

# Machine Learning as the Key to Personalized Curation

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<https://github.com/karyafar/openAir2015>

# Overview

Etsy

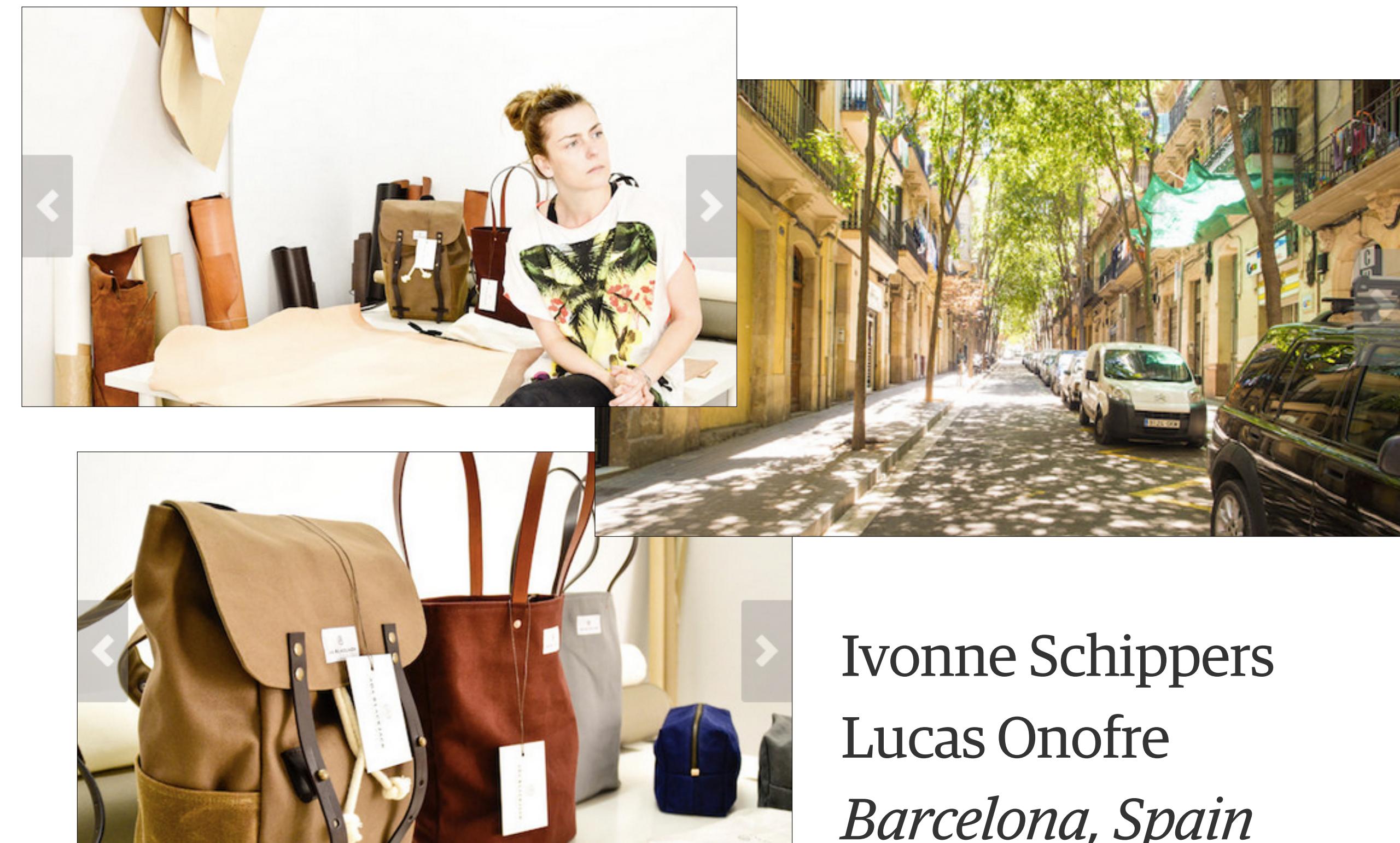
Personalized Recommendations on Etsy

Machine Learning Models @ Etsy

Conclusion

Etsy is an online marketplace where people connect to buy and sell **unique** goods: Handmade, vintage, or craft supplies

The screenshot shows the AdaBlackjack shop page on Etsy. The top navigation bar includes categories like Art, Home & Living, Jewelry, Women, Men, Kids, Vintage, Weddings, and Craft Supplies. The search bar contains "Etsy". The shop's logo, "ADA BLACKJACK BAGS & LEATHER GOODS", is prominently displayed. The shop owner is listed as Ivonne from Barcelona, Spain. The shop has been open since Jan 4, 2012, with 122 sales and 2,630 admirers. The "Shop Sections" sidebar lists items such as tote bags, pouches, satchels, wallets, backpacks, and cases. The main content area displays featured items from AdaBlackjack, including various backpacks and totes in different colors like Dark Grey, Light Grey, Camel, Tobacco, Auburn, Grey, Olive, and Dark Blue. Each item has a small image, the name, the shop name, and the price.



Ivonne Schippers  
Lucas Onofre  
Barcelona, Spain

People buy and sell on Etsy from nearly every country in the world.

