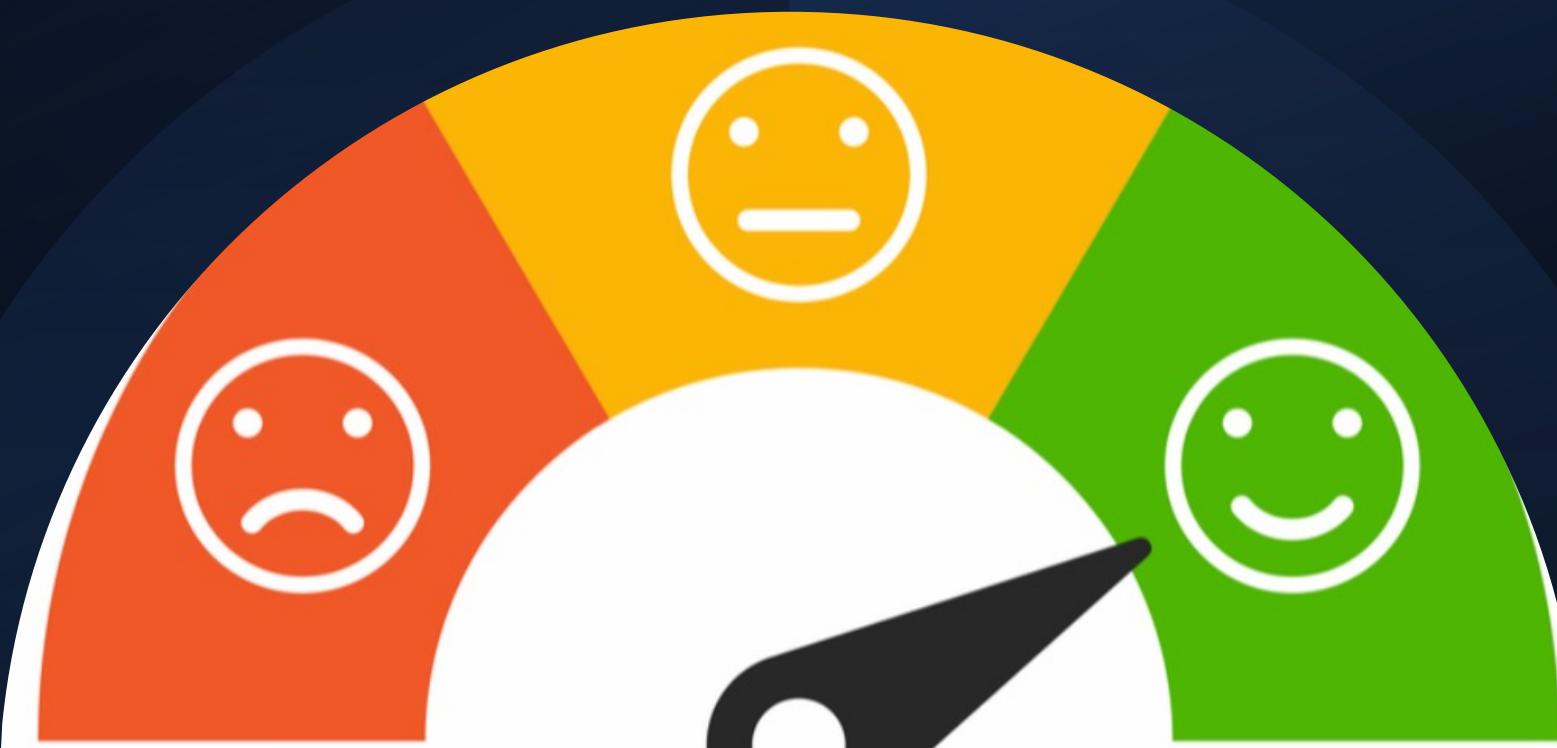


# Sentiment Analysis of Amazon's Deteriorated Product Ratings

Minjae Lee





# Agenda

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- **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 asin\$)

