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A High Accuracy Recommendation System for the Rubber Industries: Integrating Collaborative Filtering with Multi-layer Perceptron Classifier

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Abstract: ***Collaborative filtering is a widely used method in Machine Language to discover relationships between data. It facilitates recommendation systems that find similarities between user data and items, recommendation system playing a crucial role in various industries. Multilayer perceptron classifier used in our model, a connection with neural networks that performs well in regression and achieves high accuracy in classification tasks. When compared to other neural network architectures like convolution neural network (CNN), recurrent neural network (RNN), auto encoder (AE), and generative adversarial network (GAN), MLP remains a fundamental approach. Collaborative filtering involves multiple users, viewpoints, and data sources collaborating to classify information or patterns and recommend items that similar users might like. Instead of recommending items based on their features, we group users into neural networks with similar preferences and suggest items based on their classifier's preferences.***

Keywords: collaborative filtering, recommendation system, multilayer perceptron, neural network

I. INTRODUCTION

A recommendation system known as collaborative filtering suggests products to users based on the interests and actions of multiple users. Through collaborative filtering, the algorithm gathers information on user interactions, such as ratings or past purchases. This data is used to identify user similarities in preferences or behavior. Subsequently, the system provides product recommendations to users based on the preferences of other similar users. In the rubber industry, where various production processes occur, and inputs with similar characteristics share output with other inputs, we have implemented this collaborative filtering approach. Upload the details of the raw materials under the sub-module ‘raw materials’ and examine the natural and rubber raw materials. By identifying the best output, we recommend the appropriate rubber additives based on similar characteristics, thereby enhancing the effectiveness of the recommendation system using collaborative filtering. Analyze the report in this module and proceed to upload the raw materials for a testing report using a classification algorithm.

II. OBJECTIVES

The main objectives of this project is recommendation system for rubber industries In our application we help a process the best recommendation system called collaborative filtering, with this one’s output is fed in to the others input. The project is intended to achieve the following objectives:

1) It is applicable to nonlinear complex problems.
2) Works with large amounts of input data.
3) After learning, it offers immediate prediction.
4) Even with similar data, the very same accuracy ratio can be achieved.

III. EXISTING AND PROPOSED WORK

A. Existing Work

Our current system serves as a valuable resource for scholars, aiding them in exploring new fields and gaining a deep understanding of the advancements in their respective domains. Additionally, it helps scholars stay up-to-date with the latest state-of-the-art works in their disciplines. One of its essential features is the ability to facilitate the discovery of relevant articles for researchers. To enhance this process, hybrid recommendation methods based on collaborative filtering (CF) have been proposed.

Utilizing the power of NRL (Network Representation Learning), Cluster and NCN (Neighbor Collaborative Network) leverage the entire citation network topology to identify adjacent researchers within clusters. However, due to the scarcity of citation network data, some comparisons between scholars may yield values less than zero, leading to inaccurate recommendations. To address this issue, we present a novel method that develops a paper rating matrix, considering both network topology and text information from attributed citation network embedding. Furthermore, we propose an innovative approach based on attributed collaboration network representation learning to tackle the data sparsity problem in neighbor scholar selection. Cluster, a cutting-edge citation recommendation algorithm, combines the strengths of collaborative filtering with network representation learning for more effective citation recommendations. In the age of scholarly big data, where scholars are publishing at an unprecedented rate, finding related papers has become increasingly challenging.

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B. Proposed Work

In our Rubber Industry business model, we have implemented collaborative filtering to identify similarities between datasets and provide recommendations through our robust classifier algorithm, known as multi-layer perception (MLP). When a process unit makes a request, the system predicts the rubber-based recommendations for raw materials. The prediction process analyzes the positions assigned in the algorithm to generate the recommendation. Once the recommendation process for a request is completed, the algorithm indicates the order in which raw materials should be used for the next production. MLP is a supervised learning technique used for data categorization. The algorithm involves training multiple neural networks using input data and connection parameters to generate estimations for hidden layers. Collaborative Filtering (CF) is a statistical method employed to identify and recommend products and services relevant to specific users. Customer feedback is scored and stored in a database through the algorithm. As long as the database is sufficiently large to reflect the opinions of the user base, CF allows for continuous improvement in recommendations.