**~21M**

Active Buyers

**1.4M**

Active Sellers

**~35M**

Listings

Stats as of March 31, 2015

In a 2014 survey of Etsy buyers, 92% agreed that Etsy offers products they cannot find elsewhere.

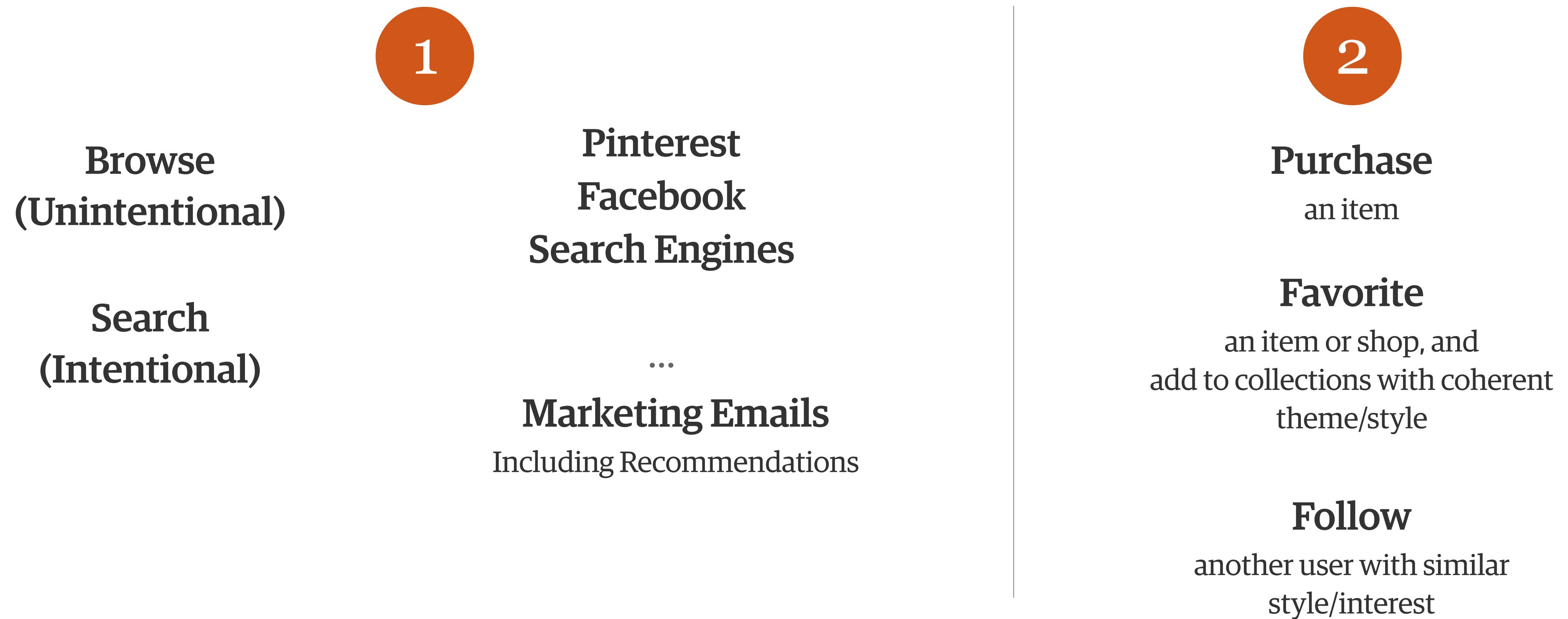


PendantWorld



Circuit Board Pendant!

# How do people typically use Etsy?



# Etsy Overview

All Categories > "desk lamp" (10,756 Results)

