

ICREON

E b o o k

RISE OF PERSONALIZATION -

**ROLE OF  
RECOMMENDATION  
SYSTEMS & MACHINE  
LEARNING**

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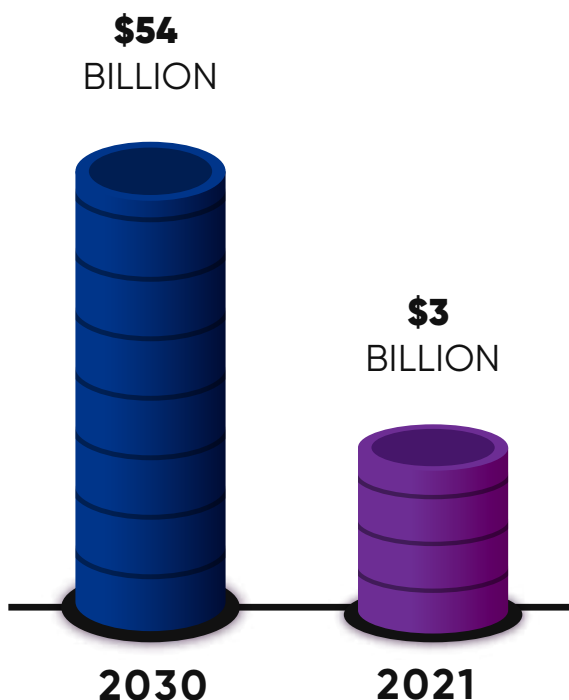
Introduction to

# Personalized recommendation system and role of machine learning

A recommender system is an inseparable part of any ecommerce website that provides recommendations and suggestions to users about a service, item, or product that is most pertinent for them based on their interests. These recommendations assist the user in making a decision, for example, what to buy, which news to read, which song to listen to, and which image to view next. These systems are quite helpful for users who are indecisive about what to click next from a huge pool of items/services. A recommender system helps them decide by suggesting the most likable items to the user based on their interests and needs.

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## GLOBAL RECOMMENDATION ENGINE FORECAST



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The market size of recommendation engines globally is expected to reach **US 54 billion** by the end of this decade, from **USD 3 billion in 2021**, and is forecasted to register a **CAGR of 37%** during the forecast period (2022–2030). Straits Research

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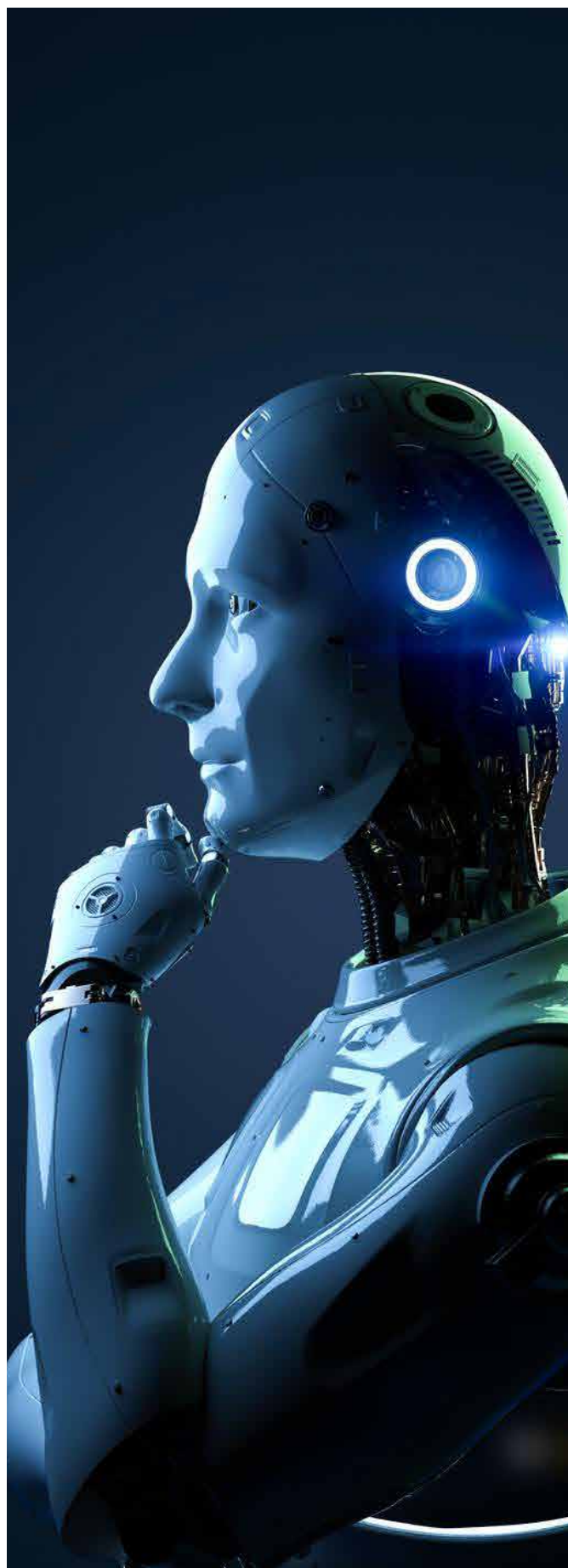