IV. METHODOLOGY

A. Collaborative Filtering

Collaborative filtering efficiently filters information by leveraging interactions and data collected from other users within the system. Its fundamental premise is that individuals who have concurred in their evaluations of specific items in the past are likely to concur again in the future. [1] Collaborative Filtering is an algorithm based on calculated guesses to suggest new items based on the closeness in the behavior of similar customers. It determines similarity between items based on customer ratings

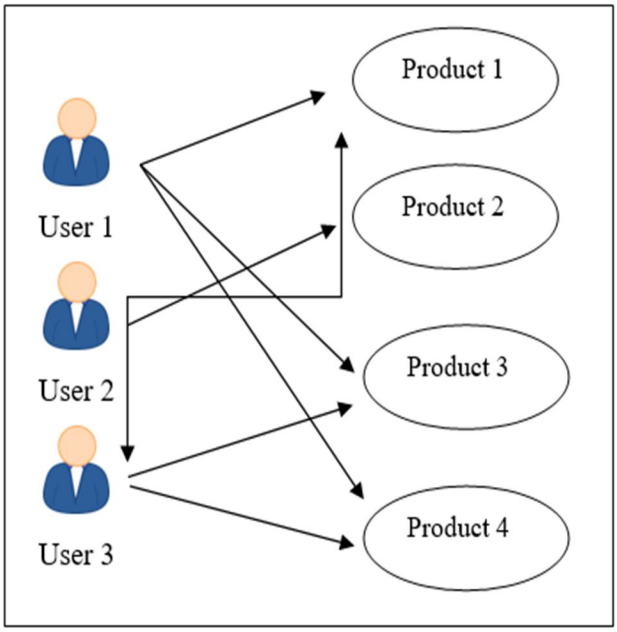

Fig 1. Collaborative filtering

B. Multilayer Perceptron

MLP an abbreviation for Multi-layer Perception, is also referred to as MLP. It consists of fully connected dense layers that transform input dimensions to the desired dimension. The neural network architecture comprises multiple layers, with neurons connected to one another, enabling the outputs of certain neurons to serve as inputs for others. [7] It is a neural network with a non-linear input-to-output mapping. It is a feedforward algorithm that propagates linear combinations to the next layer, allowing it to learn weights that minimize the cost function.

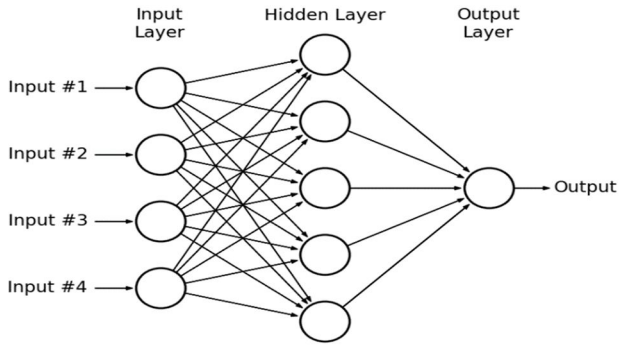

Fig 2. Multi-layer perceptron

V. SYSTEM DESIGN

In our application, we implement an efficient recommendation system known as collaborative filtering, where the output of one process is fed as input to another. First, upload the details of the raw materials in the sub-module named 'raw materials' and examine the natural and rubber raw materials. Then, proceed to send the rubber details to the vendor via the 'view materials' module on the manager's home page. Subsequently, receive the raw materials from the company manager, which will be processed and sent on the due date. During the supply process, the supplier will provide the necessary supply ID for raw materials and list any items that are not in stock. The supplier will also inform the company manager about the availability of the unsent quantity of raw material on a particular date. If needed, acquire not-ready stock materials and obtain an alternative date for raw materials from the vendor module. Upon receiving the alternative date, the company will set the production date to commence the process. After uploading the raw materials for the analysis process, we will carefully analyze and identify the appropriate rubber output. We recommend the best output and suggest it as input for similar additives in the rubber-making process, enhancing the effectiveness of the recommendation system through collaborative filtering. In this module, thoroughly analyze the report and subsequently upload the raw materials for a testing report.