# 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

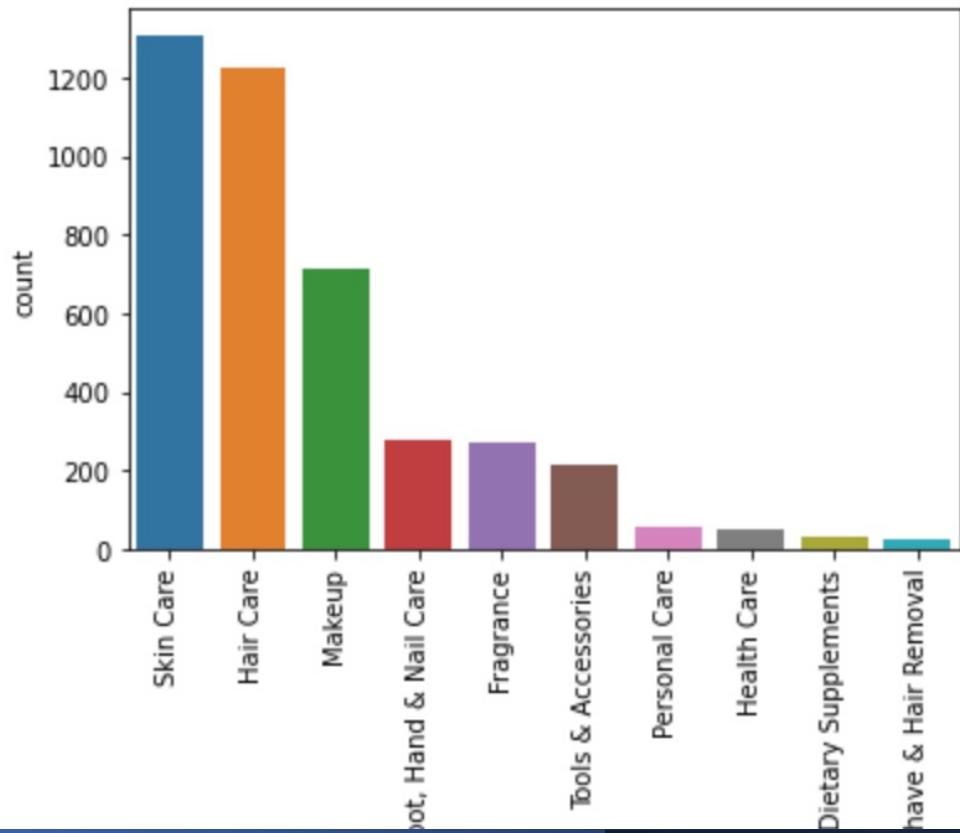
- converted all text to lowercase
- formatted empty spaces
- Expanded contraction (eg. mgmt. to management)
- Filtered all punctuation
- filtered stopwords (have, is, was)
- Lemmatization: getting the root words (better : lemma good)



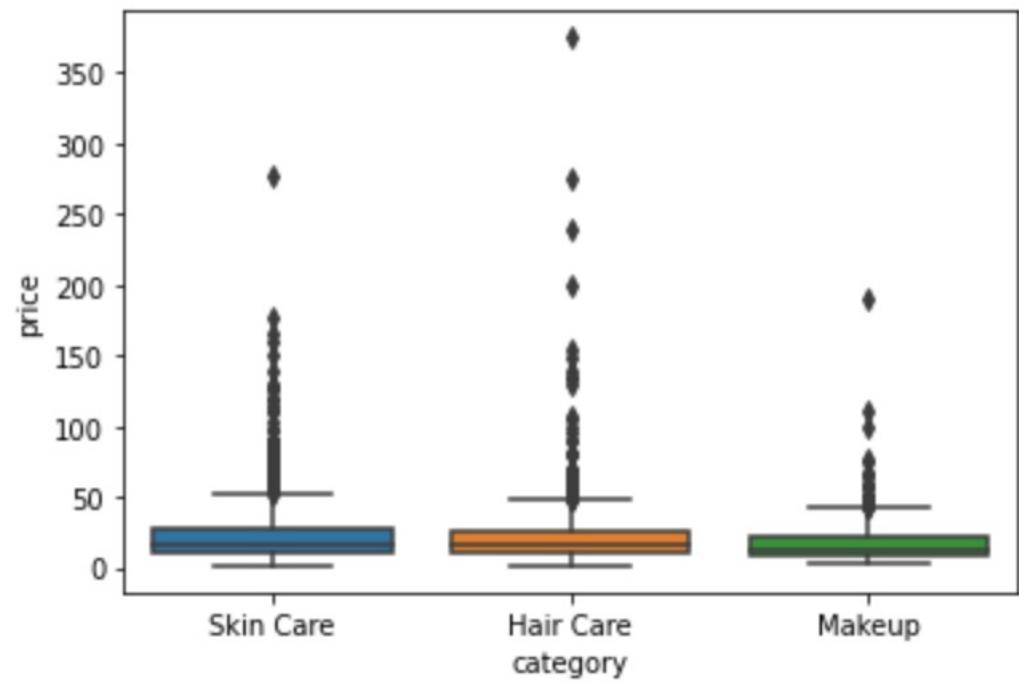
# Exploratory Data Analysis (EDA)

