Capstone project

Hitting the top notes

Modeling on fragrance notes to classify ratings

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Image source: @_positivity on @fruitassembly IG, hiclipart.com/

Background - My motivation

CHERRIES—IN GENERAL

Season: late spring–late summer

Taste: sweet

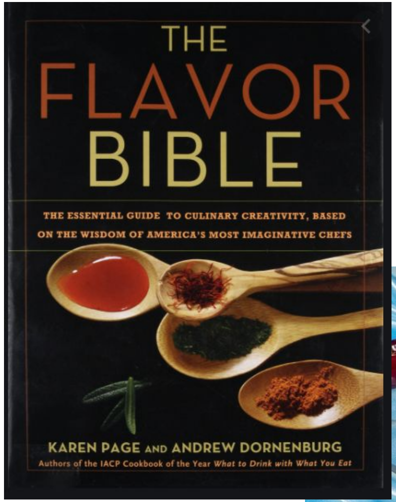
Weight: light–medium

Volume: moderate

Techniques: flambé, poach, raw, stew

Flavor Affinities

cherries + almonds + cream + kirsch + vanilla
cherries + chocolate + walnuts
cherries + coconut + custard
cherries + coffee + cream
cherries + goat cheese + ice wine vinegar + black pepper + thyme
cherries + honey + pistachios + yogurt
cherries + mint + vanilla
cherries + orange + sugar + dry red wine
cherries + sweet vermouth + vanilla



Image/ data sources: *The Flavor Bible*, Karen Page, Andrew Dornenburg; @morgan.light on @fruitassembly IG

Background - Classes of notes

Top: Form initial impression. Selling point.
High volatility.
Light, bright (like citrus fruits)

Middle: Forms the body. 40-80% of total aroma.
Midrange volatility.
Complex, midweight (like florals)

Base: Foundation of fragrance. Brings depth.
Low volatility.
Deep, heavyweight (like sandalwood)

Datasource: https://www.alphaaromatics.com/blog/understanding-the-top-notes-heart-notes-base-notes-of-fragrance/

Preprocessing - Dummify notes

Before

	title	0	1	2	3
0	Aamal The Spirit of Dubai for women and men	Top0Turkish Rose	Top1Bulgarian Rose	Top2Bergamot	Top3Fruits
1	Aatifa Ajmal for women and men	Top0Nutmeg	Top1Rose	Top2Cumin	Middle0Amber

