

# Recommendation Engine

# Agenda

- 
1. Need of recommendation engines
  2. Types of Recommendation Engines
  3. Content Based
  4. Collaborative Filtering

# Recommendation Engines

Online Shopping India | Buy Mo: x +

https://www.flipkart.com

Apps Home - [SAP] Step-By-Step: Your Fi Corporate Identity Ki Home #amas: Popularity, Tr SAP BusinessObjects Imported From IE SAP CRM 7.0 SAPAnalyticsTraining Other bookmark

Flipkart Plus Search for products, brands and more Preetika More Cart

Backpacks Men's Wallets Men's Watches Watches Watches Frames Men Sunglasses Watches

**Recommended Items**  
Inspired by Your Interest

VIEW ALL

Miss & Chief Big and Me... ₹1,999 55% Off ₹899

Miss & Chief 1:16 5-chan... ₹1,899 53% Off ₹899

Webby Remote Controlle... ₹2,599 58% Off ₹1,099

Miss & Chief Hummer wi... ₹1,899 55% Off ₹849

Mdfashion kart Mad Rac... ₹1,579 51% Off ₹778

Zurie Toy Collection Off ... ₹3,199 75% Off ₹791

Miss & Chief Open Bugat... ₹1,899 53% Off ₹899

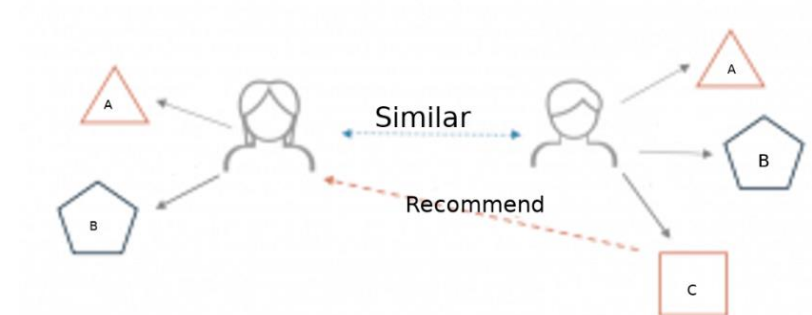
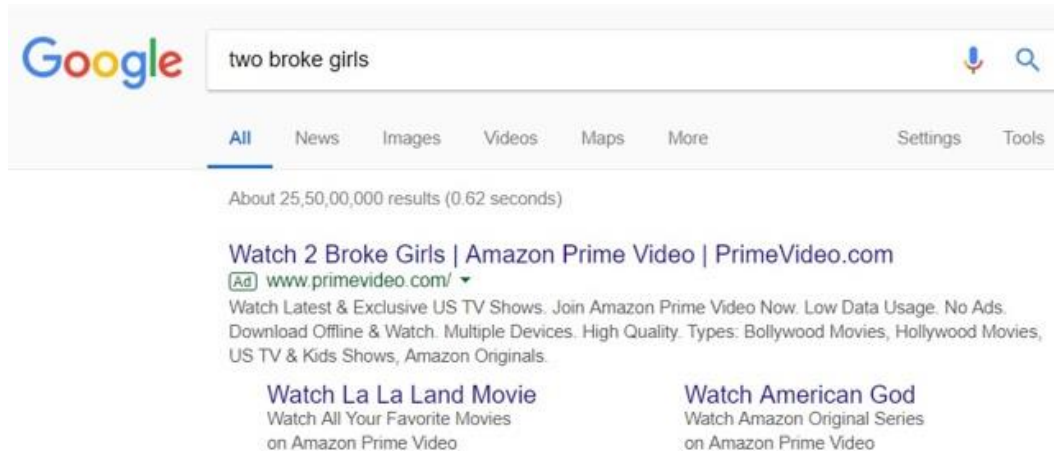
Miss & Chief Speed ₹2,799 53% Off ₹1,302

Whirlpool Large Capacity From ₹27,999 UP TO ₹3,300 OFF on Exchange

Top-selling Refrigerators Up to ₹6,000 Off on Exch. FROM ₹9,499 No Cost EMI\*

Breakfast Specials Sandwich Makers SHOP NOW

# Recommendation Engines



It is an algorithm whose aim is to return the most relevant information to a user by discovering the patterns in a dataset.

