



**Understanding Seasonal Trends Through LDA Topic Modeling**

# PROBLEM STATEMENT

- Collaborating with Sephora to analyze customer skincare preferences and support Sephora with identifying top skincare product categories and optimizing inventory based on customer reviews:
  - Performing sentiment analysis using an LDA model to detect trending topics throughout the four seasons, with a specific focus on five skincare categories.
  - Utilizing term frequency analysis to identify product category highlights and understand customer preferences and priorities in skincare products.
  - Studying consumer preferences by skin type to gauge factors influencing skincare purchases.

# SYSTEM DESIGN

01

## Data Processing

- Consolidate data
- Drop irrelevant columns
- Data engineer (timestamp)

03

## LDA Topic Modeling

- Use year, season, skin type, product categories to filter data
- Perform text analytics (topic modeling and term frequency) to discover customer sentiment

02

## Trend Identification

- Category popularity over the years
- Seasonal popular products under the categories of interest
- Popular products by skin type

04

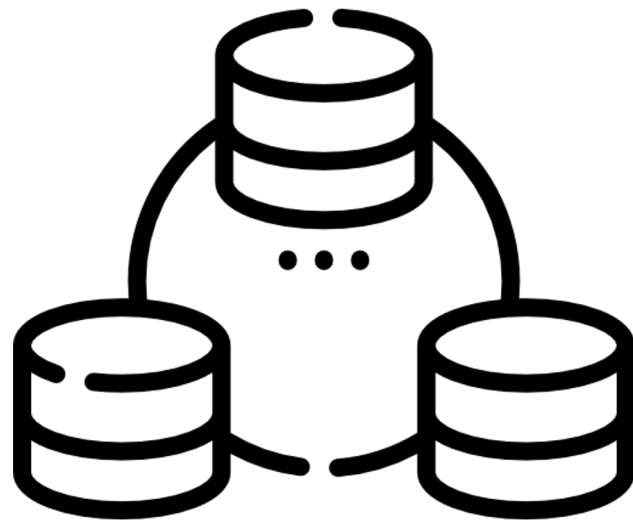
## Insights/ Recommendations

- Discover trends from customer sentiments
- Generate actionable insights for the client in operational improvement to boost sales

# DATA DESCRIPTION

The final dataset has 700,000+ review records from 2008 to March 2023, with 21 columns:

- product details (product name, categories, ingredients, highlights, etc.),
- customer information (skin type, hair color, eye color),
- customer reviews (review text, review title, ratings, etc.)

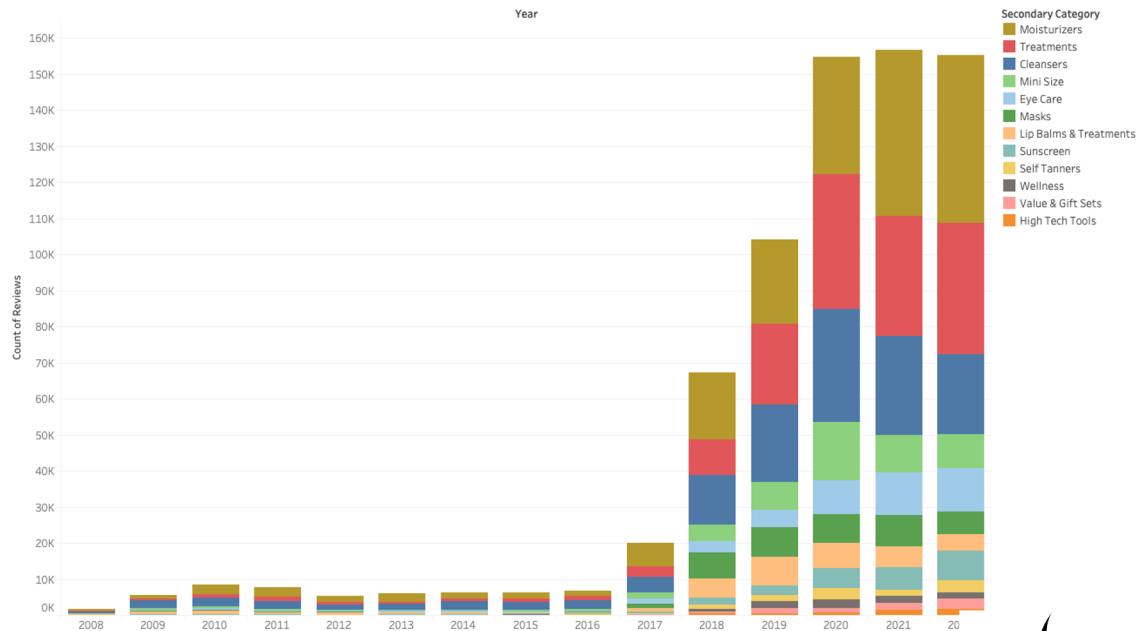


# TREND IDENTIFICATION

Sephora's skincare products have experienced rapid growth in popularity since 2016, with

