

THE SCIENCE BEHIND “RECOMMENDED FOR YOU”

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Abstract: This report is based on the algorithm science behind “recommended for you” which is nowadays used by every player in the market focusing on establishing its brand or expanding its current business. This report will give details about companies who have successfully used this science behind “recommended for you” and have excelled in the segment and about how further companies can choose this way to influence and frame the consumer behavior.

“RECOMMENDED FOR YOU” is the knowledge available with the company to decide on the basis of the information that they have and the data user uses as filters on online portals.

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WHAT ARE RECOMMENDED SYSTEMS?

Wikipedia definition: Recommendation systems are a subclass of *information filtering system* that seek to predict the ‘rating’ or ‘preference’ that user would give to an item.

A recommendation system is basically a computer program that helps a user to discover and to find products and content as well as data for predicting and suggesting the users rating of every item and presenting them the items that they would rate highly.

Recommended systems are one of the most comprehensible applications of big company data. With online buying and selling consumers have nearly infinite choices. No one has enough time to try each and every product for sale. Recommendation system plays a crucial role in helping users find required products and content they are looking for.

Behind the scenes these systems are supported by a recommender engine. A recommender engine assesses information about the user and predicts the rating the user would give the product. If the company can forecast the users rating for a product before the user even sees the product that forecast report becomes very helpful for the company.

That means the customer can directly view the products they would like the best and won’t spend their time with products they do not need.

Let us just picture a scenario where you are browsing for an e-book to buy on an online reading. The online book store knows about your past book purchases and the ratings that you gave them. Depending on this data/information, it tries to predict how the companies will rate every product in its content. Using these forecasted ratings shown by the book store will show you only the books that it thinks you’ll prefer the most. These are also the books that you will most likely purchase.

Why should we use recommendation system?

In the words of Steve Jobs: “A lot of times, people don’t know what they want until you show it to them.” Customers may really like your product, your job opening but they may not be aware that it exists. The job of the recommendation engine is to open the user to a whole new products and possible variations and choices which they would not think to search.

There are 2 types of recommendation systems:

1 OFFLINE

2 ONLINE

In the external world, we can think of people around us as a recommendation engines.

- **Your family and friends as clothes recommendation system:** with ample style options now available to the users, they often rely on friends and family to recommend stores and places for Styles and fashion opinions and tell us what looks better on us.
- **Your Professors and book recommendation engines:** when we want to research or better understand a concept our professors can lead us to titles which best suit our needs.
- **Your friends as movie recommendation engines:** If you have friends who know your cinematic tastes well, you’re likely to trust their movie recommendation over a random stranger’s pick.

(Notice: All these “offline recommenders” know something about you. Those people know your style, taste and what looks good on you, and thus can make more informed decisions.)

It is this personalized based on getting to know you that online recommenders aim to emulate.

MAJOR ONLINE RECOMMENDATION SYSTEMS:

1. FACEBOOK	PEOPLE YOU MAY KNOW	Facebook uses a recommendation engine to suggest face book users you may know offline or in person and not on online. The system is trained on personal data of mutual friends, where user went to school, places of work and mutual network or social gatherings.
2. NETFLIX	OTHER MOVIES YOU MIGHT ENJOY	When user fill his taste and preferences or give ratings to movies or television shows, user is helping Netflix to filter through millions of selections to get a better idea of what the customers might like to view. Netflix algorithm for recommendations include: <ul style="list-style-type: none"> • Genre of movies , televisions shows available • Your streaming history, previous ratings made by you • Combined rating of all Netflix users who have similar tastes like you.
3. LINKED IN	JOBS YOU MAY BE INTERESTED IN	Feature shows jobs posted on linked in that match your profile in some way. These recommendations shown in the titles and description in your previous experience, skills other users have “endorsed”.
4. AMAZON	CUSTOMERS WHO BOUGHT THIS ITEM ALSO BOUGHT...	Amazons algorithm crunches data on all of its millions of customer baskets, to figure out which items are frequently bought together. This can lead to huge returns.
5. SPOTIFY	DISCOVER WEEKLY	Mix of best strategies used by other services to create their own uniquely powerful discovery engine. <ol style="list-style-type: none"> 1. collaborative filtering: analyze both your and other’s behaviors 2. Natural Language Processing: models which analyze texts 3. Audio: models which analyze the raw audio tracks themselves.

