



Foli-Q



This is Sareena

When she was six years old, her caretaker tried to **cut off six inches of her hair** because they didn't know how to take care of it.

Sareena Today

As a biomedical engineer, Sareena has **over five years** of laboratory expertise in **bioengineering and tissue engineering** that she uses to build the foundation of her research in hair analysis.



The Origins of Foli-Q

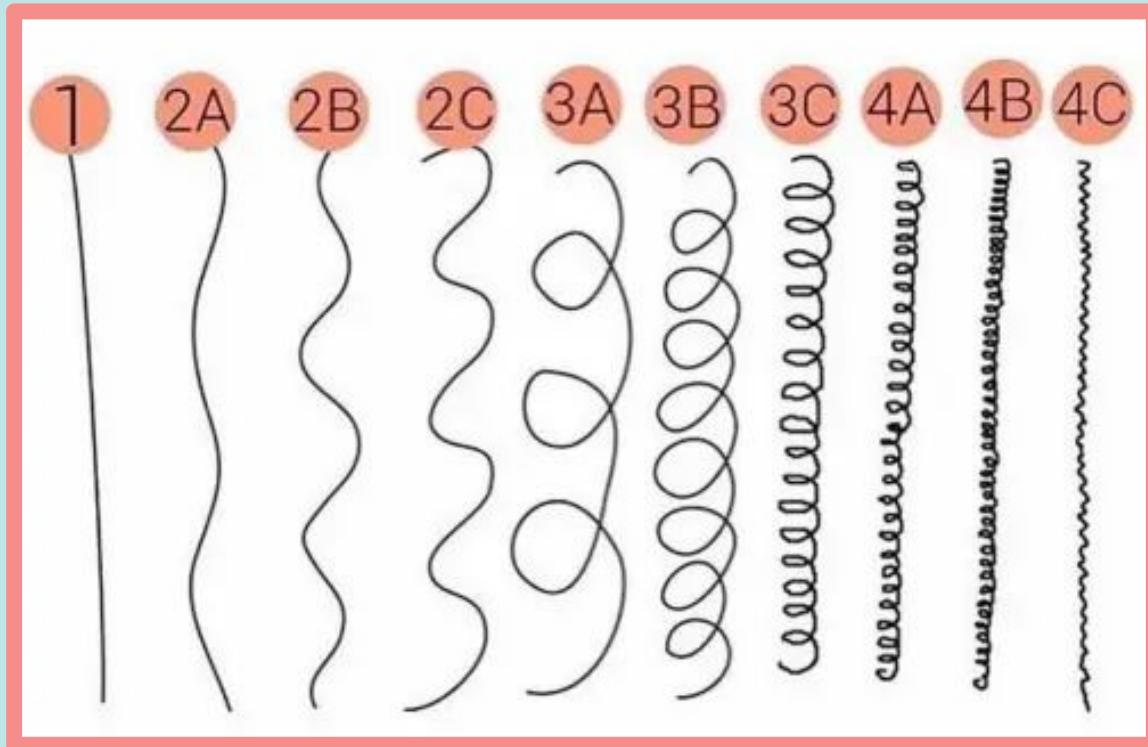
Foli-Q started as a class project at Lehigh, where users would send in **hair samples** and receive **hair product and styling recommendations**.

Foli-Q's CBS TV Unstoppable Episode

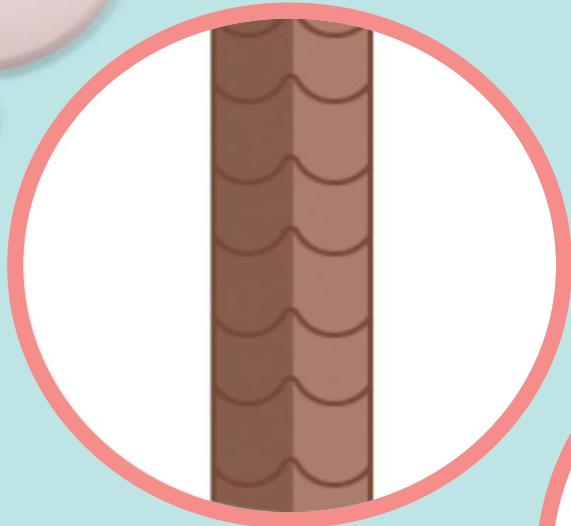


Lauren Fountain

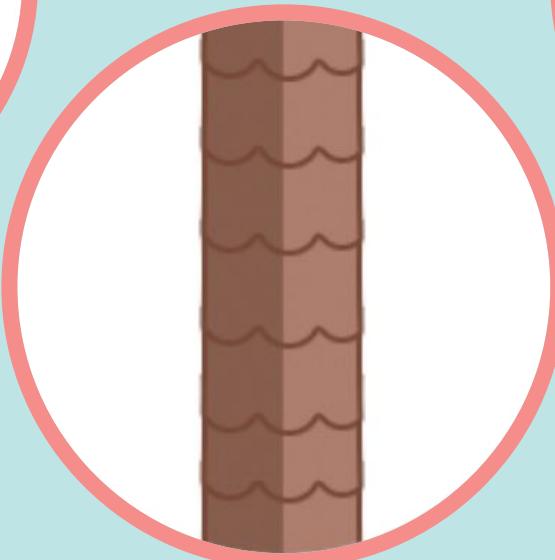
Knowing Your Hair Type



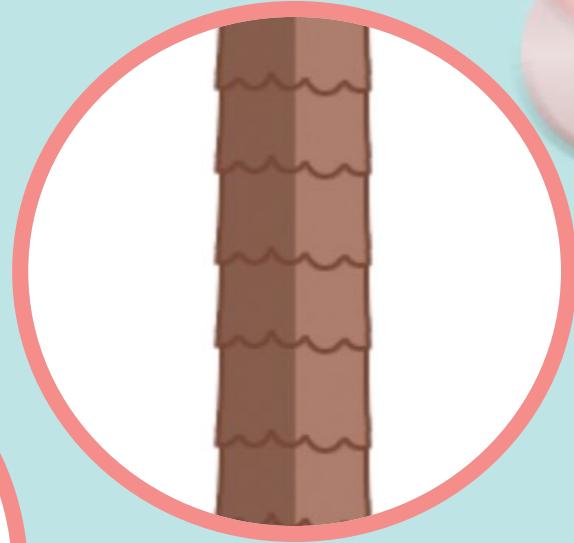
Knowing Your Hair Type



Low Porosity



Medium Porosity



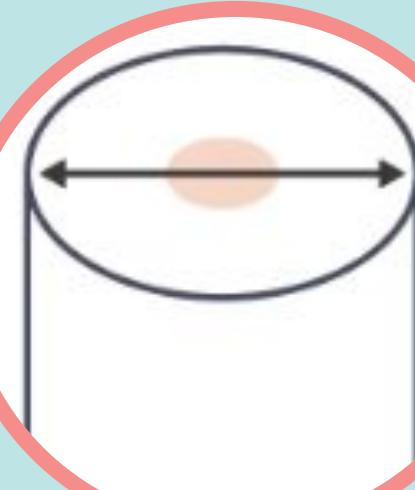
High Porosity

Knowing Your Hair Type



Fine Hair
 <30 micrometers

Medium Hair
30-50 micrometers



Thick Hair
 >50 micrometers

Knowing Your Hair Type



Low Density



Medium Density



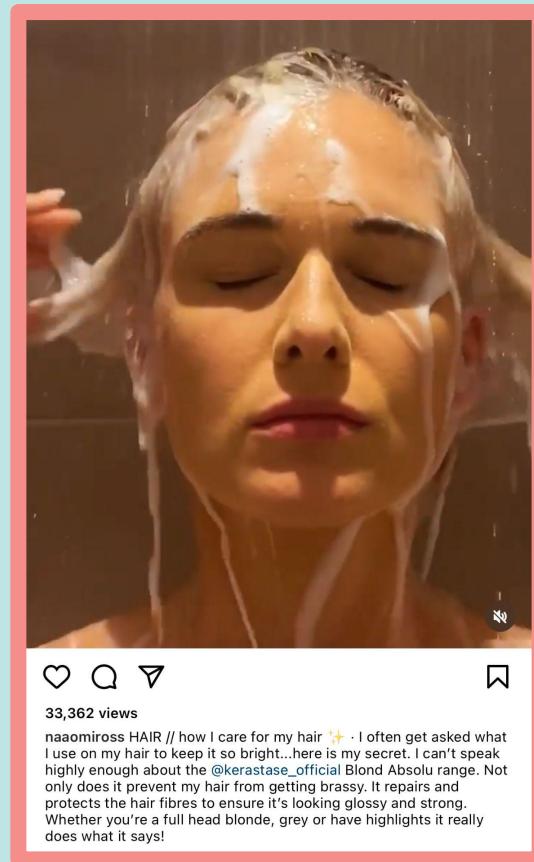
High Density

Hair Care Purchasing Process Now

1

Customer receives recommendations from **influencers** (i.e. Tik Tok and Instagram)

Influencer Recommendations



Influencer Recommendations

Move on the new era of
ultimately smooth hair
with Pantene ❤️



479.3K

1143

43.1K

5809

g: @kylabacerdo · 4-11

Part 1 | That glow-up from 3 PM frizzy hair to
smooth hair all day long after moving... more

🌙 Moonlight - @Kali Uchis



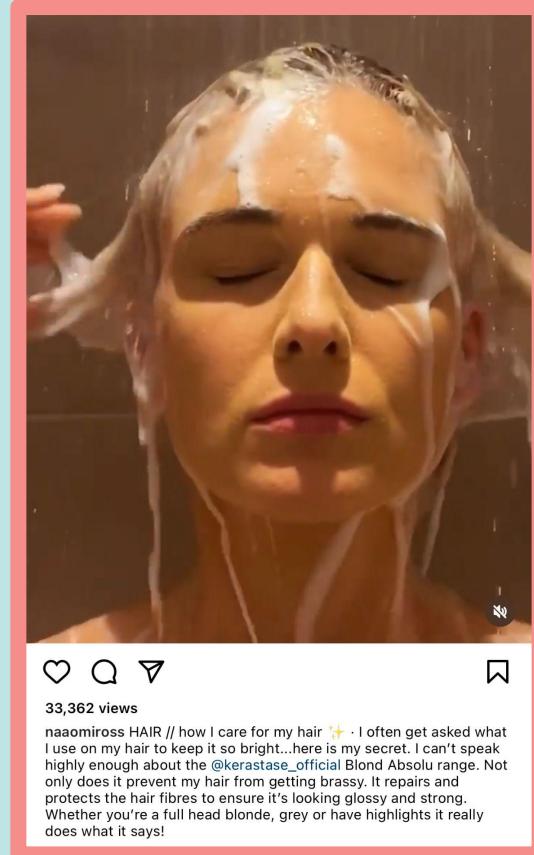
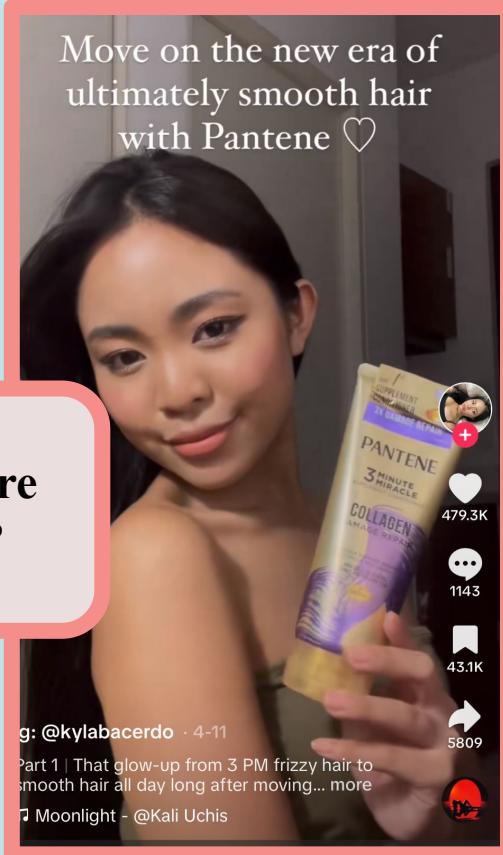
33,362 views

naomiross HAIR // how I care for my hair ✨ - I often get asked what I use on my hair to keep it so bright...here is my secret. I can't speak highly enough about the @kerastase_official Blond Absolu range. Not only does it prevent my hair from getting brassy. It repairs and protects the hair fibres to ensure it's looking glossy and strong. Whether you're a full head blonde, grey or have highlights it really does what it says!

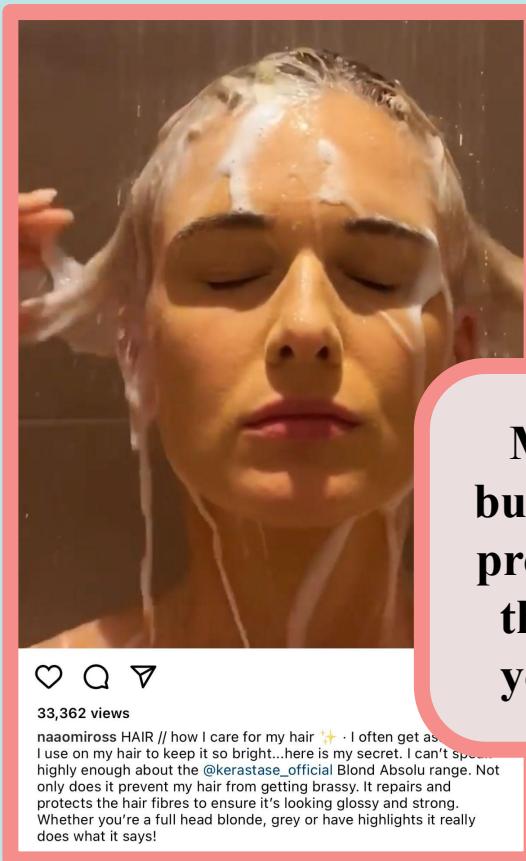
Overwhelming
number of
advertisements on
TikTok and
Instagram

Influencer Recommendations

How honest are
the reviews?



Influencer Recommendations



May result in buying too many products or ones that aren't for your hair type

Lauren Fountain

Hair Care Purchasing Process Now

1

Customer receives recommendations from **influencers** (i.e. Tik Tok and Instagram)

2

Customer receives recommendations from **friends and family**

Friends and Family Recommendations



Friends and Family Recommendations

More honest
recommendations



Friends and Family Recommendations



Limited
knowledge on hair
science

Friends and Family Recommendations

Recommendations
based on small
scope of products



Hair Care Purchasing Process Now

1

Customer receives recommendations from **influencers** (i.e. Tik Tok and Instagram)

3

Customer goes to a store and chooses a product based on **fragrance, packaging, or product claims**

2

Customer receives recommendations from **friends and family**

Finding a Product at the Store



Finding a Product at the Store

Overwhelming
number of choices



Finding a Product at the Store



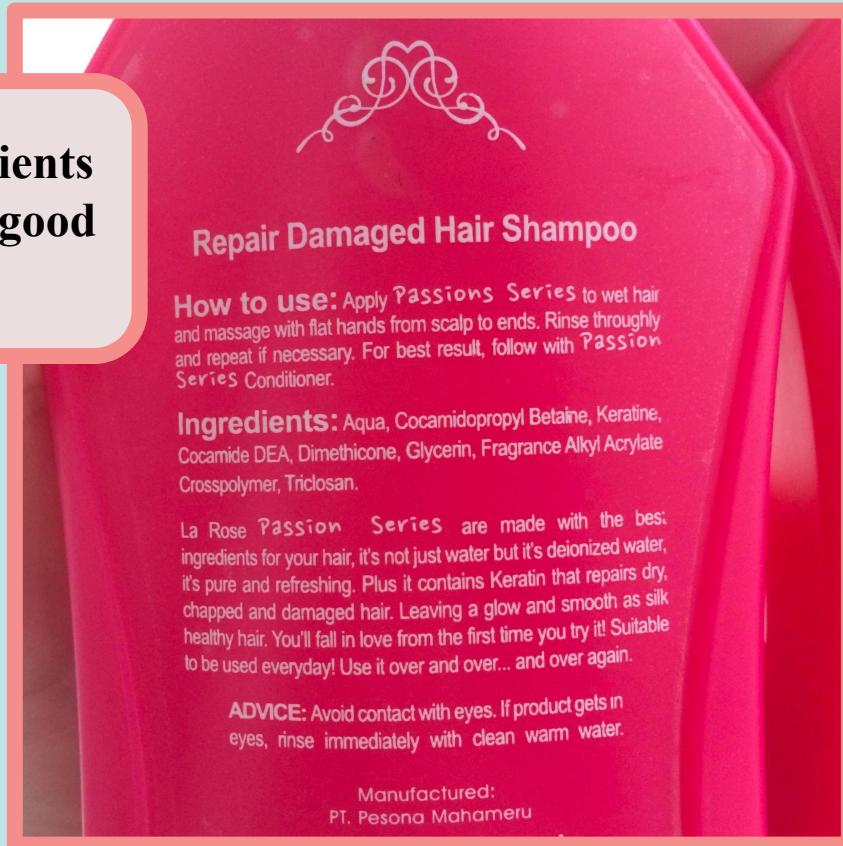
You read the description of a few bottles to see what best describes *your* hair.

Finding a Product at the Store



Finding a Product at the Store

What do the ingredients really do? Are they good for your hair?



Finding a Product at the Store



How accurate are the claims? How do you test their accuracy?

Finding a Product at the Store

How do you know
your hair type?



Issues with this Process

Many customers **don't**
know their hair type or
inaccurately assess their
hair issues

Issues with this Process

Many customers **don't know their hair type or inaccurately assess their hair issues**

Customers buy **too many products that don't address their hair concerns**

Analysis with Foli-Q

Online Analysis

In-Person Analysis

Analysis with Foli-Q

Online Analysis

In-Person Analysis

Analysis with Foli-Q



Hair Analysis

\$57.00 ~~\$100.00~~ SALE

[ADD TO CART](#)

Buy with Pay

[More payment options](#)

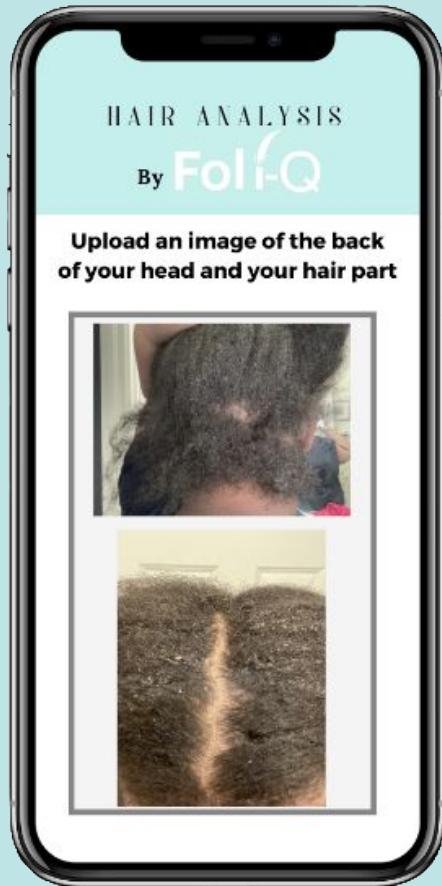
Ever get overwhelmed by the product selection in the store with the assortment of products readily available for you to use?

How do you choose the right products? Maybe you like the smells or label colors?

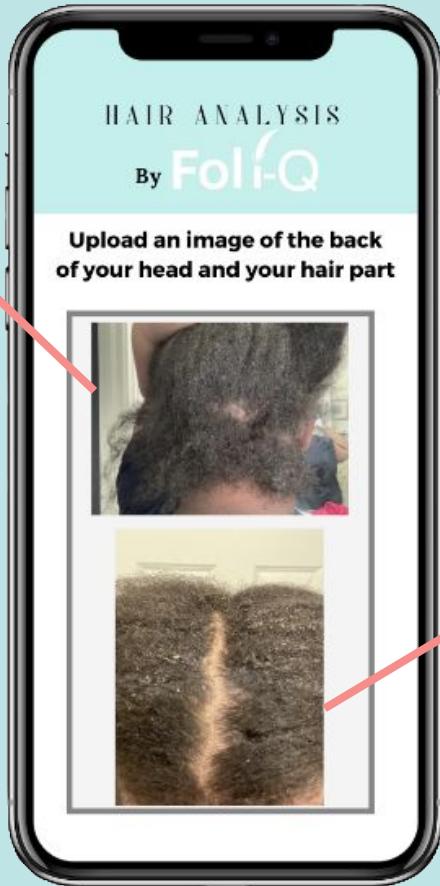
Maybe you looked online to try to find some answers or got some recommendations from friends or family but was still unable to really make any progress?

Analysis with Foli-Q

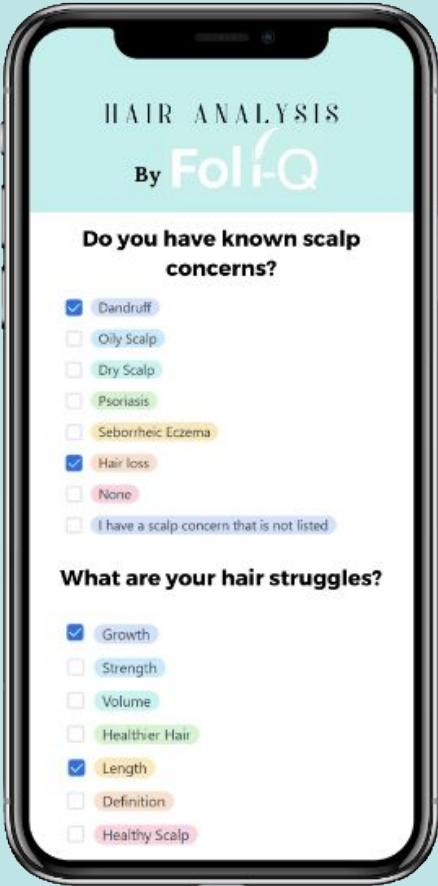
Upload an image of the back of the customer's head and their hair part



Analysis with Foli-Q



Analysis with Foli-Q

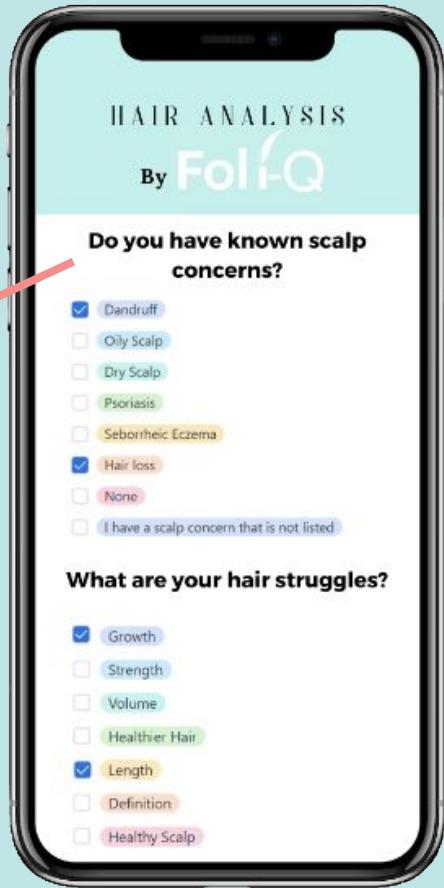


Customer fills out a questionnaire with their known **scalp concerns** and **hair struggles**

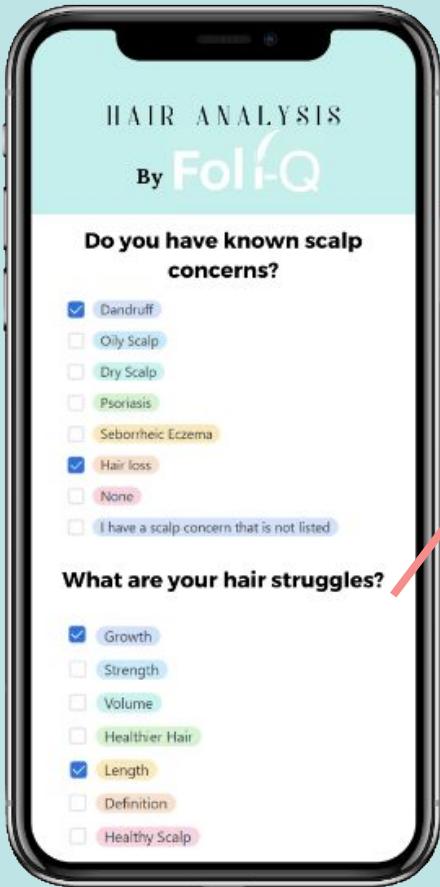
Analysis with Foli-Q

Scalp concerns:

- Dandruff
- Oily scalp
- Dry scalp
- Psoriasis
- Seborrheic eczema
- Hair loss
- None
- Other