- 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

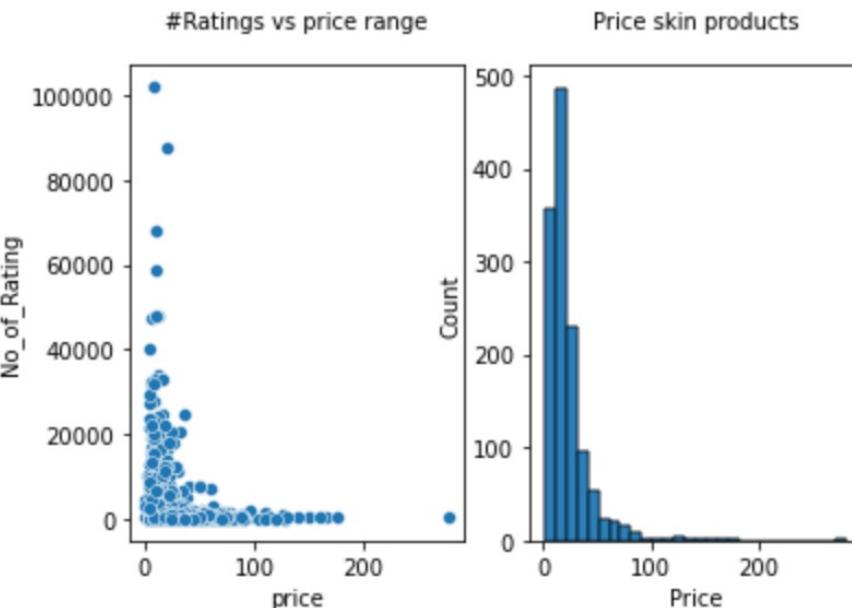
## Top 10 product categories



- 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