After

top_0_mandarin_orange	top_1_green_apple	top_2_thyme	middle_0_2_lavender
1	1	1	1

Preprocessing - Results

The dataset drastically changed shape

Raw data

155 columns

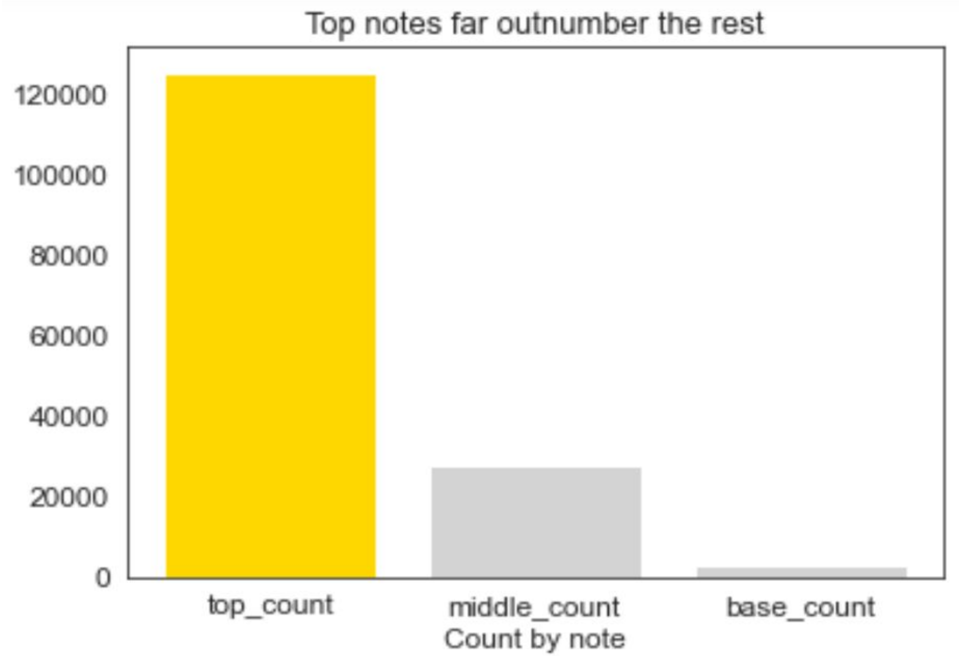
42k rows

Raw + dummified notes data

6k columns

42k rows

Data profile - Top, middle, base notes



Abundance of top notes data

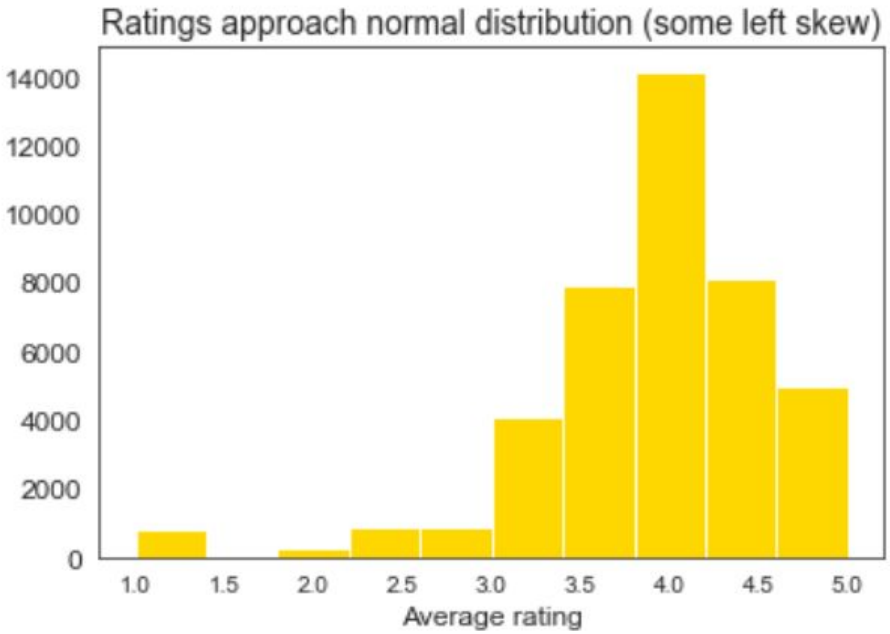
=

Project focus

Quick hit (top) only

Image sources:

Data profile - Average ratings



After binning, modeled just on ratings 3 and 4

Image source: prada.com

EDA - Fragrance notes

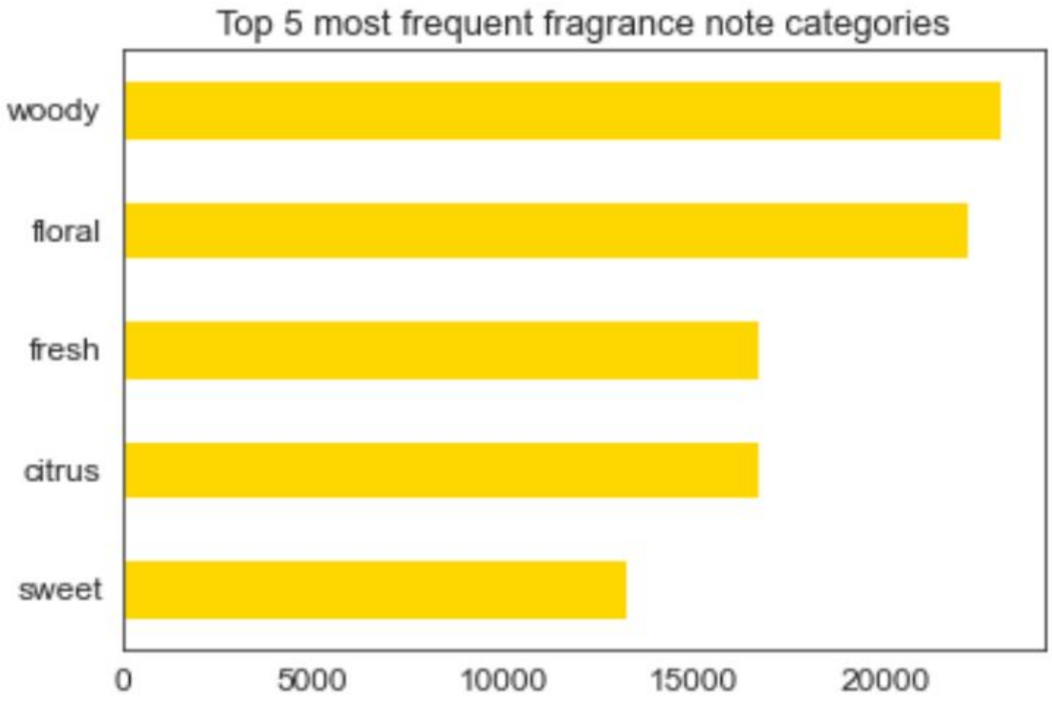
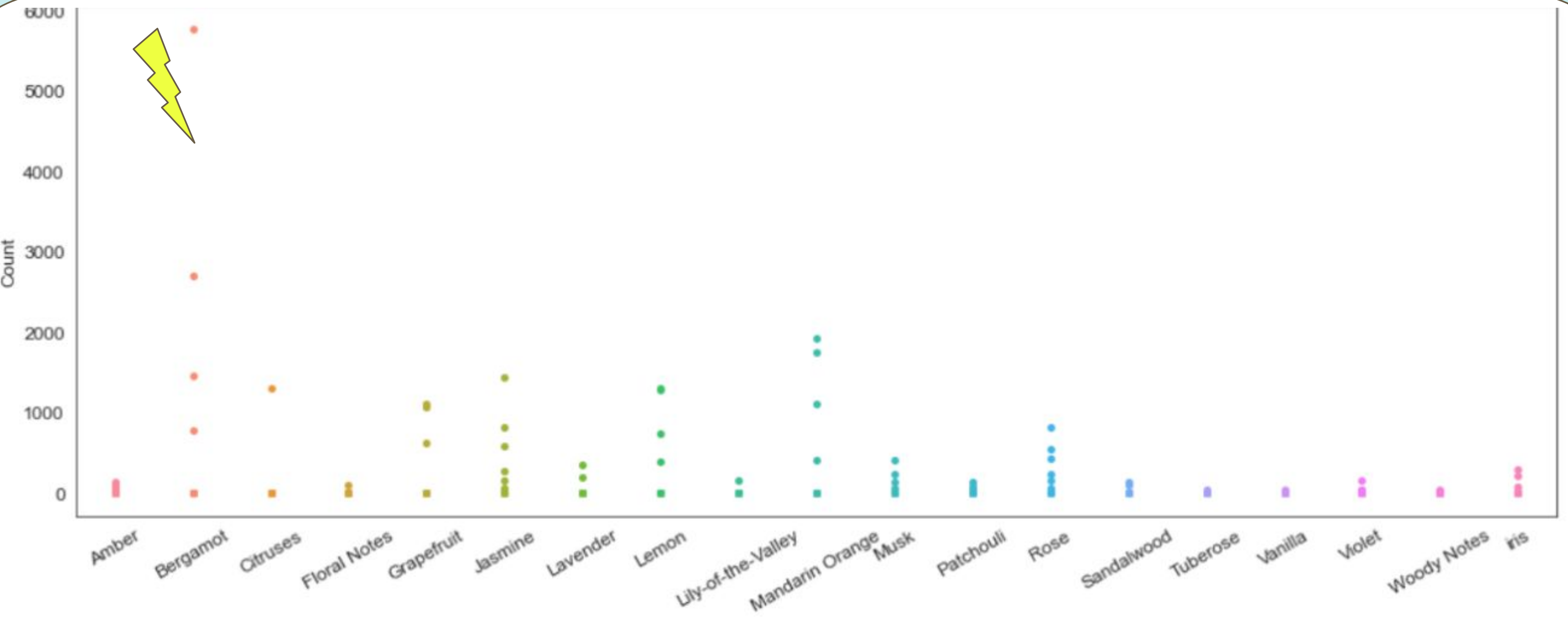


Image source: prada.com

EDA - Counts of most frequently used notes



Sampling of data science methods

A bit like sampling fragrances!