Analysis with Foli-Q



Hair Struggles:

- Growth
- Strength
- Volume
- Healthier hair
- Length
- Definition
- Healthy scalp

Analysis with Foli-Q

Online Analysis

In-Person Analysis

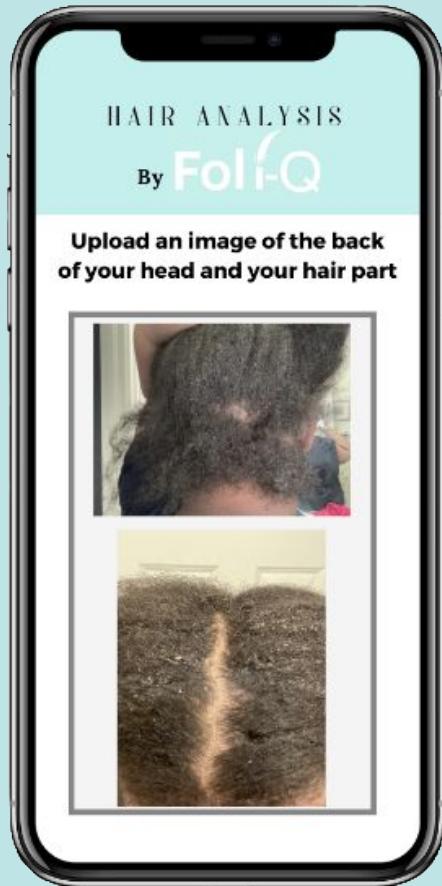
Analysis with Foli-Q

Online Analysis

In-Person Analysis

Analysis with Foli-Q

Upload an image of the top of the customer's head, back of their head, left temple, and right temple



Analysis with Foli-Q

Skybasic

\$29.99 per microscope

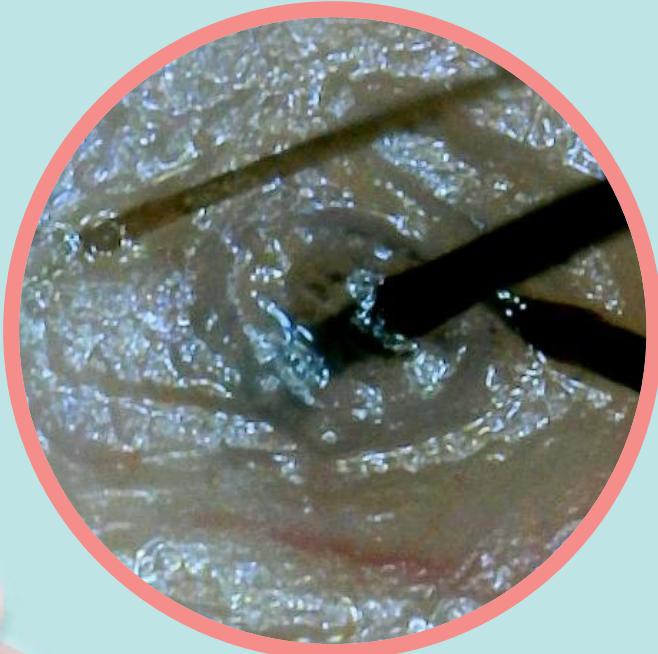


Analysis with Foli-Q

Upload a microscope image of the top of the customer's head, back of their head, left temple, and right temple



Analysis with Foli-Q

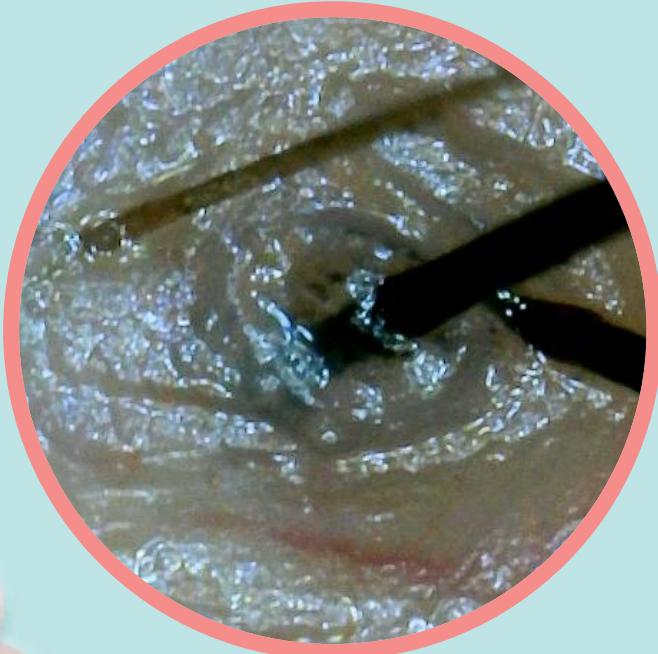


Analysis with Foli-Q



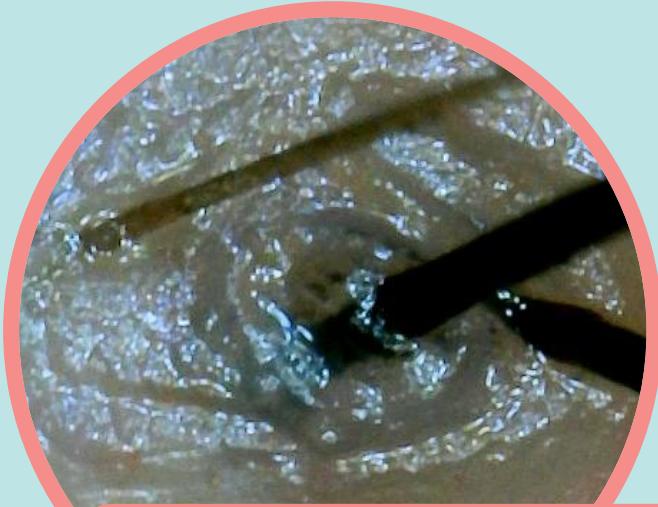
Can measure hair to determine hair thickness

Analysis with Foli-Q



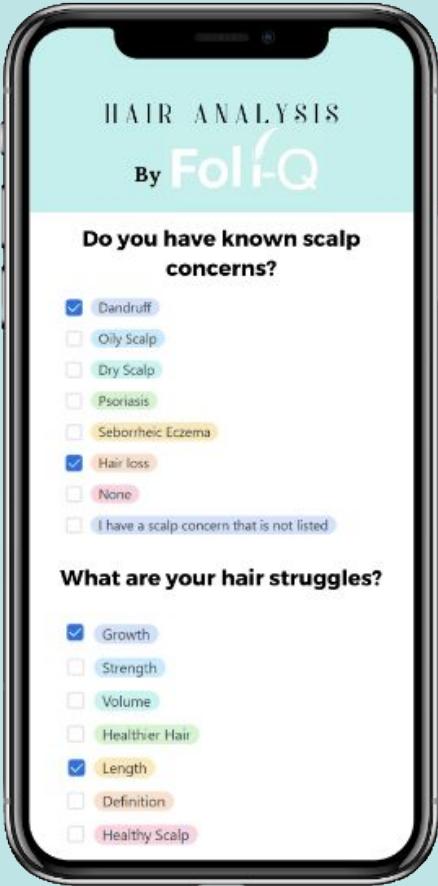
Can identify scalp conditions:
oily, dry, dandruff, psoriasis,
and buildup

Analysis with Foli-Q



Can see how far individual hair strands are from each other to determine density

Analysis with Foli-Q

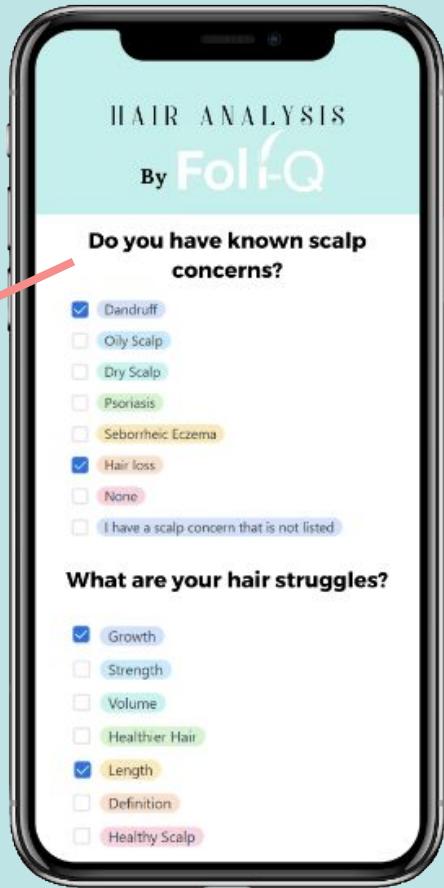


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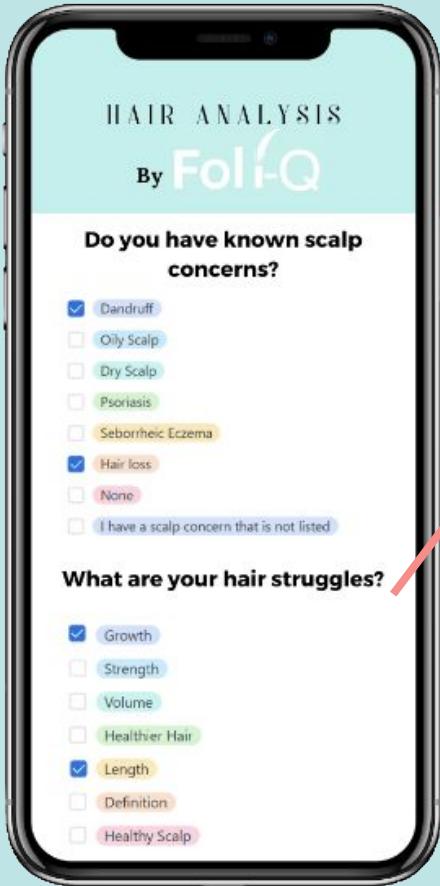
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- Other



Analysis with Foli-Q



Hair Struggles:

- Growth
- Strength
- Volume
- Healthier hair
- Length
- Definition
- Healthy scalp

Foli-Q Hair Reports



Clear photos and the addition of microscope images leads to **more accurate results with in-person analysis**

Foli-Q Hair Reports

Description of hair type
and curl pattern



Foli-Q Hair Reports

Type: Coily Hair

Coily hair can consist of loose, tight, and spiral coils throughout the hair strand. It is common for coily hair to have frizz and dryness. The best way to style coily hair for better curl formation is when the hair is wet. It is best to comb your coily hair while it is wet instead of when it is dry. But you still need to be careful while styling your wet hair because excessive combing and roughness can lead to damage.

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Foli-Q Hair Reports



Description of hair thickness

Foli-Q Hair Reports

Thickness:
Fine

Hair thickness is how thick each hair strand is. With finer hair, it is easier for your hair to be weighed down so you should use lighter products.

Foli-Q Hair Reports

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Foli-Q Hair Reports

Description of hair density



Foli-Q Hair Reports

Density:
Low
Density

Your hair density tells you how many strands of hair you have on your head. The number of hair follicles where our hair grows is finite. So everyone is born with a set hair density no density level is bad. The number of hairs on our heads can be impacted by many factors like stress, hormones, diet, and age. With low-density hair, you have a lower amount of hair on your head. This means you should use lighter formulated products.

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Foli-Q Hair Reports



Description of hair porosity

Foli-Q Hair Reports

Porosity: High Porosity

Porosity tells you about how your hair interacts and retains products and water. With high porosity hair, water and product can enter your hair easily making your hair limp and maybe even over moisturized. Often when your hair goes through chemical processing you can have higher porosity hair. Overtime with damage our hair porosity can increase. Some people have high porosity hair naturally.

Foli-Q Hair Reports

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Foli-Q Product Recommendations



<https://amzn.to/436ZVQ3>

The Conditioning Wash is both a shampoo and a conditioner. It will definitely cleanse your hair but it will also nourish it at the same time. **HOW THE MAGIC HAPPENS** - Unlike traditional 2in1 products, which have a lot of harsh cleansers and a little bit of conditioners, our Co-wash is a conditioner with a little bit of cleansers. None of the lather, all of the moisture!

Foli-Q Product Recommendations



<https://curlsmith.com/collections/conditioning-wash>

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Three hair product or styling tool recommendations are given

Foli-Q Product Recommendations



<https://amzn.to/436ZVQ3>

Co-washes are conditioners used to wash hair. Sometimes shampooing the hair often can be stripping to the hair but can benefit the scalp. Co-washes allow you to gently wash the hair and scalp without stripping your hair. Some co-washes have surfactants to help clean the scalp but co-washes do not usually sud. When applying make sure you are scrubbing your scalp gently but thoroughly. Also make sure to gently scrub when rinsing.

Provides description about what the product is and why it matches your hair type

Foli-Q Product Recommendations



<https://amzn.to/436ZVQ3>

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Provides recommendation for how to use the product

Current Foli-Q Products



Leave-In Conditioners



Hair Masks

Current Foli-Q Products



Leave-In Conditioners



Hair Masks

Foli-Q's Leave-In Conditioner



Leave-in conditioner **nourishes** the hair shaft by drawing moisture from the air into the hair. This would be put in **wet, freshly washed hair** and would not be washed out.

Foli-Q's Leave-In Conditioner



\$25 for 8 oz



\$32 for 8 oz

Foli-Q's Leave-In Conditioner



Hydrating + Shining



Protein Repair

Foli-Q's Leave-In Conditioner



**For Low Density
Hair**



**For Low to Medium
Density Hair**

Current Foli-Q Products



Leave-In Conditioners



Hair Masks

Current Foli-Q Products



Leave-In Conditioners



Hair Masks

Foli-Q's Hair Masks



Hair masks help increase the **strength** and **elasticity** of the hair strands, preventing **breakage**. Hair masks can be put on after conditioner and rinsed out, or they can be put on wet hair and left in the hair.

Foli-Q's Hair Masks



\$25 for 8 oz



\$32 for 8 oz

Foli-Q's Hair Masks



Hydrating + Shining



Protein Repair

Foli-Q's Hair Masks



**For Low Density
Hair**



**For Low to Medium
Density Hair**

Target Audience

Foli-Q's target audience is **women aged 18-26 with textured hair**. Textured hair care products are **underrepresented** on the market and **education** for caring for textured hair is even more **limited**.



Lauren Fountain

Sareena's Story and Foli-Q's Impact



- 1** **Introduction:** *Lauren Fountain*
- 2** **AI Overview and Outsource:** *Chris Toh*
- 3** **AI Algorithms and Implementation:** *Ben Speyer*
- 4** **Manufacturing:** *Rafael Bonner*
- 5** **Competitive Analysis and Promotion:** *Stephen Salamone*
- 6** **Integration and Projections:** *Matt Slaski*
- 7** **Conclusion:** *Lauren Fountain*



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AI and Machine Learning

What is Artificial Intelligence?

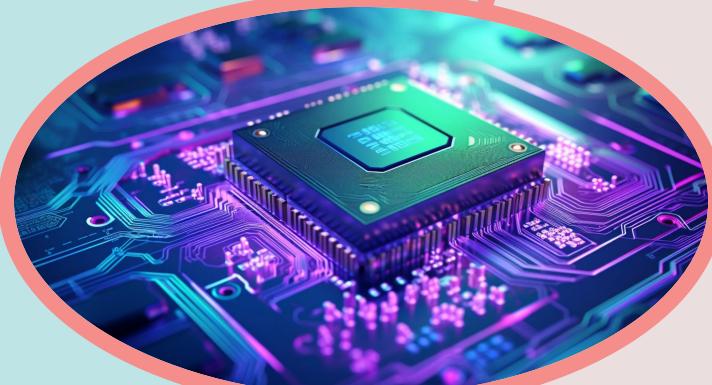
Artificial Intelligence



“Artificial intelligence leverages computers and machines to mimic the problem-solving and decision-making capabilities of the human mind.” - IBM

What is Machine Learning?

Machine Learning



“While artificial intelligence encompasses the idea of a machine that can mimic human intelligence, machine learning does not. Machine learning aims to teach a machine how to perform a specific task and provide accurate results by identifying patterns.” - Google Cloud

What is an Algorithm?

Algorithm

Formula used to generate predictions from input data.

Algorithm

Formula used to generate predictions from input data.

Example: Object Classification

What is a Model?

Model

1 Pattern Recognition

Model

1 Pattern Recognition

2 Reasoning and Learning

Model

1 Pattern Recognition

2 Reasoning and Learning

3 Making Predictions

Deep Learning



“Deep learning methods attempt to **automate more complex tasks** that typically require human intelligence... to describe images, translate documents, or transcribe a sound file into text.” - AWS

Data types

Data types

Images



Data types

Images

Text



Data types

Images

Text

Videos



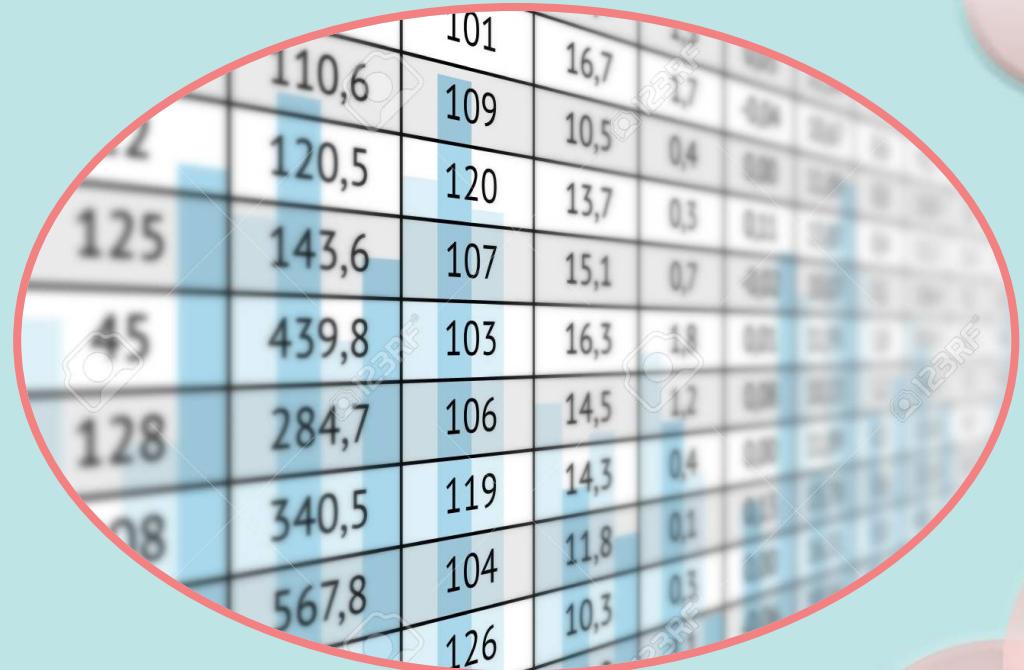
Data types

Images

Text

Videos

Numerical



| | | |
|-------|-----|------|
| 110,6 | 101 | 16,7 |
| 120,5 | 109 | 10,5 |
| 125 | 120 | 0,4 |
| 143,6 | 107 | 13,7 |
| 45 | 103 | 0,3 |
| 439,8 | | 15,1 |
| 128 | 106 | 0,7 |
| 284,7 | | 16,3 |
| 340,5 | 119 | 1,1 |
| 567,8 | 104 | 14,5 |
| | | 14,3 |
| | 126 | 0,4 |
| | | 11,8 |
| | | 10,3 |

Data types

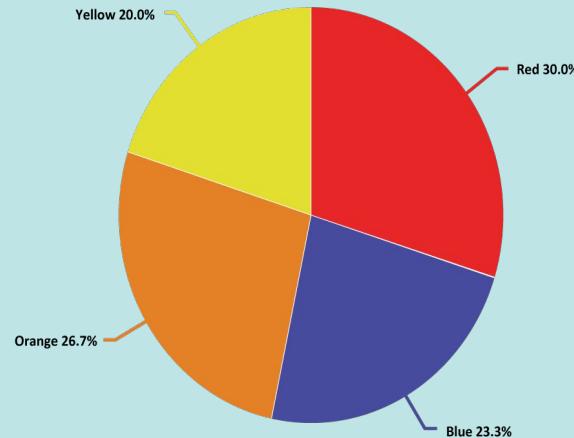
Images

Text

Videos

Numerical

Categorical

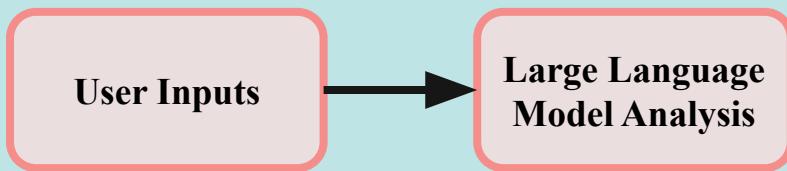


Application of AI and ML

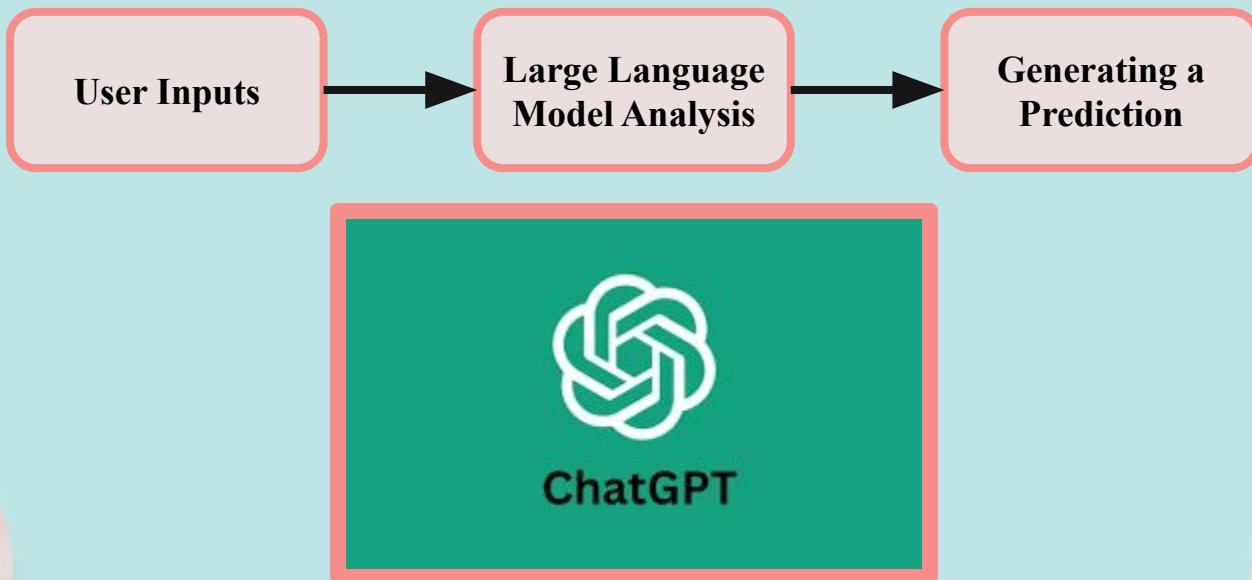
Application of AI and ML

User Inputs

Application of AI and ML



Application of AI and ML

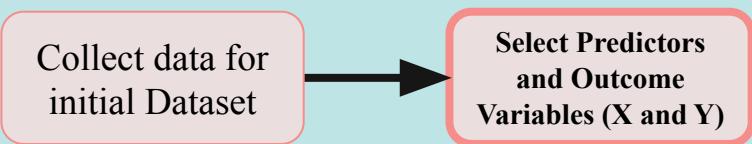


How is an ML model built?