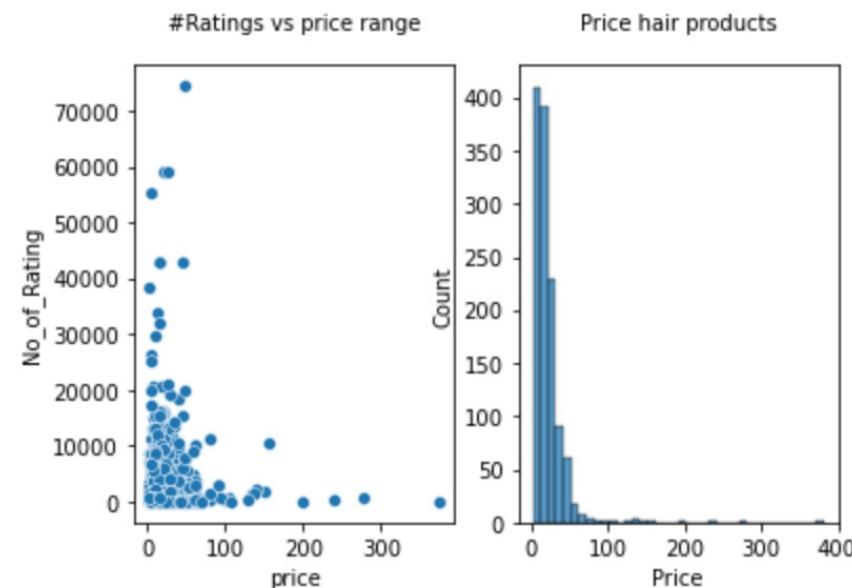


# Skin Products

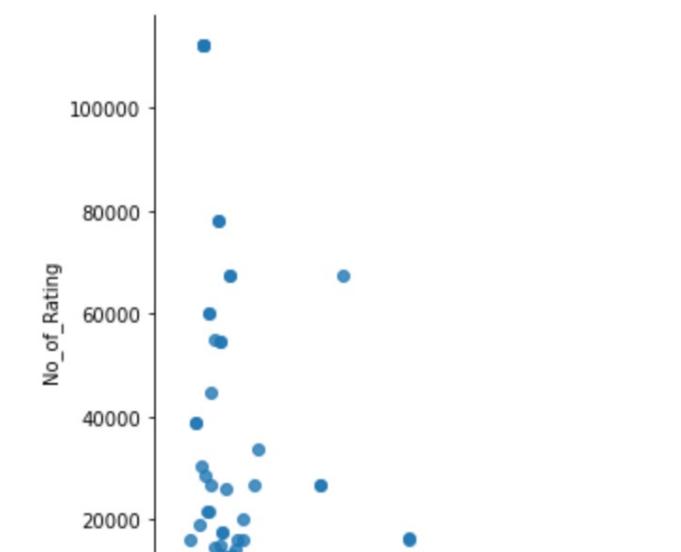
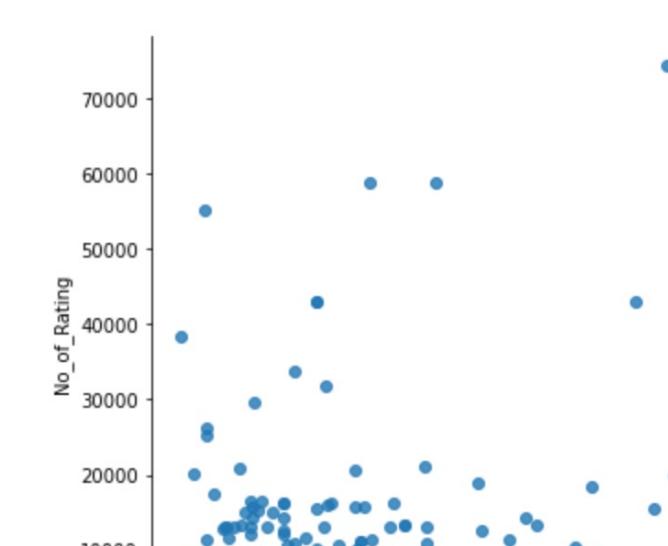
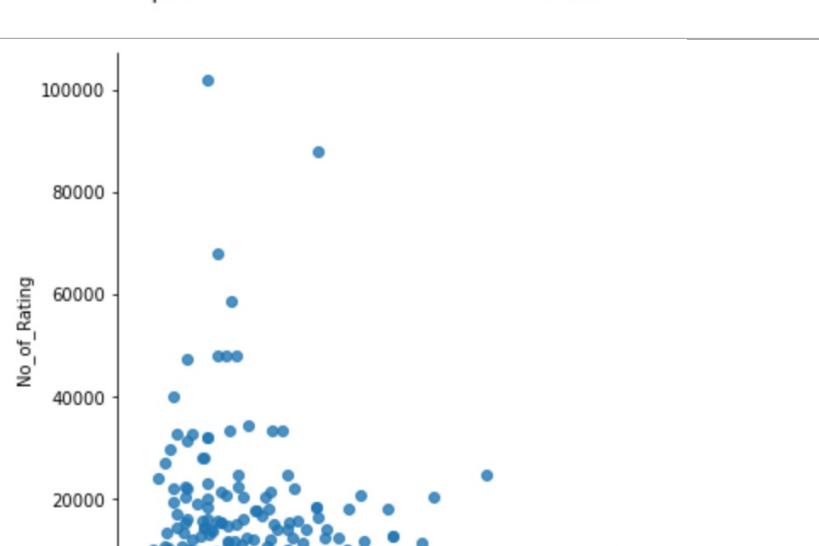