A. System Architecture

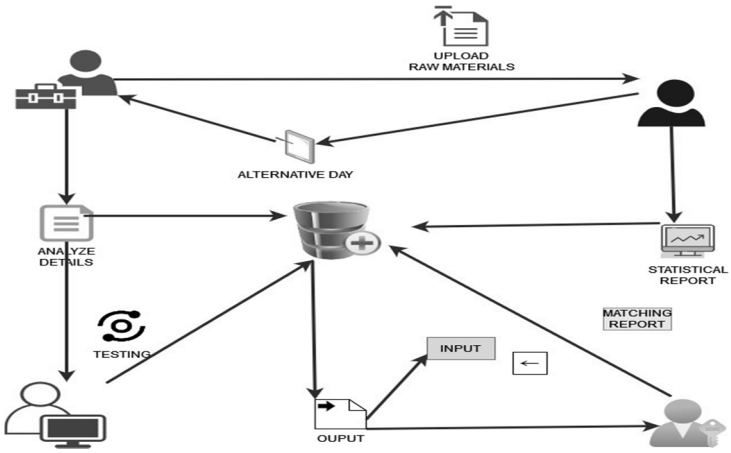

Fig 3. System architecture

Fig 3 shows recommendation system using various modules like the company manager module, vendor module, process unit module, and admin module.

B. Company Manger Module

This module gives the registration process with the company manager's details of name, email id, contact number, date of birth, and password. With this, the company manager can log in to the companypage
Upload the details of the raw materials in the sub-module name ‘raw materials' and view the raw materials of natural and rubber.
Then send the rubber details to the vendor in the module view materials on the manager home page
The company will fix the date of production to start the process and send it to the processing unit.

C. Vendor Module

Vendor can log in to the vendor page. If the vendor is new, he can create a new account. vendor can log in to the vendor page. If the vendor is new, he can create a new account.
After admin approval, the vendor can log in to the vendor page.
Then receive raw materials from the company manager which are to be processed and sent on the due date.
While sending the supply he will provide the necessary supply id for raw materials and list out the supply items, not in stock

D. Process unit Module

Process unit can log in to the Process unit page. If the processing unit is created a new account then login
After the login process view report from the manager then update and upload the raw materials in synthetic and natural rubber
After uploading the raw materials sent to the analysis process, here we will analyze and find the appropriate rubber output
We find the best output and we suggest the rubber output to the input of the similar addictives in the making of rubber

E. Admin Module

In the admin module, there are sub-modules named view testing report, approve vendor, testing, and view matching report.
The admin views the project vendor details approved by the admin then view the testing report from the processing unit and then matches the common materials into the two tables after matching the process.
As said above we get the output of rubber from our prediction, thus by this output, the admin can search for similar addictives in the making of rubber and he can suggest the output rubber type to add as addictive for the new process.
So through this recommendation, we will get better product results in making of rubber.