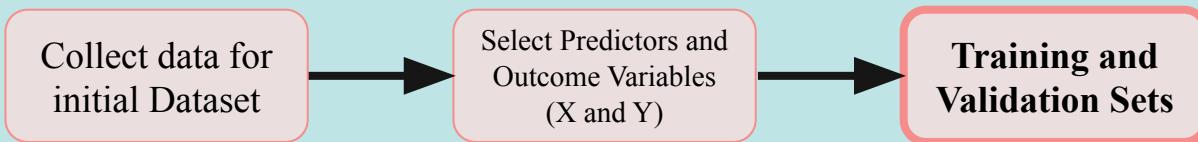
How to Design an ML Model

Collect data for
initial Dataset

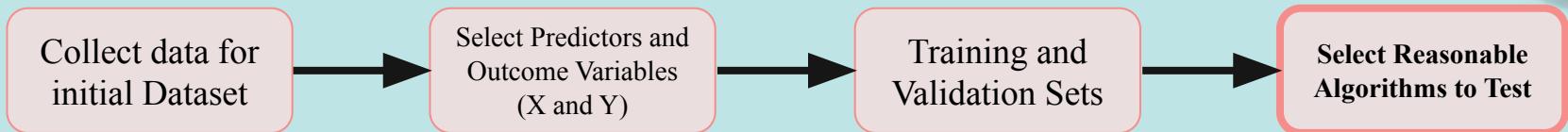
How to Design an ML Model



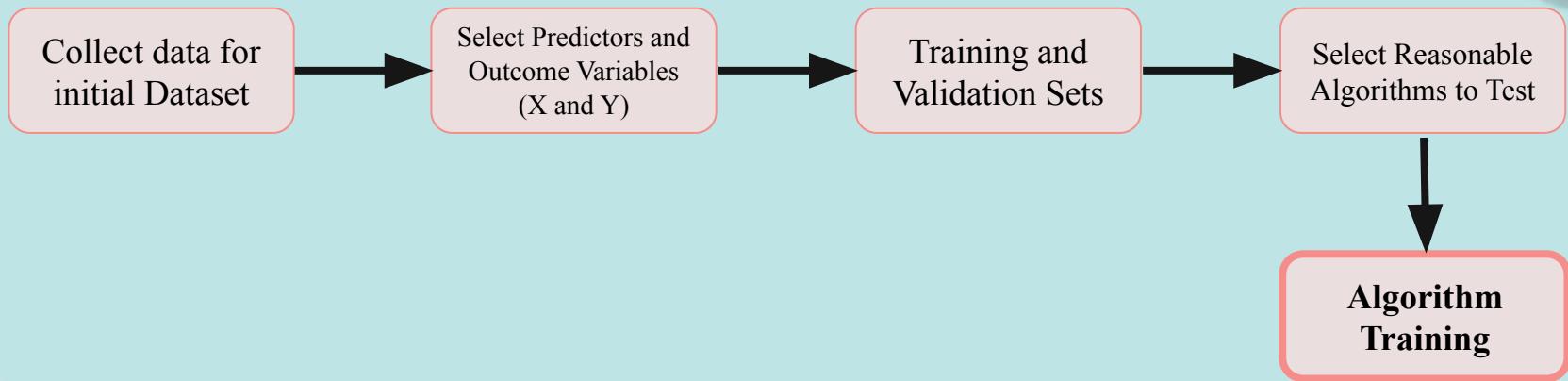
How to Design an ML Model



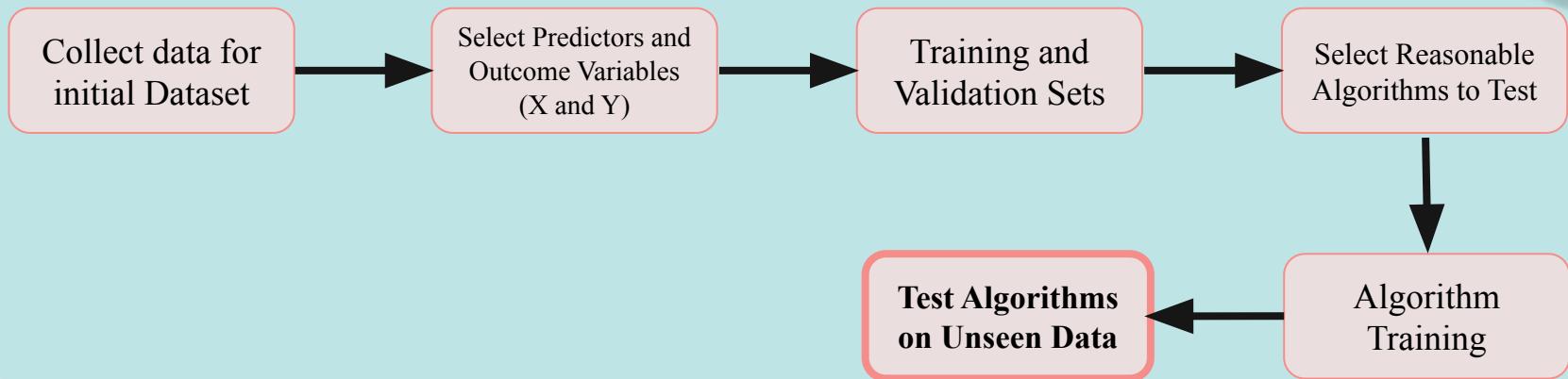
How to Design an ML Model



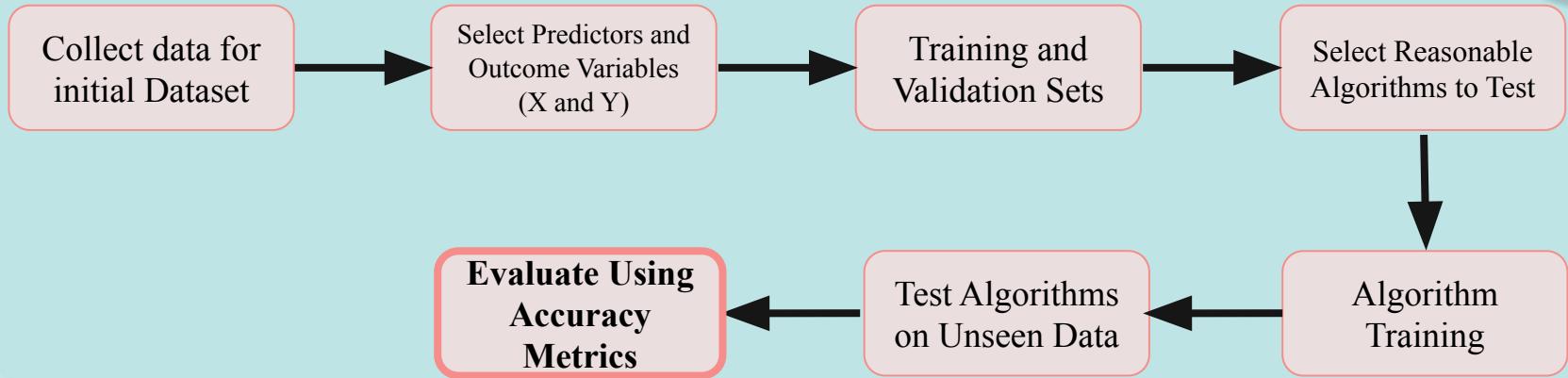
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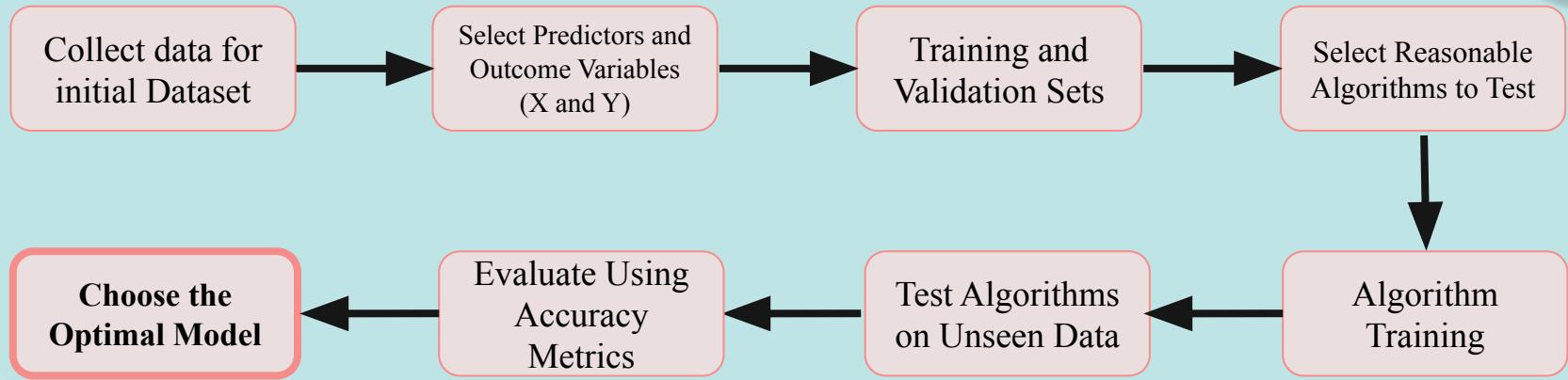
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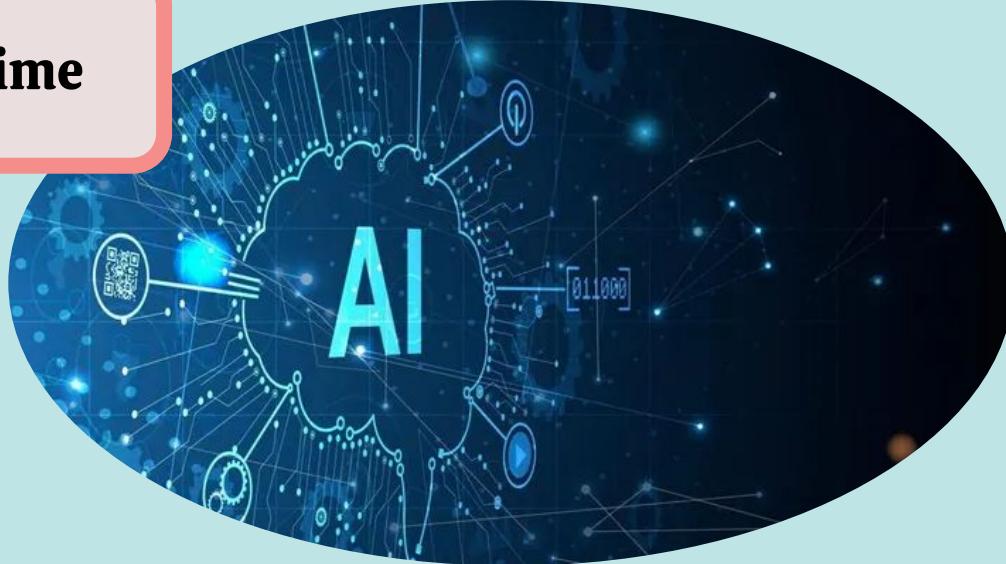
How to Design an ML Model



Why Use AI for Foli-Q?

Why Use AI for Foli-Q

Save Time



Why Use AI for Foli-Q

Save Time

Improve
Customer
Experience



Why Use AI for Foli-Q

Save Time

Improve
Customer
Experience

Grow and
Expand the
Company



Why Use AI for Foli-Q

Save Time

Improve
Customer
Experience

Grow and
Expand the
Company

Help people find
solutions to their
hair struggles



How Can Foli-Q Use AI?

How Can Foli-Q Use AI?



How can Foli-Q use AI?



How can Foli-Q use AI?



Current Status of Data

Current Status of Data

**Currently have: 260
regular images**

Current Status of Data

Currently have: 260
regular images

**130 of top of head and 130
of back of head**

Current Status of Data

Currently have: 260
regular images

130 of top of head and 130
of back of head

**50 Micrographic
Images**

Constraints

Constraints

Lighting

Constraints

Lighting

Angle

Constraints

Lighting

Angle

Zoom Focus

Current Status of Data

**Quality and Consistency over
Quantity and Low Correlation**

Collecting More Images

Cosmetology School





Kimberly

“This would revolutionize the way that we educate our new students how to understand hair.”

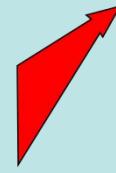
Chris Toh

Images Require Embedding for Analysis

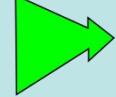
| | | |
|---------|---------|---------|
| #642b4e | #7b4360 | #936073 |
| R: 100 | R: 123 | R: 147 |
| G: 43 | G: 67 | G: 96 |
| B: 78 | B: 96 | B: 115 |

| | | |
|---------|---------|---------|
| #7a4360 | #a1727a | #c89c8f |
| R: 122 | R: 161 | R: 200 |
| G: 67 | G: 114 | G: 156 |
| B: 96 | B: 122 | B: 143 |

| | | |
|---------|---------|---------|
| #945f71 | #ca9b91 | #f6d0ac |
| R: 148 | R: 202 | R: 246 |
| G: 95 | G: 155 | G: 208 |
| B: 113 | B: 145 | B: 172 |



| | | |
|-----|-----|-----|
| 100 | 123 | 147 |
| 122 | 161 | 200 |
| 148 | 202 | 246 |



| | | |
|----|-----|-----|
| 43 | 67 | 96 |
| 67 | 114 | 156 |
| 95 | 155 | 208 |



| | | |
|-----|-----|-----|
| 78 | 96 | 115 |
| 96 | 122 | 143 |
| 113 | 145 | 172 |

Issues with Web-Scraped Images

Issues with Web-Scraped Images



Issues with Web-Scraped Images

1

Different Angles

Issues with Web-Scraped Images

1

Different Angles

2

Different Zooms

Issues with Web-Scraped Images

1

Different Angles

2

Different Zooms

3

Multiple People

Issues with Web-Scraped Images

1

Different Angles

2

Different Zooms

3

Multiple People

4

Background Noise

Issues with Web-Scraped Images

1

Different Angles

2

Different Zooms

3

Multiple People

4

Background Noise

5

Unexpected Search
Results

Outsourcing Solutions

Outsourcing Solutions



Outsourcing Solutions



Outsourcing Solutions



Amazon Web Services (AWS)



Curtis Darst - AWS Solutions Architect

Chris Toh

Custom-labels Rekognition Model

Custom-labels Rekognition Model

Oily, normal, dry scalp

Custom-labels Rekognition Model

Oily, normal, dry scalp

Dandruff, Eczema, Psoriasis

Custom-labels Rekognition Model

Oily, normal, dry scalp

Dandruff, Eczema, Psoriasis

Low, Medium, High Density

Custom-labels Rekognition Model

Oily, normal, dry scalp

Dandruff, Eczema, Psoriasis

Low, Medium, High Density

**Hair thinning, Hair
damage/frizzy hair**

Custom-labels Rekognition Model

Oily, normal, dry scalp

Dandruff, Eczema, Psoriasis

Low, Medium, High Density

Hair thinning, Hair
damage/frizzy hair

Hair Type: curly, wavy, coily,
straight

Model Requirements

Model Requirements

**Peak confidence threshold for
given set of labels**

Model Requirements

Peak confidence threshold for
given set of labels

**Varies based on image quality
and complexity**

Model Requirements

Peak confidence threshold for
given set of labels

Varies based on image quality
and complexity

**Need at least 10 baseline
images that are labeled**

Model Training

Model Training

Create a free AWS account

Model Training

Create a free AWS account

10 free training hours and 4 free
inference hours **per month**

Model Training

Create a free AWS account

10 free training hours and 4 free
inference hours **per month**

Training: \$1/hour

Model Training

Create a free AWS account

10 free training hours and 4 free
inference hours **per month**

Training: \$1/hour

Inference: \$4/hour

Amazon Web Services (AWS)



amazon **Rekognition**

Amazon Web Services (AWS)



amazon **Rekognition**

Most data on-hand for iPhone images

Amazon Web Services (AWS)



amazon **Rekognition**

Most data on-hand for iPhone images

Able to build and test a model for free

Amazon Web Services (AWS)



amazon Rekognition

Most data on-hand for iPhone images

Able to build and test a model for free

AWS provides scalable solutions for data storage and app development

Amazon Web Services (AWS)

Create backend for application

AWS Amplify



+

React

Amazon Web Services (AWS)

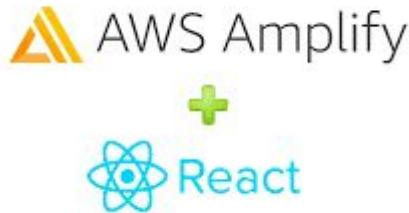
AWS Amplify



Create backend for application

Build front end User Interface

Amazon Web Services (AWS)



Create backend for application

Build front end User Interface

Host a web/mobile application

Amazon Web Services (AWS)



Create backend for application

Build front end User Interface

Host a web/mobile application

Cost is Storage-based: 2.3 cents per gigabyte per month

Outsourcing solutions



Microsoft Azure



Split data function for model training
(70% training and 30% validation)

Microsoft Azure



Split data function for model training
(70% training and 30% validation)

Billed by use of the model

Microsoft Azure



Split data function for model training
(70% training and 30% validation)

Billed by use of the model

**Microsoft never controls Foli-Q's data
or has access to it**

1 **Introduction:** *Lauren Fountain*



AI Overview and Outsource: *Chris Toh*

3 **AI Algorithms and Implementation:** *Ben Speyer*

4 **Manufacturing:** *Rafael Bonner*

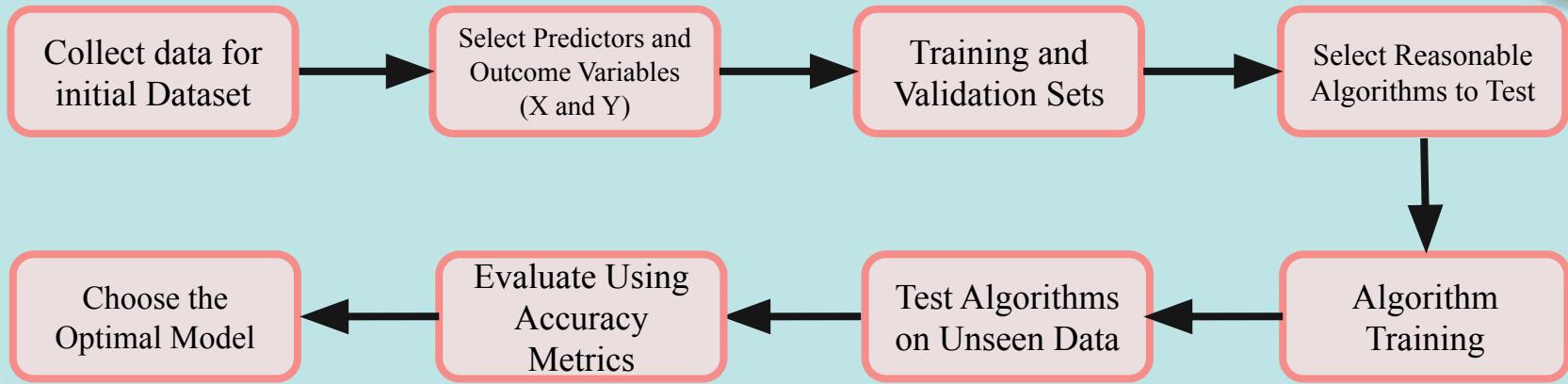
5 **Competitive Analysis and Promotion:** *Stephen Salamone*

6 **Integration and Projections:** *Matt Slaski*

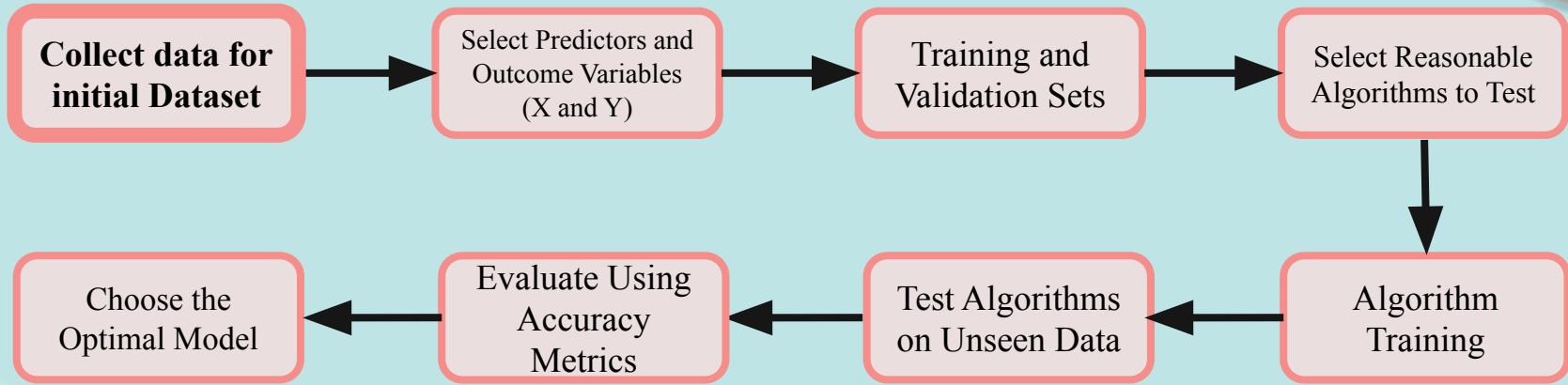
7 **Conclusion:** *Lauren Fountain*

- 1** **Introduction:** *Lauren Fountain*
- 2** **AI Overview and Outsource:** *Chris Toh*
-  **AI Algorithms and Implementation:** *Ben Speyer*
- 4** **Manufacturing:** *Rafael Bonner*
- 5** **Competitive Analysis and Promotion:** *Stephen Salamone*
- 6** **Integration and Projections:** *Matt Slaski*
- 7** **Conclusion:** *Lauren Fountain*

How to Design an ML Model



How to Design an ML Model



How Can Foli-Q Collect Data

Events at Lehigh

How Can Foli-Q Collect Data

Events at Lehigh

**Partnerships With
Cosmetology Schools**

How Can Foli-Q Collect Data

Events at Lehigh

Partnerships With Salons

Partnerships With
Cosmetology Schools

How Can Foli-Q Collect Data

Events at Lehigh

Partnerships With Salons

Partnerships With
Cosmetology Schools

Customer Submissions

How Can Foli-Q Collect Data

Events at Lehigh

Partnerships With Salons

****Web-scraping****

Partnerships With
Cosmetology Schools

Customer Submissions

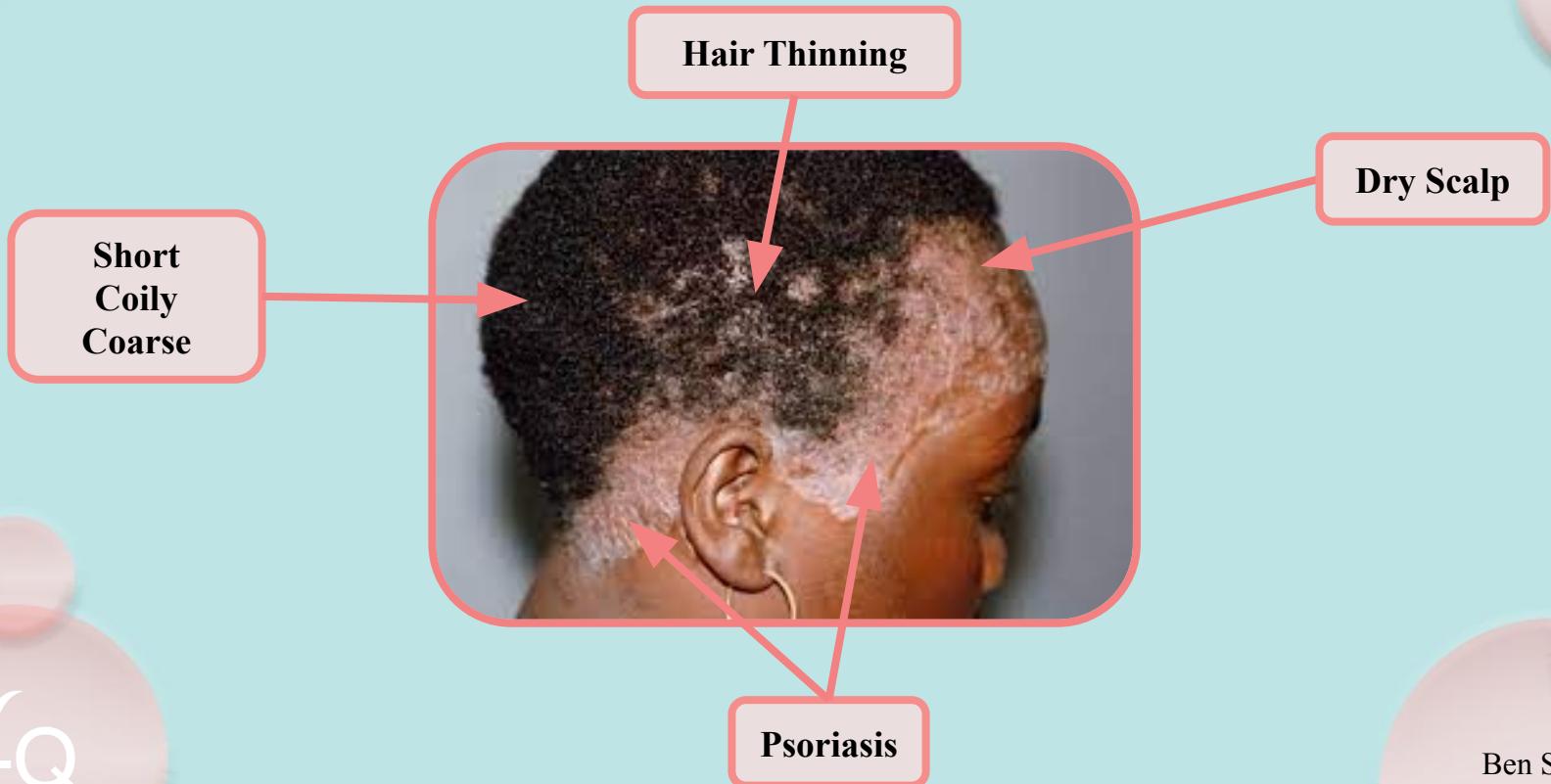
Image Labeling Solutions



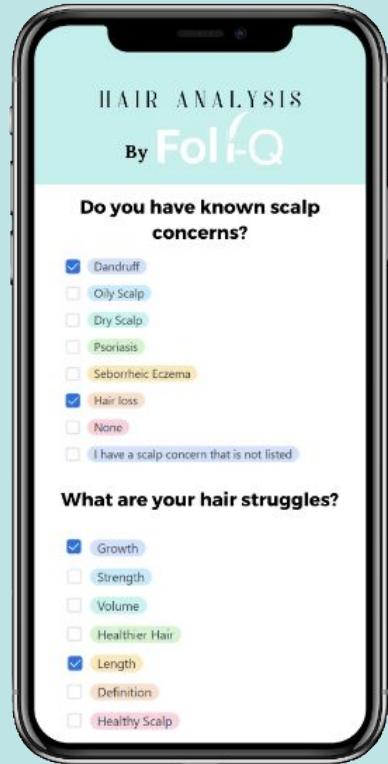
Image Labeling Solutions



Image Labeling Example



Survey Data



Foli-Q Dataset

| Has your hair gone through any chemical processes? | How long have you used chemical processes in your hair? | what is your hair like when it is humid? | How fast does your hair dry? | How often do you shampoo? |
|----------------------------------------------------|---------------------------------------------------------|------------------------------------------|------------------------------|---------------------------|
| None | Never | My hair is not effected by humidity | 2 hours | 2 days a week |
| None | Never | My hair is not effected by humidity | less than an hour | Everyday |
| None | 4 years or more | My hair is not effected by humidity | less than an hour | 2 days a week |
| None | Never | Frizzy Tangled | 4 or more hours | 2 days a week |
| None | Never | Tangled | 4 or more hours | Everyday |
| None | Never | Frizzy | 4 or more hours | Once a week |
| Bleach Dye | 4 years or more | Frizzy | 2 hours | Once a week |
| Relaxer | 1-6 months | Frizzy | 2 hours | 4 days a week |