# Hair Products

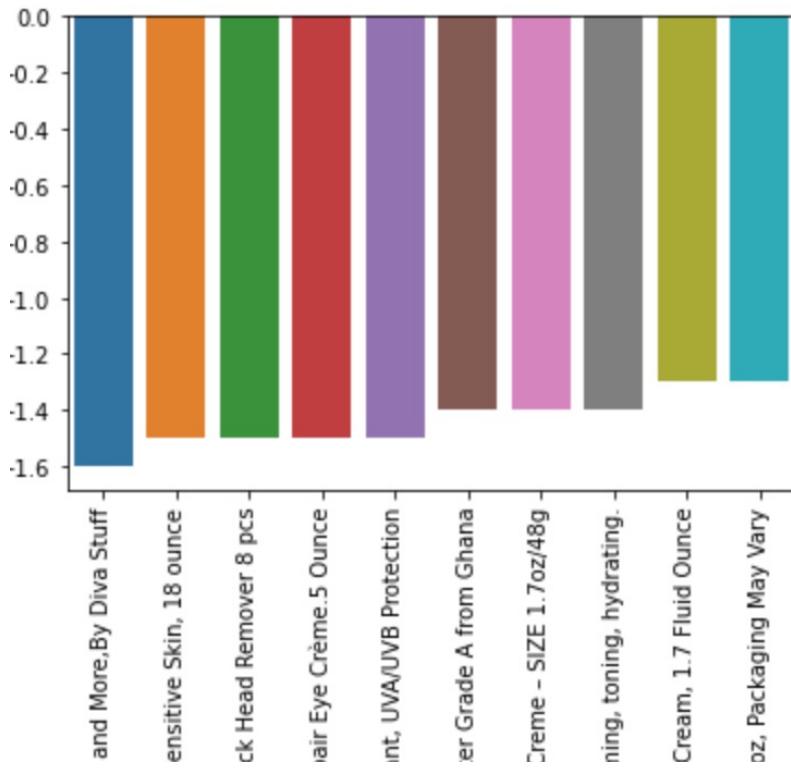
People usually spend more on hair product than skin and makeup