What can one do with Recommendation Systems?

Recommendation system can also be used to find out how similar different products are to each other. If products are very similar they might appeal to the same users. When user clicks on one product, we can use this to give the user links to other products that are very similar.

Product resemblance is especially beneficial in cases where company doesn’t know much about a particular user. The company can suggest like products, even if the user hasn’t entered any of their own product reviews yet. We can also use recommendation engine to work out if two unlike customers are alike to each other. If two users have similar preferences for products, we can assume they have similar interests. For example a social site can use this information to recommend a couple of users to become friends.

Methodologies used behind making recommendations:**Majorly 3 types of filtering methodology is used****1 Content based recommendation systems: they recommend based on product attributes.**

Content based recommendation systems are recommendation engines that use their information of each product to suggest new products.

Let’s say that you tell a friend that you just watched the movie Iron man starring Robert Downey Jr. and that you really liked it. Your friend might recommend you to watch Avengers next. Both movies are science fiction and both feature the same movie star.

It can be a better recommendation because the movies have many attributes in common. This is the idea behind content and data based on recommendation engine. They try to suggest products that have similar attributes to a product that the consumer already have a liking towards.

2. Collaborative filtering: they suggest depending on relevant users.

Collaborative filtering systems make suggestions only on the basis of how users rated products in the past, not based on anything about the products themselves.

In collaborative filtering, the recommendation system has no information about the actual product it is recommending on the site. It only knows how other users rated the products and content. It makes use of those past ratings to make new recommendations.

Collaborative Filtering has a very big advantage over content based recommendation.

The advantage is that you don't even need to know anything about the products that you're recommending. As long as you have user review data, you can build a collaborative filtering recommendations.

But it does have some limitations too, it only works when you already have user reviews to work from. If you don't have any reviews, you can't make recommendations. That means it is difficult to recommend products to brand new users because new users haven't reviewed any products yet. And finally collaborative filtering inclines to favour products with lots of good reviews over products with few or very less negative reviews. This can make it hard for users to discover new releases since they aren't likely to get recommended as often.

3. Hybrid recommendations: It is the combine recommendation system of both collaborative and content based filtering.

Recent research has shown that a mixed approach, combining collaborative filtering and content based filtering could be more operative in some cases. Hybrid approaches can be implemented in several ways by making content based and collaborative based predictions separately and then combining them, by adding content based capabilities to a collaborative based approach and vice versa or unifying the approaches into one model. Several studies empirically compare the performance of the hybrid with the pure collaborative and content based methods and demonstrate that the hybrid methods can provided more accurate recommendations than pure approaches.

Netflix is a good example of a hybrid recommendation system. They make recommendation by combining the watching and searching habits of similar users (i.e. collaborative filtering) as well as offering movies that share characteristics with films that a user has rated (content based filtering)

BENEFITS OF RECOMMENDATION SYSTEMS ON AN E-COMMERCE SITE.

There are many uses for a recommendation systems on an e-commerce website.

- 1. Drive Traffic:** A recommendation engine can bring traffic to your site. It achieves this personalized email messages and targeted blasts.
- 2. Deliver Relevant Content:** By analyzing the customer's current site usage and his previous browsing history, a recommendation system can deliver relevant product recommendations as he shops. The data is collected in real time so software can react as his shopping habits change.
- 3. Engage shoppers:** Shoppers become more engaged in the site when personalized recommendations are made. They are able to delve more deeply into the product without having to perform search after search.
- 4. Convert shoppers to customers:** Converting shoppers into customers takes a special touch, personalized interactions from a recommendation engine show your customer that he is valued as an individual. In turn this engenders his loyalty.
- 5. Increase average order value:** Average order values typically go up when a recommendation engine uses to display personalized options. Advanced metrics and reporting can definitely show effectiveness of a campaign.
- 6. Increase number of items per order:** In addition to the average order value rising, the number of items per order also typically rises when a recommendation engine is employed. When the customer is shown options that meets his interest, he is more likely to add items to his purchase.
- 7. Control Merchandising and inventory rules:** A recommendation engine can add your own marketing and inventory control directives to the customers profile to feature products that are promotionally prices, in clearance or overstocked. It gives you the flexibility to control what items are highlighted by the recommendation system.
- 8. Reduce workload and overhead:** The volume required to create a personal shopping experience for each customer is usually far too large to be managed manually. Using a recommendation system automates the process of easing the workload of the companies IT staff and companies' budget is saved.