Over 100 Columns of Data

Data Cleaning

Remove or Fill Null Values

Data Cleaning

Remove or Fill Null Values

Convert Variables to Proper
Data Type

Data Cleaning

Remove or Fill Null Values

Create “Dummy Variables” for
All Categorical Variables

Convert Variables to Proper
Data Type

Data Cleaning

Remove or Fill Null Values

Create “Dummy Variables” for
All Categorical Variables

Convert Variables to Proper
Data Type

**Other Organization and
Cleaning as Needed**

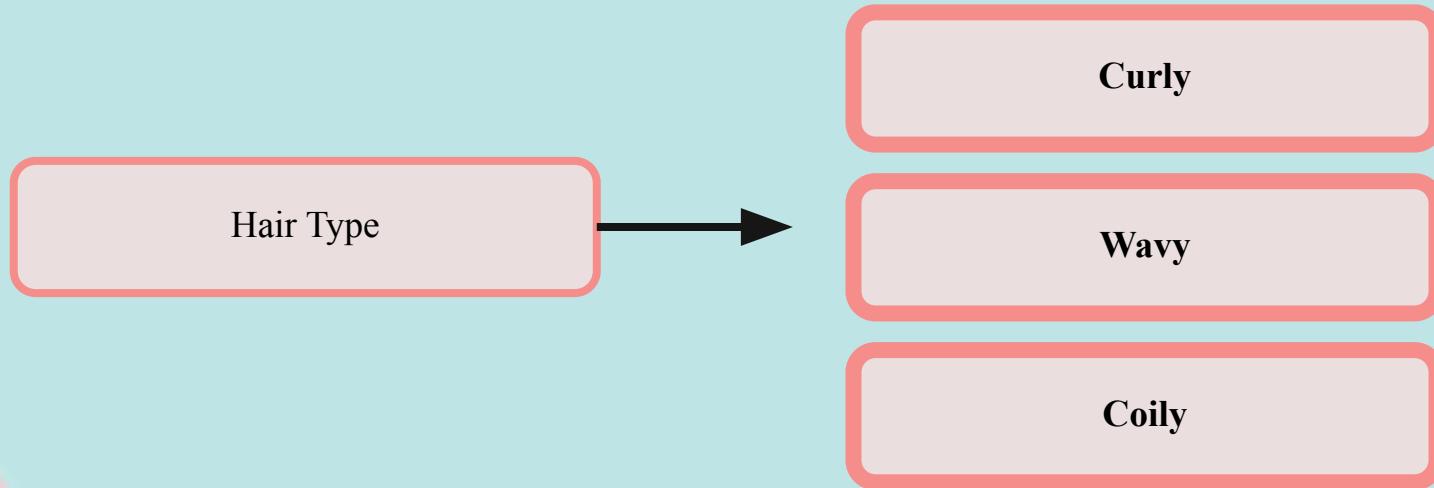
Dummy Variables

- $n-1$ dummy variables for each class of categorical variable
- Set to 0/False if not in category
- Set to 1/True if in category
- Base class does not have a dummy
- Base class is True when all others are False

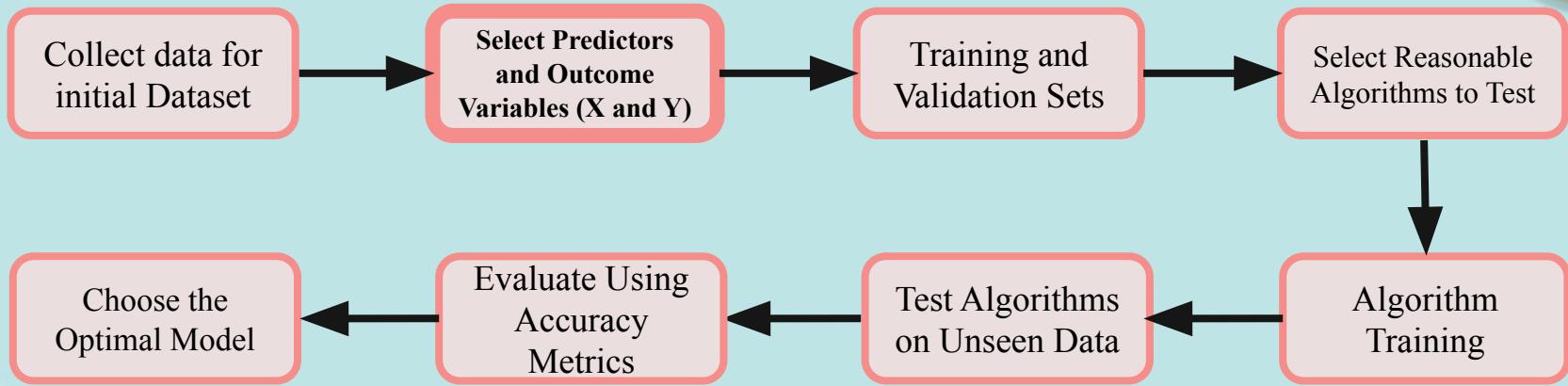
Dummy Variables

Hair Type

Dummy Variable Example



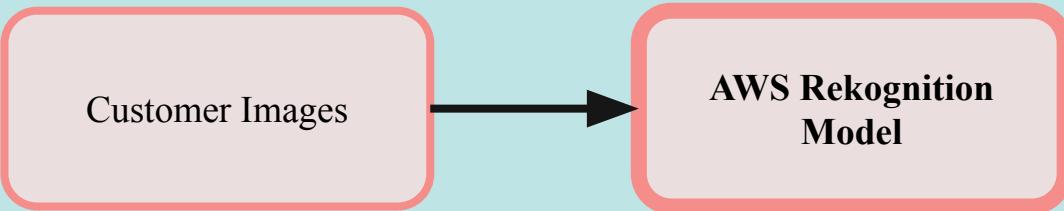
How to Design an ML Model



ML Model Structure

Customer Images

ML Model Structure



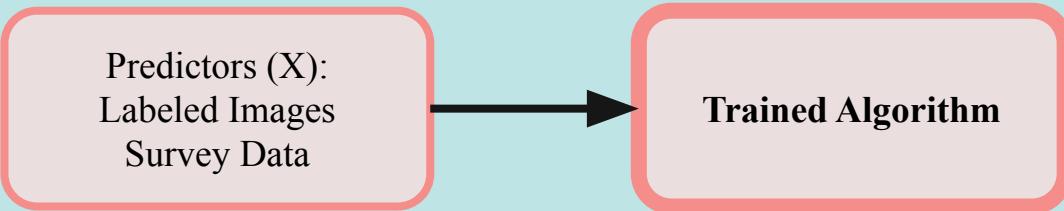
ML Model Structure



ML Model Structure

Predictors (X):
Labeled Images
Survey Data

ML Model Structure



ML Model Structure



Selecting Predictors

Consult Sareena's
Domain Knowledge

Selecting Predictors

Consult Sareena's
Domain Knowledge

**Data Exploration
and Visualization**

Selecting Predictors

Consult Sareena's
Domain Knowledge

Data Exploration and
Visualization

**Identify Variables
With High Correlation
to Outcome Variable**

Model output: Foli-Q products

- AI will streamline analysis process
- This will give Foli-Q more time to focus on product development
- AI model needs products to recommend in order to be profitable and generate sales, so we propose four new lines of shampoos and conditioners complete Foli-Q's product portfolio

Model output: Foli-Q products

Dry

Model output: Foli-Q products

Dry

Oily

Model output: Foli-Q products

Dry

Oily

Sensitive

Model output: Foli-Q products

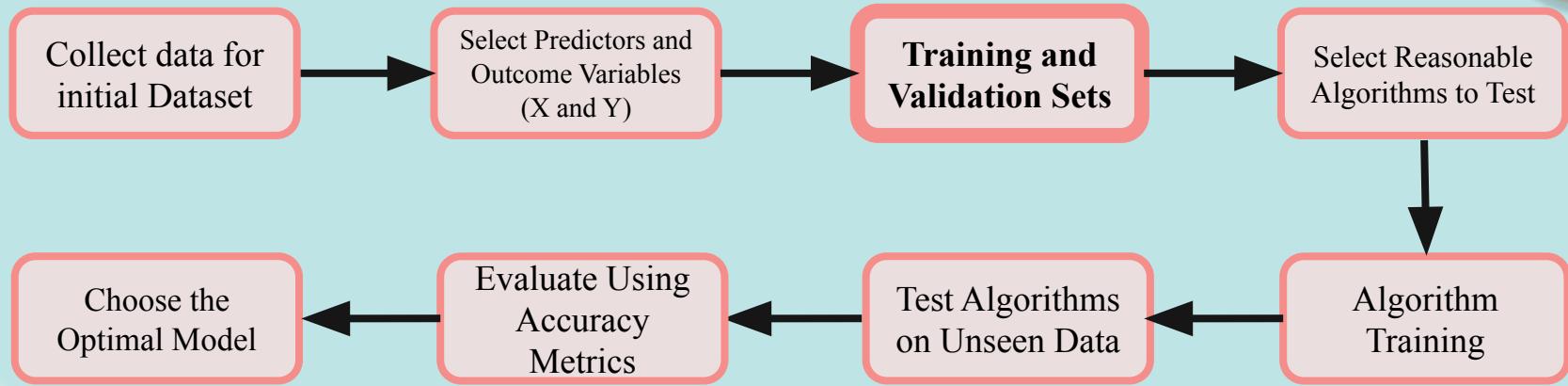
Dry

Oily

Sensitive

Clarifying Detox

How to Design an ML Model

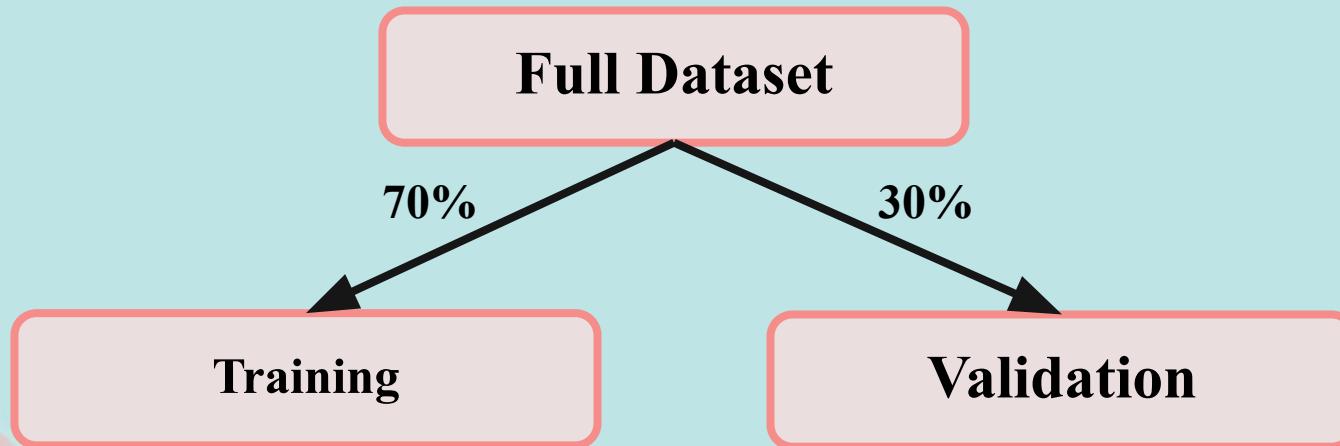


How to Split Data

- No true “golden rule”
- Somewhere between 50/50 to 70/30
- Depends on size and skew of data set
- Best to ensure split is balanced to reduce overfitting

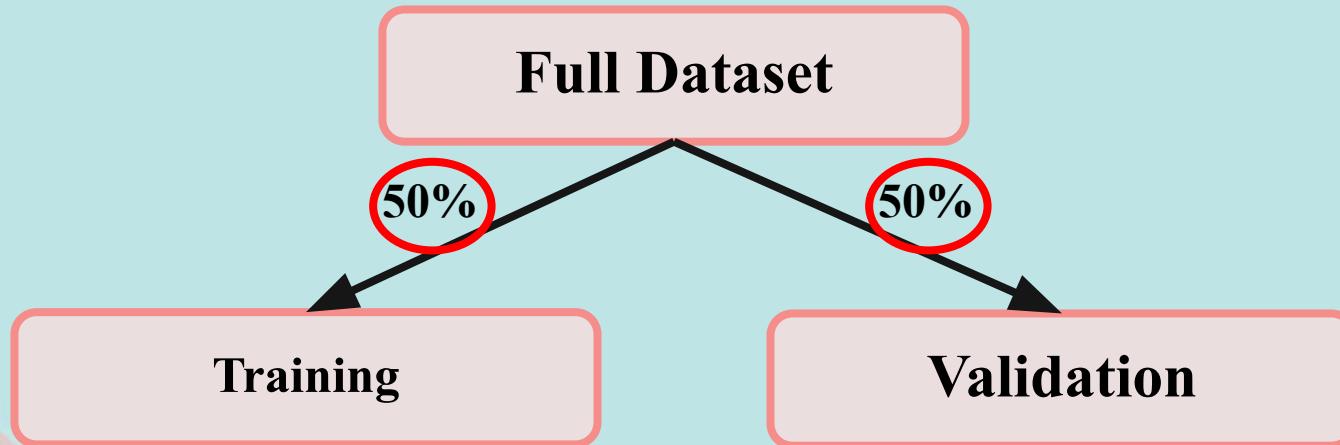
How to Split Data

```
#split data  
x_train, x_test, y_train, y_test = train_test_split(x,y, test_size = 0.3)
```



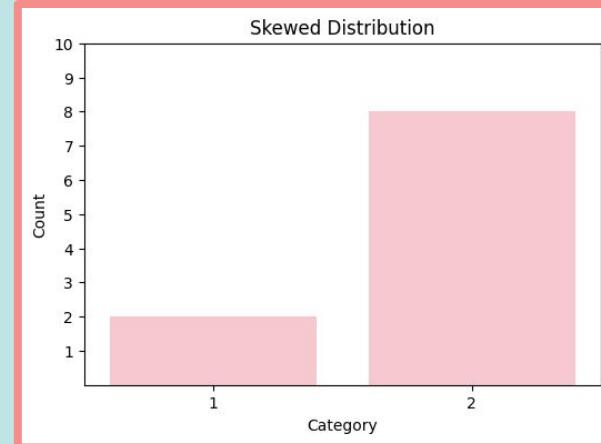
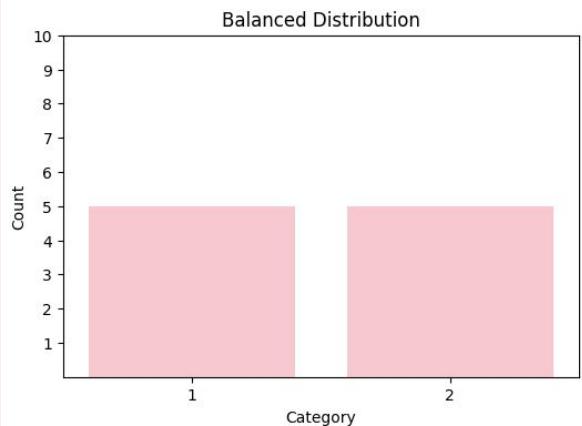
How to Split Data

```
#split data  
x_train, x_test, y_train, y_test = train_test_split(x,y, test_size = 0.5)
```



Skewed Distributions

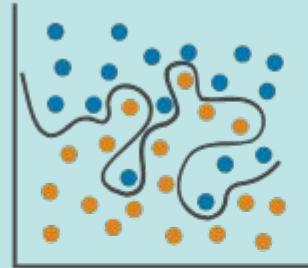
When one category contains more records of data than another, or the mean is not centered



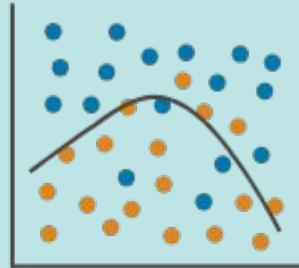
Overfitting

When a model's formula becomes highly specific towards data in training set and doesn't predict well on generalized population or unseen data

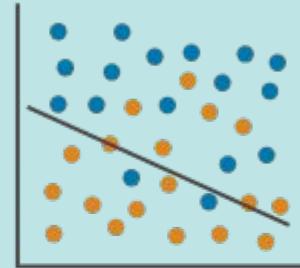
Overfitting



Right Fit



Underfitting



How to Avoid Overfitting

Collect “Enough” Data for
Each Category

How to Avoid Overfitting

Collect “Enough” Data for
Each Category

Achieve Balanced Distributions
If Possible

How to Avoid Overfitting

Collect “Enough” Data for
Each Category

**Prune Data to Balanced
Subsections of Data**

Achieve Balanced Distributions
If Possible

How to Avoid Overfitting

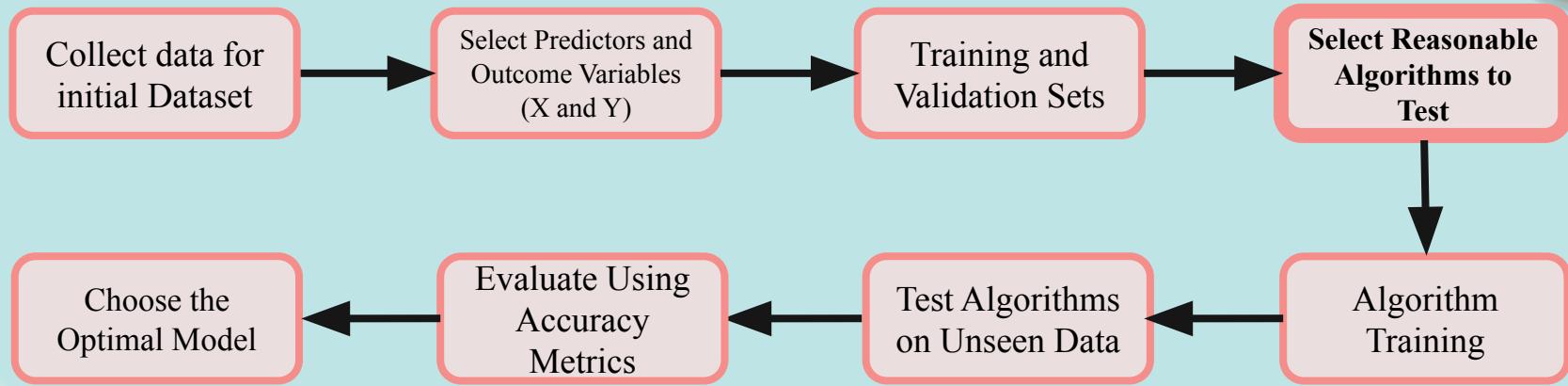
Collect “Enough” Data for
Each Category

Prune Data to Balanced
Subsections of Data

Achieve Balanced Distributions
If Possible

Select Proper Algorithms

How to Design an ML Model



The Big Question

What Algorithm(s) should Foli-Q use?

Identifying Relevant Algorithms

What is our outcome variable?

Identifying Relevant Algorithms

What is our outcome variable?

Numerical or Categorical
Data?

If categorical, does it have
known classes?