The numbers seem promising and that's the reason why the top companies like Amazon and Netflix leverage recommendation engines in their applications so accurately.

***But how does a recommender work so efficiently and present the right suggestions to users?***

The answer is machine learning. A recommender system is developed with advanced artificial intelligence and machine learning techniques. These AI and ML algorithms analyze users' past behavior, interests, and some other parameters to come up with the suggestion of an item/ service that they may like or have an interest in.

Multiply this for an individual user on a given platform and you'll get to see how a recommender engine brings a clear picture of both individual buyers and the audience altogether. This will also keep a tab on underlying sales dynamics that a human being struggle to catch up. On top of that, Machine Learning programs can tap into a massive range of contextual parameters, which is not strictly related to customer. For instance, as the end of the season approaches, the ML based recommendation system of an ecommerce store would start suggesting Christmas products & goodies. While a streaming platform may adapt its recommendation engine from the first day of the week, suggesting family movies and shows over the weekend.



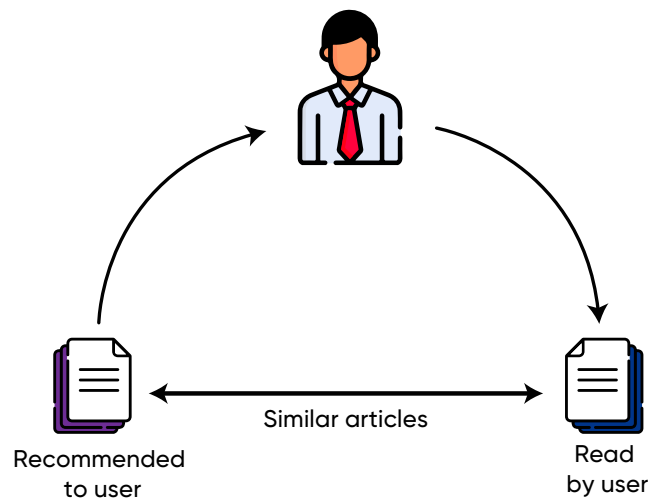
# Approaches of ML-based recommendation system

Personalized recommendation systems make use of different approaches for the machine learning model to work depending on the type of application of the recommender. Let's take a look at the fundamental approaches and the parameters these approaches use:

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## **CONTENT-BASED FILTERING**

Content-based filtering is an approach used for recommender systems based on the user's profile interests and preferences and the product/item description. This approach is suitable when there's data available on the product but not much information about the user. Product data like location, name, description, uses, and applications are used, while a classification is developed to treat the user's likes and dislikes of the product features. User profiles are generated by the algorithm, and interests and preferences are comprehended based on what the users liked in the past or what type of product they are currently viewing.

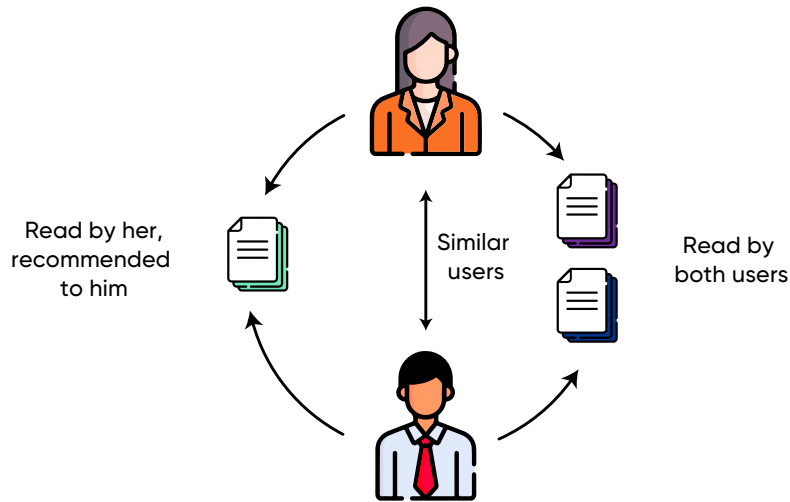


## **COLLABORATIVE FILTERING**

Collaborative filtering uses the past and future agreement coherence approach. This methodology is based on the assumption that the users who liked and agreed to a productservice/suggestion in the past will also like the same one in the future. We can say that the collaborative filtering approach simply makes use of rating profiles of the users to check coherence between past products and current

