviews, more products