VI. RESULT

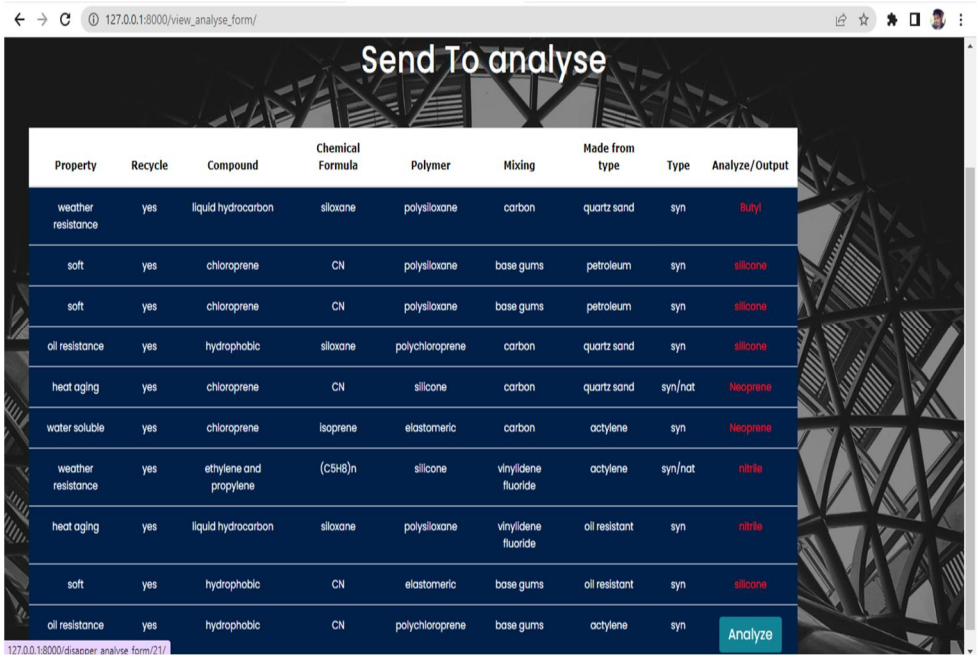

Fig 3.Analyse

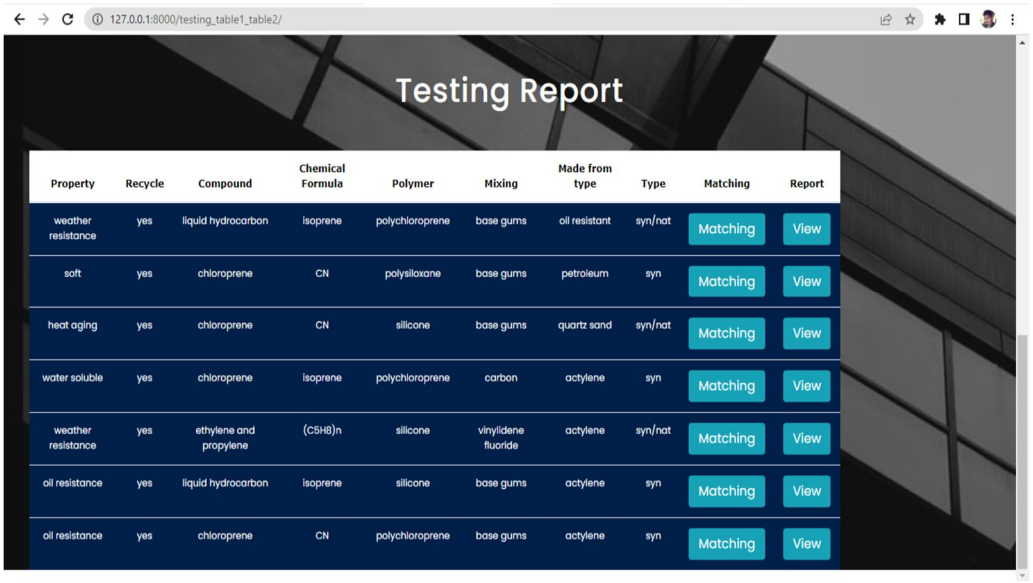

Fig 4. Testing

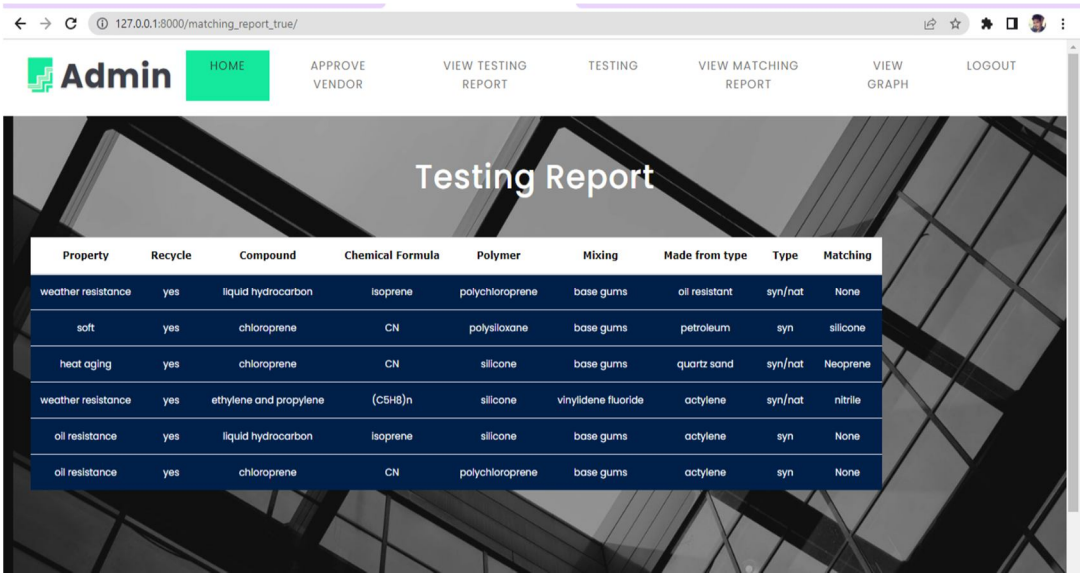

Fig 5.Testing report

VII. CONCULSION

We have introduced a recommendation system known as collaborative filtering, which not only provides recommendations but also identifies similarities, enabling one process's output to serve as a recommendation for another. This approach proves effective due to the shared nature of the processes. In the rubber industry, we apply this technique by feeding rubber from one process into another as an input, resulting in a high-quality final output. This achievement is made possible through our rigorous analysis process.