RECOMMENDATION ENGINES AND ITS MARKETING: POWER OF RECOMMENDATION.

Recommendation systems are a powerful and vital tool for Amazon, Netflix and more. Recommendation systems explains why marketers should be paying attention.

Netflix long list of suggested movies and TV shows is a fantastic example of a personalized user experience. In fact about 70% of everything user watch is personalized recommendation according to the company.

In 2006, Netflix launched prize to search for machine learning experts who could improve its previous using algorithm. A team of algorithm scientists bested the company's algorithm by 10% a small percentage you may think but it was convincing enough for the company to expect huge improvements in the future. The team's efforts earned them a \$1million prize.

Recommendations engines can help marketers and organizations increase the likelihood of arriving at recommendations tailor to the users' past, activity or behavior using in depth past knowledge based big data and analysis

IMPROVING WITH USE

The goal of Netflix prize was to improve member retention or in other words make its surveys more "sticky" in the long run. But the company wasn't looking for the one time improvement.

The promise of recommendation engine is to build a self-improving system one that gives a sufficient stream of data can better satisfy user's overtime. By offering a list of what may likely appeal to its member's hyper-specific classification Netflix has narrowed down the myriad on demand video streaming options.

Netflix has very little time to convince users to browse the app and select a video, they lose interest in 60-90 seconds after reviewing around only 20 titles according to the company.

Recommendations engine in all niches have the possibility of creating the same kind of extreme differentiation.

CHALLENGES IN BUILDING RECOMMENDATIONS SYSTEMS

A recommendation system can be a daydream or a boon whereas same engine can be nightmare if it can be easily fooled by the people on the system can be manipulated easily.

1. **Cold start problem:** how does the companies deal with new users and product that have no history?
Solution: Use content boosted approach. It is mixture of content based filtering as well as collaborative filtering. You can use product description and attributes as well as demographic to recommend products to users.
2. **Data Scarcity:** User Item rating matrix is very sparse because stores have many products and all those products will not be rated by many users. Scarcity makes training computationally inefficient.
Solution: use dimensionality reductions. Remove unnecessary users and products from where we are not learning much and reduce scarcity of user-item rating matrix.
3. **GREY-SHEEP PROBLEM:** From the name grey sheep it is understood that the behavior of consumers is unpredictable. How do company deal with such behavior?
Solution: Pure collaborative filtering does not work.
4. **Synonymy:** How does the consumer deal with the products that are practically same but different?
Solution: Latent collaborative filtering is a kind of algorithm that can classify hidden features from the information. This algorithm works really well for synonymy as well. So if we have lot of items with synonymy this is the way to go.
5. **Shilling attacks:** How does the company deal with people who are trying to game the recommendation system?
Solution: Take precautions and monitor user behavior.

CONCLUSION:

Recommended for you concept evolved to influence social behaviors not to benefit the marketer, but to benefit society. Recommendation system have evolved with the technology, many companies have successfully used it to accustom there sales and cater to their consumer needs. Recommendation make use of the data from the customers past preference and the things they spend most of their time on social media networks. It gives a fair idea for the companies of what is expected by the customers. Companies like Amazon, YouTube, and Netflix have shown with proper use of recommendation system they can have a competitive advantage over its competitors in the market. Recommendation system can influence consumer buying behavior. The recommendation system will act as a new channel of communication and touch point which will also uplift the brand image of the companies as an innovative service provider. Recommendation system will have big market to capture in the coming future as growing demand for customer needs and fulfilling their demand has formed a strong base in today's market which will lay its steps in the future as well

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