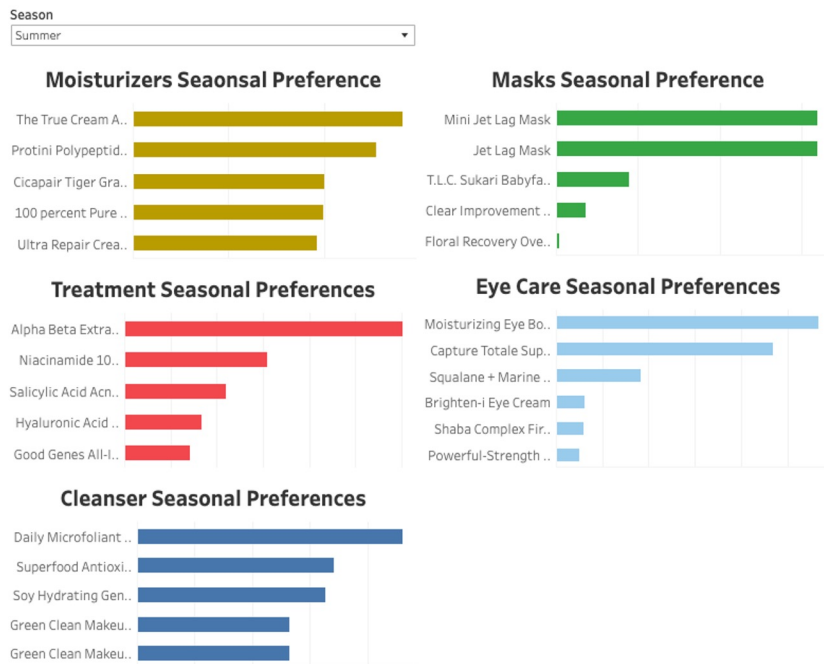
- **moisturizers,**
- **treatments,**
- **cleansers,**
- **eye care,**
- **masks**

accounting for the majority of this surge.



Count of Reviews for each Year. Color shows details about Secondary Category. The view is filtered on Year and Secondary Category. The Year filter excludes 2023. The Secondary Category filter excludes Shop by Concern.

# TREND IDENTIFICATION



- Customers' product preferences shift across different seasons, especially in the treatment, masks, and eye care categories.

\*[https://public.tableau.com/views/SephoraSeasonalPreference/Dashboard1?:language=en-US&publish=yes&:sid=&:display\\_count=n&:origin=viz\\_share\\_link](https://public.tableau.com/views/SephoraSeasonalPreference/Dashboard1?:language=en-US&publish=yes&:sid=&:display_count=n&:origin=viz_share_link)

Positive Reviews	Winter	Spring	Summer	Fall
Eye Care	1. Texture 2. Formula 3. Makeup 4. Fine Lines 5. Puffiness	1. Dark Circle 2. Fine Lines 3. Feel 4. Day and Night 5. Smooth	1. Long Lasting 2. Applicator 3. Dark Circle 4. Fine Lines 5. Texture	1. Dark Circle 2. Long lasting 3. Texture 4. Gel 5. Serum
Masks	1.Dry 2.Morning/Night 3.Overnight 4.Texture 5.Feel	1. Sensitive 2. Pore-Cleaning 3. Long-lasting 4. Soft 5. Feel	1. Smell 2. Clay 3. Dryness 4. Jet_Lag 5. Glow	1. Smell 2. Moisturize 3. Soft 4. Acne 5. Dry
Treatments	1. Acne Care 2. Fine Lines 3. Skinlongevity 4. Greasy 5. Dry	1. Acne Care 2. Acne-Peel 3. Darkspot 4. Sensitive 5. Acne Scars	1. Day/Night Use 2. Smell 3. Wrinkle 4. Overnight- Acne treatment 5. Serum	1. Herbs 2. Acne 3. Fine Line 4. Wrinkle 5. Soft
Moisturizers	1. Fine line 2. Sensitive 3. Rich texture 4. Rejuvenating 5. Free & complimentary	1. Influencer 2. Cost-efficiency 3. Vitamin C 4. Light but moisturizing 5. SPF & good with foundation	1. Light texture 2. Anti-aging 3. Scent 4. Cost-efficiency 5. Moisturize all-day	1. Oil & cream 2. Soften and non-greasy 3. Cost-efficiency 4. Influencer 5. Smooth
Cleansers	1. Moisturizing 2. Non-drying 3. Dark-spot brightening 4. Acne 5. Removing residual makeup	1. Softening skin 2. Sensitive skin 3. Removing residual mascara 4. Cost-efficiency 5. Scent	1. Acne 2. Cost-efficiency 3. Microfoliant 4. Removing residual makeup 5. Gentle on skin	1. Non-drying 2. Cost-efficiency 3. Eye makeup & mascara 4. Oil-cleansing 5. Sensitive skin