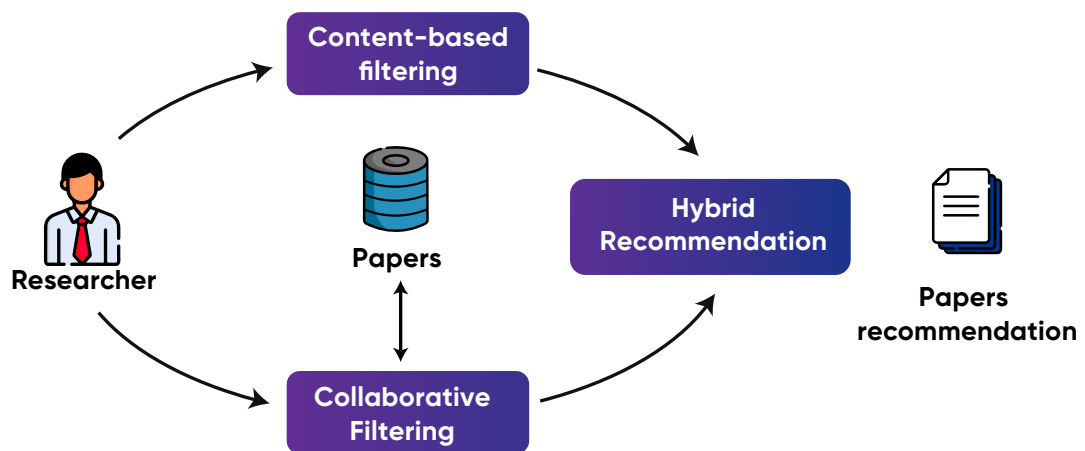


products and generate a suggestion out of the relativity between past and present interests. This method sometimes is also referred to as a memory-based approach.

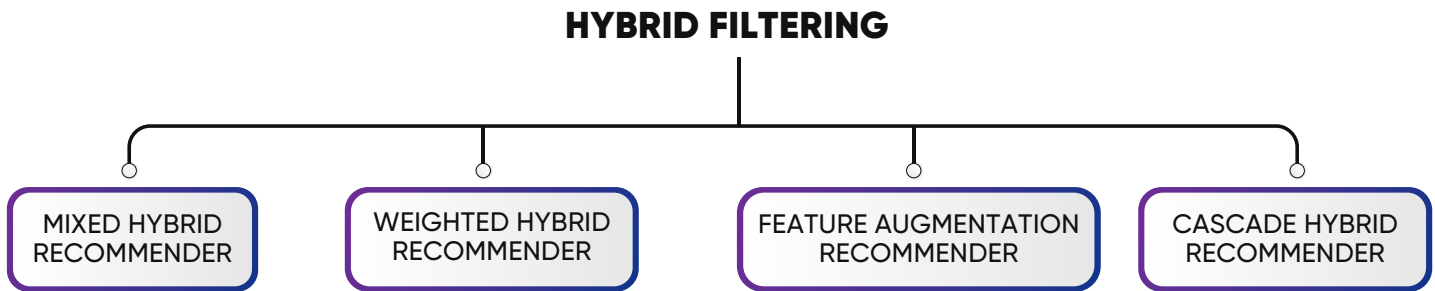


## HYBRID FILTERING

Hybrid filtering is a result of a combination of content-based filtering and collaborative filtering. This hybrid recommendation methodology works in different ways, for example, by making content-based suggestions and collaborative suggestions and then combining the result of these two, or by adding collaborative capabilities to the content-based approach, etc. Companies prefer hybrid recommenders since these systems carry the strength of two different approaches homogenized together.



Let's take a brief look at a few hybrid recommender systems:



### **MIXED HYBRID RECOMMENDER**

In a mixed hybrid recommender, the output suggestions made by different other recommender systems are just unioned together and presented as a single recommendation output.