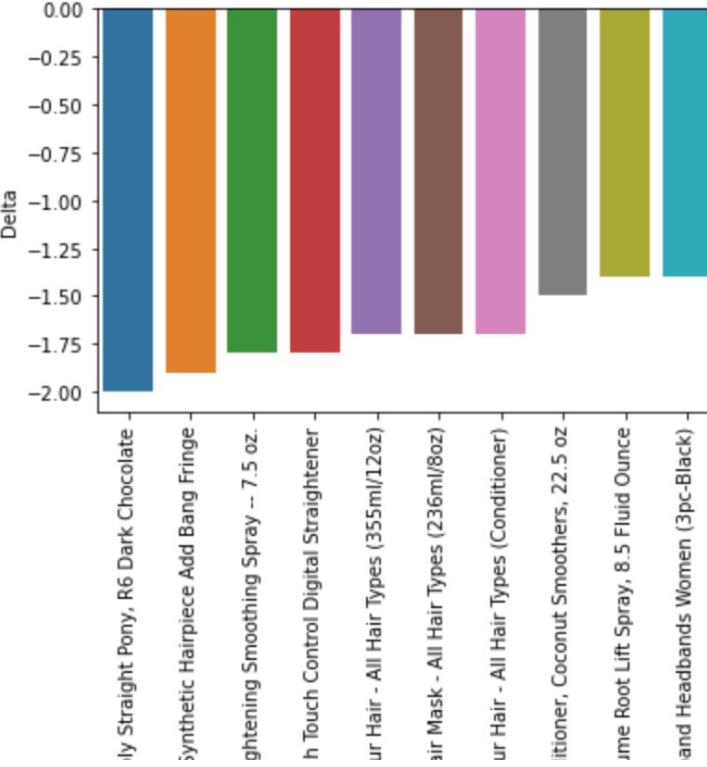
# Makeup



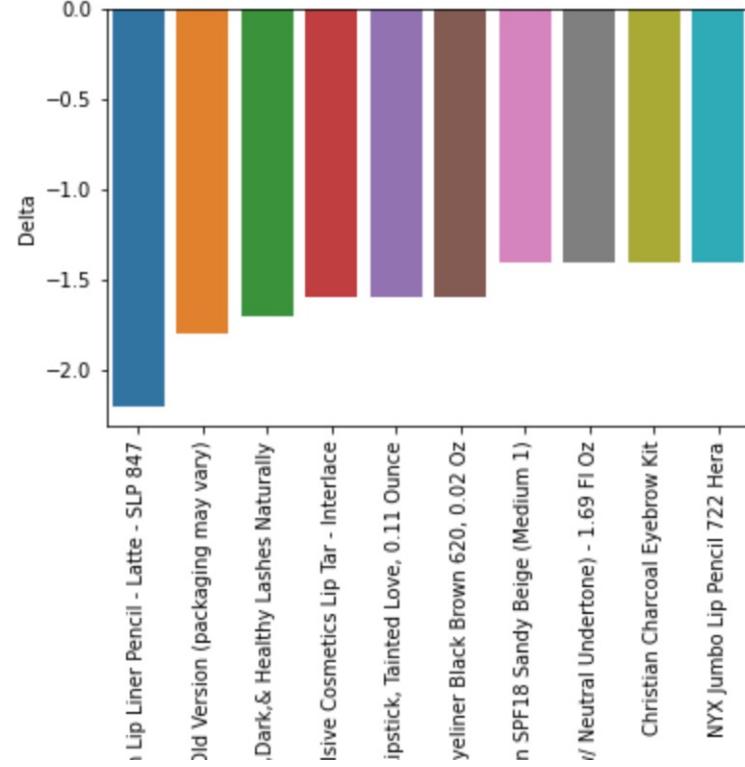
## Top 10 skincare products that dropped rating in 6 years