Logistic regression (inference + predictions)

Tree-based modeling (inference)

Clustering (inference)

Image source: https://www.dior.com/fr_fr/parfum/maison-christian-dior/service-dessai-maison-christian-dior

Modeling results - Accuracy scores

Logistic regression
with *and* without
Principal Component Analysis (PCA)

Baseline = 54%

Majority class = Rating 4

	With PCA	Without PCA
Train set	70.2%	70.2%
Test set	56.4%	54.7%
	80 components	

Image source:

Modeling results - Accuracy scores

Tree-based models

	Decision tree	**Random Forest + GridSearchCV**
Baseline model = 54% Majority class = Rating 4	Train set: 92% Test set: 54%	Train set: 92% Test set: 60%

Image source:

Modeling: Anatomy of a decision tree

Root node

Like an upside-down tree

If-else split

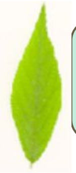
Branch B

Branch A

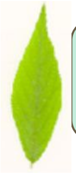
Decision node

Decision node

Leaf node



Leaf node



Leaf node

Image sources: https://www.etsy.com/search?q=GOLDEN%20CHAIN%20tree%20Laburnum%20anagyroides%20, https://www.researchgate.net/figure/Example-of-leaf-shapes_fig3_257403882

Modeling: Decision tree

```
|--- fruity <= 0.50
|   |--- honey <= 0.50
|   |   |--- patchouli <= 0.50
|   |   |   |--- earthy <= 0.50
|   |   |   |   |--- balsamic <= 0.50
|   |   |   |   |   |--- tonka (coumarin) <= 0.50
|   |   |   |   |   |   |--- fresh spicy <= 0.50
|   |   |   |   |   |   |   |--- herbal <= 0.50
|   |   |   |   |   |   |   |   |--- vanilla <= 0.50
|   |   |   |   |   |   |   |   |   |--- powdery <= 0.50
|   |   |   |   |   |   |   |   |   |   |--- warm spicy <= 0.50
```

Image source: https://www.etsy.com/search?q=GOLDEN%20CHAIN%20tree%20Laburnum%20anagyroides%20