Numerical vs Categorical Algorithms

Numerical

Categorical

Regressors

Numerical vs Categorical Algorithms

Numerical

Ridge Regressors

Categorical

Logistic Classifiers

Numerical vs Categorical Algorithms

Numerical

Regressors

Categorical

Classifiers

Supervised vs Unsupervised Learning

Supervised

Uses **labeled input data** for predictions or classification into **known classes**

Unsupervised

Supervised vs Unsupervised Learning

Supervised

Uses **labeled input data** for predictions or classification into **known classes**

Unsupervised

Analyzes and categorizes **unlabeled input data** into **unknown classes**

Supervised vs Unsupervised Learning

Supervised

Uses **labeled input data** for predictions or classification into **known classes**

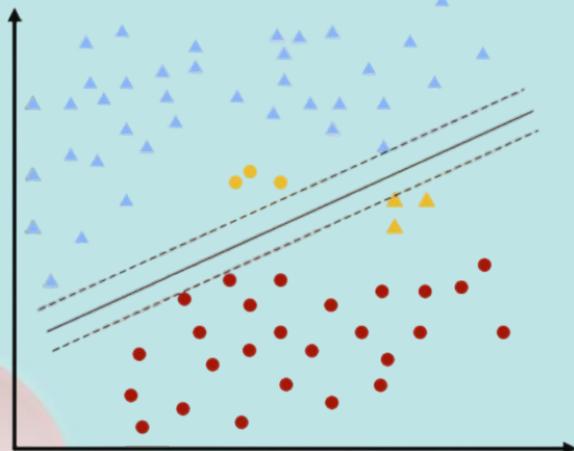
Unsupervised

Analyzes and categorizes **unlabeled input data** into **unknown classes**

Supervised Learning

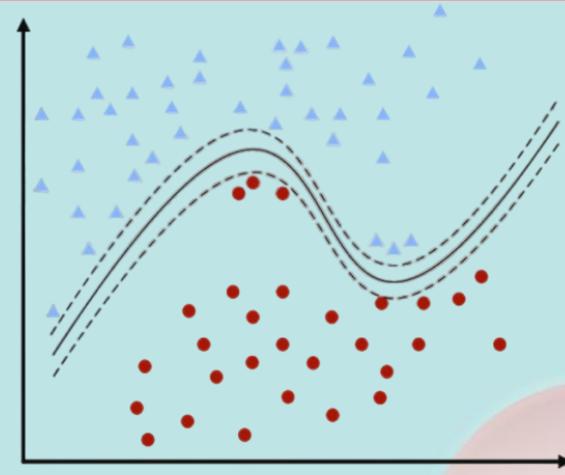
Linear Algorithms

- Assume data can be separated linearly
- Easier to implement and comprehend but less accurate



Non-Linear Algorithms

- Seek to find complex relationships within data for more accurate results



Supervised Learning

Linear Algorithms

Non-Linear Algorithms

Logistic Regression

Supervised Learning

Linear Algorithms

Logistic Regression

Non-Linear Algorithms

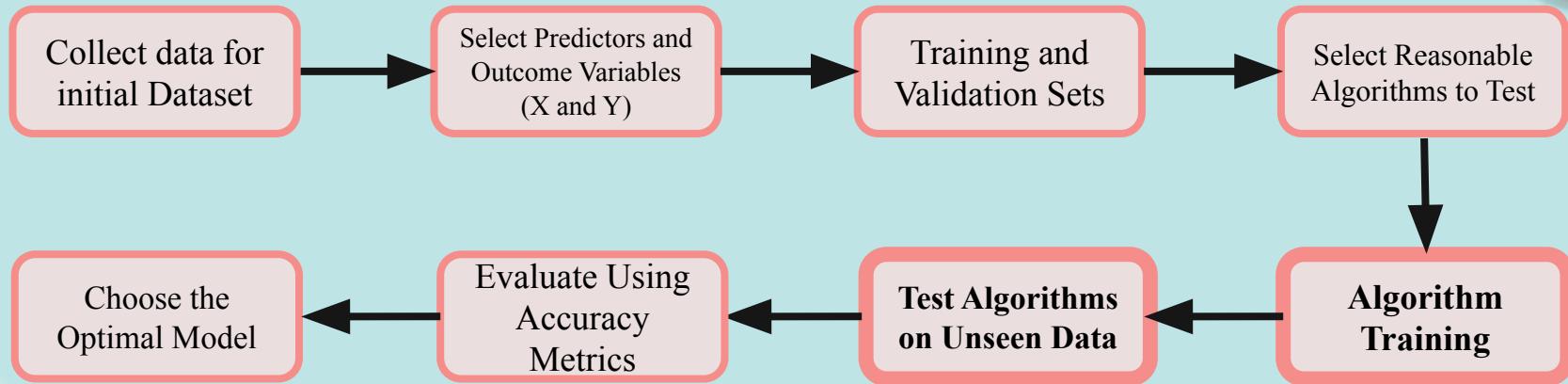
Decision Tree

Random Forest

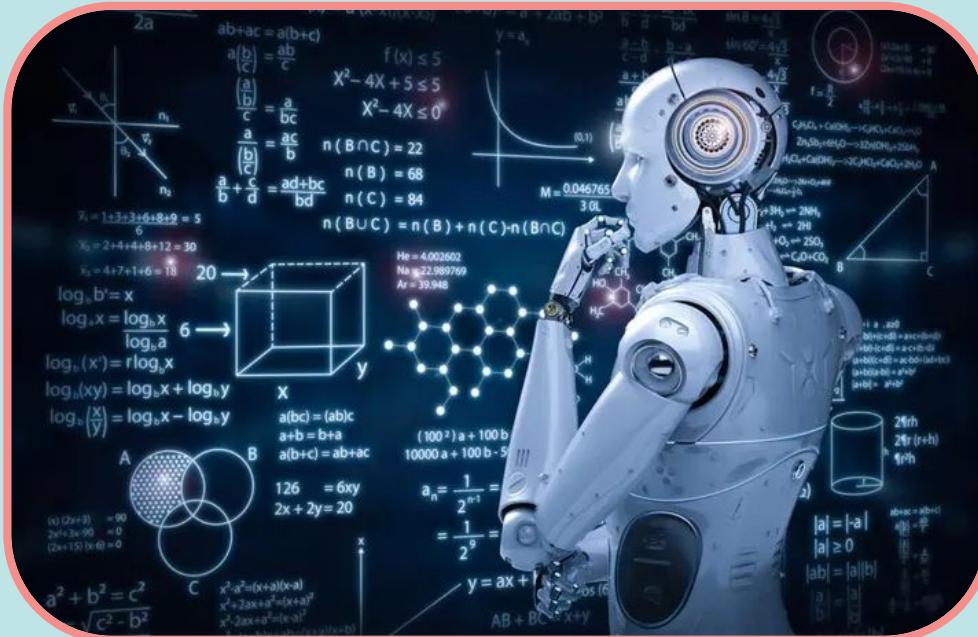
Gradient Boost

Neural Network

How to Design an ML Model



Myth of Machine Learning





 pandas

 matplotlib



 scikit
learn

 TensorFlow

 seaborn

BeautifulSoup

Machine Learning Libraries

```
#import library for splitting data set
from sklearn.model_selection import train_test_split

#import libraries for ML algorithms
from sklearn.linear_model import LogisticRegression
logr = LogisticRegression()

from sklearn.tree import DecisionTreeClassifier
dtree = DecisionTreeClassifier()

from sklearn.ensemble import RandomForestClassifier, GradientBoostingClassifier
randforest = RandomForestClassifier()
gboost_sk = GradientBoostingClassifier()

from xgboost import XGBClassifier
gboost_x = XGBClassifier()

from sklearn.neural_network import MLPClassifier
mlp = MLPClassifier(activation = 'relu',
                     hidden_layer_sizes=(20,20,20,20))

#import evaluation metrics
from sklearn.metrics import accuracy_score, balanced_accuracy_score, roc_auc_score, confusion_matrix
```

Machine Learning Code

```
#create list of algorithms
algos = [(logr, "Logistic regression"),
(dtree, "Decision tree"),
(randforest, "Random forest"),
(gboost_sk, "Gradient boost"),
(gboost_x, "XGBC"),
(mlp, "Neural Network")]

#list of metrics to analyze accuracy of algorithms
metrics = [(accuracy_score, "test_accuracy"), (balanced_accuracy_score, "balanced_accuracy"),
(roc_auc_score, "roc_auc")]

#define predictors and outcome variables
x = df[predictors]
y = df[outcome]

#split data
x_train, x_test, y_train, y_test = train_test_split(x,y, test_size = 0.3)
```

Machine Learning Code

```
#create function to run and test each algorithm and save results to df
def run_ml(algos, metrics, x_train, x_test, y_train, y_test):

    #store results in pandas data frame
    Algorithm_tests = pd.DataFrame([], columns = ["test_accuracy", "balanced_accuracy", "roc_auc"])

    #fit model, predict, and check accuracy for each algorithm, then store results in data frame
    for algo, algo_name in algos:
        algo.fit(x_train, y_train)
        y_test_pred = algo.predict(x_test)

        print(f'Confusion matrix for {algo_name}:')
        print(confusion_matrix(y_test, y_test_pred))

        #call each function in metrics to calculate accuracies of algorithms and store in df
        for function, f_name in metrics:
            Algorithm_tests.loc[algo_name, f_name] = function(y_test, y_test_pred)
    #return
    return Algorithm_tests
```

DIG Labs Quote



\$10k per model

Time and Cost Projections

Freelancer.com

AI model to recommend hair products from customer data [Open](#)

Details Proposals Upgrades Files Tasklists Share ...

\$ Amount ★ Rating ⏱ Within 7 days 📹 Video Bids More Filters Recommended

 **Ashraf M.** @Ashraf714031  
★★★★★ 5.0 38 \$ 6.0 100% Egypt
Machine Learning & Deep Learning Eng./Data analyst

\$1,500.00 USD in 7 days

Hi there, I am very familiar with the requirements of your projects, I am an artificial intelligence engineer with a master's degree and over 10 years of experience in Data Science, Machine learning, Deep Learning, Computer Vision, NLP, OCR, Data Visualization, Web Scraping, and Data Analysis. I have completed many projects... [more](#)

Replies within a few hours Chat Award

 **Gowrylakshmi G.** @gowrilakshmi2322  
★★★★★ 5.0 24 \$ 5.9 100% Germany
AI/ML/DL/Vision & Trading bot/APIs & Python/R/Mathlab

\$1,500.00 USD in 7 days

Hi, How are you? Very happy to bid your project because my skills are fitted in your project. I am a AI engineer with 8 years of experience in machine learning, deep learning, data science, OCR, NLP and AI. I am very familiar with sklearn, nltk, YOLO, GPU, Mediapipe, Generative Adersarial Network, openAI, Mask R-CNN, CNN, RNN, GAN... [more](#)

Replies within a few hours Chat Award

Bids Average bid
57 • \$2,003 USD

35 Developers estimated that they could complete **one model in 7 days or less**

Time and Cost Projections

Option A: One Model for each Product

8 models

Time and Cost Projections

Option A: One Model for each Product

8 models



1 week per model
\$2,000 per model

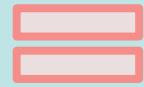
Time and Cost Projections

Option A: One Model for each Product

8 models



1 week per model
\$2,000 per model



8 weeks
\$16,000

Time and Cost Projections

Option B: One Model for each Category

4 models

Time and Cost Projections

Option A: One Model for each Product

4 models



1 week per model
\$2,000 per model

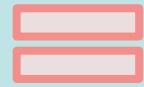
Time and Cost Projections

Option A: One Model for each Product

4 models

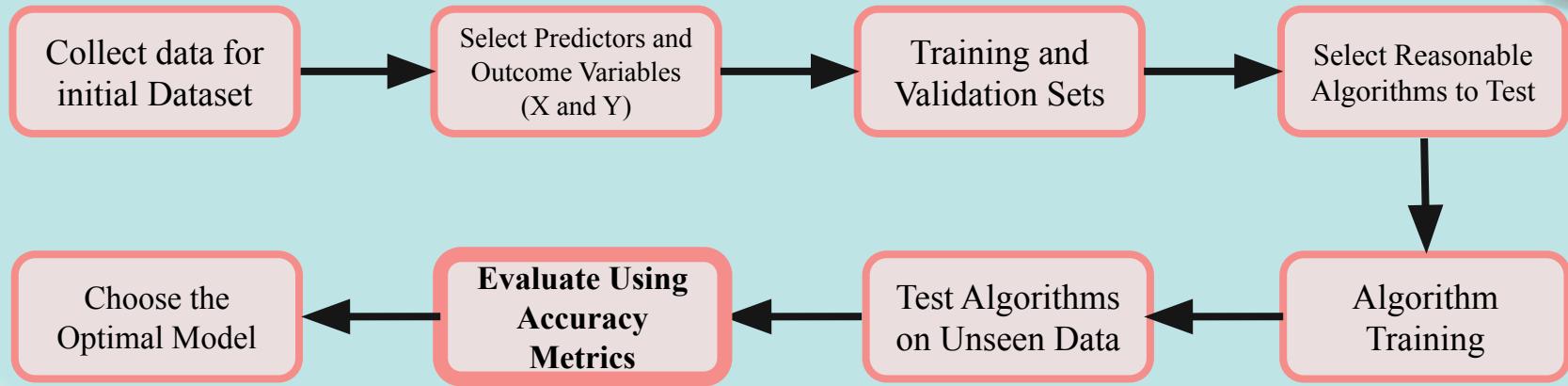


1 week per model
\$2,000 per model



4 weeks
\$8,000

How to Design an ML Model



How to Select an Evaluation Metric

Type of Model:
Regressor or Classifier

How to Select an Evaluation Metric

Type of Model:
Regressor or Classifier

Skew of Data Set

How to Select an Evaluation Metric

Type of Model:
Regressor or Classifier

Skew of Data Set

**Performance
Goals**

Evaluation Metrics

Classifier Metrics

Accuracy

Balanced Accuracy

AUC-ROC Score

Confusion Matrix

Regressor Metrics

Evaluation Metrics

Classifier Metrics

Accuracy

Balanced Accuracy

AUC-ROC Score

Confusion Matrix

Regressor Metrics

Mean Squared Error

Root Mean Squared Error

Mean Absolute Percentage Error

R-squared Correlation

Evaluation Metrics

Classifier Metrics

Accuracy

Balanced Accuracy

AUC-ROC Score

Confusion Matrix

Regressor Metrics

Mean Squared Error

Root Mean Squared Error

Mean Absolute Percentage Error

R-squared Correlation

Speed/Runtime

Evaluation Metrics

Classifier Metrics

Accuracy

Balanced Accuracy

AUC-ROC Score

Confusion Matrix

Speed/Runtime

Regressor Metrics

Mean Squared Error

Root Mean Squared Error

Mean Absolute Percentage Error

R-squared Correlation

Machine Learning Evaluation

```
run_ml(algos, metrics,  
x_train, x_test, y_train, y_test)
```

Confusion matrix for Random forest:

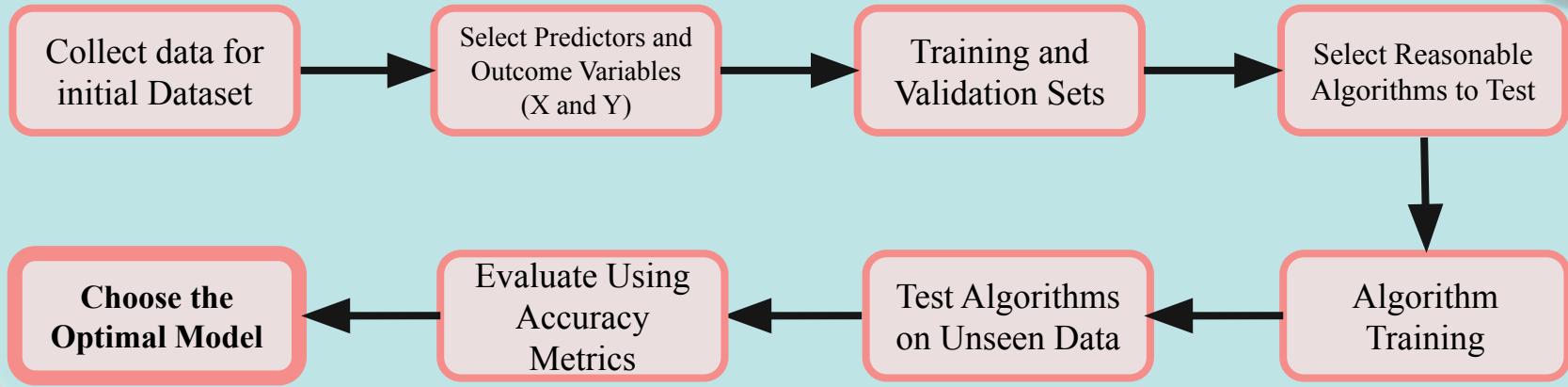
True neg. False pos.

```
[[16563  219]  
 [ 1208 9872]]
```

False neg. True pos.

| | test_accuracy | balanced_accuracy | roc_auc |
|---------------------|---------------|-------------------|----------|
| Logistic regression | 0.684301 | 0.642581 | 0.642581 |
| Decision tree | 0.912784 | 0.908926 | 0.908926 |
| Random forest | 0.948783 | 0.938963 | 0.938963 |
| Gradient boost | 0.89125 | 0.874629 | 0.874629 |
| XGBC | 0.948927 | 0.938714 | 0.938714 |
| Neural Network | 0.772988 | 0.777773 | 0.777773 |

How to Design an ML Model



Important Notes About ML

- **Data collection and training** are never complete, they are a **continuous ongoing process**
- Important to **experiment with different sets of predictors** in order to determine best model
- In some cases, **semi-supervised learning** may be necessary
- Models generate **predictions**, which are **not always correct**

Proposed ML Solution

1. Analyze and label images using AWS Rekognition model

Proposed ML Solution

1. Analyze and label images using AWS Rekognition model
2. Use labels and surveys as input for product recommendation models

Proposed ML Solution

1. Analyze and label images using AWS Rekognition model
2. Use labels and surveys as input for product recommendation models
3. **1-2 models for each category: Dry, Oily, Sensitive, Detox**

Proposed ML Solution

1. Analyze and label images using AWS Rekognition model
2. Use labels and surveys as input for product recommendation models
3. 1-2 models for each category: Dry, Oily, Sensitive, Detox
4. **Test multiple algorithms for each model, and select best performers**

Proposed ML Solution

1. Analyze and label images using AWS Rekognition model
2. Use labels and surveys as input for product recommendation models
3. 1-2 models for each category: Dry, Oily, Sensitive, Detox
4. Test multiple algorithms for each model, and select best performers
5. **Results reviewed by hair care expert and sent to customer**

Proposed ML Solution



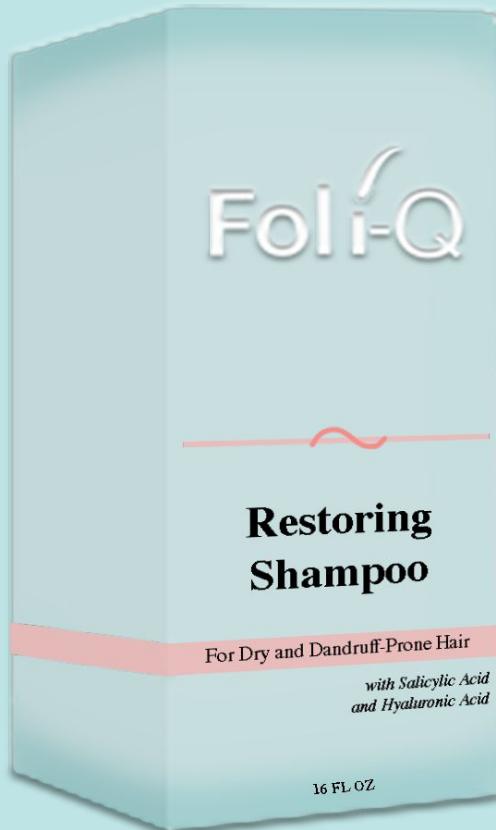
- 1 **Introduction:** *Lauren Fountain*
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- 6** **Integration and Projections:** *Matt Slaski*
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Manufacturing

Product

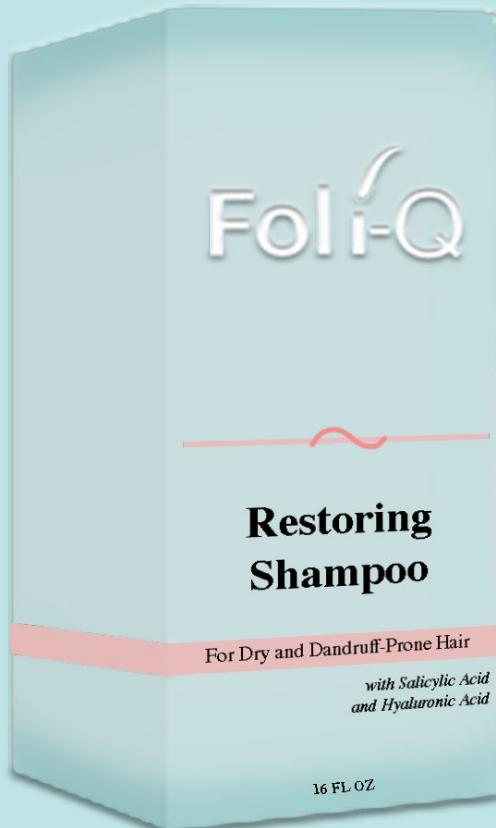


Foli-Q

Rafael Bonner

Product

16 Fl Oz Tube



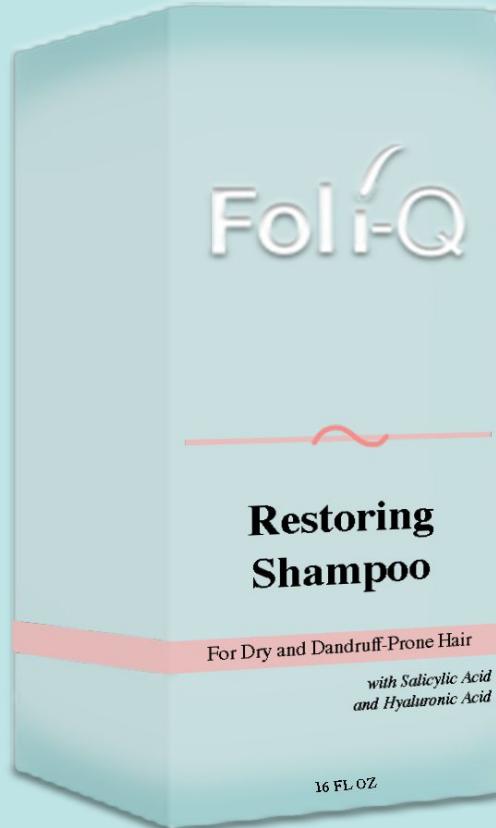
Foli-Q

Rafael Bonner

Product

16 Fl Oz Tube

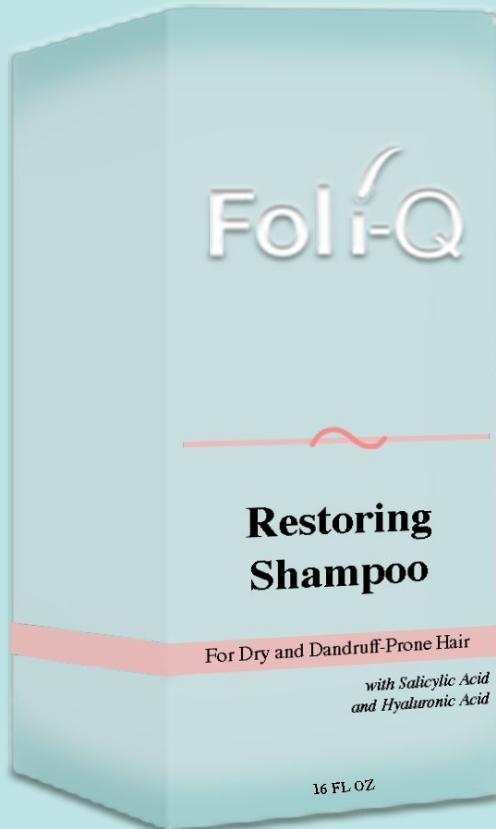
Key ingredients:
Salicylic Acid,
Ketoconazole, and
Zinc pyrithione



Product

16 Fl Oz Tube

Key ingredients:
Salicylic Acid,
Ketoconazole, and
Zinc pyrithione

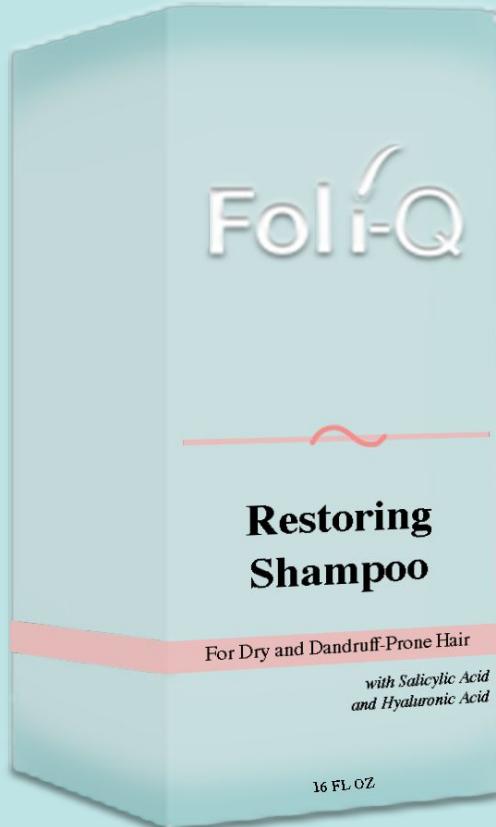


“Hydrates, Exfoliates,
and Helps with Scalp
Irritation”

Product

16 Fl Oz Tube

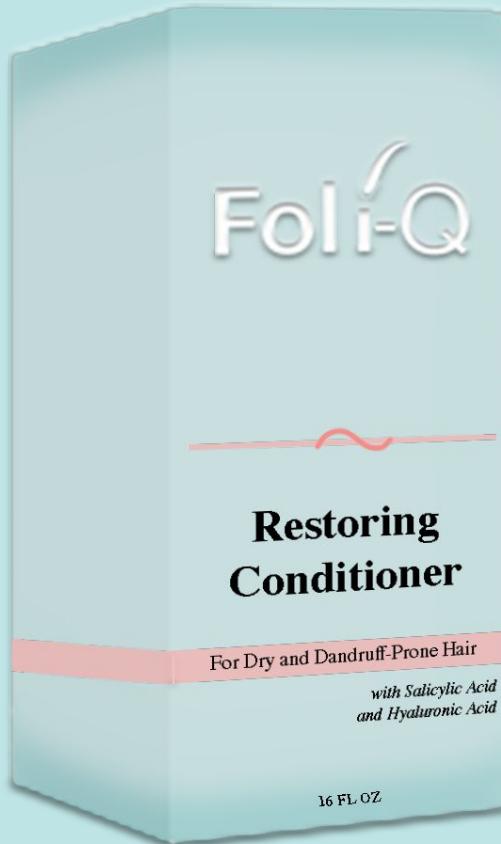
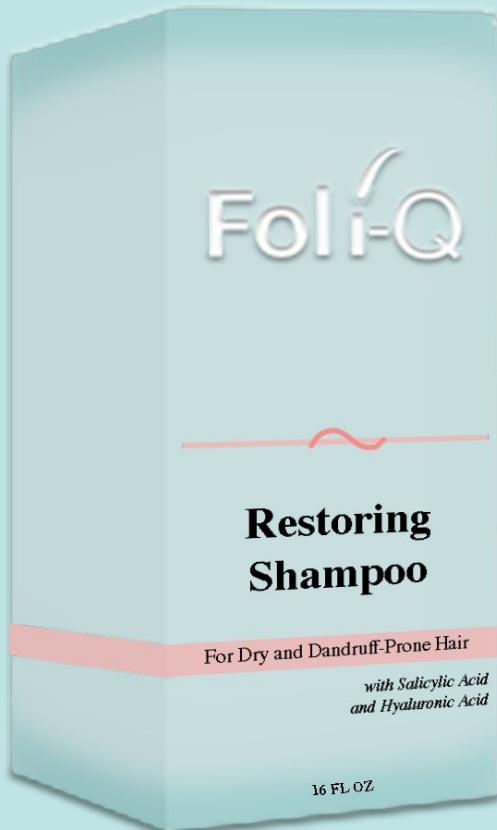
Key ingredients:
Salicylic Acid,
Ketoconazole, and
Zinc pyrithione