### **WEIGHTED HYBRID RECOMMENDER**

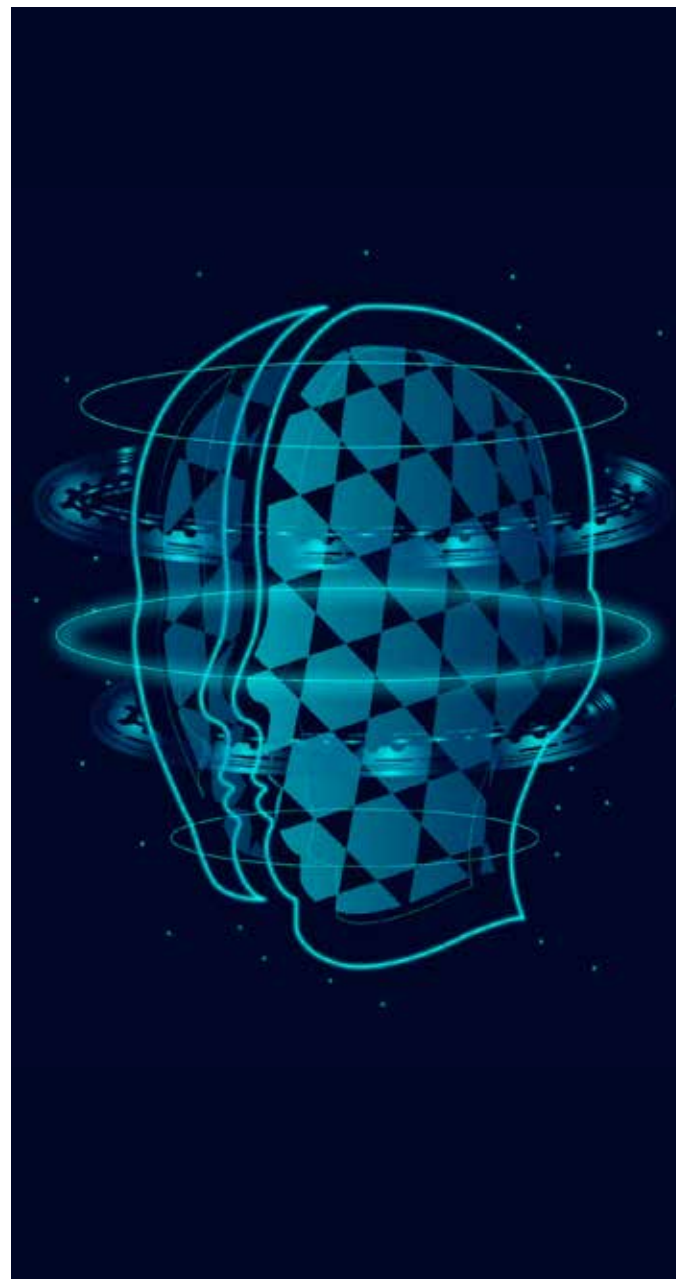
In a weighted recommender system, the suggestions made by individual recommender systems are assigned a weight, and then these weights are summed together to come up with a final suggestion.

### **FEATURE AUGMENTATION RECOMMENDER**

This hybrid technique uses a set of features combined together, which then works as an input to the following filtration technique.

### **CASCADE HYBRID RECOMMENDER**

In a cascade hybrid recommender, the output suggestions made by one recommender system are taken as the input of the other recommender system.



# Challenges of personalized recommendation systems

Building a personalized recommendation system comes with its own pool of difficulties that when disclosed, can enhance the efficiency and performance of an ML-based recommendation system. Let's have a brief look at some of the challenges associated with personalization techniques and recommender systems.

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## **ADEPTNESS IN SEARCH ENGINES**

The internet contains vast amounts of user data including audio, text, videos, and graphics. This often results in irrelevant search suggestions, making it time-consuming and overwhelming for users. Personalized recommendation systems can help overcome this challenge by extracting the user's domain knowledge and building a profile to provide limited suggestions based on their interests.

## **HANDLING DATA SPARSITY**

Data sparsity is a challenge for personalized recommender systems because good items rated by few users may not be recommended. This can lead to bad recommendations for new or unique users. Recovery frameworks can overcome this by establishing transitive connections between customers through past and present feedback.

## **TIME AWARENESS**

Recommender systems often neglect the time-related demographics of users when providing suggestions, which can result in challenges when predicting user preferences at a specific time. This issue, referred to as popularity span, can be overcome by considering users' past activities and product transactions over time to understand their current interests.

## **WEBSITE OR PLATFORM PERSONALIZATION**

A personalized recommender system must personalize the user's interaction with the website. This involves generating personalized web pages based on the user's interests and connecting them through hyperlinks. An ML-based recommendation system can accomplish this by modeling websites as a graph and using backward breadth-first traversal to suggest relevant web pages based on user queries.