Modeling results: What we can infer

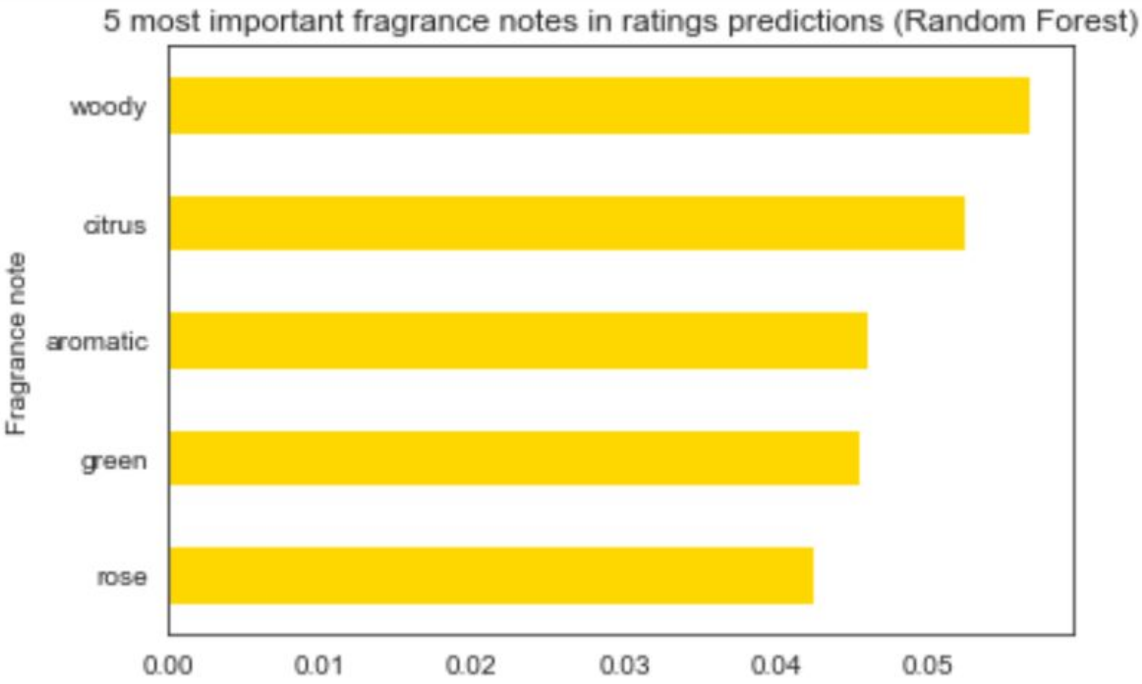
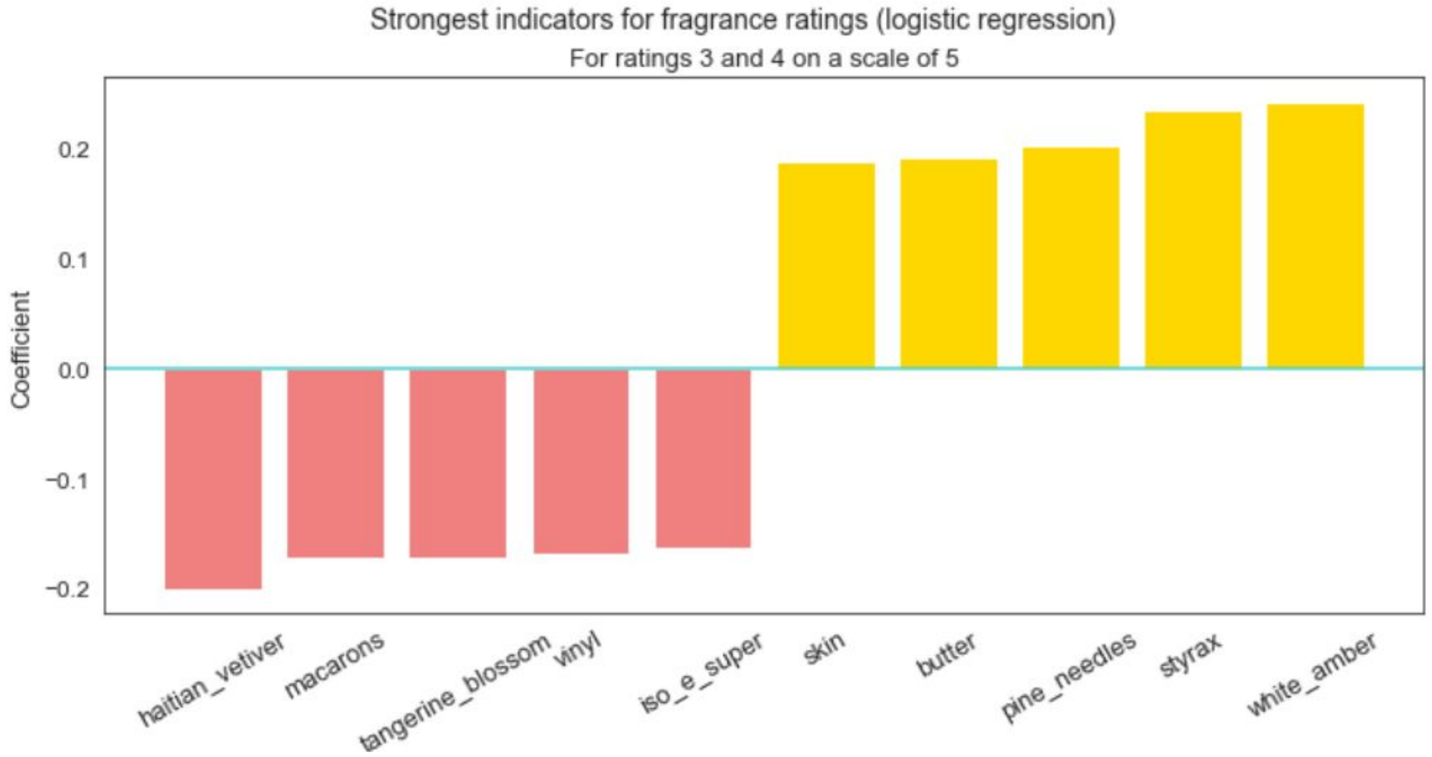