"Hydrates, Exfoliates,
and Helps with Scalp
Irritation"

Retail Price: \$36.00

Product



Foli-Q

Rafael Bonner

Different Formulations

Dry Scalp



Different Formulations

Dry Scalp



Oily Scalp



Different Formulations

Dry Scalp



Oily Scalp



Sensitive Scalp



Different Formulations

Dry Scalp



Oily Scalp



Sensitive Scalp



Clarifying/Detox



Jupiter Restoring Scalp Serum



Jupiter Restoring Scalp Serum

Best for:
mild-to-moderate
dandruff and dry
scalp



Jupiter Restoring Scalp Serum

Best for:
mild-to-moderate
dandruff and dry
scalp

Zinc Pyrithione and
Niacinamide



Jupiter Restoring Scalp Serum

Best for:
mild-to-moderate
dandruff and dry
scalp

Zinc Pyrithione and
Niacinamide

Apply to scalp up to
4x per day



Jupiter Restoring Scalp Serum

Best for:
mild-to-moderate
dandruff and dry
scalp

Zinc Pyrithione and
Niacinamide



Apply to scalp up to
4x per day

Retail Price: \$29.00

Contract Manufacturers



Fragrance Manufacturing

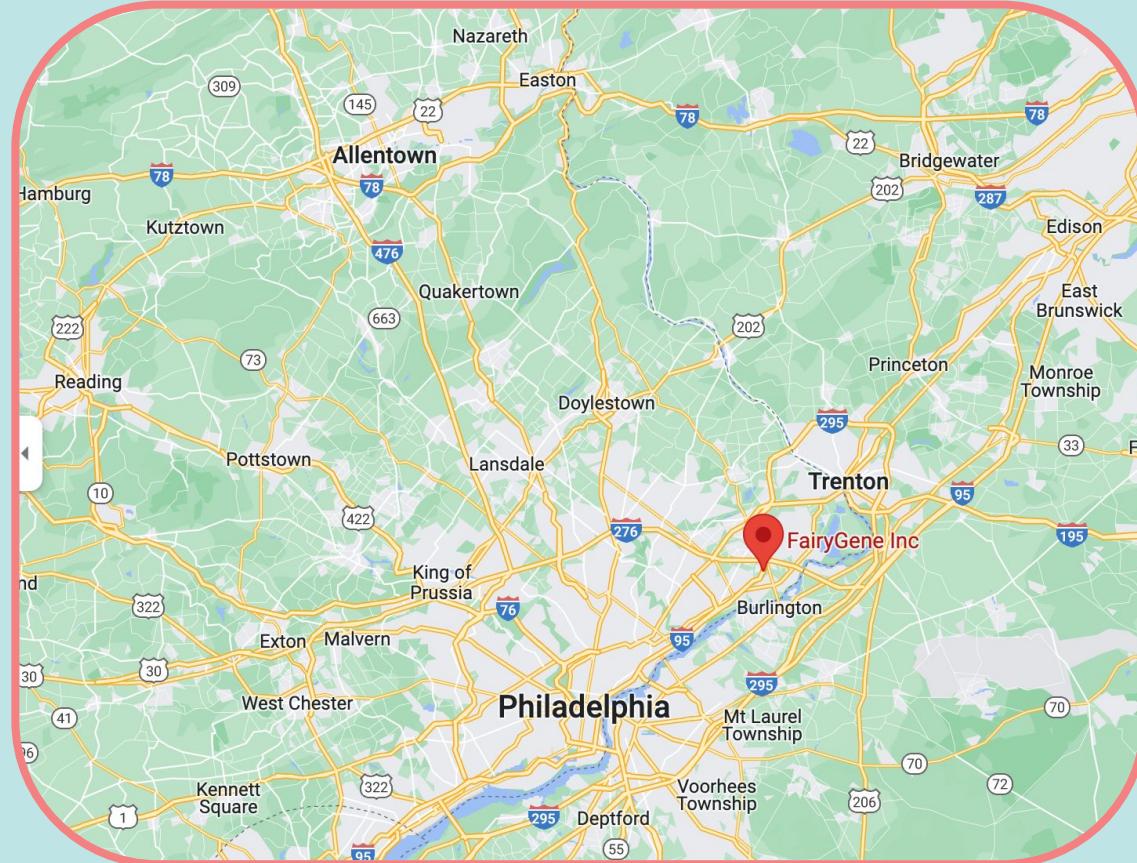


**Jessica Lewicki,
Account Manager**

Contract Manufacturers



Fairy Gene



Fairy Gene



HOME

R & D

MANUFACTURING

FILLING & PACKAGING

FORMULA AVAILABLE

MY ACCOUNT

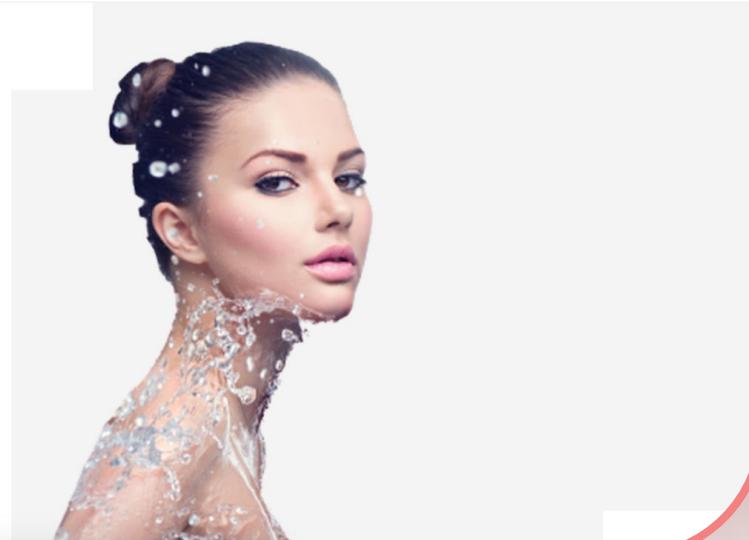
CONTACT US



Welcome to FairyGene
Leading Cosmetics Company

Innovative Cosmetics Private Label & Contract Manufacturer

Shop Now



Fairy Gene



Angie Li, Salesperson

Fairy Gene

Private Label

Fairy Gene



Shampoo – Apple Cider Vinegar
Shampoo

\$4.99

Sample Bulk

Buy Now —

Fairy Gene

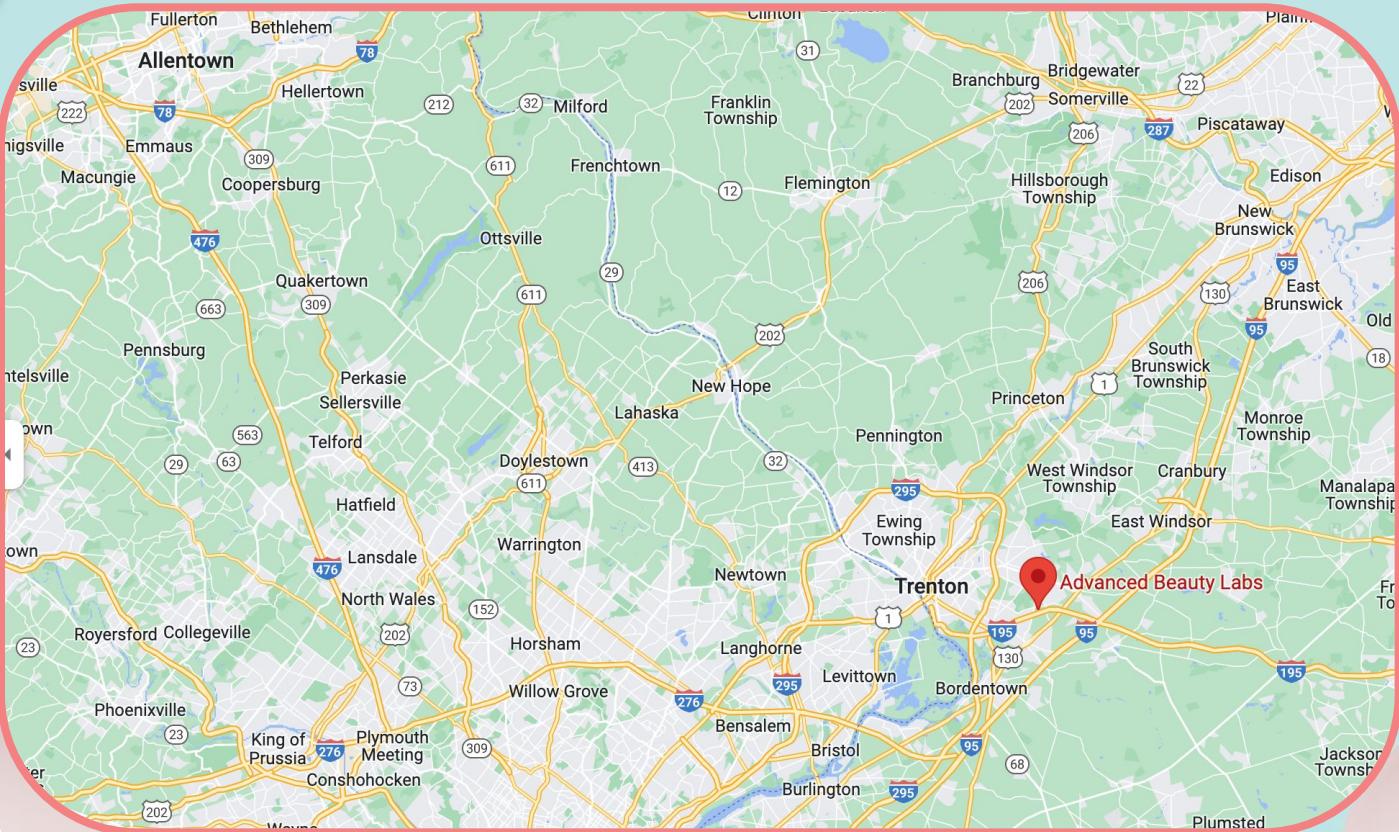
Private Label

**Contract
Manufacturing**

Contract Manufacturers



Advanced Beauty Labs



Advanced Beauty Labs

[HOME](#)[ABOUT](#)[FORMULATION](#)[FACILITY](#)[CONTACT](#)

WELCOME TO ADVANCED BEAUTY LABS!

We specialize in creating leading skincare and personal care products. Advanced Beauty Labs offers partial turnkey partnership to support product development needs from custom formulation to finished goods. Our facility is ISO certified, cGMP certified, FDA registered and OTC licensed. We are conveniently located in Hamilton, NJ.

[Schedule a 30 Minute Kickoff Meeting](#)

Welcome to Advanced Beauty Labs!



Rafael Bonner

Advanced Beauty Labs



**Cynthia Sinchi, Senior Account
Executive**

Rafael Bonner

Advanced Beauty Labs

FORMULATION CAPABILITIES



FACE

- Cleansers
- Cleansing Balms
- Exfoliators (Chemical and Physical)
- Masks
- Serum
- Treatments
- Creams
- Toners
- Oils
- Mists
- Makeup Spray
- Primers
- Makeup Removers

EYES

- Creams/Gels/ Sleep Masks
 - Makeup Removers
 - Color Correctors
- LIPS
- Scrubs
 - Masks
 - Balms
 - Oils
 - Glosses

HAIR

- Masks
- Shampoos
- Dry Shampoos (non-aerosol)
- Conditioners
- Leave-In Conditioners
- Scalp Scrubs
- Scalp Treatments
- Styling Creams
- Gels
- Pomades
- Oils
- Protective Sprays

BODY

- Powders
- Lotions
- Creams
- Exfoliators
- Shower Gels
- Masks
- Scrubs
- Oils
- Deodorants
- Alcohol-Free Fragrance

Advanced Beauty Labs

FORMULATION CAPABILITIES



FACE

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- Exfoliators
- Shower Gels
- Masks
- Scrubs
- Oils
- Deodorants
- Alcohol-Free Fragrance

Advanced Beauty Labs

DEVELOPMENT PROCESS

Custom Formulation

Cost: \$3,500/3 Submissions

Timing: 3-4 weeks for first submission
2-3 weeks after feedback for tweaks

Process:

1. ABL receive NPD brief & fee
2. Kick Off Meeting
3. Product submissions & testing
4. Formula approval & sign off

Stability & Pre-Production

Cost: \$700 Regulatory Fee

+ Third Party Testing Fees
+ Pilot Batching Fees

Deliverables:

- ☒ INCI List
- ☒ Preliminary Regulatory Folder
- ☒ SDS
- ☒ PAO
- ☒ Shelf Life
- ☒ 3 Month Stability Report at 25°C and 42°C in final packaging and glass

Production

Cost: Quoted \$/unit

Timing: 10-18 weeks

Deliverables:

- ☒ CoA
- ☒ Microbial Testing
- ☒ QA Support

Custom Formulation

1

**ABL receives New Product
Development Form**

ABL Product Development Kick-Off Form

We at Advanced Beauty Labs are thrilled to get the opportunity to work with you and develop awesome, effective, and life changing consumer products.

The first step in any project is to make sure we understand your requirements clearly and setup expectations. For that reason, we ask that you take a few minutes to let us know a little about yourself and what you're looking to accomplish.

We'll get back to you within 2 business days.

All information is subject to our confidentiality agreement. You will receive an email copy of your questions and that's it.

Specific Sales Representative *

Tell us a little about yourself.

Name *

First Last

Phone Number *

- -

###

Email *

Company Name

Address *

Street Address

Address Line 2

City

State / Province / Region

Postal / Zip Code

Country

About your company/brand:

About Your Launch

A description of the section goes here.

Product Name *

Target Ship Date: *

/ / 

MM DD YYYY

Target Launch Date:

/ / 

MM DD YYYY

Target Unit Price Point *

\$.

Dollars Cents

Target Unit Fill Size (ml)

Estimated SKU Count

Est. Units for Initial Launch

In what countries are you planning to launch:

Packaging

Who will be supplying the packaging and what kind of packaging are you looking for?

Packaging Source:

Packaging Preference:

Graphic Assistance Needed:

Shipper Packout:

About your product

Tell us about the product you want to launch.

Regulatory Class

Cosmetic

Drug

Medical Device

Custom Formulation

1

ABL receives New Product Development Form

2

30 minute Kickoff Meeting with ABL

Custom Formulation

1

ABL receives New Product Development Form

2

30 minute Kickoff Meeting with ABL

3

Product Submission and testing

Custom Formulation

1

ABL receives New Product Development Form

2

30 minute Kickoff Meeting with ABL

3

Product Submission and testing

4

Formula Approval and Sign Off

Stability & Pre-Production

INCI List

Stability & Pre-Production

| Common name | INCI name |
|---------------------------|-------------------------------------------------------------|
| Purified water | Water (Aqua) ^[1] |
| Sodium Coco Sulfate | Sodium Coco-Sulfate ^[1] |
| Vitamin E | Tocopherol ^[1] |
| Beeswax | Beeswax ^[1] |
| Vegetable Glycerin | Glycerin ^[1] |
| Oat bran | Avena Sativa (Oat) Bran ^[1] |
| Shea butter | Butyrospermum Parkii (Shea Butter) ^[1] |
| Paraben | Methylparaben ^[1] |
| Aloe vera leaf gel | Aloe Barbadensis Leaf Juice ^[1] |
| Tea tree oil | Melaleuca Alternifolia (Tea Tree) Leaf Oil ^[1] |
| Peppermint leaf oil | Mentha Piperita (Peppermint) Oil ^[1] |
| Spearmint leaf oil | Mentha Viridis (Spearmint) Leaf Oil ^[1] |
| Wintergreen leaf oil | Gaultheria Procumbens (Wintergreen) Leaf Oil ^[1] |
| Lavender oil | Lavandula Angustifolia (Lavender) Oil ^[1] |
| Extra virgin olive oil | Olea Europaea (Olive) Fruit Oil ^[1] |
| Saponified oil of coconut | Sodium Cocoate ^[1] |
| Saponified oil of palm | Sodium Palmate ^[1] |
| Hemp oil | Cannabis Sativa Seed Oil ^[1] |
| Jojoba oil | Simmondsia Chinensis (Jojoba) Seed Oil ^[1] |
| Sunflower oil | Helianthus Annuus (Sunflower) Seed Oil ^[1] |

Stability & Pre-Production

INCI List

**Safety Data
Sheet**

Material Safety Data Sheet

| | |
|----------------|-------------------------------------|
| Trade Name: | VELVASIC |
| | Silicone-based Conditioner/Softener |
| Chemical Name: | Cosmetic Blend |

SECTION 1 -- MANUFACTURER'S NAME

Emergency Phone # : (818) 897-2440

Manufacturer's Name: Premiere Products, Inc.
Address: 10312 Norris Avenue, Suite C
City/State/Zip Pacoima, CA. 91331

Telephone Number (For Information): (818) 897-2440

SECTION 2 -- HAZARDOUS INGREDIENTS

NONE

SECTION 3 -- PHYSICAL DATA

Appearance = Color - Standard, Odor - Standard
Specific gravity = 0.97 -1.00
Solubility in water - Soluble
Viscosity - water like appearance
pH : 5.3 - 5.8

SECTION 4 -- REACTIVITY DATA

Stable - non reactive

SECTION 5 - FIRE AND EXPLOSION HAZARDS

Non Flammable

Stability & Pre-Production

INCI List

**Safety Data
Sheet**

Shelf Life

Stability & Pre-Production

INCI List

**Safety Data
Sheet**

Shelf Life

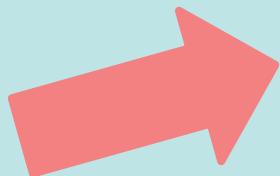
**3 Month
Stability**

Production

**Cost: Quoted
\$/unit**

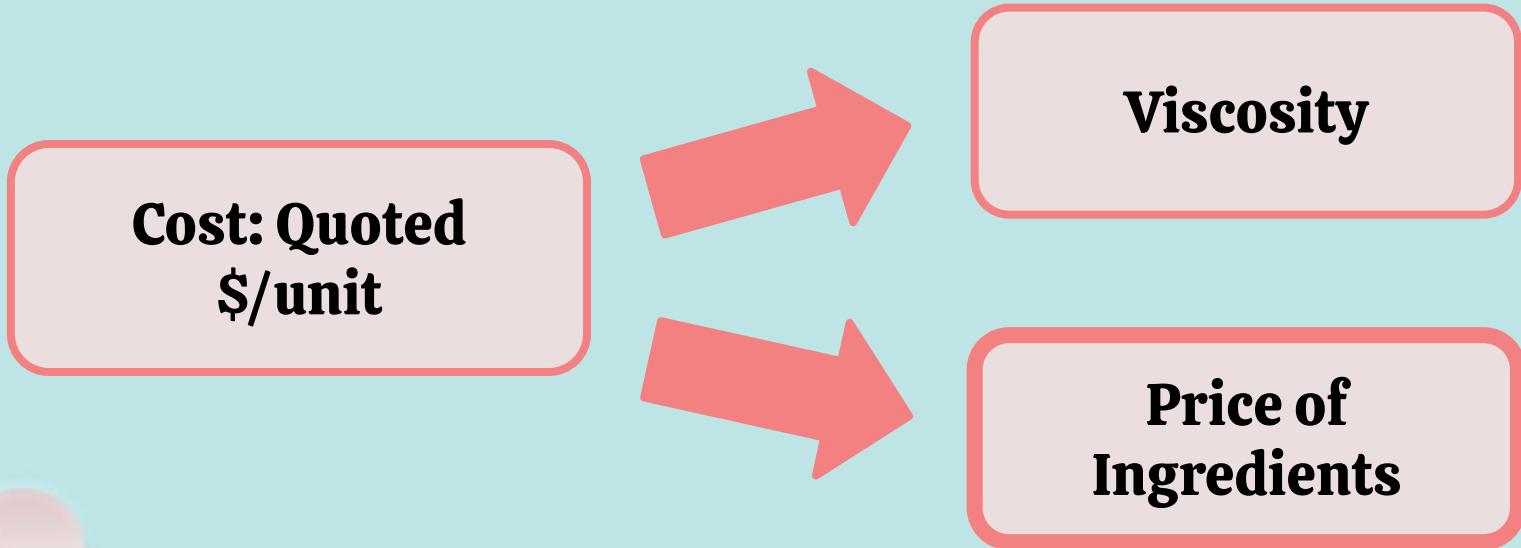
Production

**Cost: Quoted
\$/unit**



Viscosity

Production



- 1** **Introduction:** *Lauren Fountain*
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- 6** **Integration and Projections:** *Matt Slaski*
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Marketing

Customer Persona



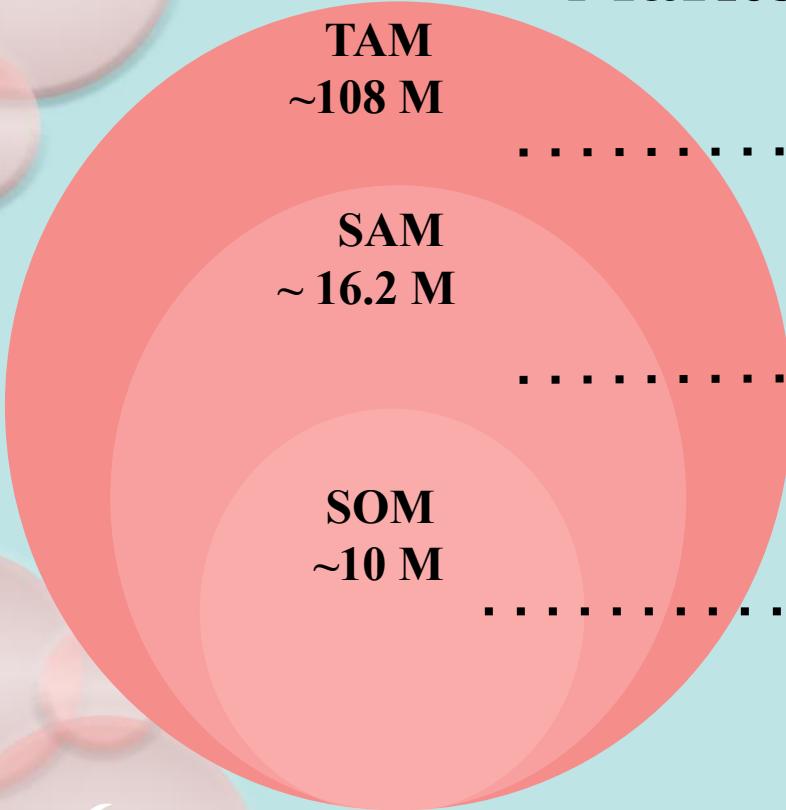
Tiana

Age: 23
College Graduate

Professional
Technology Literate

Textured Hair
Specific Hair Needs

Market Analysis



Total Available Market:

108 Million women with curly, coily, wavy hair
65% of women in the United States, (BASF)

Serviceable Available Market:

16.2 Million women ages 18-26
15% of Women, (Census Bureau)

Serviceable Obtainable Market:

10 Million women purchase a shampoo or conditioner every month or more frequently
62% women, (Statista Consumers)

Competitive Analysis: Myavana



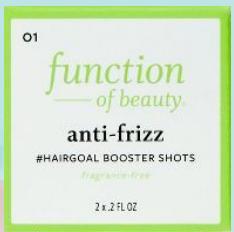
- Textured hair analysis company
- \$99 kit, ship strands of hair to lab
- Two weeks to receive hair analysis

Competitive Analysis

*function
— of beauty*



Competitive Analysis



- 30 question hair analysis quizzes (no image analysis)
- Can be purchased in select stores (Target) or online
- Base Shampoo and conditioners with additives

Function of Beauty



- \$27 custom Shampoos and Conditioners (website)

Function of Beauty



\$3.50 additives
mixed in product by
customers

\$9.99 non-custom
shampoo/conditioner

Function of Beauty



- \$3.50 Additives
- Mixed in shampoos/conditioners by customers
- Purchased separately (3 recommended per shampoo)

Competitive Analysis

The

Hair Lab

by Strands™



Strands Hair Lab

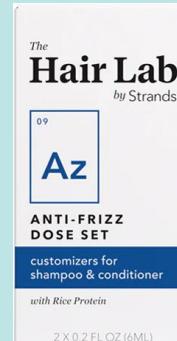
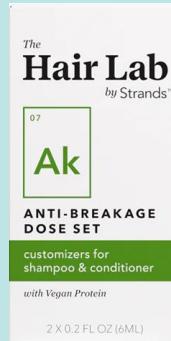
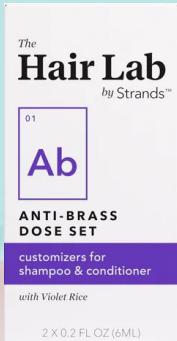