# Top 6 personalization benefits you get with recommender systems

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An ML based recommendation system not just makes simple product/service suggestions to the users, but also helps develop custom personalized messages/emails and to showcase a potential product/-service that needs attention. Let's take a brief look at a few more benefits of personalization techniques and recommender systems:



## Engages the audience

A personalized recommendation system tends to engage the audience when it suggests the right products/items/services to the user and helps them not get lost in the broad rabbit hole.



## Better conversion

Adding personalization techniques and recommender systems to your business will boost business conversions. It is because a personalized experience always makes a user feel valued, elite and luxe, hence their long-term loyalty ratio is maintained and so are the business conversions.



## Reduced workload

Dealing with customer data manually to provide recommendations can be hectic. The techniques of deep learning for personalized search and recommender systems provide automatic real-time suggestions, reducing the IT staff's manual workload.



## Automation

Manually suggesting products and services is time-consuming and almost ineffective in today's IT realm. Since these systems use deep learning for personalized search and recommender systems, it acquires hyperautomation and thus save more time and cost.



## More traffic

The personalized emails developed by an ML-based recommendation system tend to elevate traffic and growth toward the website or platform. The higher the traffic is, the more unique data you get to nourish the user profiles for developing more precise personalized recommendation systems.



## Content relevancy

Suggesting relevant services/products work when the system understands and researches the user's browser history, interests, and click-through rates. The recommender system keeps doing its job in real-time and communicates back and forth with the user profile and system algorithms about changed user habits to display the most relevant content to the user.



# Best practices for ecommerce-focused personalized recommender systems

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An ML based recommendation system not just makes simple product/service suggestions to the users, but also helps develop custom personalized messages/emails and to showcase a potential product/-service that needs attention. Let's take a brief look at a few more benefits of personalization techniques and recommender systems:

## **CHOOSE A RECOMMENDER SYSTEM WITH KEEN CARE**

Since there is a variety in the types of recommender systems, choose one with features that comply with and suit your application's parameters and needs. Study how a content-based recommender works and what types of businesses make the most out of that type. Similarly, gather knowledge about hybrid and collaborative approaches to pick the best one for your business needs.

## **UNDERSTAND YOUR BUSINESS SALES AND THEIR INTEGRATION WITH RECOMMENDER**

Before diving straight into developing the system that you chose, understand how business terminology will integrate with your personalized recommendation system. As the main goal of using a recommender system is to automate the process, serve the customers a seamless experience, and ultimately improve the revenue streams, a detailed understanding of how all processes will work, comply and

integrate with each other as well as a business framework is mandatory.

## **OUTLINE A RECOMMENDER SYSTEM STRATEGY**

Once the choice of system and understanding of its compliance with your business work infrastructure is sorted out, start to plan a strategy with which you want your recommender to work. Developing strategy is directly associated with the approach of recommender that you will use, hence a strong knowledge of the work methodology of the respective recommender approach is mandatory. When outlining the strategy, consider machine learning technologies like deep learning for personalized research and recommender systems.



## **STORE DATA AND NOTICE TRENDS TO FEED ML ALGORITHMS**

Data is the fundamental requirement to build an ML-based recommender system from scratch. The more accurate and meaningful the data is, the more precision and prediction power the system will hold in its personalized results. This step may take a while before you initiate the development of the personalized recommendation system. Hence, try to store user data such as how users interact with a product, their likings, interests, how well a product is reviewed, and what kind of users purchase unique products. Similarly, do the same research on trends associated with the products, such as how a product impacts users' behavior before and after purchase. Ultimately, use this data to feed into your deep learning model.



# About Icreon

Icreon is a leading digital solutions agency built for challengers who need to get to 'What's Next', first. They help businesses define the future of their customer experiences, then enable them through technology engineering and the power of digital. These robust experiences guide customers through and beyond a commerce transaction and into a continuous and ongoing relationship with client brands.

Founded in 2000, Icreon has been helping businesses of all sizes, from Fortune 500s and mid-markets, usher in a new age of digital maturity resulting in more efficient and powerful brands. Headquartered in New York City, Icreon's global capabilities expand across Washington D.C., Philadelphia, New Dehli, and Pune offices. Companies such as GSK, Novartis, Jazz Pharmaceuticals, New York Road Runners, Lincoln, and more, partner with Icreon to fulfill their digital transformation needs. With over 350+ technology experts across engineering, digital strategy, and user-experience design, Icreon is the preferred digital transformation agency equipping growth brands for what comes next.

