Sentiment Analysis of Amazon's Deteriorated Product Ratings

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Agenda

- **Data collection and Scraping** : Selenium, Beautiful Soup
- **Data Cleaning**: pandas dataframe, Regular Expressions, nltk (text preprocessing)
- **Exploratory Data Analysis**: pandas, seaborn, matplotlib library
- **Sentiment Analysis and Business Recommendation:** Natural Language Processing

Sentiment Analysis

- Contextual mining of texts to identify and **extract subjective information** from a source material
- Sub field **of Natural Language Processing**
- Business Importance: **Businesses gauge customer's opinion** through sentiment analysis of reviews, blogs, social media, reviews, news etc. **to predict market trend** and cater products accordingly

Data Collection

- Amazon Beauty Product dataset from 2014 collected from :

‘http://jmcauley.ucsd.edu/data/amazon/index.html’ UCSD dataset for research purposes

- Additional data scraped using the product asin numbers using selenium and beautiful soup

Features in the Dataset

	reviewerID	asin	reviewerName	helpful	reviewText	overall	summary	unixReviewTime	reviewTime
0	A1YJEY40YUW4SE	7806397051	Andrea	[3, 4]	Very oily and creamy. Not at all what I expect...	1	Don't waste your money	1391040000	01 30, 2014
1	A60XNB876KYML	7806397051	Jessica H.	[1, 1]	This palette was a decent price and I was look...	3	OK Palette!	1397779200	04 18, 2014
2	A3G6XNM240RMWA	7806397051	Karen	[0, 1]	The texture of this concealer pallet is fantas...	4	great quality	1378425600	09 6, 2013

2014- Dataset (9 features, 12101 unique asins)

	asin	name	category	description	price	rating	No_of_Rating
0	9788072216	Prada Candy by Prada for Women 1.7 oz Eau de P...	Fragrance	Brand Prada Scent Honey, Musk , Vanilla Item F...	56.29	4.7	1391
1	B00004TMFE	Avalon Organics Therapy Thickening Conditioner...	Hair Care	Brand Avalon Organics Scent Biotin B Hair Type...	7.81	4.1	5646
2	B00004TUBL	CLASSIC Better Living Two Chamber Dispenser, W...	Bath	Color White Brand CLASSIC Item Dimensions LxWx...	39.99	4.3	99

Scraped Data 2023 (7 features, 4242 unique asins)

Data Cleaning

Removed unwanted columns and kept the following features:

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 4242 entries, 0 to 4241
Data columns (total 13 columns):
 #   Column          Non-Null Count  Dtype
---  ------          --------------  -----
 0   asin            4242 non-null   object
 1   overall         4242 non-null   int64
 2   helpful         4242 non-null   float64
 3   Not helpful     4242 non-null   float64
 4   review_concat   4242 non-null   object
 5   summary_concat  4242 non-null   object
 6   overall rating  4242 non-null   int64
 7   name            4242 non-null   object
 8   category        4242 non-null   object
 9   description     4242 non-null   object
 10  price           4242 non-null   float64
 11  rating          4242 non-null   float64
 12  No_of_Rating    4242 non-null   int64
dtypes: float64(4), int64(3), object(6)
memory usage: 464.0+ KB
```

Merged both the dataset based on asin id

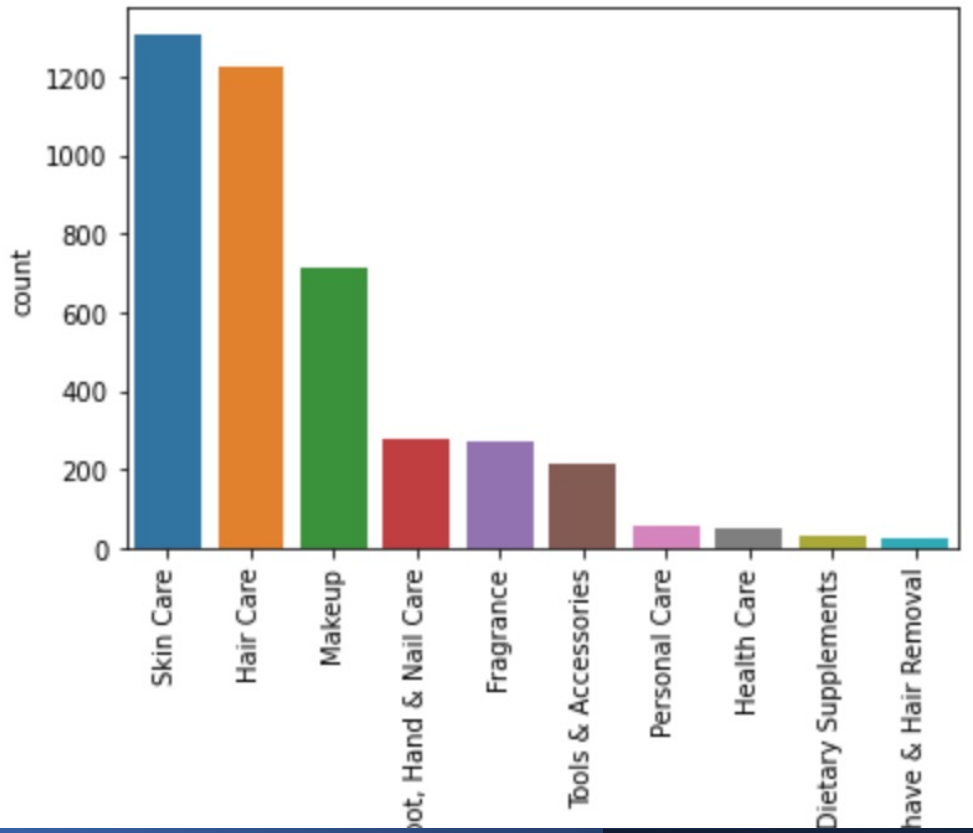
Changed all numerical features to int64 or float64 datatype (whichever applicable)

Preprocessed the datatype object(strings) for NLP

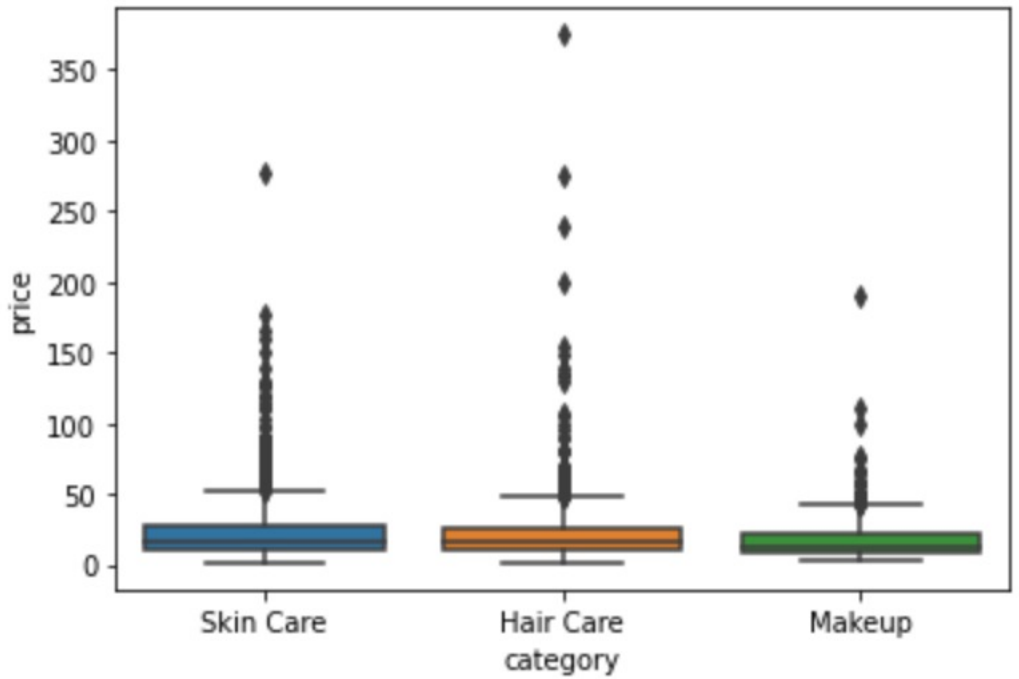
- converted all text to lowercase
- formatted empty spaces
- Expanded contraction (eg. mgmt. to management)
- Filtered all punctuation
- filtered stopwords (have, is, was)
- Lemmetization: getting the root words (better : lemma good)

Exploratory Data Analysis (EDA)

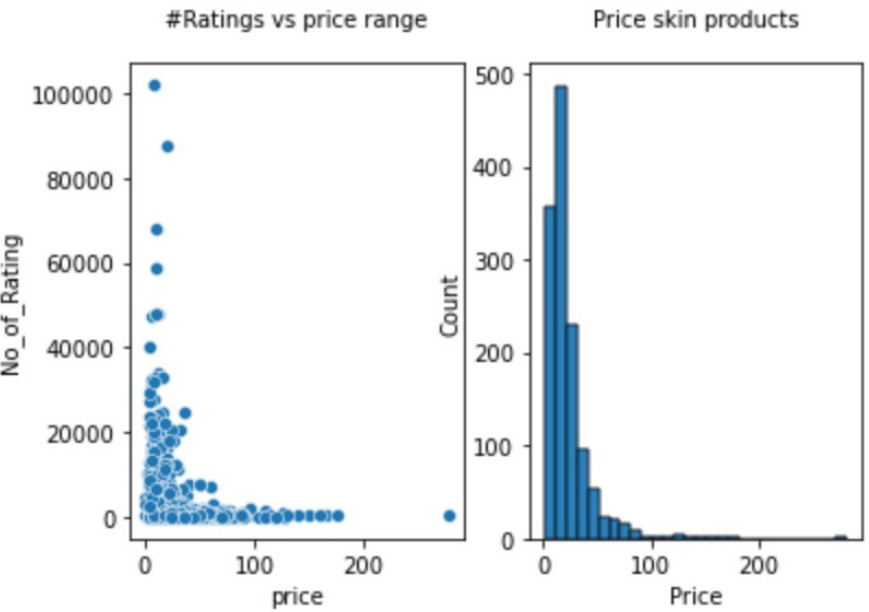