- \$9 Shampoo/Conditioner
- \$3 Additives (3 recommended)

Strands Hair Lab

The Hair Lab by Strands™

- Heavy on options
- Light on analysis

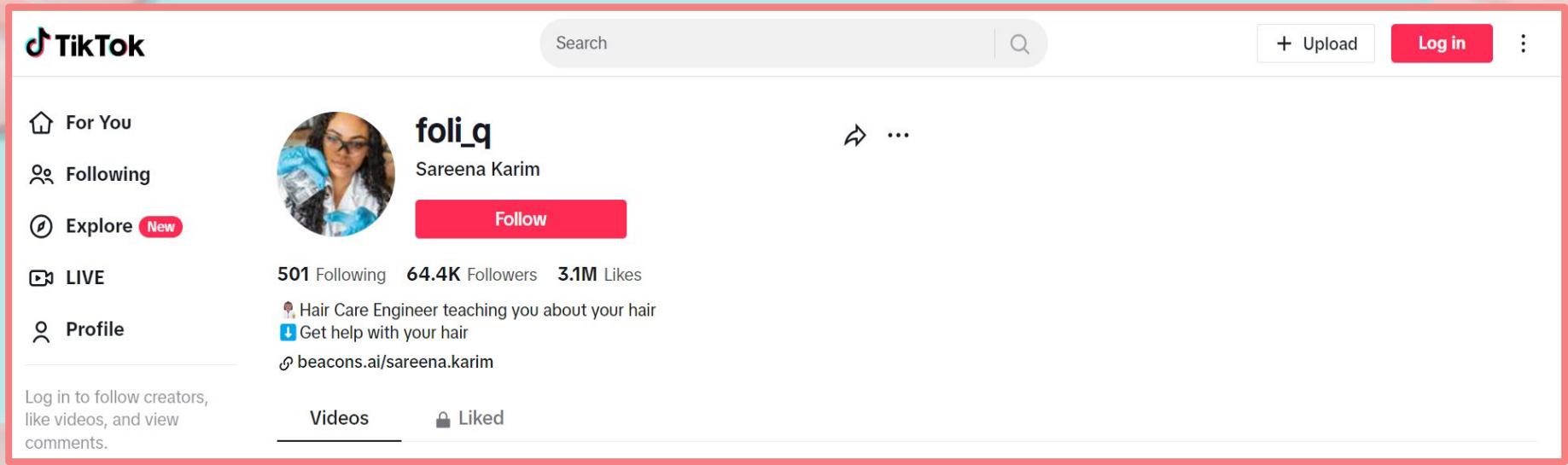


CBS TV Unstoppable Series



Stephen Salamone

Social Media Outreach



The image shows a screenshot of a TikTok profile page for a user named foli_q. The profile picture is a circular photo of a woman with dark hair and glasses, wearing a white shirt. The username "foli_q" is displayed above the name "Sareena Karim". Below the profile picture is a red "Follow" button. To the right of the profile picture are three icons: a share icon, a three-dot menu icon, and a search icon. At the top of the screen, there is a navigation bar with icons for "For You", "Following", "Explore" (with a "New" badge), "LIVE", and "Profile". On the far right of the top bar are "Upload" and "Log in" buttons. The main content area shows the user's stats: "501 Following", "64.4K Followers", and "3.1M Likes". Below the stats is a bio: "Hair Care Engineer teaching you about your hair", "Get help with your hair", and a link "beacons.ai/sareena.karim". At the bottom of the profile page, there are two tabs: "Videos" (which is underlined) and "Liked". A note on the left says "Log in to follow creators, like videos, and view comments." The entire profile page is framed by a red border.

- Hundreds of Videos on TikTok
- 3.1 Million Likes

Stephen Salamone

TikTok Videos

The grid displays six TikTok video thumbnails:

- Pinned comment:** How to build a curly hair routine for fine curly hair
- Engagement:** 1318 views
- Text overlay:** Hair Analysis
- Product:** \$57.00-\$100.00 SALE
- Image:** A woman with curly hair and a bottle of hair product.
- Text overlay:** If you have been strug...

Pinned comment: we're rating how well the Chi heat protectant works under the microscope

Engagement: 222.8K views

Text overlay: Rating how well the ...

Pinned comment: a hair mounted onto the slide

Engagement: 33.4K views

Text overlay: Hair analysis for curly h...

Pinned comment: What I would at Ulta, Sephora, and Target as someone obsessed with beauty products and science

Engagement: 1581 views

Text overlay: What i would buy for th...

Pinned comment: Building a routine using multiple Bonding products

Engagement: 982 views

Text overlay: Replying to ...

Pinned comment: Can silicones actually damage your hair?

Engagement: 822 views

Text overlay: Did you know the silico...

Q/A on Hair Science

TikTok Videos

The grid contains the following video descriptions:

- Pinned** How to build a curly hair routine for fine curly hair
- Pinned** we're rating how well the Chi heat protectant works under the microscope
- Pinned** a hair mounted onto the slide
- Pinned** What I would buy at Ulta, Sephora, and Target as someone obsessed with beauty products and science
- Pinned** Building a routine using multiple Bonding products
- Pinned** Can silicones actually damage your hair?

Below each thumbnail is a snippet of text and engagement metrics:

- If you have been strug... 1318
- Rating how well the ... 222.8K
- Hair analysis for curly h... 33.4K
- What i would buy for th... 1581
- Replies to ... 982
- Did you know the silico... 822

Q/A on Hair Science

Hair Product Reviews

TikTok Videos

The image displays a grid of six TikTok video thumbnails, each featuring a woman with curly hair. The thumbnails are arranged in two rows of three. Each thumbnail includes a caption, a small image, and engagement metrics (likes and comments).

- Thumbnail 1:** Pinned. How to build a curly hair routine for fine curly hair. If you have been strug... (Image: Woman with curly hair). Hair Analysis. \$57.00-\$100.00 SALE. 1318 likes, 1 comment. Learn Rewards.
- Thumbnail 2:** Pinned. we're rating how well the Chi heat protectant works under the microscope. Rating how well the ... (Image: Woman holding a red Chi heat protectant bottle).
- Thumbnail 3:** Pinned. a hair mounted onto the slide. Hair analysis for curly h... (Image: Woman holding a slide with a hair sample under a microscope).
- Thumbnail 4:** Pinned. What I would buy at Ulta, Sephora, and Target as someone obsessed with beauty products and science. What i would buy for th... (Image: Woman wearing blue gloves, holding a petri dish).
- Thumbnail 5:** Building a routine using multiple Bonding products. Replying to ... (Image: Woman holding several bottles of hair care products).
- Thumbnail 6:** Can silicones actually damage your hair? #Dove Partner. Did you know the silico... (Image: Woman looking directly at the camera).

Q/A on Hair Science

Hair Product Reviews

Ingredient Analysis

Effects of Saltwater on Hair

Social Media Outreach



foliqhair [Follow](#) [Message](#) [+9](#) [@](#) ...

350 posts 9,290 followers 621 following

Sareena | Hair Science Videos | Hair Care Analysis
Hair Care Engineer teaching you about your hair
Hair science videos
Haircare Tips
Get help with your hair
foliq.me/products/email-consultation

[products](#) [reviews](#) [Q&A](#) [blog](#)



Example: Aardvark



- Local sports shop located on Main Street of Bethlehem
- Offers a customized shoe-buying process using AI Technology
- Foot-Scanning/shoe report fully integrated into customer experience

Example: Aardvark



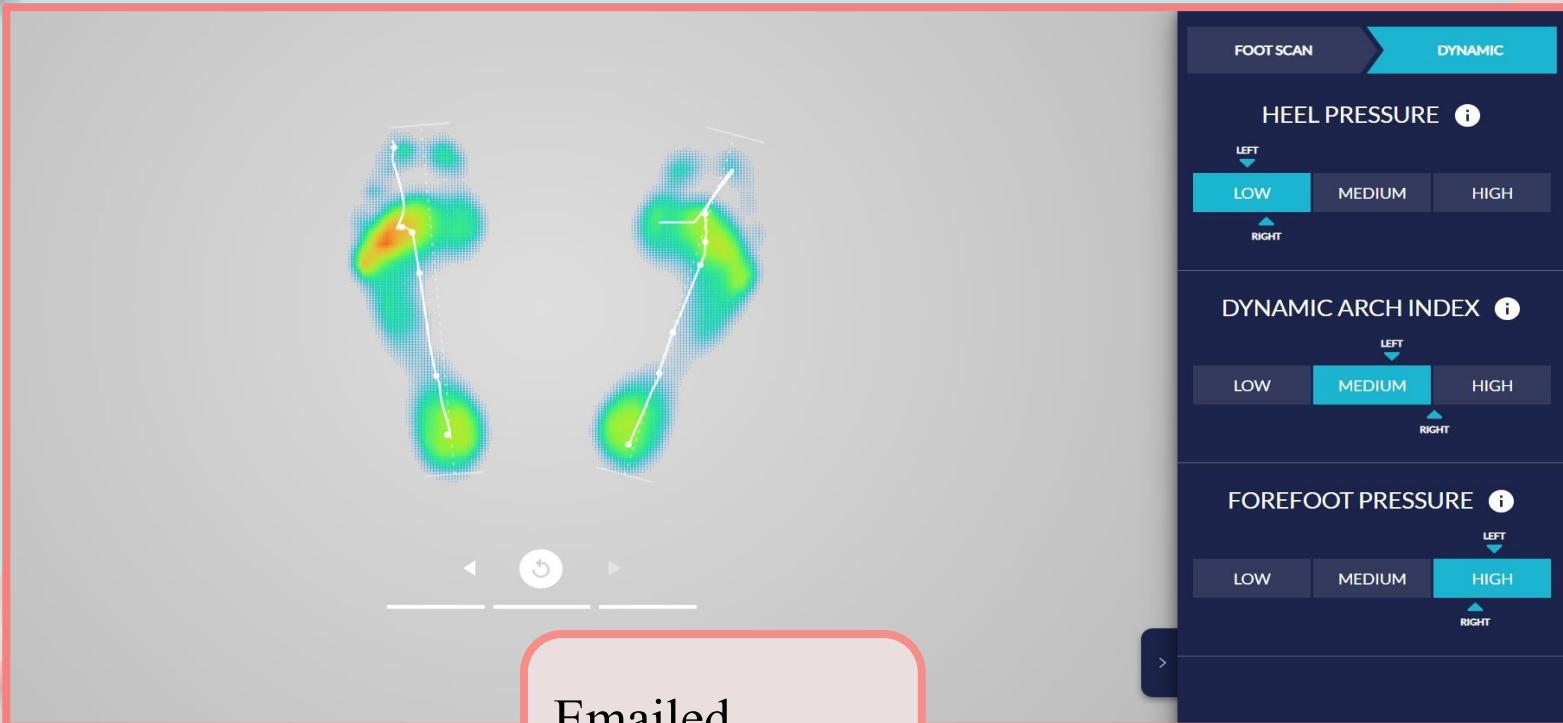
Foot Scanning Technology
using an AI model

Example: Aardvark



Customized feet report for shoe fitting recommendations

Example: Aardvark



Emailed
Scanner Report

Stephen Salamone

Customer Experience



Skybasic

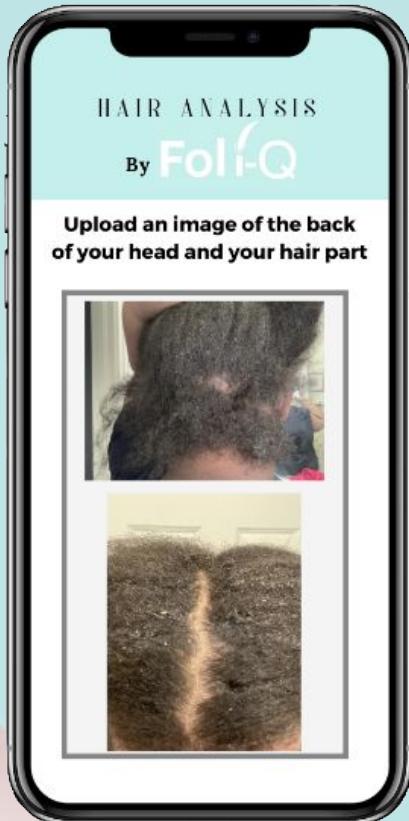
aws



Foli-Q

Stephen Salamone

Customer Experience



Easy to use

Fast

Accurate

- 1** **Introduction:** *Lauren Fountain*
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Integration Techniques



Salons



Retail

The screenshot shows the Foli-Q website's "Accessories" page. The header features the Foli-Q logo in a teal color. Below the header is a navigation bar with links: Home, Hair MasQs and Conditioners, Hair Care Accessories (which is the current page), Hair Care Services, Learn, Our Story, and Contact Us. A search icon is also present. The main content area is titled "Accessories". At the bottom of the page, there are filters for "FILTER BY All products" and "SORT BY Best selling", and a note indicating "6 products".

Direct-to-Consumer

Our Journey with Salons



Verve Hair Salon



Eskandalo Hair Salon



A-List Hair Salon



Versatile Strands Salon



Clementine Hair Salon

Matthew Slaski

Salons Takeaways

Some interest was expressed, mainly for hair analysis with a microscope, but we believed there were more shortcomings with this approach

Limitations with the Salon Route

- Stylists are certified and hold a tremendous amount of expertise
- Clientele consists of repeat customers
- Bias towards certain products/brands
- No real path for Foli-Q growth

Growing Direct-to-Consumer

The screenshot shows the Foli-Q website's accessories section. At the top, there is a navigation bar with links: Home, Hair MasQs and Conditioners, Hair Care Accessories (which is underlined), Hair Care Services, Learn (with a dropdown arrow), Our Story (with a dropdown arrow), and Contact Us. Below the navigation is a search icon. The main heading is "Accessories". Underneath it, there are filter options: "FILTER BY All products" and "SORT BY Best selling". To the right, it says "6 products".

Build up FoliQ Website

-Show examples of customers using microscope and getting the analysis

-Add CBS video in either Home or Learn section

Better Integrate
Social Media
Outlets



Matthew Slaski

The Retail Strategy

Creating a relationship with a Retail Outlet to license the technology
and the assortment of products to go with it

The Retail Strategy Advantages

Strong and Growing Customer
Base

The Retail Strategy Advantages

Strong and Growing Customer
Base

Proven and Effective
Brand/Following

The Retail Strategy Advantages

Strong and Growing Customer Base

Proven and Effective Brand/Following

Reliable Track Record of Past Deals with other Brands

The Retail Strategy Advantages

Strong and Growing Customer Base

Proven and Effective Brand/Following

Reliable Track Record of Past Deals with other Brands

Large Teams to Continue Growing the AI Model

Sephora



Professional Retail Outlet for
Personal Care and Beauty Products

- Up to \$10 Billion in Revenue
- Over 2700 Stores Worldwide

Sephora Visit



Lindsay Thomas
Sephora Operations
Manager

Takeaways:

- Sephora is very tech heavy
- It tries to develop its own softwares from a built up database
 - ex) Color IQ
- Sephora has a variety of programs for sponsoring smaller brands

Color IQ



- Sephora's own similar tech for skin tone for makeup
- Linked to customer's Sephora profile

Sephora Programs

Sephora Accelerate Program

Brand sponsorship focused on building a community for people of color



SEPHORA STANDS
Accelerate

Sephora Programs

Sephora Accelerate Program

Brand sponsorship focused on building a community for people of color



SEPHORA STANDS
Accelerate



Sephora's Next Big Thing

Collection of up and coming indie brands with exclusive deals with Sephora

Ulta



Beauty Retail Outlet that's also a competitor to Sephora

- Up to \$10 Billion in Revenue
- Roughly 1400 Stores In the US

Ulta Program

Ulta Affiliate Program

Collection of brands that are entitled to promotions and commission from Ulta



The 15% Pledge



Separate Non-Profit in the Beauty Industry that supports black-owned businesses by encouraging retailers to invest 15% in small indie brands

The 15% Pledge Steps

Being a member of the Business Equity Community

Having a Presence on Google Shopping

At least one self-identifying Black Person with 50% or more equity

Having between 2-15 employees (founder included)

E-commerce side must have minimum annual revenue of \$100,000

Benefits to FoliQ

1. Brand sponsorship program gives FoliQ a relationship with a major retailer
2. Great way to establish customer-based relationships
3. Stable revenue option

Our Recommendations

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1. Salon Route is a little too limited
2. Focus on combination of Retail & DTC
3. Retail Route → Relationship with Sephora/Ulta

Sephora Trial Run

Sephora Trial Run would test our product and technology in a retail setting

- 5 Stores
- \$36 Per Unit
- 400 Units Per Store

Initial trial run with 2 microscopes and 1 trained in-store employee

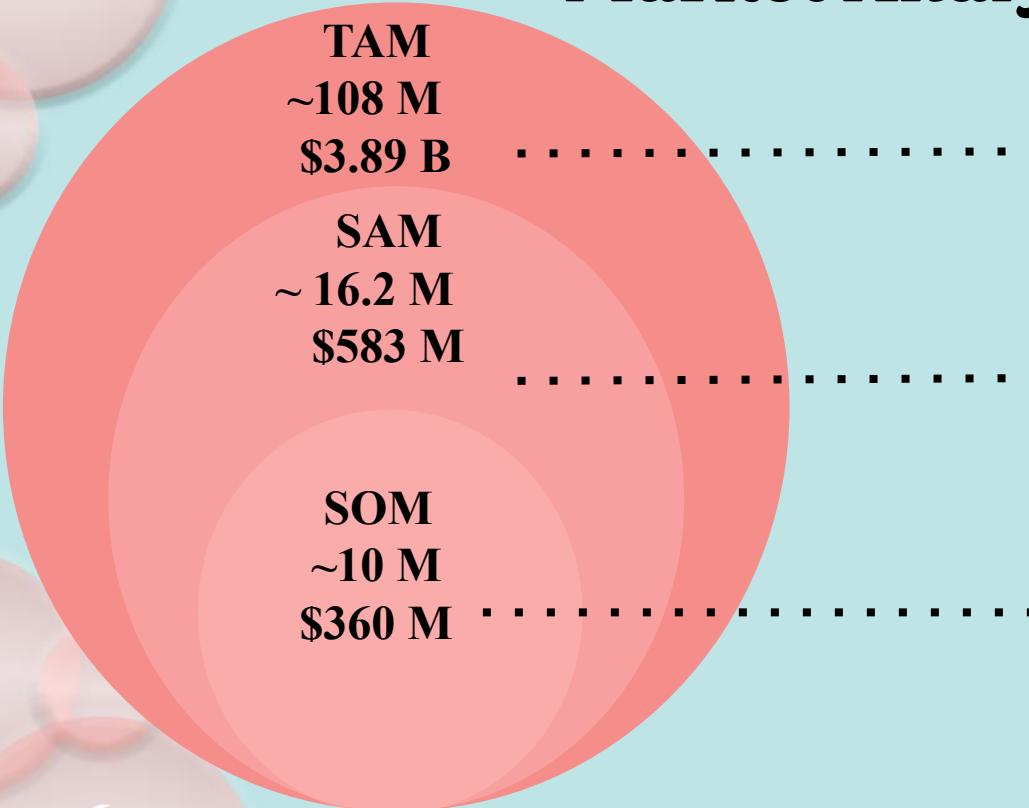


Sephora Trial Run

Sephora customers receive a hair analysis **valued at \$57** for free



Market Analysis



Total Available Market:

108 Million women with curly, coily, wavy hair
65% of women in the United States, (BASF)

Serviceable Available Market:

16.2 Million women ages 18-26
15% of Women, (Census Bureau)

Serviceable Obtainable Market:

10 Million women purchase a shampoo or conditioner every month or more frequently
62% women, (Statista Consumers)

Cost Projections



Develop the Machine
Learning Model



Manufacture products
for initial launch

AI Development Cost Projections

AWS Image Labeling

- Training Costs
- Inference Costs
- Storage Costs

Product Recommendation Models

- 4 Model Solution
- 8 Model Solution

\$17,000 - \$25,000

Initial Manufacturing Cost Projections

Formulation Costs
\$30,000

Production Costs
\$24,000

Estimations from Advanced Beauty Labs

Product Margins

Retail

Sephora Selling Price - \$36
Sephora Buying Price - \$18
(100% markup for Sephora)

Sephora Buying Price - \$18
Production Cost - \$10
(44% margin for Foli-Q)

Direct to Consumer

Foli-Q Selling Price - \$36
Production Cost - \$10
(72% margin for Foli-Q)

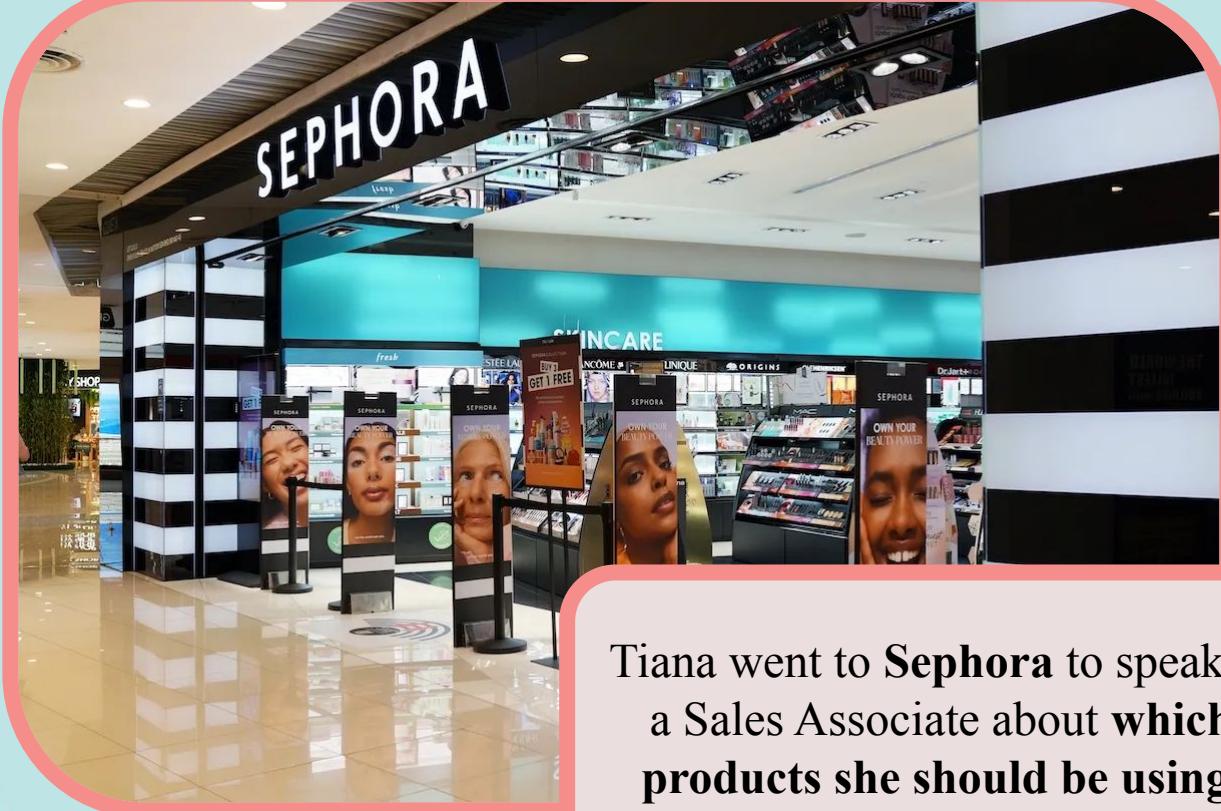
- 1 **Introduction:** *Lauren Fountain*
- 2 **AI Overview and Outsource:** *Chris Toh*
- 3 **AI Algorithms and Implementation:** *Ben Speyer*
- 4 **Manufacturing:** *Rafael Bonner*
- 5 **Competitive Analysis and Promotion:** *Stephen Salamone*
-  **Integration and Projections:** *Matt Slaski*
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Tiana was **overwhelmed** with the number of hair care products on the market. She couldn't find **the product for her hair type** regardless of how many products she purchased.



Lauren Fountain



Tiana went to **Sephora** to speak to a Sales Associate about which products she should be using.

The Sales Associate recommended
that she tries Foli-Q to get an
individualized and
science-backed hair report.