# Recommendation Engines

A recommendation engine is a tool, that allows algorithm developers predict what a user may or may not like among a list of items.

Help users discover products or content that we may not come across otherwise.

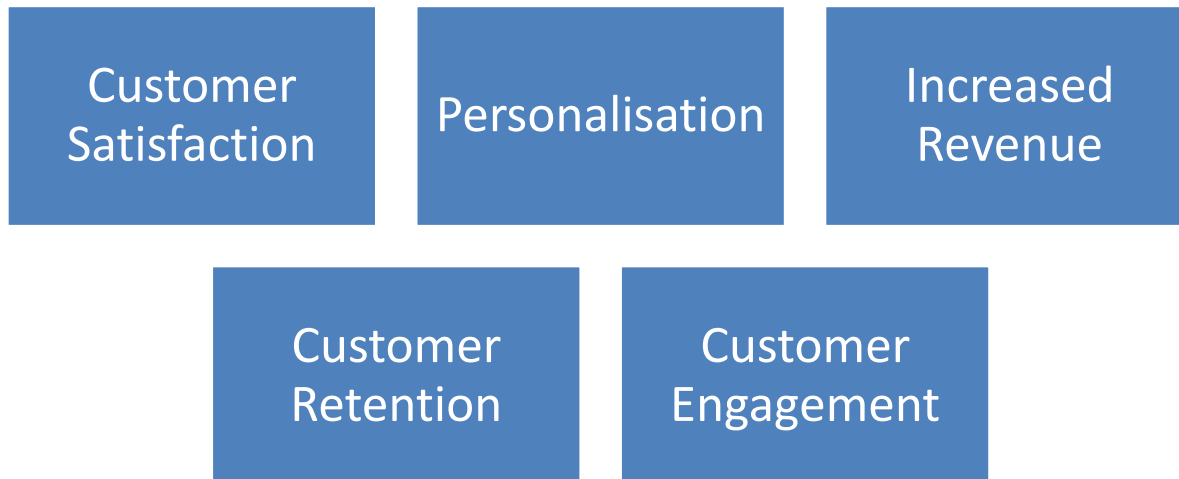
This is highly used in the websites like Amazon, Flipkart, Facebook etc.

# Need of Recommendation Engines

The objective of internet marketing is to introduce the product to the potential customers, show them indirectly how it fits into their needs and how it matches their preferences and then repeating this time and again until they make a buy.

So, Recommendation engines calibrate to the preferences of the users.

Benefits:



# Recommendation Engines: Use Case

Company PQR Ltd manufactures laptops and selling across all ecommerce websites like amazon and flipkart. But their sales has been declining constantly. They invested heavily in digital marketing, SEO, content marketing etc. But were not able convince customers to make the buy. So, they hired cognitior as their business consultant for this project.