# POSITIVE INSIGHTS

- Seasonal Preferences: **texture of products** seem to be the biggest factor in seasonal preferences.
  - Summer & Spring: preference for lighter texture, refreshing scents products that contains SPF and fights acne and pore issues
  - Winter & Fall: preference for richer textures that brightens complexion
- Eye Care Trends:
  - In general, consumers want products that are suitable for both day and night
  - In winter, customers want richer texture to help makeup last longer
  - While, in other seasons, they tend to focus more on dark circle, puffiness and fine lines
- Mask Trends:
  - Customers who purchase masks tend to use them as a supplement to their routine regimen. Their seasonal preferences reveal distinct and intriguing trends
  - In winter, customers prefer nourishing and hydrating overnight masks.
  - While in warmer seasons, there's a inclination to deep-cleansing masks (“clay” and “pore”).



# POSITIVE INSIGHTS

- Treatment trends:
  - For customers who buy treatments, skin health and skinlongevity are their primary goal, because they often utilize them to battle skin issues such as wrinkles, texture, hyper pigmentation, acne, and breakouts.
  - Under this overarching theme, we can also see that customers prefer the treatments that prevent or mitigate acne in warmer seasons, and the treatments that fights acne scars and brightening dark spots in winter
  - Another finding is customers' preference for treatments with herb and other natural ingredients.
- Moisturizer trends:
  - In spring and summer, customers prefer moisturizers with light texture and refreshing scents that provide long-lasting hydration and leave their skin soft and smooth. Another key requirement is containing SPF and blending well with foundation.
  - In winter, customers are inclined to buy deep nourishing moisturizers with rich texture. Some also prefer oil-infused moisturizers to help then fight dryness in the cold weather.
  - Another interesting trend customer mentioned “influencer” and “free and complementary”, indicating they responded well to these marketing strategies.

# POSITIVE INSIGHTS

- Cleanser trends:
  - An overarching trend is that customers mentioned cleanser's property to remove makeup, particularly eye makeup.
  - This trend is possibly caused by two main reasons:
    - some people who wear lighter makeup and look to simplify their skincare routine,
    - some people who wear heavier makeup seek to supplement their makeup remover and achieve more thorough cleansing.
  - Another notable trend is that, in summer, customers want cleansers with exfoliants but also gentle on their skin.
  - Non-drying and cost-efficiency ("little goes a long way") are two other main topics throughout the year.

# POSITIVE INSIGHTS

## Business suggestions:

- Sephora can leverage these insights into what customers prioritize in top-selling skincare products to shape their **marketing strategies**. For instance, they could organize seasonal store displays, positioning these products prominently and complementing them with advertisement boards highlighting their properties that address customers' most pressing needs.
- If Sephora aims to enhance the sales of similar products, they can utilize these insights to launch customer education campaigns, collaborate with influencers, and give out free samples. These strategies would help generate increased interest and recognition for these products.
- Sephora can further support skincare brands by offering feedback to aid in their product development processes.