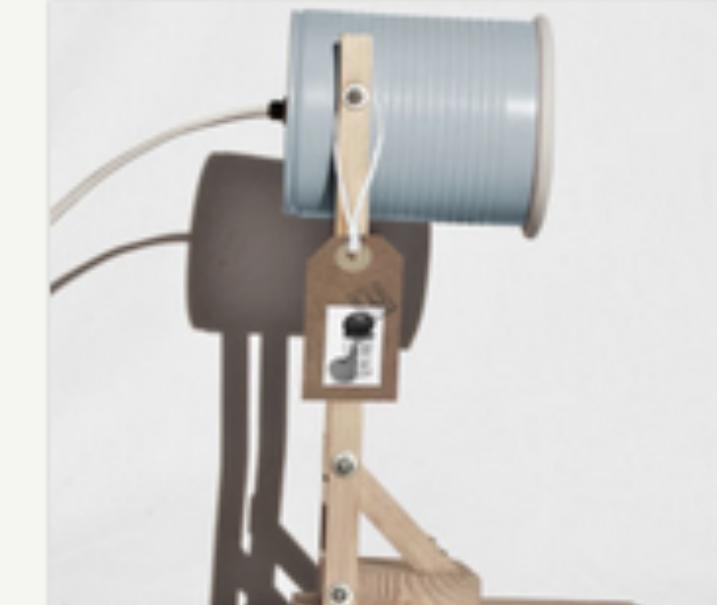
Sort By: Relevancy ▾

 Ad  
Edison Lamp Nostalgic - Steampunk ...  
Timberson \$95.00 USD

 Ad  
Cascade Lamp by LightWater Artisans  
LightwaterArtisans \$749.00 USD

 Ad  
Brass Branches Desk Lamp w/ Marbl...  
brandonlenoir \$199.00 USD

 Ad  
Desk Lamp, Nursery Lamp, Bedside ...  
EllaMenoPeaDesign \$65.00 USD

 Ad  
Desk lamp , pastel light cyan color.....  
ILIU \$29.25 USD

 Ad  
Mid Century desk lamp vintage yello...  
rubyinthesky \$49.99 USD

 Ad  
Vintage Mid-Century Desk Lamp  
UrbanAmericana \$125.00 USD

 Ad  
Industrial Desk Lamp - Mint Green Wi...  
IndLights \$89.00 USD

 Ad  
Nintendo zapper gun desk lamp  
WarriorGameCrafts \$65.00 USD

All Categories > “desk lamp” (10,756 Results)



Edison Lamp Nostalgic - Steampunk ...

Timberson

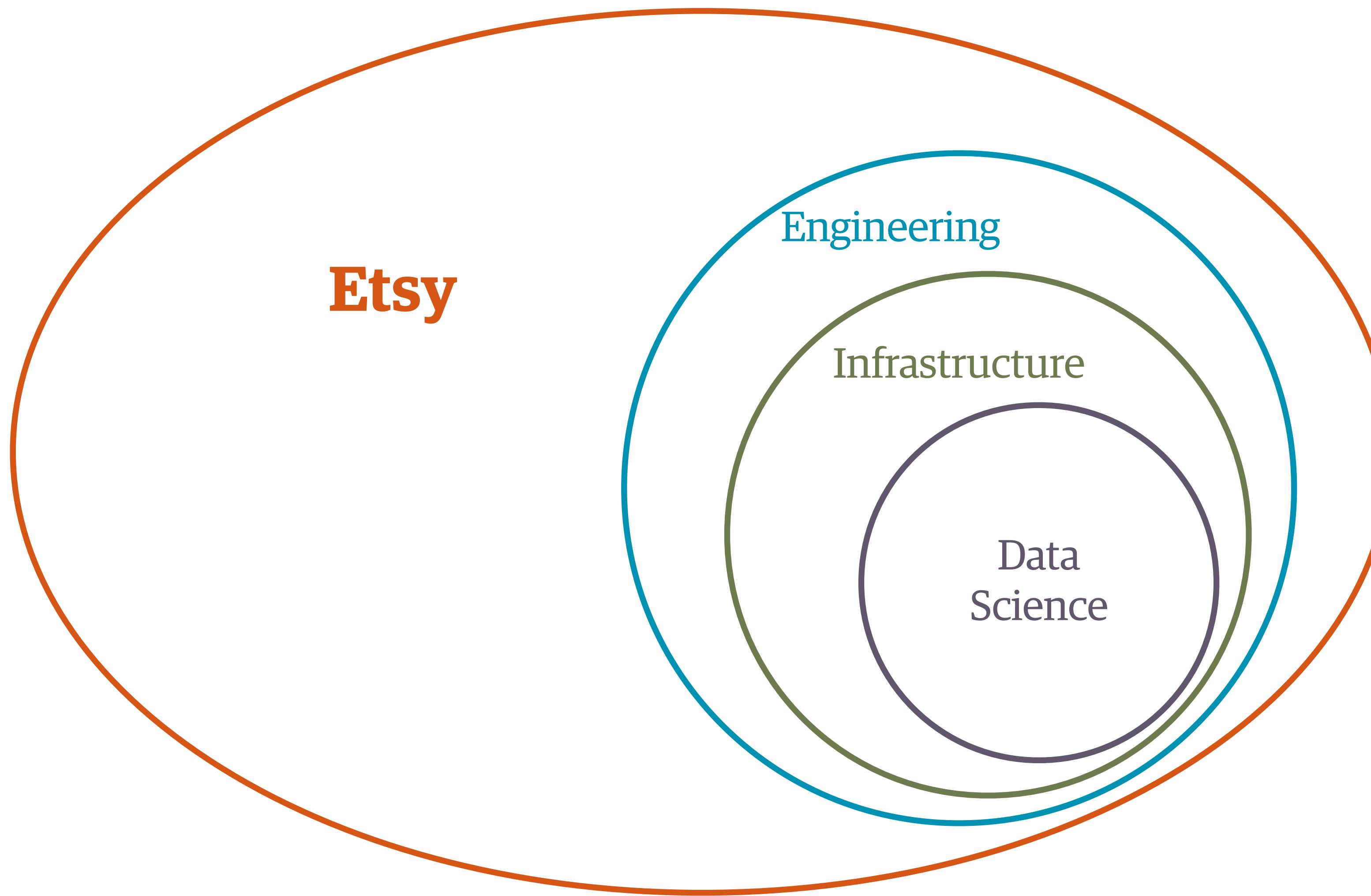
\$95.00 USD



Cascade Lamp by LightWater Artisans

LightwaterArtisans

\$749.00 USD



# Data Science



**Rob Hall**

Search, checkout



**Diane Hu**

Buyer Experience, Buyer Activation  
Manufacturing



**Kamelia Aryafar**

Security, Marketing, Membership



**Josh Attenberg**

Team Leader, Local



**Andrew Clegg**

International, Ops, Security



**Corey Lynch**

Search, Ads

# Recommendations on Etsy

# Recommendations on Etsy



Bamboo Honeycomb Place Mat &...