Image sources: saksfifthavenue

Modeling results: What we can infer



Clustering - Results

Silhouette score

Cohesion *(intra-cluster distance)* - separation *(inter-cluster distance)*

Range: -1 (worst) to 1 (best)

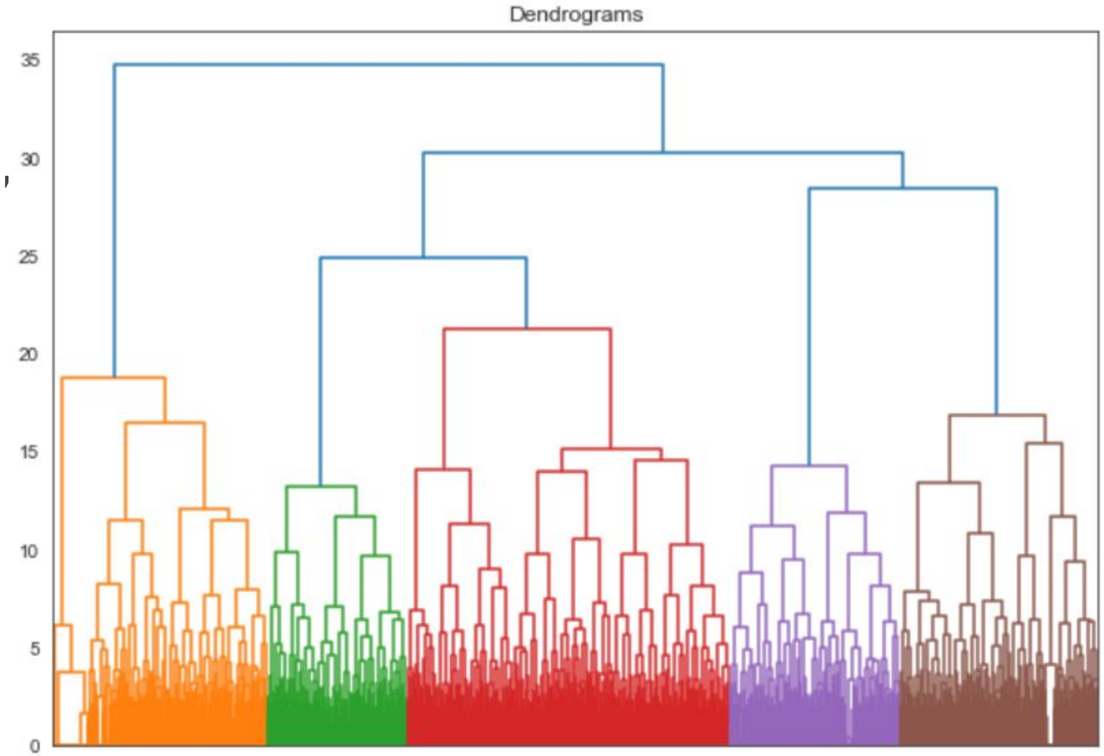
DBSCAN

Silhouette score: -0.3

*K*Means

Silhouette score: -0.2

Clustering - Next steps



Feature agglomeration
+
Hierarchical clustering

Next steps (seriously)

Recommender system for product development

Live data stream

Now, a quick demo!

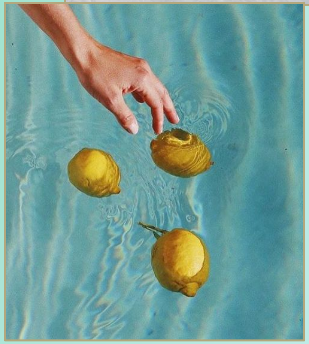


Image source: @fatimah.hsh and @taylor.g.simpson on @fruitassembly IG