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SUPERVISED COLLABORATIVE FILTERING USING MULTILAYER PERCEPTRON

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ABSTRACT

Collaborative filtering is a technique which is used extensively in Machine Language, which is used to find the relationship between pieces of data. It is used to provide recommendation system to find the similarities between user data and items. Typically, recommendation systems play a significant part in any business or sector. This is especially true when collaborative filtering is used to uncover similarities as well as to obtain the output of one's data, which is then transmitted to the input of other data. Here in our model, we have used MLP Classifier which stands for Multilayer perceptron classifier, which are associated with neural networks and it also works fine with the regression. It produces highly accurate results when it comes to classification. Multilayer Perceptron (MLP) is the most fundamental type of neural network architecture when compared to other significant types, including Convolution Neural Network (CNN), Recurrent Neural Network (RNN), Auto encoder (AE), and Generative Adversarial Network (GAN). Collaborative filtering is a methodology for categorising information or patterns that makes use of various actors, points of view, and data sources. In this, we categorize users into neural networks of similar types and recommend each user based on the preferences of its classifier rather than recommending products based on their features.

Keywords: Collaborative Filtering, Multi-layer Perceptron, Neural Networks, Supervised Learning.

I. INTRODUCTION

A sort of recommendation system called collaborative filtering suggests products to other users based on the interests and actions of numerous users. By using collaborative filtering, the algorithm first collects information on how people have interacted with things, such as their ratings or past purchases. The system then employs this information to determine user similarities based on their preferences or behavior. Lastly, based on the preferences of other users, the system offers recommendations for products that a user has not yet engaged with. In the rubber business, where several production processes take place and inputs with similar characteristics share output with other inputs, we have put this collaborative filtering notion into practice. Upload the details of the raw materials in the sub-module name 'raw materials' and view the raw materials of natural and rubber. We find the best output and we suggest the rubber output to the input of the similar addictives in the making of rubber, so that the recommendation system works better with this concept of collaborative filtering, in this module analyze the report and then upload the raw materials for a testing report using classification algorithm.

II. LITERATURE REVIEW

Citation recommendation is a hybrid user-based CF that uses network representation learning to recommend citations in heterogeneous academic information networks. It outperforms state-of-the-art methods in precision, recall, and MRR (Mean Reciprocal Rank), and can better solve the data sparsity problem compared to other CF-based baselines.[1]

The recommender system is an information filtering technology used in many items, such as movies, music, venue, books, research articles, tourism, and social media. It needs an efficient searching and filtering mechanism to choose quality research papers so that the effort and time of researchers can be saved. a recommender system using a collaborative filtering approach to recommend a user with the best research papers in their domain according to their queries and based on the similarities found from other users.[2] An improved collaborative filtering algorithm is designed based on network site users and weighted fusion to improve recall rate.[3]

To predict flight's arrival delay using Artificial Neural Network (ANN). Two approaches have been adopted: historical flight data extracted from Bureau of Transportation Statistics (BTS) and selective-data training. The MLP was able to predict flight arrival delay with a coefficient of determination R2 of 0.9048 and a better R2 score of 0.9560, outperforming all existing benchmark methods.[4]

Network representation learning is a new learning paradigm proposed to embed network vertices into a low-dimensional vector space, preserving network topology structure, vertex content, and other side information. This survey reviews the current literature on network representation learning in the data mining and machine learning field, proposes new taxonomies to categorize and summarize the state-of-the-art network representation learning techniques,

summarizes evaluation protocols used for validating network representation learning, performs empirical studies to compare the performance of representative algorithms on common datasets, and suggests promising research directions to facilitate future study.[5]
The Sustainable Collaborator Recommendation (SCORE) system uses weak tie relationships from academic conferences to improve the sociability of academic conferences by recommending sustainable collaborators.[6]
A novel spatial-spectral involution MLP network (SSIN) is proposed for hyperspectral image (HSI) classification, combining the MLP structure with the involution operation. It obtains the spatial kernel weights corresponding to each pixel individually, improving the spatial interaction capability. Experimental results on four HSI datasets illustrate that SSIN can outperform some state-of-the-art methods.[7]
In "A collaborative approach for research paper recommender system" paper presents a collaborative approach for research paper recommender systems that uses publicly available contextual metadata to infer hidden associations between research papers and personalize recommendations. It provides personalized recommendations regardless of the research field and expertise.[8]