VIII. FUTURE ENHANCEMENT

The neural network learning's multi-layer classifier plays a key role in categorizing similarities and generating recommendations for material or product production based on client preferences. Collaborative Filtering stands out as the most renowned application in recommendation engines, relying on calculated predictions when users like a product, they are likely to enjoy similar products in the future. Moving forward, we plan to adopt a content-based filter, which provides personalized recommendations without the need for information about other users. This approach ensures easier scalability when catering to a large number of users.

IX. ACKNOWLEDGEMENTS

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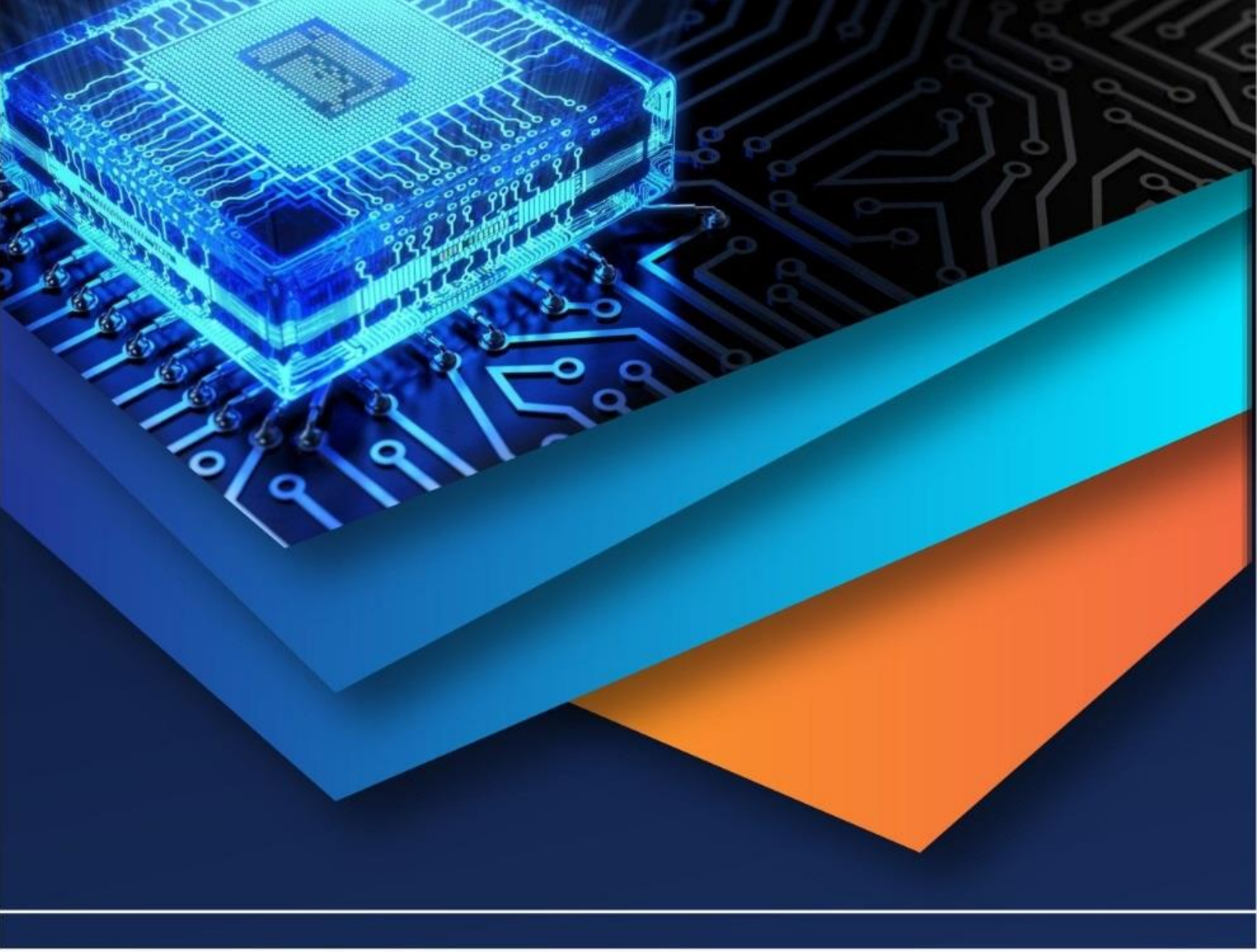

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