## **Solution given by Cognitior:**

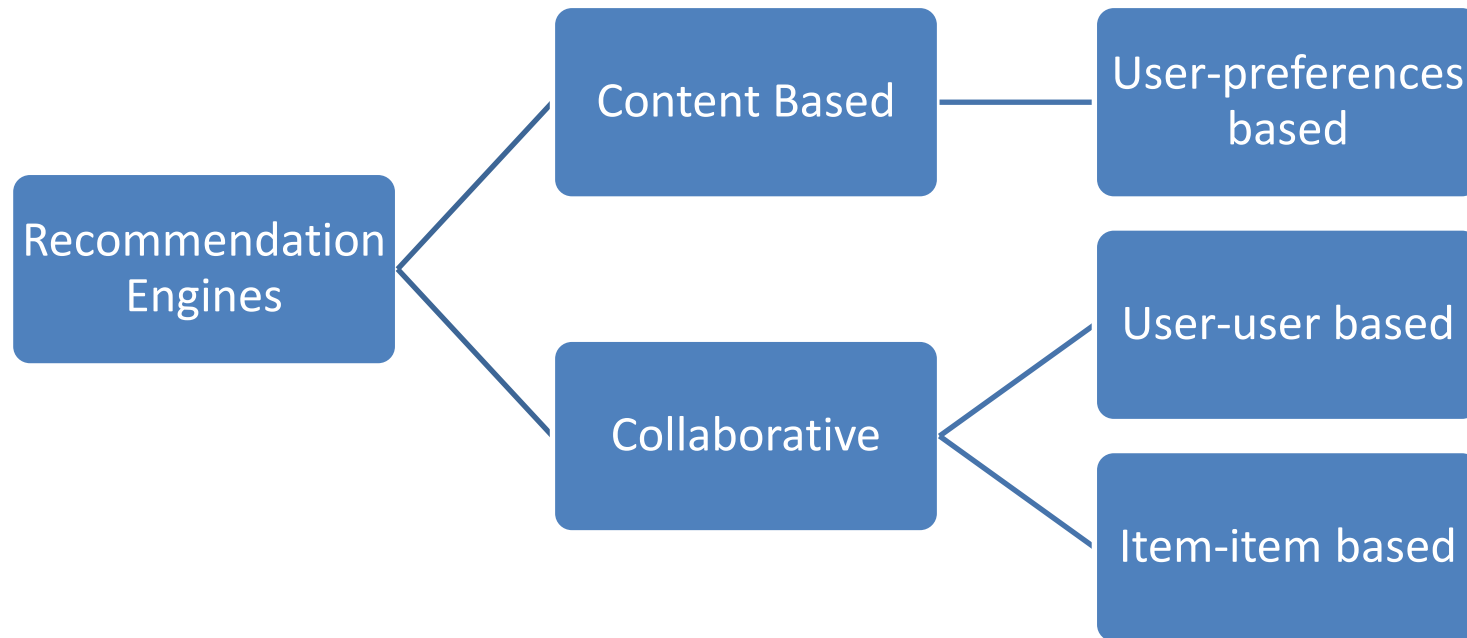
Cognitior advised them to develop to use the data of recommendation engines being already implemented by amazon (frequently bought together) and flipkart (people also searched for).

So, people who are searching for HP laptop or Lenovo Laptop, PQR can get their email ids and send them personal emails offering discount coupons.

Right at the purchase point when customer gets discount coupon from the competitor the most likely case is customer would end up buying the competitive product.

This strategy did wonders to PQR Ltd and their sales got double in the next quarter.

# Types of Recommendation Engines



It is also possible to combine both these methods to build a much more robust recommendation engine i.e. Hybrid recommendation system.



# Types of Recommendation Engines

## Content Based:

It is based on what user had liked in the past. For example: if user had liked a book “The old monk who sold his Ferrari” in the best. He/she would also like “who will cry, when you die”

Or, A user who had liked table runner from home and décor, he/she would also other dine décor products like coasters, place mats etc

## Collaborative:

a. User-user: this algorithm searches for similar customers based on their common choices and recommend the non common choices to all the customers.

For example: if Ellen likes: Game of Thrones, Breaking Bad and Orange is new black  
Whereas Amna likes Game of thrones, Breaking bad and Supernaturals.

So, a user-collaborative search engine would recommend Ellen, the “Supernaturals” whereas, “Orange is new black” to Amna.

a. b. Item- Item: this algorithm searches for similar items and bundles them together to show as recommendation to all those who search for any one item from that bundle

For example: if laptop, laptop sleeve, mouse, laptop bag, laptop fan table, laptop screen protector, laptop skin are bundled in one. So, any customer who search for laptop would see all other items as recommendations below.