\$51.67 USD | buProducts



Similar to some of your favorites

...

ITEM RECS

Justin Huan  
, SG

Follow

1573 favorites >

Has favorites we think you'll enjoy

...

This block displays a user profile for Justin Huan from Singapore. It includes a circular profile picture of a black dog, the user's name and location, a 'Follow' button, and a section showing items liked by the user with a count of 1573.

USER REC

102 items >

RichwoodCreations ★★★★★  
Rustic, Functional & Decorative ...

...

Sells items similar to your favorites

...

This block displays recommendations from the shop RichwoodCreations. It shows images of various wooden products like a world map, a monogrammed box, and a clock, along with the shop's rating, description, and other user information.

SHOP REC

# Recommendations on Etsy

Hi, Kamelia!

Following Interactions

You have new activity! Click to refresh. X

Looking for your shop activity?



Recently Favorited Items



New Items From Your Favorite Shops



Our Picks For You



**TwoGuysBowties**  
Meet the co-founders  
of men's accessories  
line Two Guys Bow  
Tie Co.  
[Read the story and  
tour their studio](#)



**One-of-a-Kind Gift Ideas**

[Shop Now](#)

Browse

Trending Items

Father's Day Gifts

Summer Celebrations

Gift Ideas

Mobile Accessories

Story Behind the Shop [See more](#)

# Recommendations on Etsy

iPad 12:32 85%

Your Feed Trending

Jedi Order - Bottle Opener Keychain... £3.30 SARNSTIE

Similar to some of your favorites

Froggy Creations 45 listings

DiceBagChick ★★★★★ (83 reviews)

Sells items similar to your favorites

# Marketing Emails

It's The Little Things

Etsy <emails@mail.etsy.com>  
to me ▾

May 2 (10 days ago) ★ ⏪ ⏴

Etsy

View this email online

Picked for You



Deer Ring Dish - Trinket Di...  
£4.75



Mens Squid on a Bike T S...  
£12.89



I'M AN  
**ENGINEER**  
TO SAVE TIME LET'S JUST  
ASSUME THAT I'M NEVER WRONG  
Funny Engineer T-Shirt En...  
£10.17



Womens VONNEGUT... S...  
£12.21



Energy Flow Fitted Hat ma...  
£16.96



Mens Vintage Robot Comp...  
£13.56

# Cart Recommendations

## You might also like...



Rose Gold Letter  
Necklace, Lower Case  
Letter, Rose Gold Initial,  
Rose Gold Initial  
Necklace, Initial Jewelry

By PROJECTDAHLIA

\$26.00 USD

Add to Cart



Gold Jewelry, Gold Bow  
Necklace, dainty  
handmade necklace,  
everyday, simple,  
birthday, wedding,

By PROJECTDAHLIA

\$24.00 USD

Add to Cart



Thin Gold chain necklace  
14 - 50 inch small 2mm  
gold chain oval links  
chain gold plated chain  
flat link chain ...

By acanthusjd

\$6.00 USD

Add to Cart

# Empty Cart Recommendations



Your cart is empty.

## Recommended Items



**Silver, gold, rose gold  
Bracelet- Pearl Bracelet-  
White Pearl- Dainty Silver  
Bracelet- Tiny Pearl  
Jewelry- 925...**