- Top 10 categories of product in the dataset
  - The largest number of products are in the categories: Skin Care, Hair Care & Makeup
  - These 3 categories will be used in sentimental analysis



- Spread of Price within each of the 3 categories
  - The price of products in hair care category is more spread out
  - Analyzed the spread of price vs number of customers around each price range
  - Number of customers is estimated from number of ratings

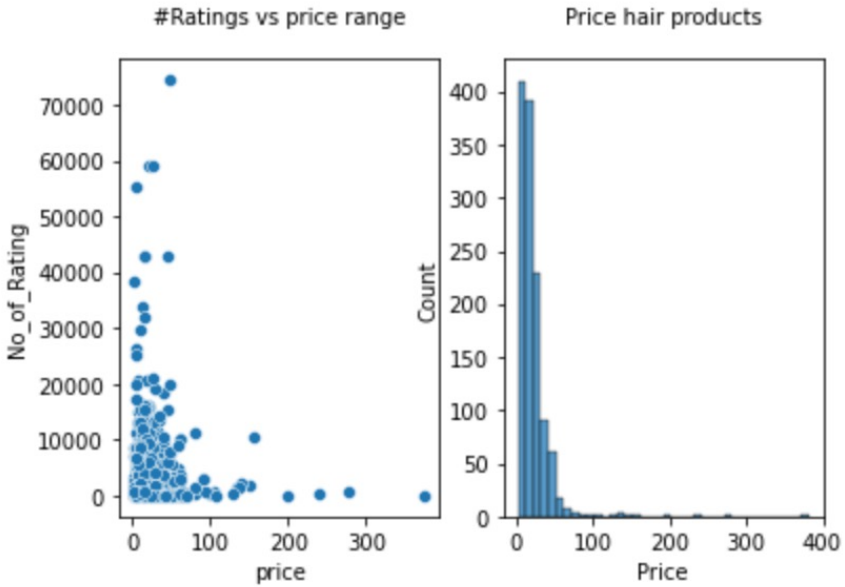


Skin Products

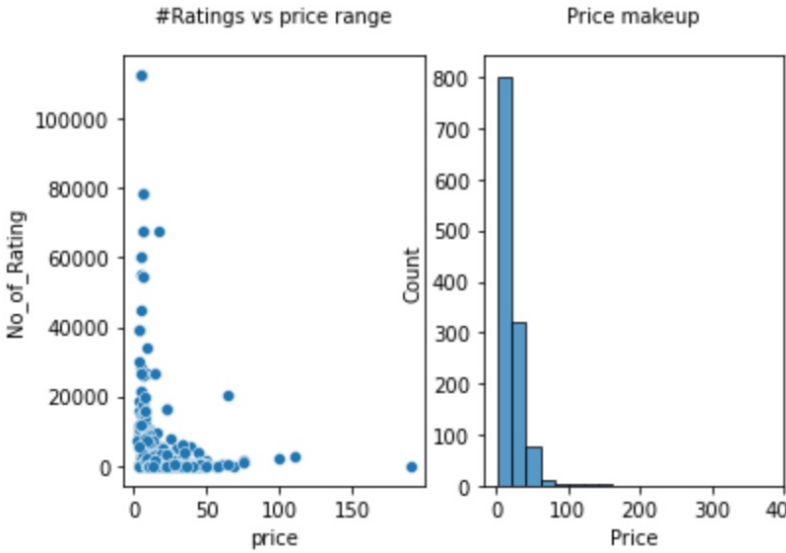


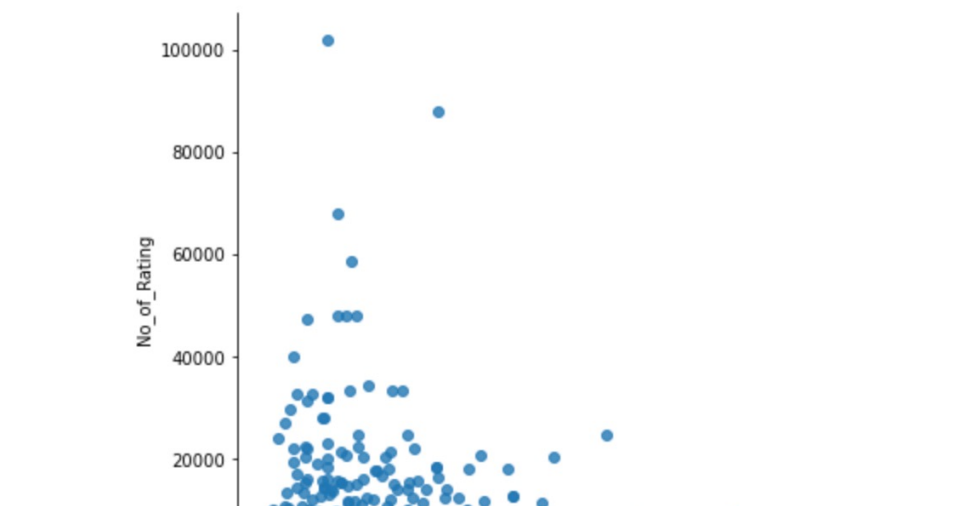
Hair Products

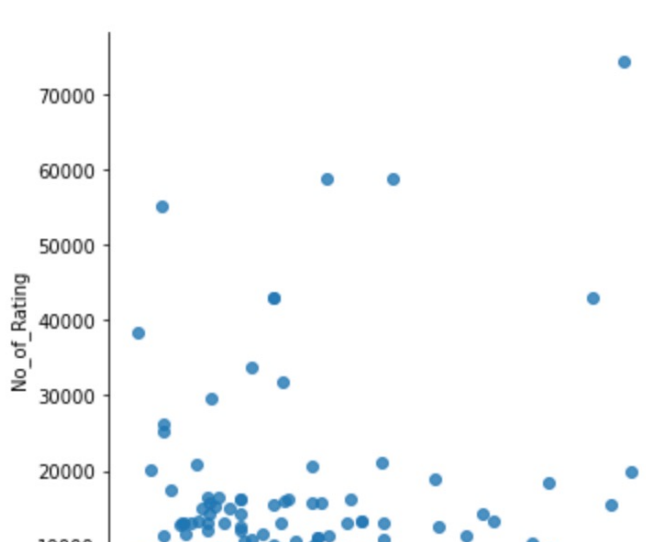