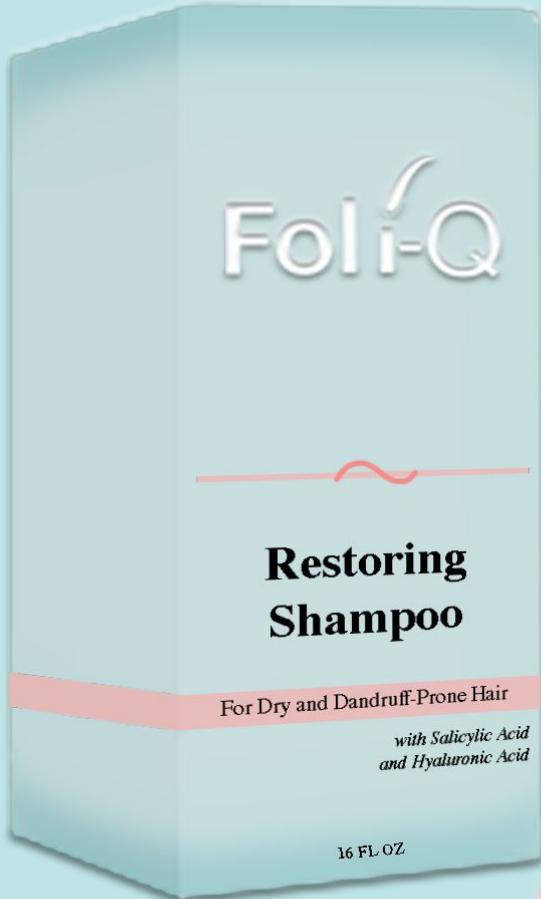


The Sales Associate scans Tiana's scalp and asks Tiana a few questions about her **hair concerns**.



Tiana receives an **individualized hair report** instantly, detailing her **hair type, her hair struggles, and styling recommendations.**

Tiana is recommended Foli-Q's restoring shampoo and conditioner. Tiana feels **confident** purchasing her new products because she now knows her **hair type** and that these products **address her hair concerns.**





Tiana's hair is now **healthier** than ever, and Tiana's **saving money** by only purchasing products that **work**.



Tiana tells her friends about Foli-Q since they also struggle with finding products that work for their **textured hair**.

Next Steps for Foli-Q



Develop the Machine Learning Model



Establish a relationship with a manufacturer



Establish a relationship with a retail partner



Folif-Q

Lauren Fountain

Thank You

Alex Fitzgerald
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Professor Richard Kish
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Angie Li
Cynthia Sinchi

Richard Kroll Jr.
Trisha Kroll
Beth Ann Knerr
Kit from Eskandalo
Karla Contreras
Marian Mell
Andrea Lee
Kofi Arhin
Lindsay Thomas
Meghna Grover

New Ventures Club
Lehigh Valley Sephora
Lehigh Valley Ulta
Clementine Salon
A-List Salon
Kimberly from Metro
Beauty Academy
KeKe's Beauty Supply
Verve Hair Salon
Versatile Strands Salon



Lauren Fountain
Introduction and Conclusion



Chris Toh
AI Overview and Outsource



Ben Speyer
AI Algorithms and Implementation



Rafael Bonner
Manufacturing



Stephen Salamone
Competitive Analysis and Promotion



Matt Slaski
Integration and Projections

Supervised vs Unsupervised Learning

Supervised Learning: Uses **labeled input data** for predictions or classification into **known classes**

Algorithms include:

- AWS Rekognition
- Linear algorithms:
 - Logistic regression
- Non-Linear algorithms:
 - Decision tree
 - Random Forest
 - Gradient boost (XGBoost)
 - Support Vector Machine (SVM)
 - K-Nearest Neighbor (KNN)
- Deep Learning: Convolutional Neural Network (CNN)

Unsupervised Learning: Analyzes and categorizes **unlabeled input data** into **unknown classes**

Algorithms include:

- Clustering
 - K-means clustering
 - ISODATA (“Iterative Self-Organizing Data Analysis Technique”)
- Association Rule Mining
 - Apriori
- Feature/dimensionality reduction
 - Principal Component Analysis (PCA)
 - Singular Value Decomposition (SVD)

Unsupervised Learning

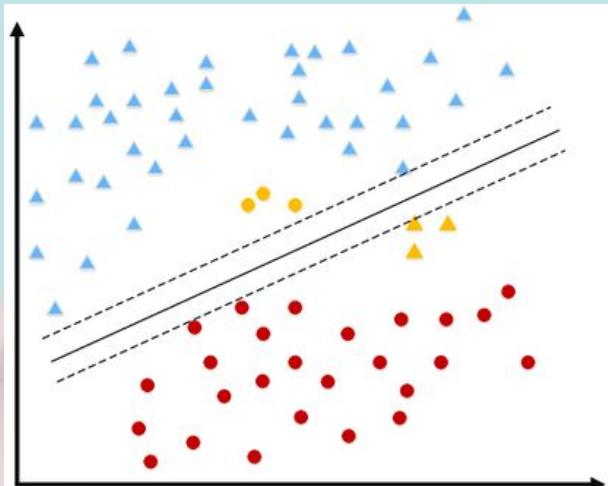
K-Means Clustering

Principal Component Analysis (PCA)

Supervised Learning

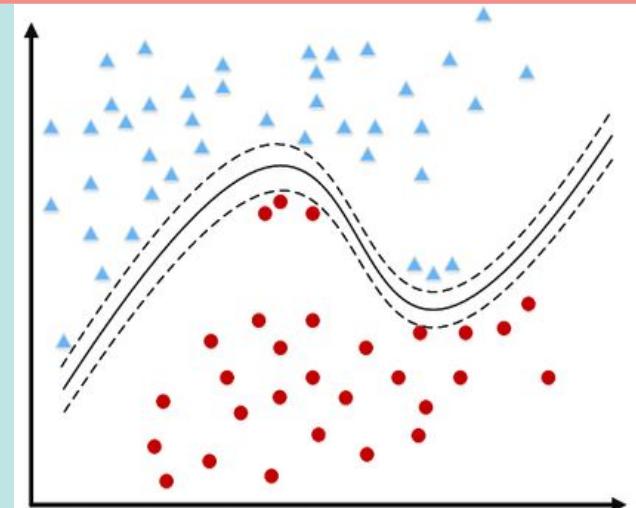
Linear Algorithms

- Assume data can be separated linearly
- Easier to implement and comprehend but less accurate



Non-Linear Algorithms

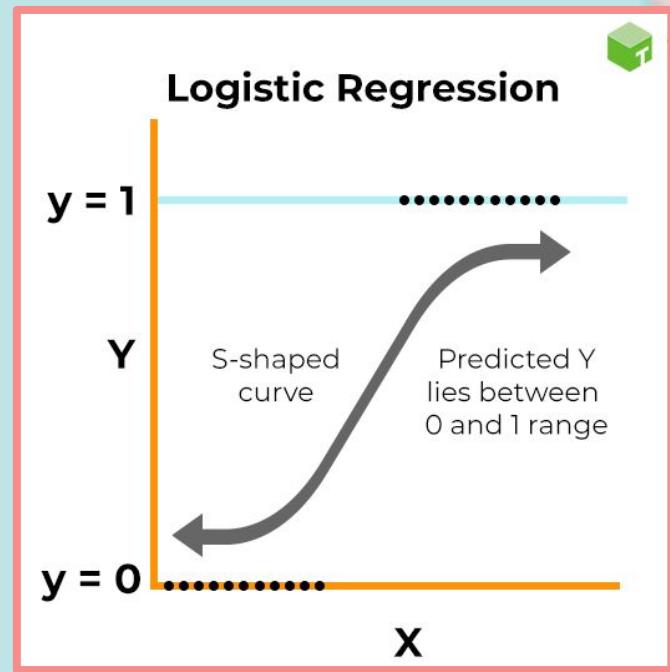
- Seek to find complex relationships within data for more accurate results



Ben Speyer

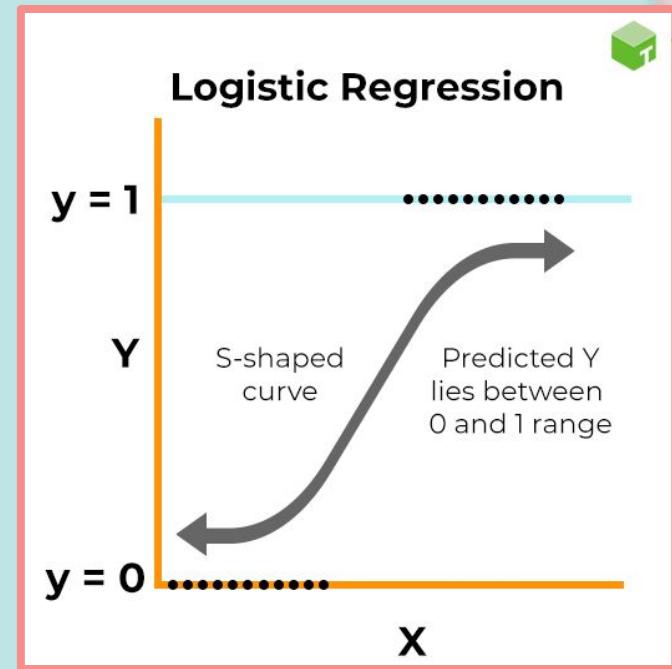
Logistic Regression

- Predicts binary outcome (y)
 - yes/no or 1/0
- User specifies predictors to be used (x)
- Creates S-shaped curve to predict y-value based on predictors (x)
 - Values on curve represent probabilities of y being equal to 1 for each point x
- Not much flexibility, can only predict 2 categories for y
- Application: Should Protein Repair Conditioner be recommended or not



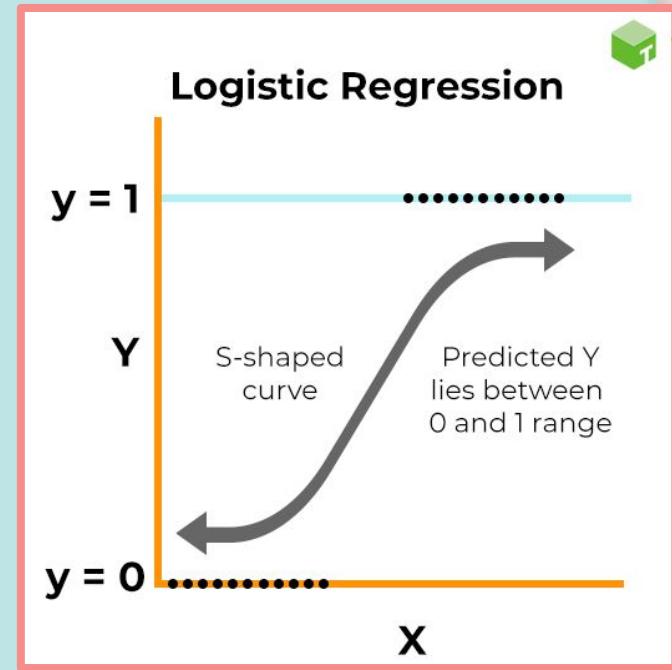
Logistic Regression - Application

- Should Protein Repair Conditioner be recommended or not?
- Should Anti-Dandruff shampoo be recommended or not?
- Etc.



Logistic Regression - Challenges

- Not much flexibility, can only predict 2 categories for y
- What do we do when y is close to 0.5, how do we classify with confidence?



Decision Tree

- Creates tree of decision nodes to classify data into categories
- Programmer specifies number of layers and nodes
- Node conditions are determined by algorithm
 - Selects node conditions with best accuracy for classifications on training data

Decision Tree - Application

- Simple trees that classify into 2 categories like logistic regression
- Can also make complex trees that classify into multiple categories:
 - Can recommend any product for a customer

Products for dry hair

Lightweight Hydrating + Shining Leave In Conditioner

Hydrating + Shining Hair MasQ

Protein Repair Hair MasQ

Protein Repair Leave in Conditioner for Dry Hair

Hair Damage

No

Yes

Low Density

Low Density

If damaged, then protein repair line.

If low density then

Hydrating Leave
In Conditioner

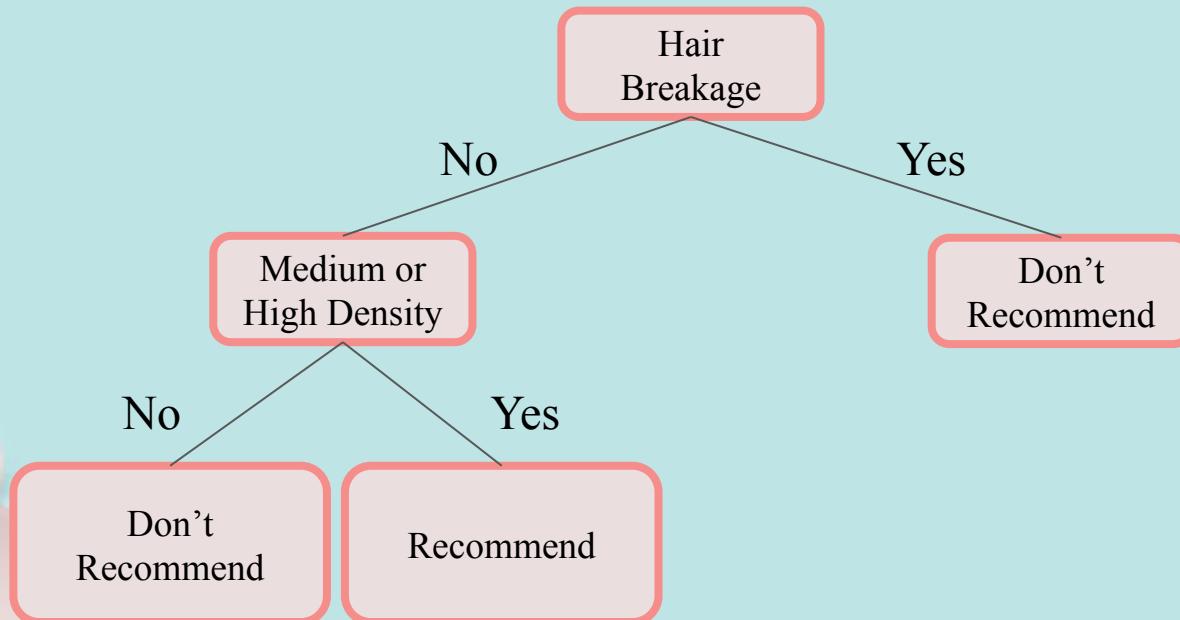
Hydrating
Hair MasQ

Protein Repa
Leave In
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Protein Repair
Hair MasQ

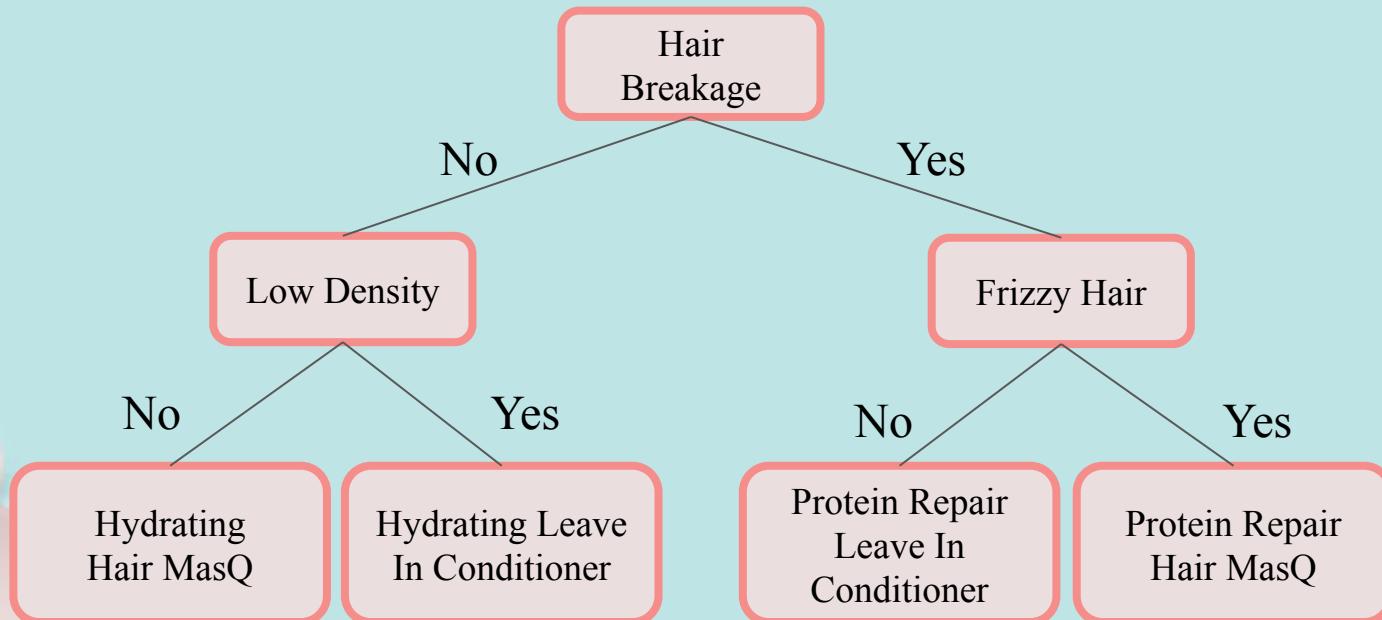
Decision Tree - Application

Should Hydrating Hair MasQ be recommended?



Decision Tree - Application

Which Product Should be recommended?



Decision Tree - Challenges

Problem

Risk of **Overfitting**:

Classification formula becomes
highly specific to training data

Decision Tree - Challenges

Problem

Risk of Overfitting:

Classification formula becomes highly specific to training data

Solution

Ensure training dataset is large enough to cover characteristics of general population

Decision Tree - Challenges

Problem

How do we recommend
more than one product?

Decision Tree - Challenges

Problem

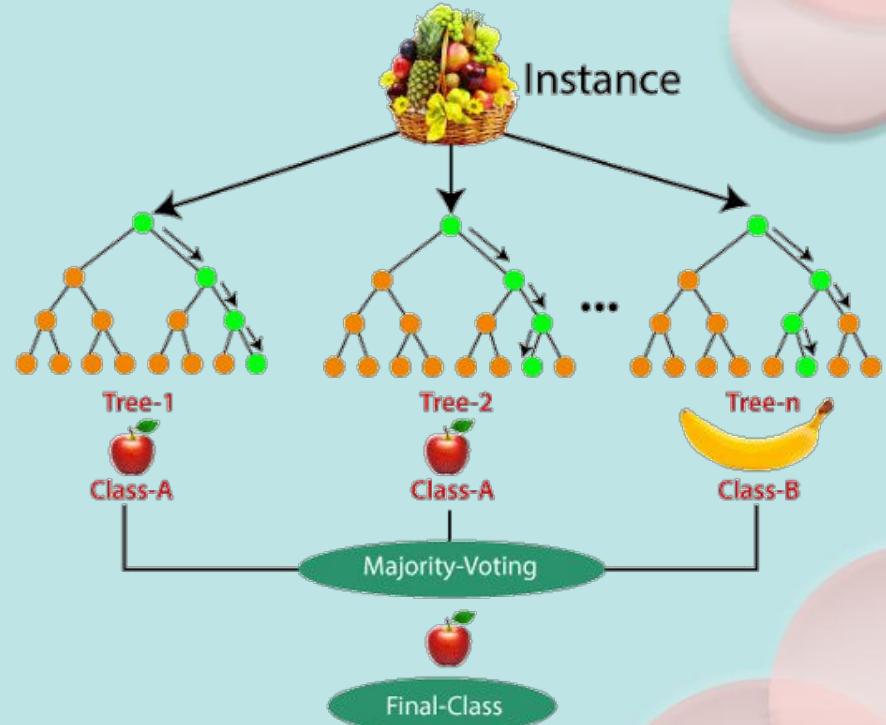
How do we recommend more than one product?

Solution

Multiple models for each product category to build a full hair-care routine

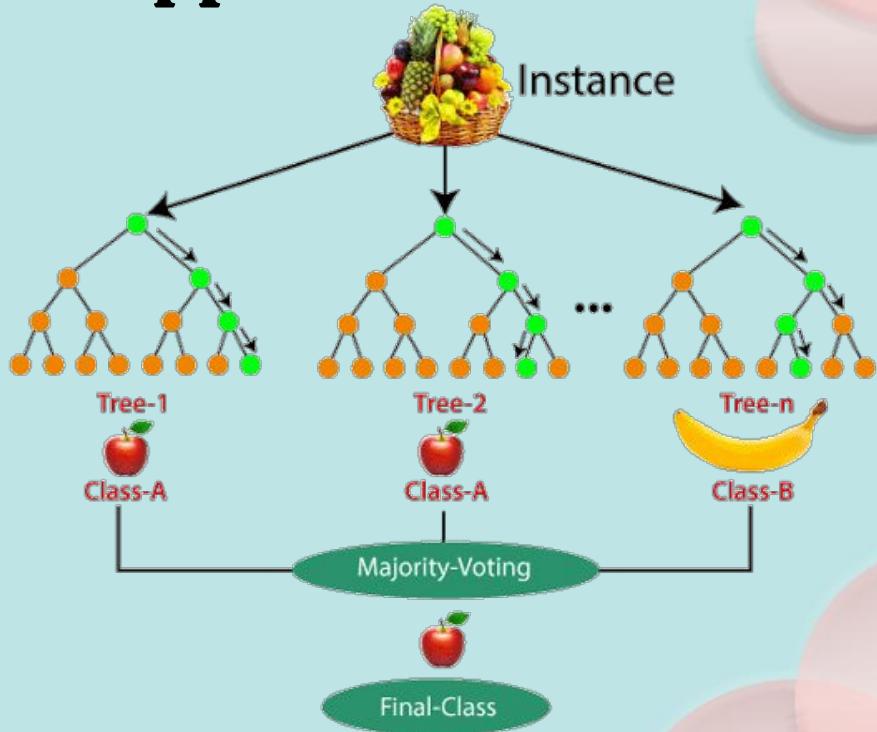
Random Forest

- Creates **multiple decision trees** and takes **aggregate or majority result** as prediction
- Programmer specifies number of trees, layers and nodes
- Node conditions of each tree are determined by algorithm
 - Selects node conditions with best accuracy for classifications on training data



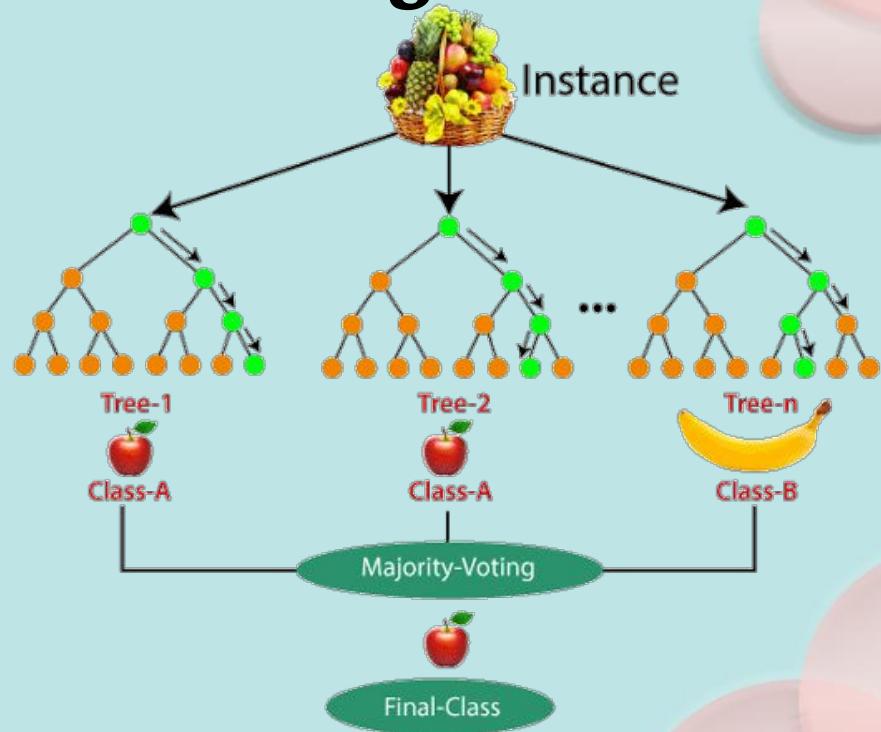
Random Forest - Application

- Works like a decision tree
- Potential to be more accurate
 - Less prone to overfitting because it uses multiple trees to predict
 - However if there is an overfitting issue it may be more difficult to identify and solve
- To recommend multiple products, we could look at the votes of each individual tree



Random Forest - Challenges

- Longer runtime than individual decision tree
- More difficult to interpret than decision tree
- Need to be careful when analyzing results of individual trees as some may be incorrect
- Again, we will need a model for each product category to build hair-care routine



3+ slides for each algorithm

- Slide 1: Description
- Slide 2: Foli-Q application
- Slide 3: Challenges and potential solutions to challenges for each model
 - Most solutions will be to experiment with different types of models or change model attributes