By West9th

**\$14.00 USD**

Add to Cart



**slip cast porcelain  
hanging crystal planter**

By Beanandbailey

**\$27.00 USD**

Add to Cart



**Aqua Mint Earrings Aqua  
Dangle Earrings  
Bridesmaid Gifts Bridal  
Jewelry Drop Earrings  
Jewelry Accessories**

By LimonBijoux

**\$22.00 USD**

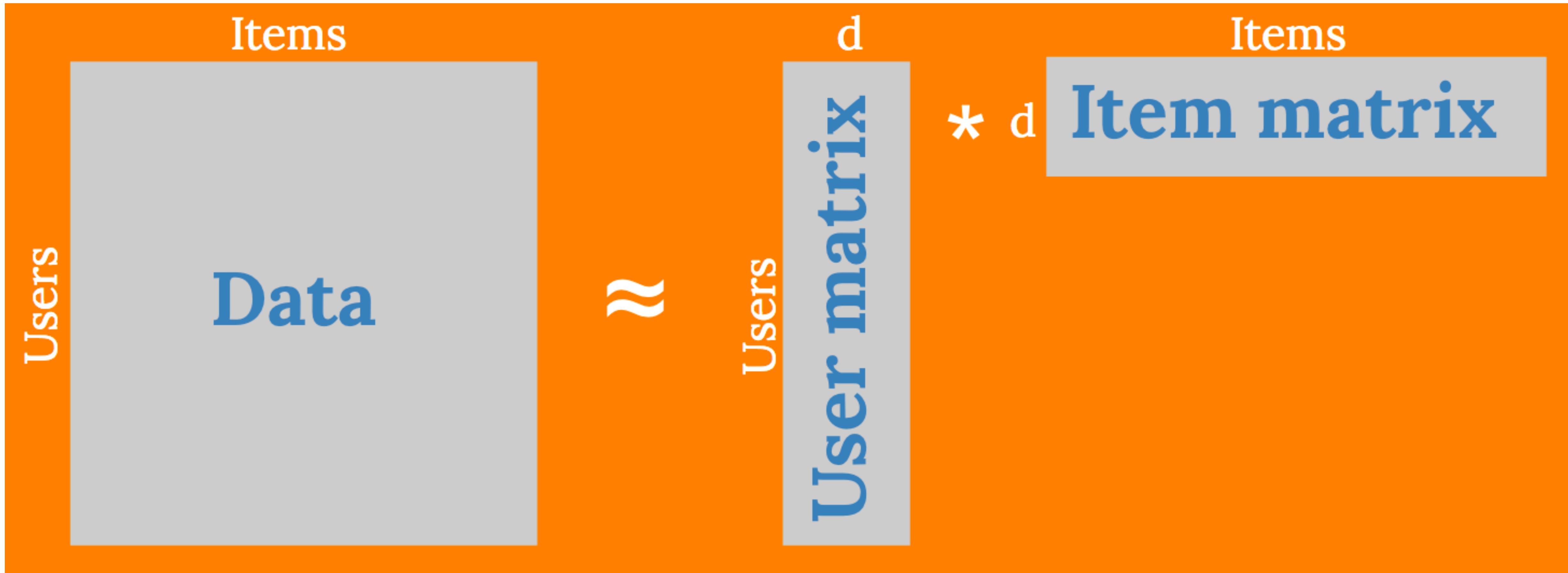
Add to Cart

# Machine Learning Models for Personalization

# Matrix Factorization ( MF )

		Items				
						...
Users	Alice	1	1	0	0	
	Bob	0	0	1	1	
	Corey	1	0	1	0	
	...					