People usually spend more on hair product than skin and makeup

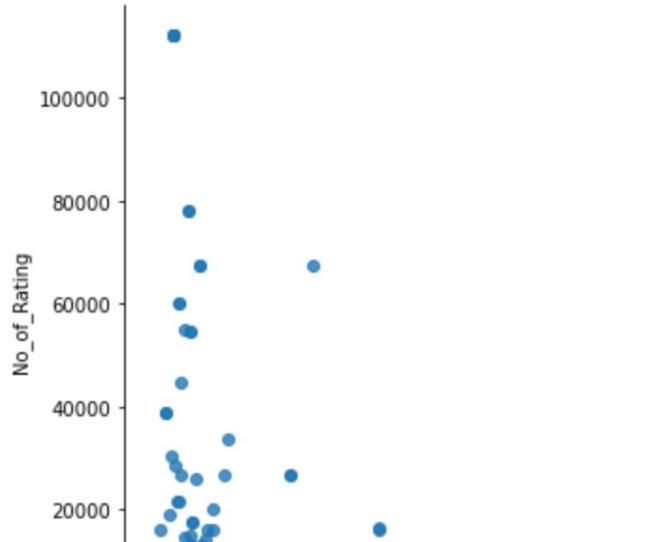


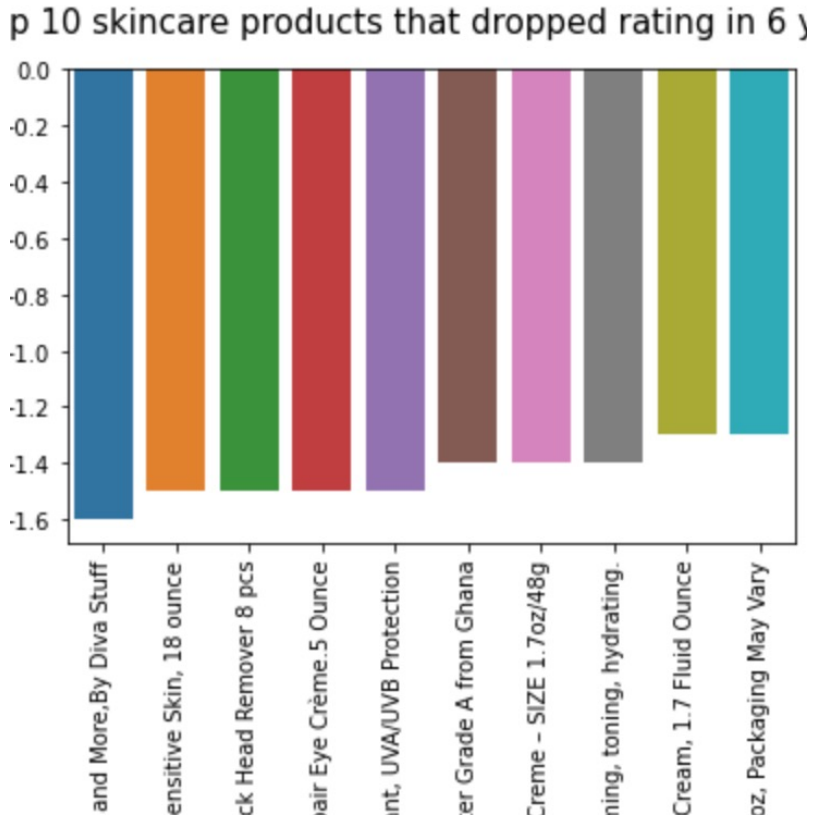
Makeup

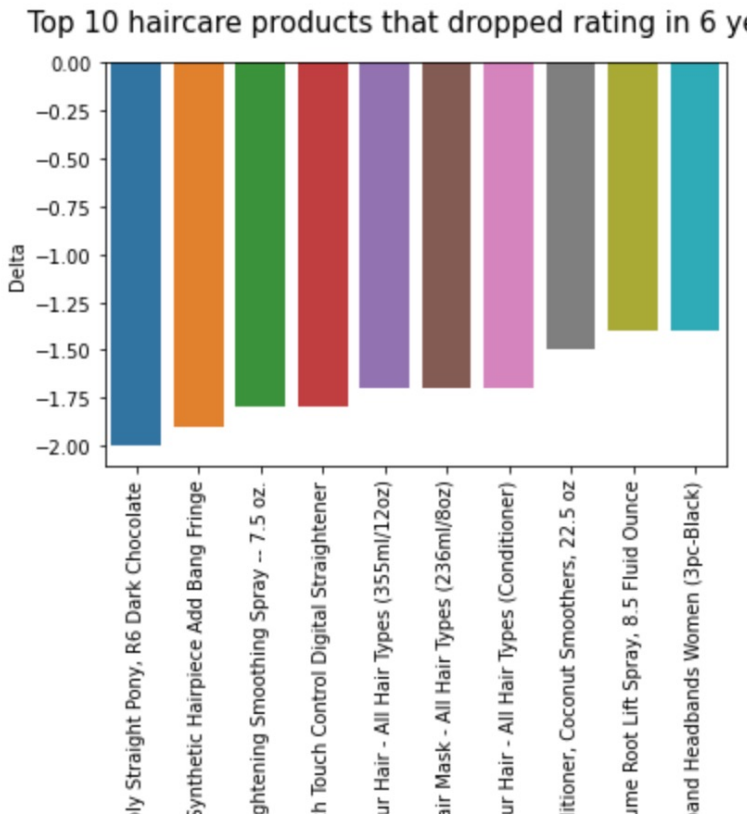


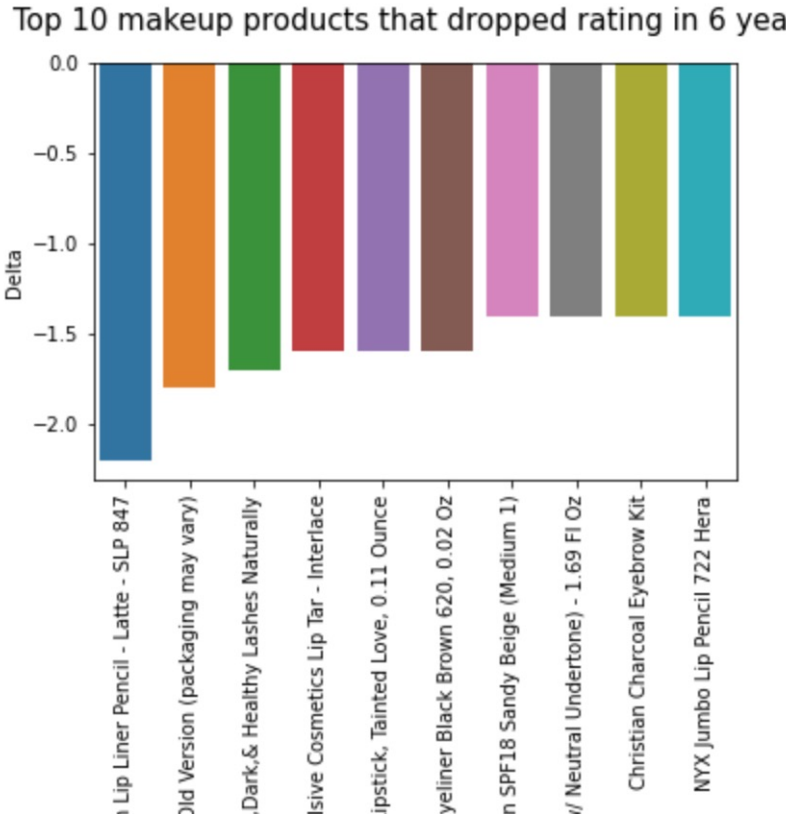










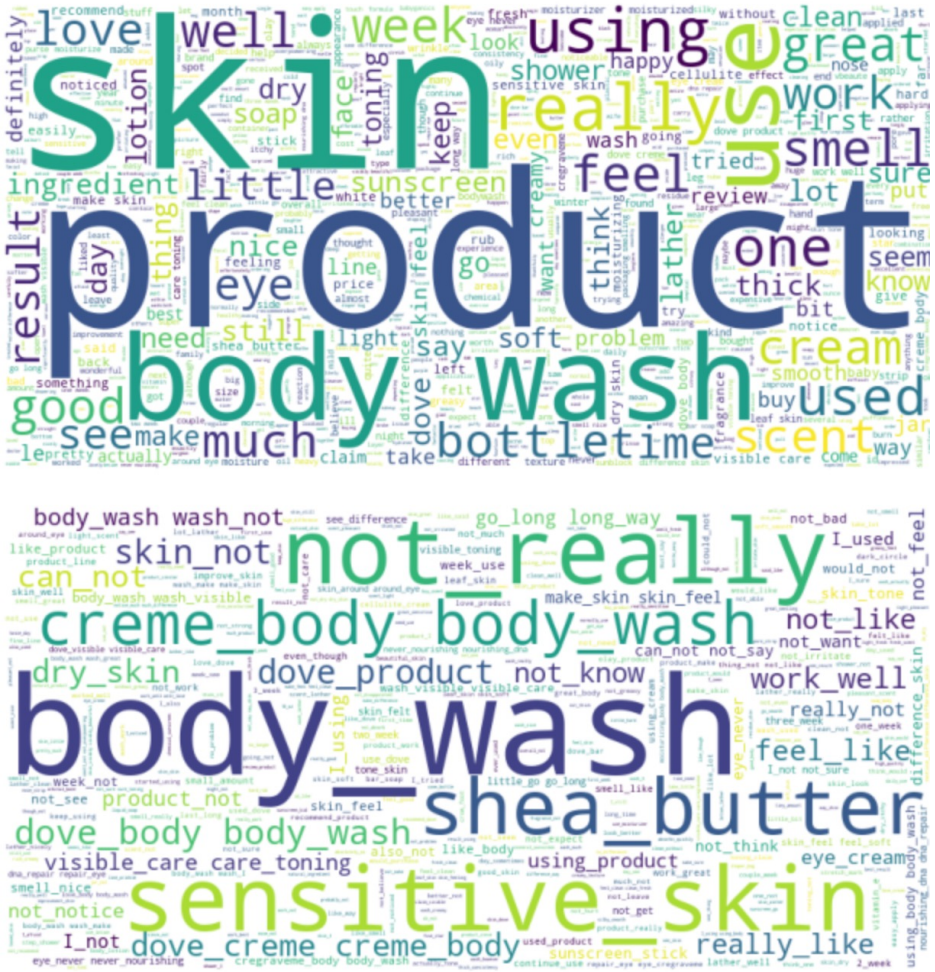


Change in ratings over 9 years (2014-2023)

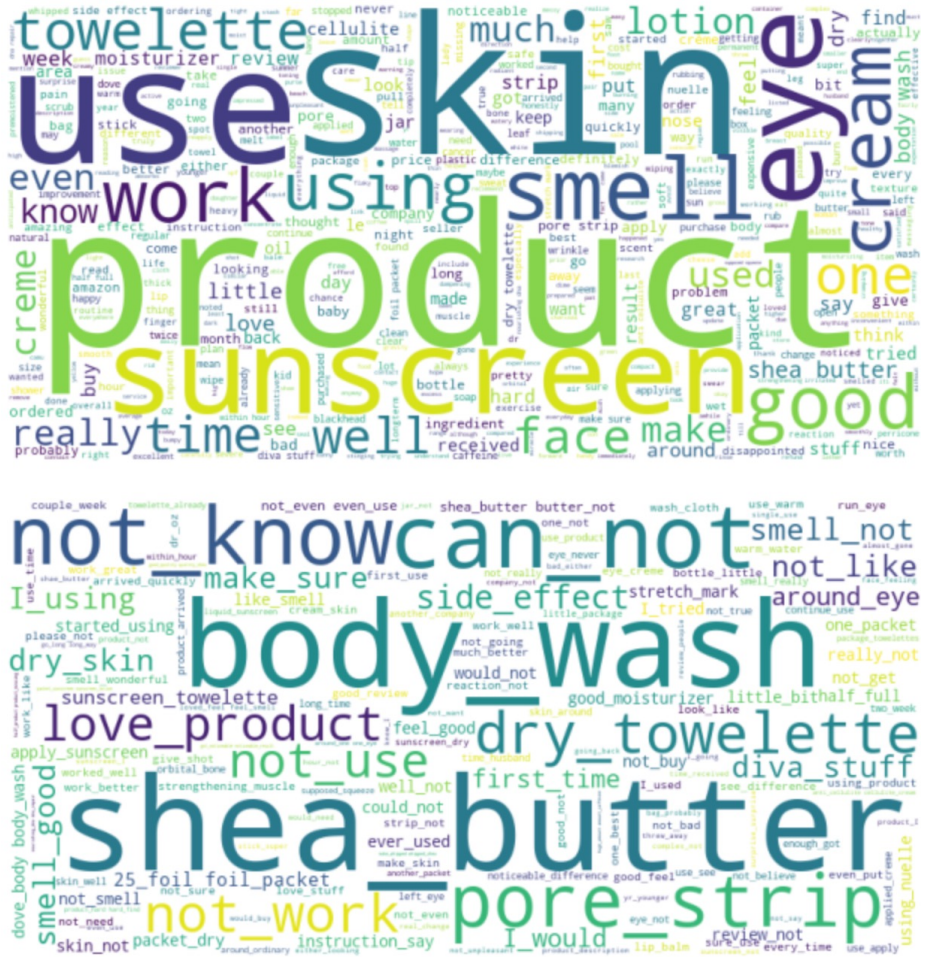
The current reviews of these 30 products were scraped using selenium and beautiful soup

Sentiment Analysis

Skin Product (word cloud from Reviews)



2014 word cloud: Reviews



2023 word cloud: Reviews

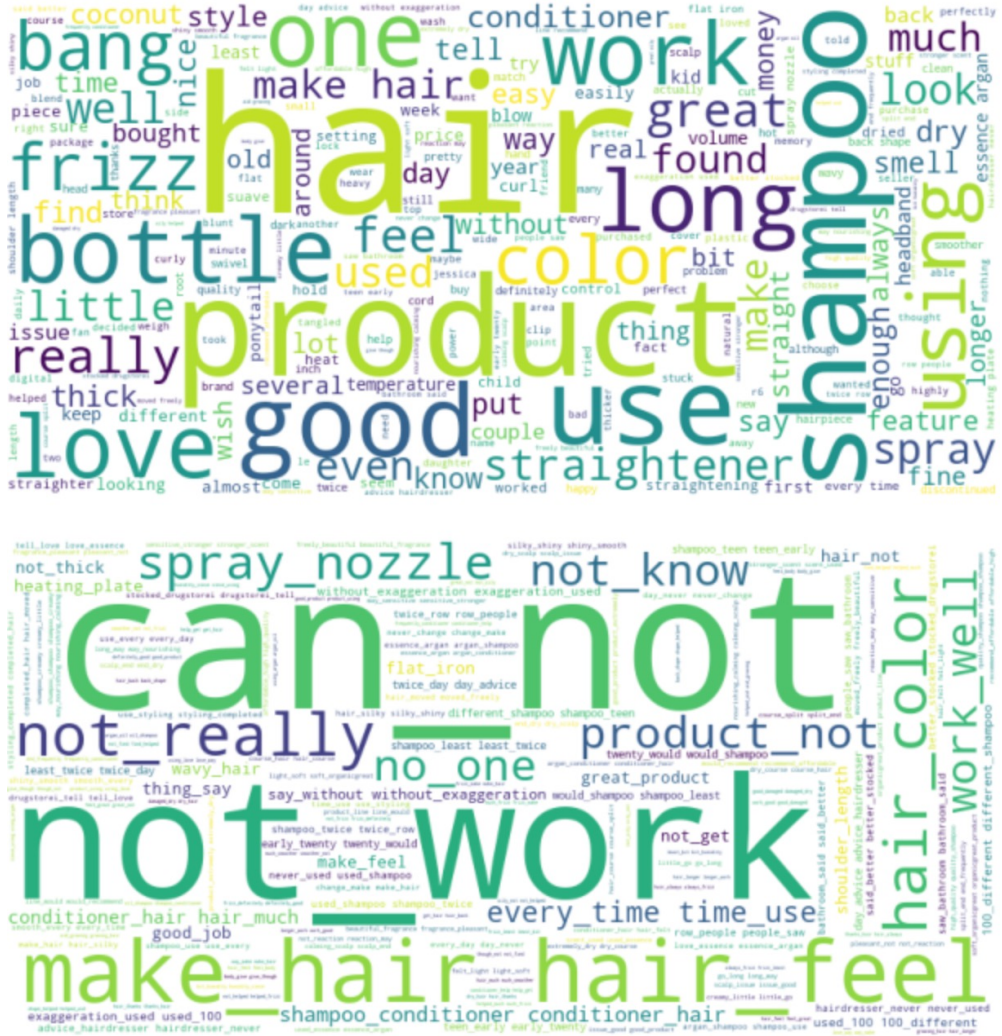
Analysis & Recommendations

For Skin products:

- There are more reviews with words like **can not, not really, not work, not know** in 2023 compared to 2014 implying quality of products have gone down
- The phrase **side effects** has been used frequently in 2023 and from sellers' point of view, contents of the product can be reevaluated for any side effect causing factor
- Words like **soft, smooth** were more frequent in 2014, **hard, dry** in 2023, look for change in ingredients
- visible care, care toning 2014, no more 2023
- **not really** in 2014, there were visible complaints in 2014 too
- word cloud for reviews **each of the 10 products** can give a much better picture about how the **sentiment of customers changed over 6 years**

Hair Product (word cloud from Reviews)

2014 word cloud: Reviews

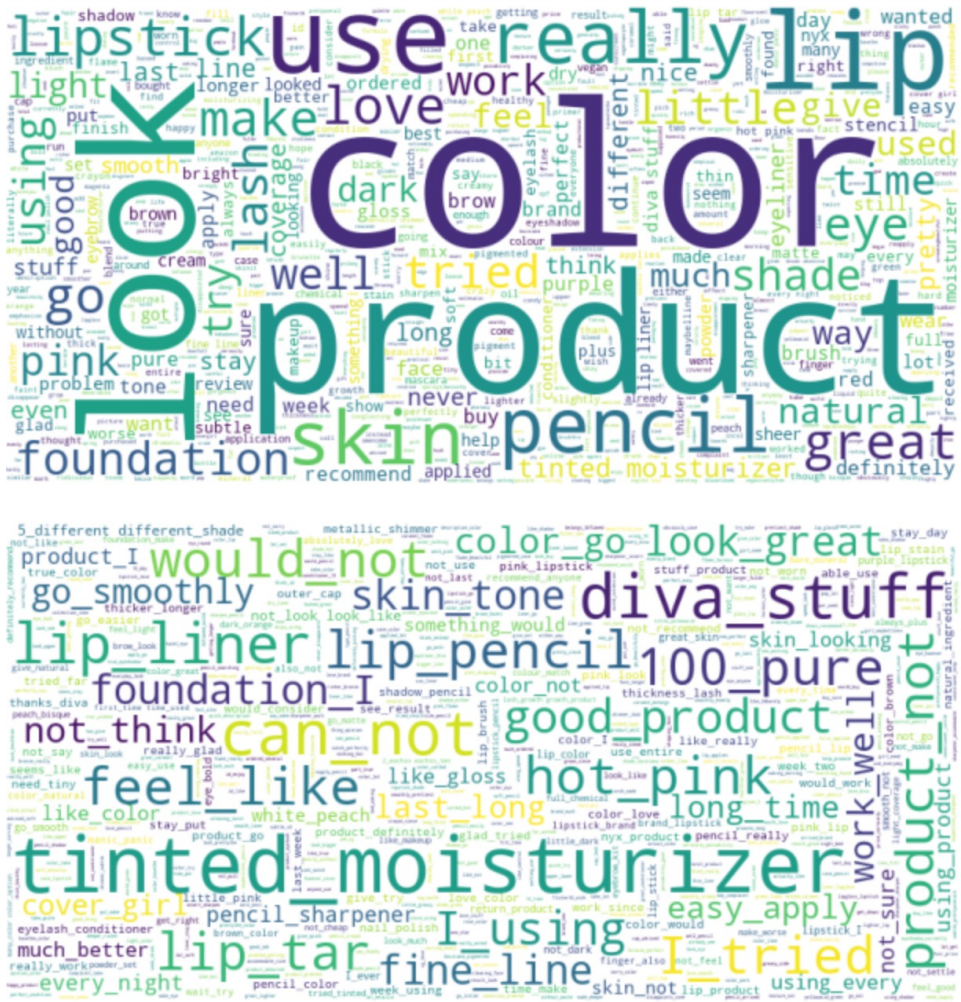


2023 word cloud: Reviews

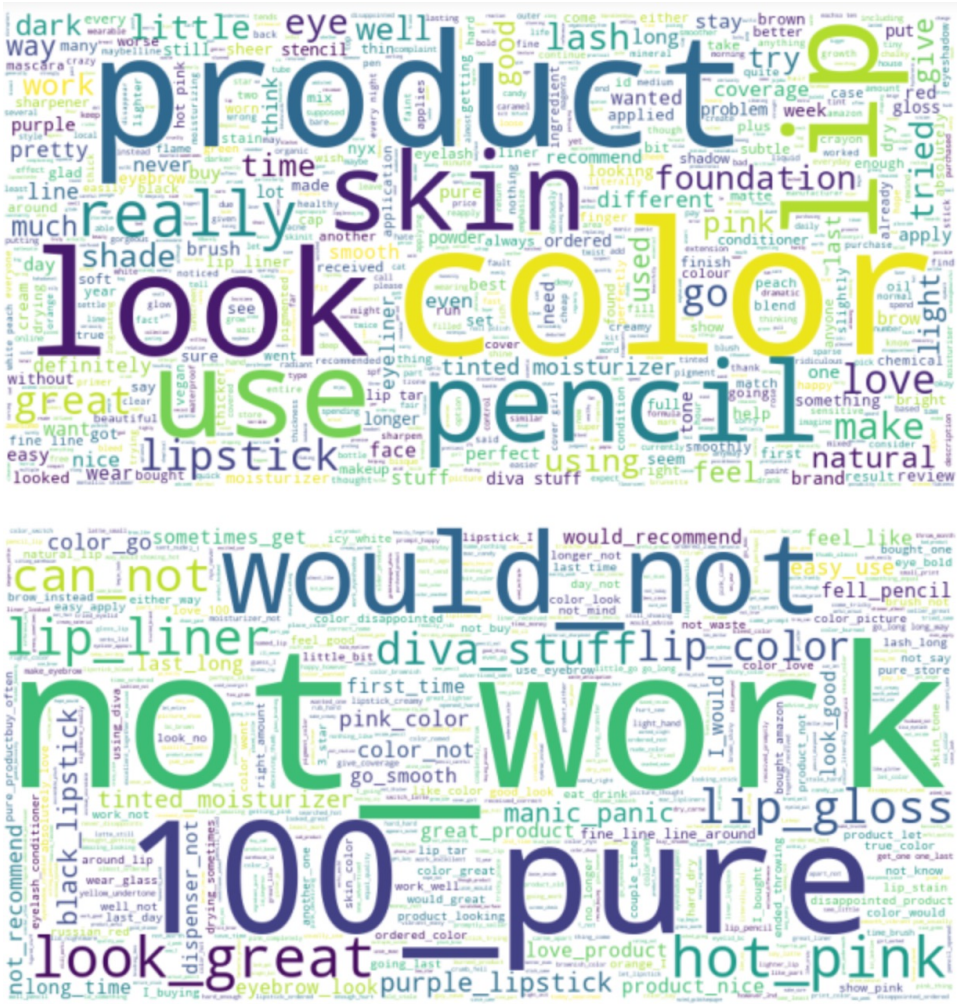
Analysis & Recommendations

- Words like **can not, not work, not really** have increased in the reviews of 2023
- **shampoo conditioner 2 in 1** appears frequently, possible reason for reduced quality
- Word related to smell like **coconut smell** appears in 2014 reviews and **old smell** in 2023. This can be further analyzed
- **spray nozzle** appears a lot in 2023 and not in 2014, possible trend
- **kid hair, tear free** appeared more frequently in 2014, possible change in ingredients by 2023

Makeup Products (word cloud from Review



2014 word cloud: Reviews



2023 word cloud: Reviews

Analysis & Recommendations

- **not work, would not** are the most appeared phrases in 2023 reviews implying drop in popularity from 2014
- Lot of discussion around the word **color,** like **hot pink**, **purple lipstick, black lipstick** in 2023 compared to just **pink** in 2014 implying change in taste
- **100% Pure** has been used a lot of time in 2023, possible concern about ingredients in the products

FUTURE WORKS

- Sentiment analysis of all 30 individual products from each category to infer meaningful inputs for **brand improvement**
- Build a **recommender system** using sentiment and trend information in these three categories

THANK YOU