## Top 10 haircare products that dropped rating in 6 years



## Top 10 makeup products that dropped rating in 6 years

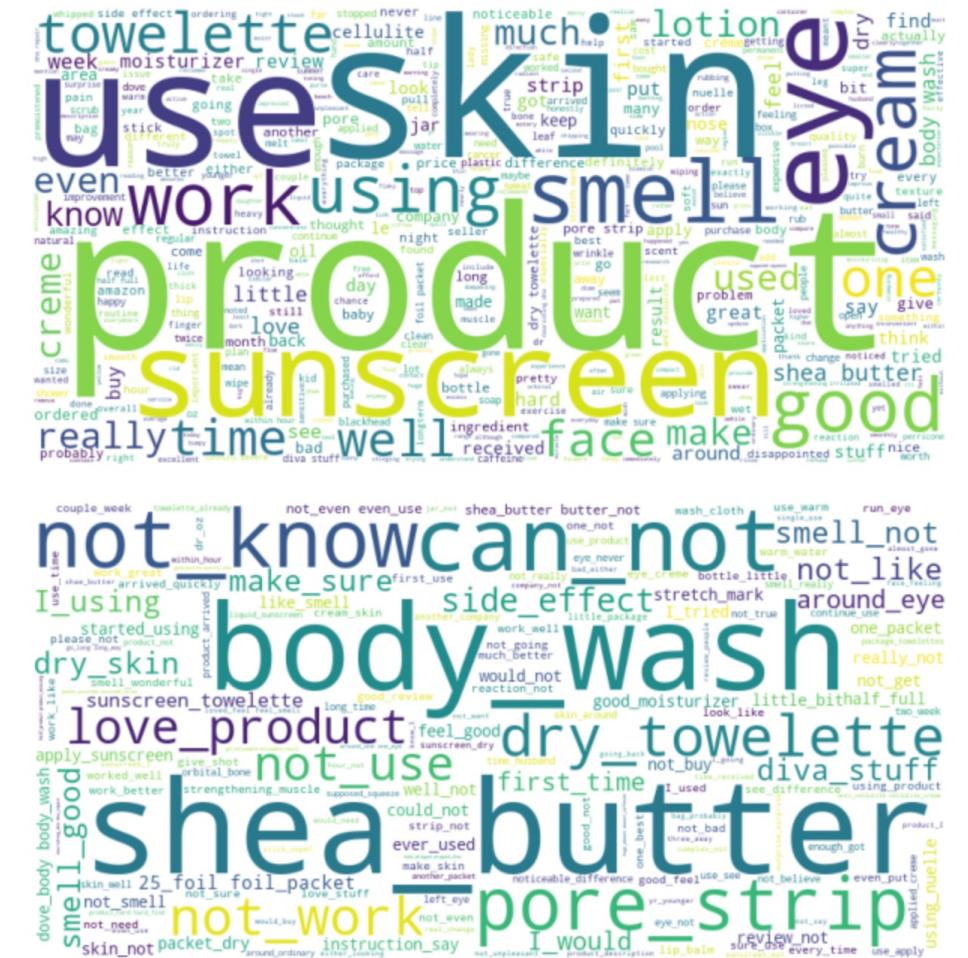
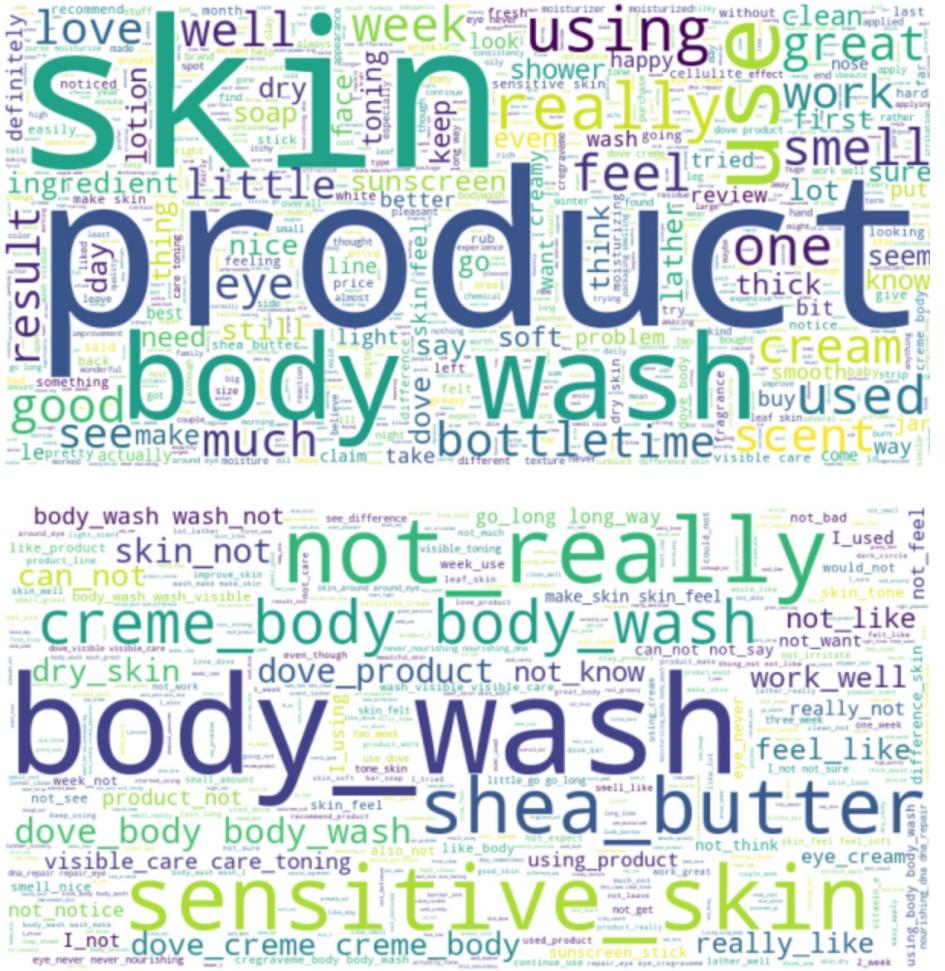


# Change in ratings over 9 years (2014-2023)

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

# Sentiment Analysis

# Skin Product (word cloud from Reviews)



## Analysis & Recommendations

For Skin products:

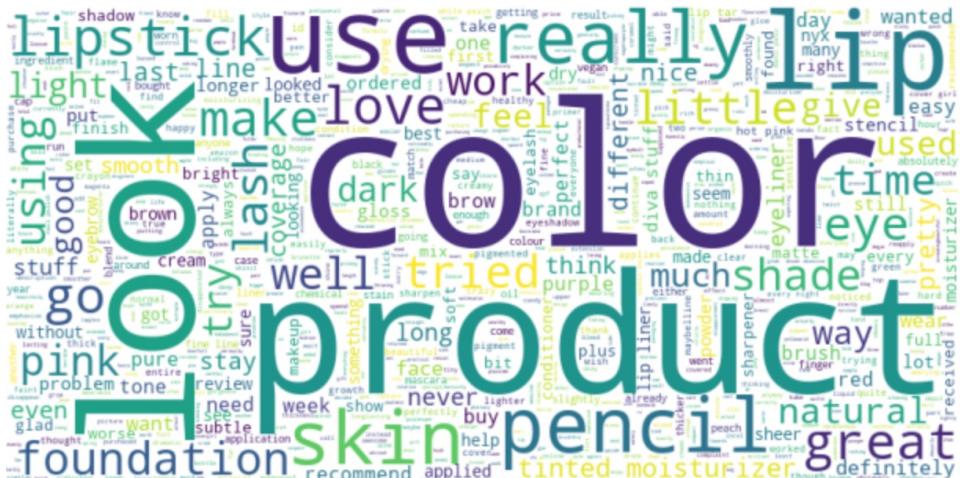
- There are more reviews with words like **can not, not really, not work, not know** in 2023 compared to 2014 implying quality of products have gone down
- The phrase **side effects** has been used frequently in 2023 and from sellers' point of view, contents of the product can be reevaluated for any 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**



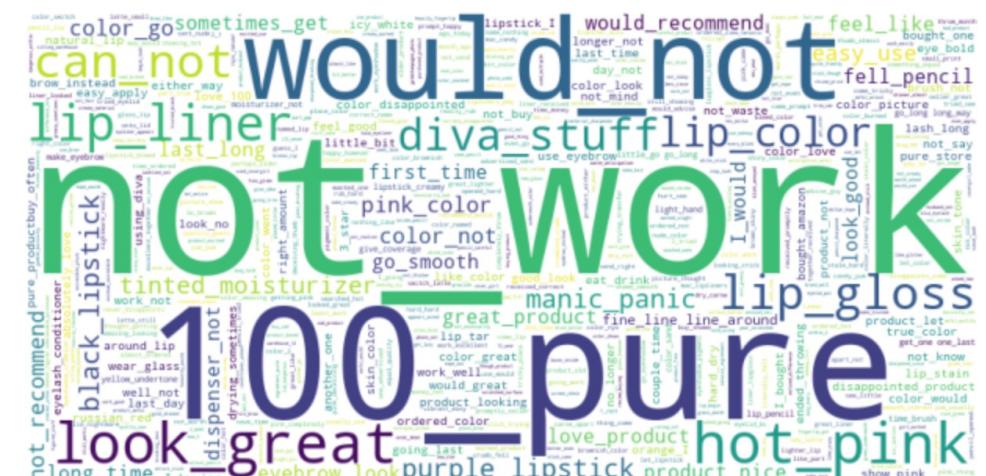
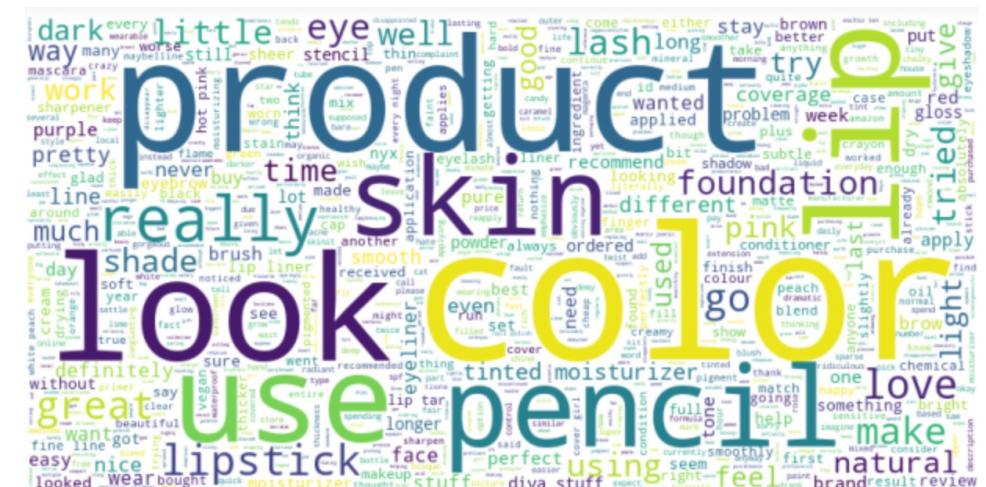
## Analysis & Recommendations

- 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

# Makup Products (word cloud from Reviews)



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

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