## Matrix Factorization ( MF )



# Users

Alice	0.9	-0.1
Bob	-0.8	0.5
Corey	0.1	0.8

# Items

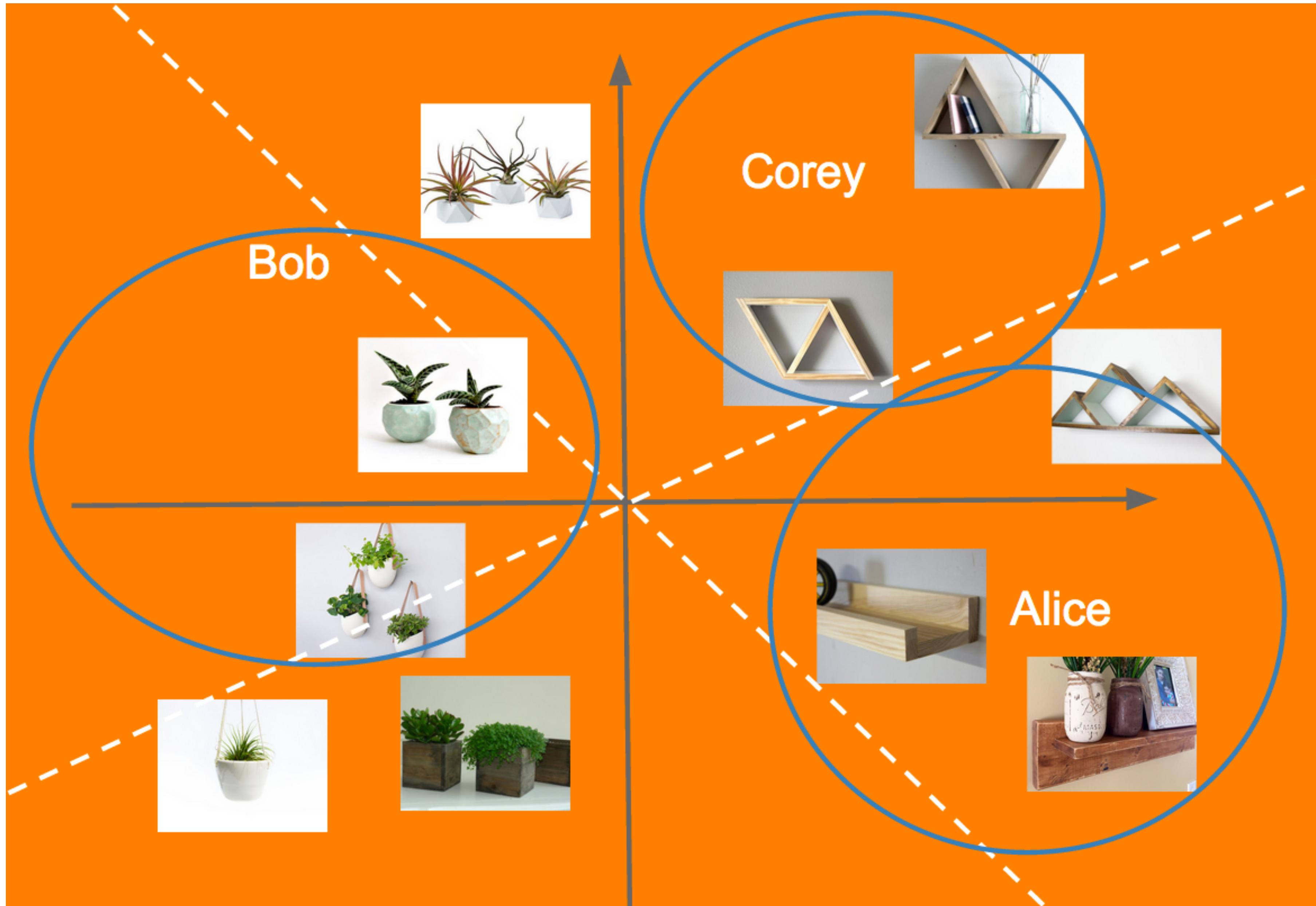
0.8	0.9	-0.7	-0.8
0.9	0.1	0.7	-0.5

score[Corey,



$$] = 0.1 * 0.9 + 0.8 * 0.1 = 0.17$$

# Locality Sensitive Hashing ( LSH )

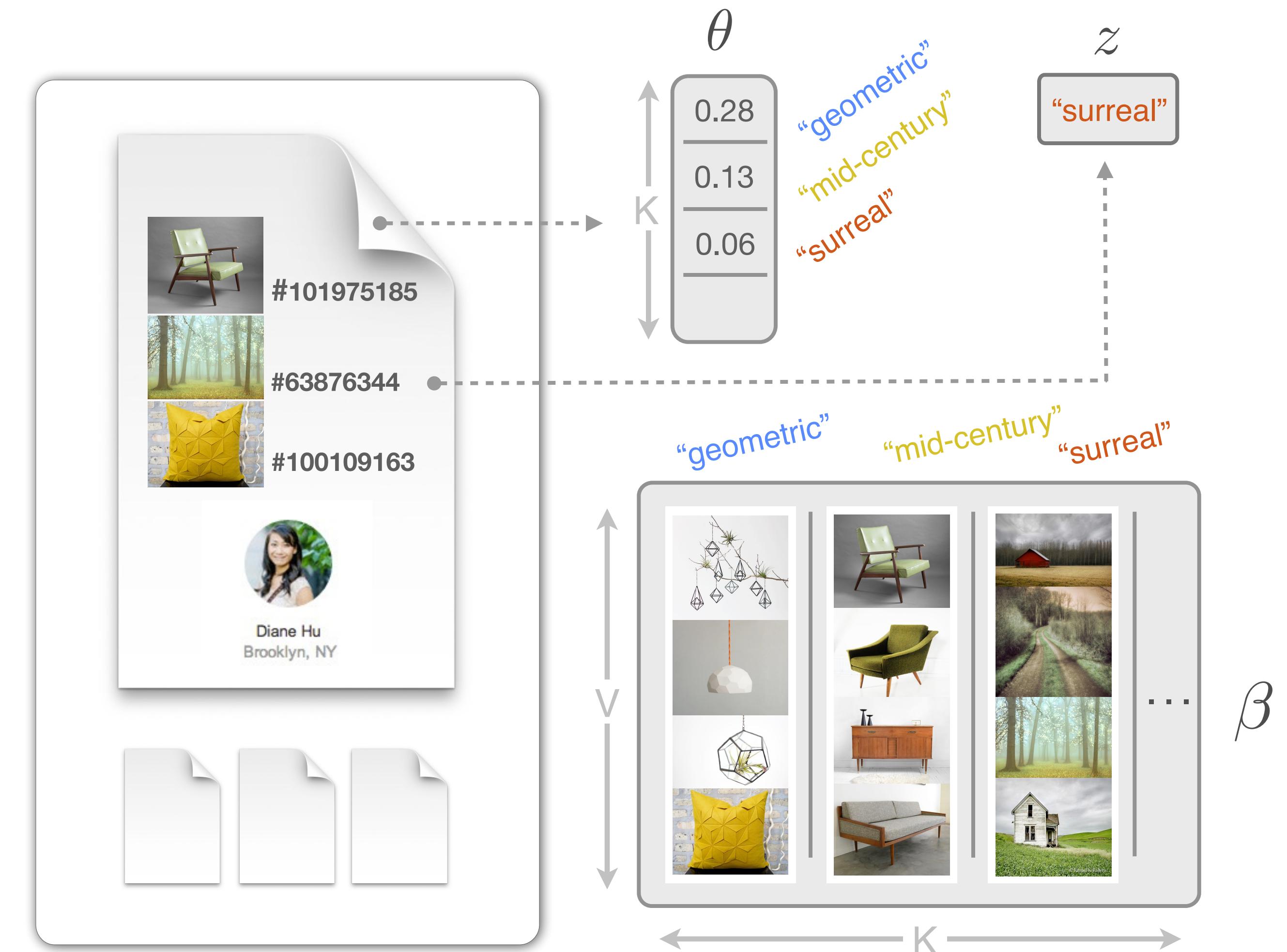


# Latent Dirichlet Allocation ( LDA )

Assume: Each user's favorited items are generated by this process:

For each user  $u$ ,

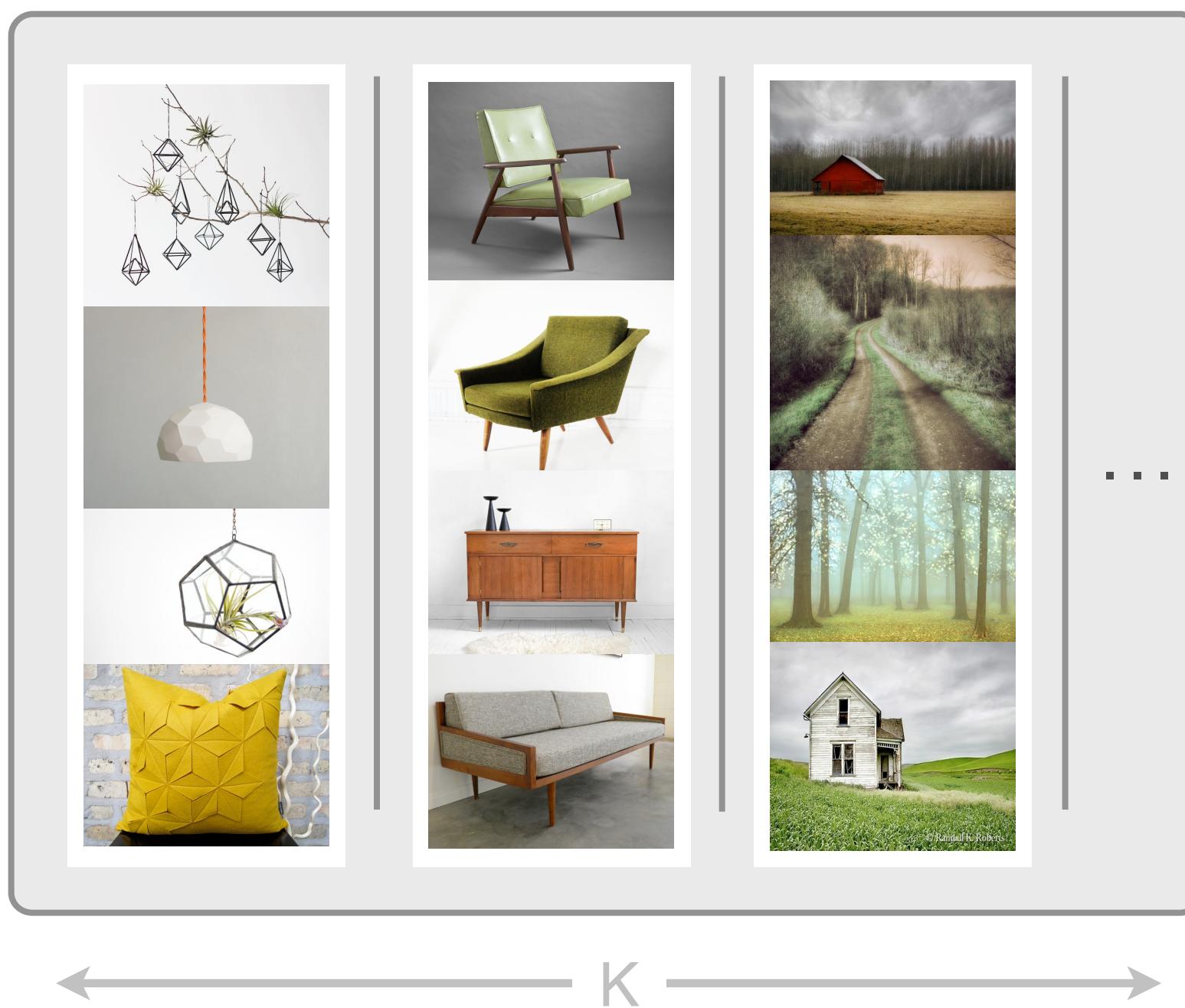
1. Draw a style profile:  
 $\theta \sim Dirichlet(\alpha)$
2. For each item,  $x_n$  that user  $u$  has favorited,
  - (a) Draw a style:  
 $z_n \sim Multinomial(\theta)$
  - (b) Draw an item:  
 $x_n \sim Multinomial(\beta_{z_n})$



# Latent Dirichlet Allocation ( LDA )

Discover popular styles on Etsy as a distribution over items

“geometric” “mid-century” “surreal”



Represent each user as a distribution over popular styles, i.e. “style profile”