# Hybrid Recommendation Engine - Example

A hybrid recommendation system is based on both user based filtering and content based filtering

# NETFLIX

# User based collaborative filtering (UBCF)

This algorithm searches a large group of people and finds a smaller set with tastes similar to the users.

It looks at other things user like and combines them to create a ranked list of recommendations.

Many algorithm have been used in measuring user similarity or item similarity:

- K - Nearest Neighbour (K-NN)

- Pearson correlation

# User based collaborative filtering (UBCF)

Consider an example of Movie recommendation

Suppose user 1 has just watched the Movie1. Let's see how the recommendation engine works and which are the movies that it thinks user would like to see next:

First Step:

Generate a list of users who have seen the following movies.



# User based collaborative filtering (UBCF)

Here we have four users who has watched the following movies

User	Movie 1	Movie 2	Movie 3	Movie 4
User 2	Yes	Yes	Yes	Yes
User 3	No	Yes	No	Yes
User 4	Yes	No	Yes	No
User 5	No	No	Yes	Yes

# User based collaborative filtering (UBCF)

Now we find users similar to User1

User	Movie 1	Movie 2	Movie 3	Movie 4
User 2	Yes	Yes	Yes	Yes
User 3	No	Yes	No	Yes
User 4	Yes	No	Yes	No
User 5	No	No	Yes	Yes
User 1	Yes	??	??	??

# User based collaborative filtering (UBCF)

Based on the data we have User 2 and User 4 are similar to User1.

User	Movie 1	Movie 2	Movie 3	Movie 4
User 2	Yes	Yes	Yes	Yes
User 3	No	Yes	No	Yes
User 4	Yes	No	Yes	No
User 5	No	No	Yes	Yes
User 1	Yes	??	??	??

# User based collaborative filtering (UBCF)

Using the data of similar users we can see that the Movie 3 gets more vote, so it is recommended to User 1

User	Movie 1	Movie 2	Movie 3	Movie 4
User 2	Yes	Yes	Yes	Yes
User 3	No	Yes	No	Yes
User 4	Yes	No	Yes	No
User 5	No	No	Yes	Yes
User 1	Yes	??	??	??



## User based collaborative filtering (UBCF) – Pros and Cons

Data not a  
constraint

Works on consumer item scenario without any user or item feature data availability

Easy to  
comprehend

Easy to explain overall mathematical logic

Cold Start

Need enough users or items to find a match, does not work for the new items or users

Sparsity

User/Rating matrix is sparse and hence, hard to find users that have rated the same items