Negative Reviews	Winter	Spring	Summer	Fall
Eye Care	1. Metal 2. Serum 3. Fine Lines 4. Feel 5. Dark Circle	1. Wrinkle 2. Difference 3. Dark Circles 4. Sensitive 5. Ingredient	1. Ingredient 2. Applicator 3. Scent 4. Dry 5. Sensitive	1. Applicator 2. Little 3. Time 4. Sensitive 5. Nothing
Masks	1. Price 2. Hype 3. Breakout 4. Reaction 5. Sensitive	1. Red 2. Sensitive 3. Bumps 4. Dry 5. Worth	1. Acne 2. Breakout 3. Red 4. Size 5. Dry	1. Oil 2. Dry 3. Redness 4. Time 5. Sensitive
Treatments	1. Acne 2. Acid 3. Bare minerals 4. Cruelty 5. Feel	1. Dry 2. Breakout 3. Sticky 4. Pimple 5. Red	1. Difference 2. Breakout 3. Sensitive 4. Waste 5. Price	1. Expensive 2. Red 3. Packaging 4. Price 5. Waste of money
Moisturizers	1. Dry 2. Sensitive 3. Drunk 4. Small 5. Scent	1. Time 2. Redness 3. Breakout 4. Red 5. Heavy	1. Alcohol 2. Bump 3. Price 4. Dry 5. Break	1. Bad 2. Argan Oil 3. Red 4. Sensitive 5. Money
Cleansers	1. Dark spot 2. Makeup removing property 3. Bottle pump 4. Skin feeling 5. Sensitivity ingredient	1. Polyethylene 2. Drying 3. Sensitivity 4. Bottle design 5. Acne control	1. Makeup removing properties 2. Acne inducing 3. Polyethylene 4. Drying 5. Waste of money	1. Bottle Design 2. Drying, acne inducing 3. Sensitivity 4. Sensitive skin breakout 5. Blurry vision

# NEGATIVE REVIEWS – GENERAL TRENDS

The key takeaways from the negative reviews can be summarized as follows:

- Consumers with sensitive skin are more cautious of ingredients in their skincare products
- Products seem to be over-hyped and did not work for certain customers
- Applicator and the packaging of products are important to consumers
- Consumers want the best bang for their buck and do not want to splurge on over-hyped, small products
- Consumers care about the scent and texture of their products
- Intense ingredients such as alcohol and polyethylene cause irritation such as bumps, redness and dryness in some consumers
- Products with oil cause breakouts in customers
- Masks, cleansers, moisturizers, and treatments have the most acne inducing or skin irritation scenarios

# NEGATIVE REVIEWS BREAKDOWN

Generally speaking, negative reviews do not exhibit clear seasonal variations as positive reviews, and consumers' complaints tend to be concentrated in the same areas across seasons. However, these results still offers a lot of valuable insights into room for improvement.

Eye care trends:

- Negative sentiments towards eye care products often arise from issues such as poorly designed **applicators** and **formulations** that tend to irritate the delicate under-eye skin, leading to sensitivity in certain customers.
- Additionally, dissatisfaction also revolves around failing to deliver promised **outcomes**, such as effectively diminishing wrinkles/fine lines or brightening dark circles.

# NEGATIVE REVIEWS BREAKDOWN

## Mask trends:

- As masks aim to enhance or address skin concerns quickly, their concentrated ingredients can sometimes lead to issues like breakouts, bumps, sensitivity, and redness.
- Some masks are **overhyped** and fail to tackle even basic issues such as dryness.

## Treatment trends:

- Treatments and serums are **pricy** because they feature concentrated active ingredients designed to enhance skin more effectively. As a result, if customers don't see the expected improvements, they might feel **disappointed** and consider their purchases a waste of money.
- As for seasonal preferences, customers showed strong preference for to be **less sticky** and effectively prevent breakouts and cool down sensitivity in warmer seasoners.

# NEGATIVE REVIEWS BREAKDOWN

## Moisturizer trends:

- In winter, customers expect that these moisturizers will combat dryness more effectively.
- During spring and fall, there is an expectation for lighter textures and a focus on effectively managing seasonal skin issues such as redness, sensitivity, and breakouts.
- In summer, although alcohol in these products can benefit some skin types, it also leads to irritation, bumps, and dryness for many other users.

## Cleanser trends:

- Bottle/pump design appears to be a big source of complaints across different seasons
- Customers like deep-cleaning cleansers to aid makeup removal and acne management, yet they prefer these products not to be overly drying.
- In spring and summer, while there is a preference for exfoliating cleansers, the micro polyethylene in these products can irritate the skin.



# RECOMMENDATIONS

- **Seasonal Variation:** optimize inventory based on seasonal preferences.
  - Prioritize lighter-textured products with SPF for Summer and Spring, focusing on acne and pore issues.
  - For Winter and Fall, emphasize richer-textured products that brighten complexion.
- **Eco-Friendly Products:** promote skincare lines that emphasize eco-friendly ingredients and packaging
- **Anti-Aging Solutions:** invest in skincare products prominently addressing anti-aging concerns.
- **Texture:** focus on products that effectively treat acne and dryness, minimize pores, and improve uneven skin texture.
- **Tailor to Combination Skin:** offer a wide range of products tailored to the needs of combination skin type, a prevalent skin type among consumers.

THANK YOU