# Discovering User Styles

## Different styles discovered by LDA

### ANIMALS



### TENTACLES



### GEOMETRIC

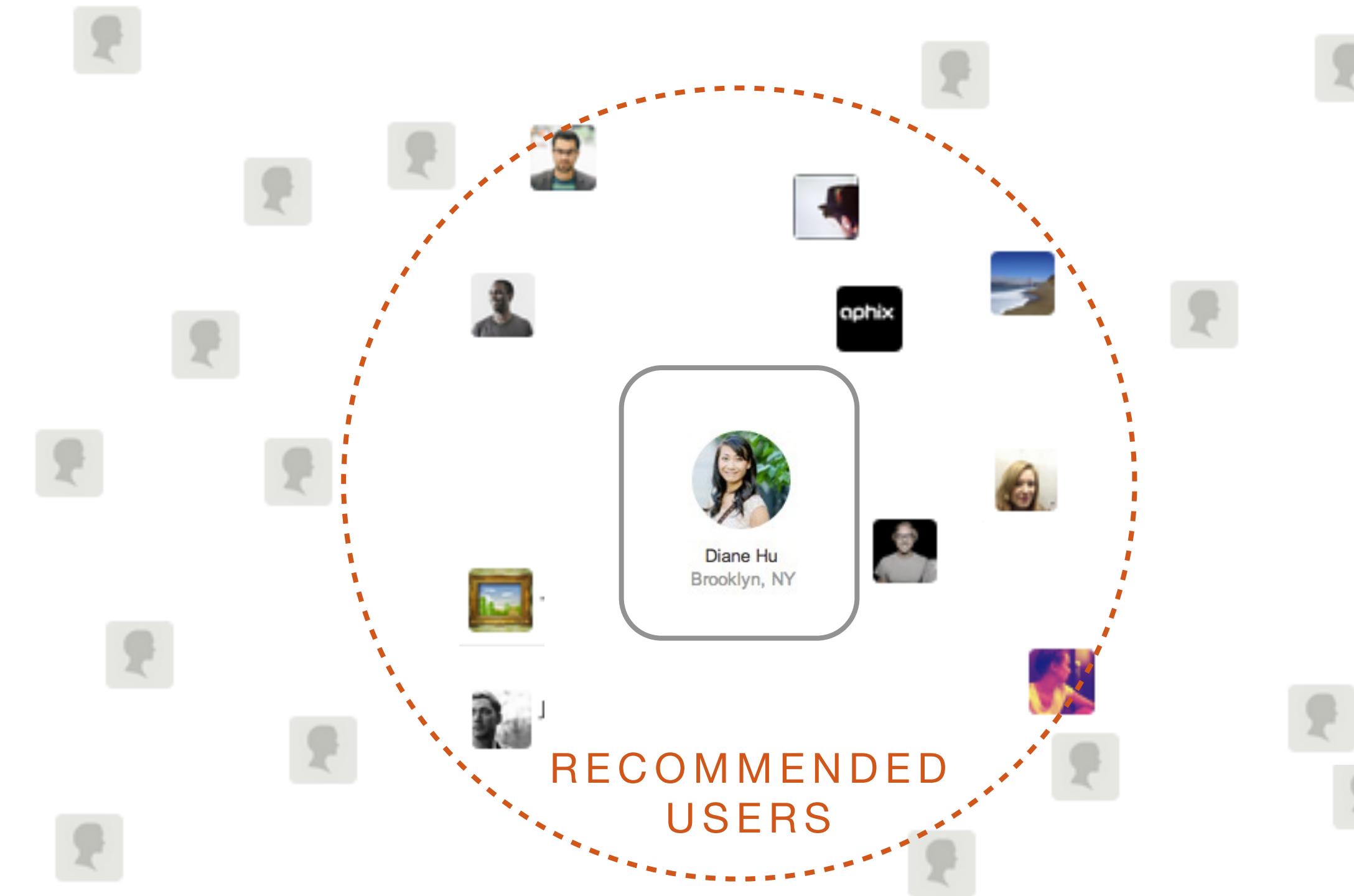


### MID-CENTURY MODERN



# User Recommendations

Given that each user has an style profile: **Recommend N users with most similar style profiles.**



# Generating Recommendations

Given that each user has a style profile: **Sample items most highly weighted styles**

## USER'S FAVORITES



## ITEM RECOMMENDATIONS



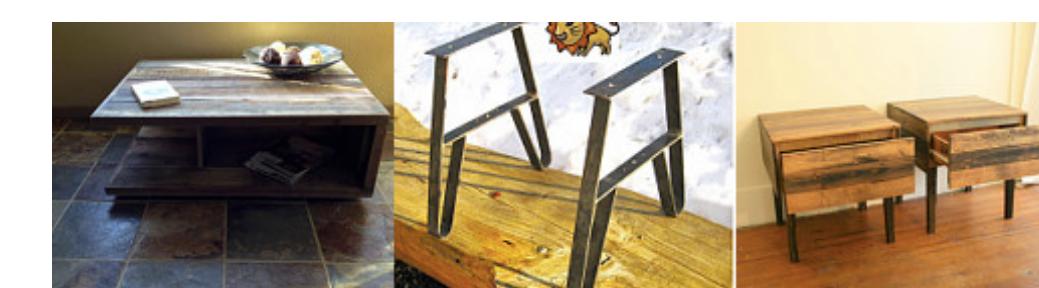
STYLE #428



STYLE #54



STYLE #655



STYLE #87

## A/B Testing

### *Example I:*

- LDA and No recommendations
- Result: **Significantly increased all business metrics**

### *Example II:*

- Different variants of LDA and Matrix Factorization (using Stochastic SVD)
- Result: **Matrix factorization and LDA comparable across business metrics**

Personalized content best engages users and  
enhance business metrics.

### *Personalization through Recommendations:*

- Build large-scale recommender systems through **Machine Learning Models**:
  - for multiple content types
  - for enhancing browse experience and matching users with items across the site.
- Improve key business metrics
- A/B testing and evaluating the results

Questions?

Thank you!

<https://github.com/karyafar/openAir2015>

Etsy