Popularity Bias

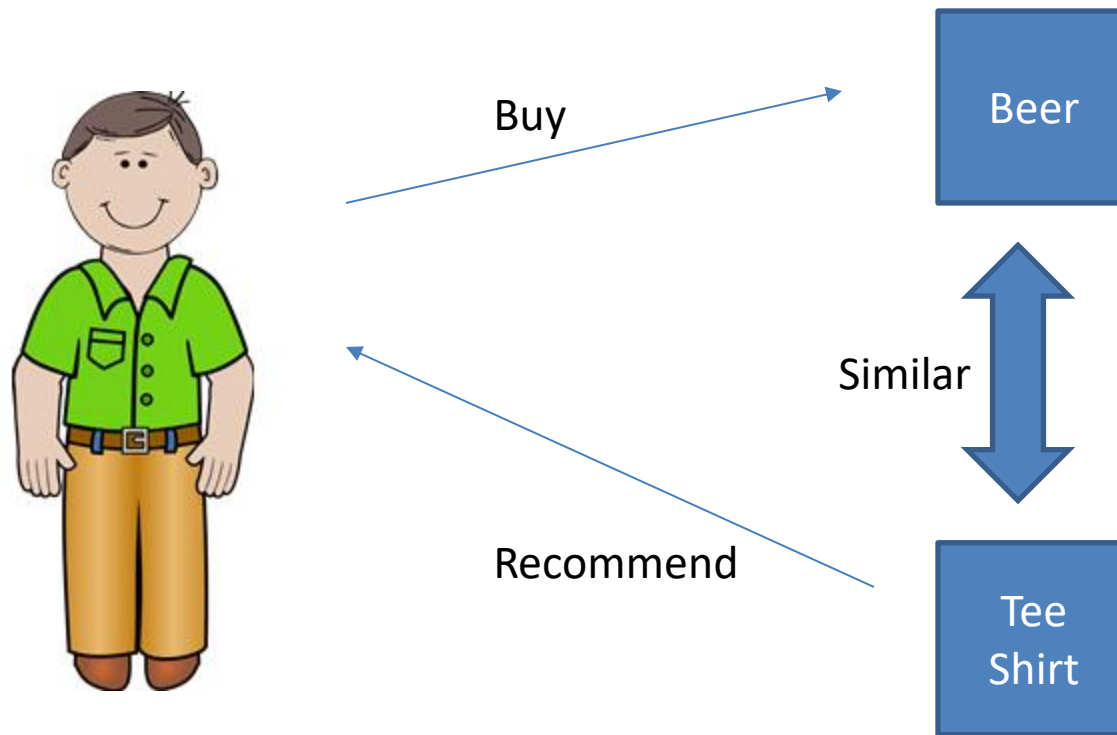
Tends to recommend popular items, cannot recommend item with unique taste

# Content based filtering

- Works with the data that user provides, either explicitly (rating) or implicitly (Clicking on a link)
- Have the content as the central entities
- Based on that data a user profile is generated to make suggestions to the user
- As the user provides more and more input the engine's accuracy increases

# Content based filtering – An Example

If user buys XYZ brands consumer merchandise, content based filtering considers XYZ brand beer can as entity and recommends other XYZ merchandise such as Tee shirt to the buyer.



# Content based filtering (CBF)

Consider an example of Movie recommendation

Suppose we have watched the Movie1. Let's see how the recommendation engine works and which are the movies that it thinks users would like to see next:

First Step:

Generate a list of features about the movies like Actors, Directors, Themes etc



# Content based filtering (CBF)

Compare columns of each movies with column of the movie1 and see which of one matches

Feature	Movie 1	Movie 2	Movie 3	Movie 4
Animated	Yes	Yes	No	No
Marvel	No	No	Yes	Yes
Super Villain	No	Yes	Yes	Yes
IMDB rating 8+	Yes	No	Yes	No
Comedy	Yes	Yes	No	Yes

## Content based filtering (CBF)

Columns with most matches is of Movie2 and the system will recommend it to the users.

Feature	Movie 1	Movie 2	Movie 3	Movie 4
Animated	Yes	Yes	No	No
Marvel	No	No	Yes	Yes
Super Villain	No	Yes	Yes	Yes
IMDB rating 8+	Yes	No	Yes	No
Comedy	Yes	Yes	No	Yes

## Content based filtering – Pros and Cons

Only user data

No need for other users data

No differentiation

Able to recommend to the users with unique taste

No first rater  
problem

Able to recommend new and unpopular items

Over  
specialization

Never recommends items outside user's content profile

No good  
judgements

Unable to exploit quality judgements to other users

## Use case: E-commerce sites

Many of the largest e-commerce websites are using recommendation systems to help their customers find products to purchase





## Use case: Social Networks

Social networking sites use recommendation system to improve user experiences



Facebook and LinkedIn focus on link recommendation  
Where friend recommendations are presented to the users



Most of the friend suggestion mechanism rely on pre-existing  
User relationship

The Facebook logo, which is the word "facebook" in a white lowercase sans-serif font centered within a solid blue rectangular background.

facebook





**THANK YOU**

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