III. EXISTING AND PROPOSED WORK

A. Existing work

Our current system can assist scholars in becoming aware of new fields and fully actually understanding the development of their fields; on the contrary side, it can assist scholars in staying current with state-of-the-art works in their disciplines. More importantly, it facilitates the discovery of relevant articles by scholars. Based on collaborative filtering, hybrid recommendation methods have been proposed (CF). Cluster and NCN can take advantage of the entire citation network topology by leveraging the power of NRL. The NRL method is used to pick adjacent researchers in the cluster and NCN procedures. Due to the scarcity of the citation network, the comparison between scholars may be less than zero, resulting in incorrect recommendations. The more accurate its knowledge extraction, the slower and more efficient its decisions will be.
We present a novel method for developing a paper rating matrix based on attributed citation network embedding that takes into account both network topology and text information. To solve the data sparsity problem in neighbour scholar selection, a novel method based on attributed collaboration network representation learning is proposed. Cluster is a novel citation recommendation algorithm that combines the benefits of collaborative filtering with network representation learning for citation recommendation. Scholars are publishing at an unprecedented rate in the age of scholarly big data, making it difficult to find related papers.
The disadvantages of cluster approach were cluster sampling reserves funds time and money over other probability sampling methods, particularly when dealing with huge measurements spread across such a vast area. In general, samples formed using the cluster method have higher random errors than samples formed using other sampling methods. Ring topology has the disadvantages of slow activity, insecure data use, and poor device attachment. Although it is scalable, the number of nodes that can be added is limited by the capacity of the central seat and the type of cable. Maintenance is difficult and expensive due to its size and complexity. In addition, the configuration is more difficult than in other topologies.

B. Proposed Work

In our business model (Rubber Industry), we have used the concept of collaborative filtering which is used to find the similarities between set of data and does the recommendation with the help of our strong classifier algorithm called multi-layer perception (MLP). After requesting, a process unit will predict the rubber-based recommendation of the raw materials. The Prediction for the raw materials is analysed based on the assigned positions in the algorithm. Following the prediction, the process for recommendation takes place. Once the recommendation process for one request is completed then the algorithm shows to which raw materials order the next production for materials goes.
MLP is a type of supervised learning technique for categorizing data. The algorithm works by training multiple neural networks. As inputs, the estimation is generated using the amount of input required per hidden layer and its connection parameters. Collaborative Filtering (CF) is a statistical method for identifying and recommending products and services that may be relevant to a specific user. Customer feedback is scored and stored in a database by the algorithm. As long as the database is large enough to reflect the opinions of a specific user base, CF allows for continuous improvement.
In comparing with unsupervised approach on collaborative filtering the supervised approach provides more effective way to recommend ones output to another's input. It is applicable to nonlinear complex problems and works with large amounts of input data. After learning, it offers immediate prediction. Even with similar data, the very same accuracy ratio can be achieved.

IV. METHODOLOGY

A. Collaborative Filtering

Collaborative filtering (CF) is a recommendation algorithm that uses item ratings assigned by users to recommend items. It has two categories: memory-based and model-based. Memory-based CF uses historical rating data to predict a specific user's rating on target items, while model-based CF uses machine learning or data mining techniques to construct an offline prediction model. However, CF-based methods can hardly do efficient recommendations for new users or items due to data sparsity.[1] Collaborative Filtering is an algorithm based on calculated guesses to suggest new items based on the closeness in the behaviour of similar customers. It determines similarity between items based on customer ratings.

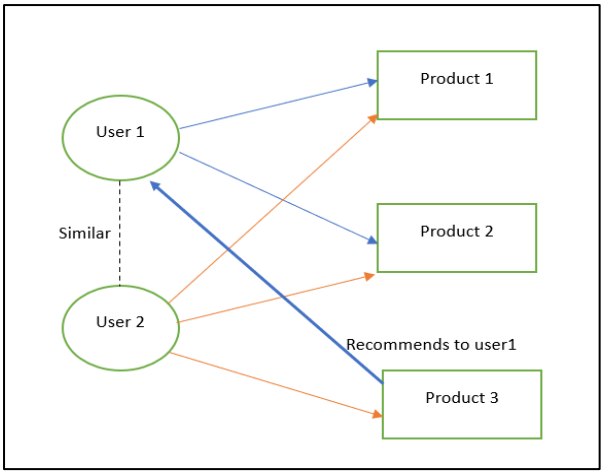

Fig. 1. Collaborative Filtering

B. Multilayer Perceptron

MLP is an efficient feed-forward neural network used for image processing and pattern recognition. It consists of an input layer, hidden layers and one output layer, and is trained using back-propagation learning to minimize squared error and adjust weights error.[9] 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.

V. SYSTEM ARCHITECTURE

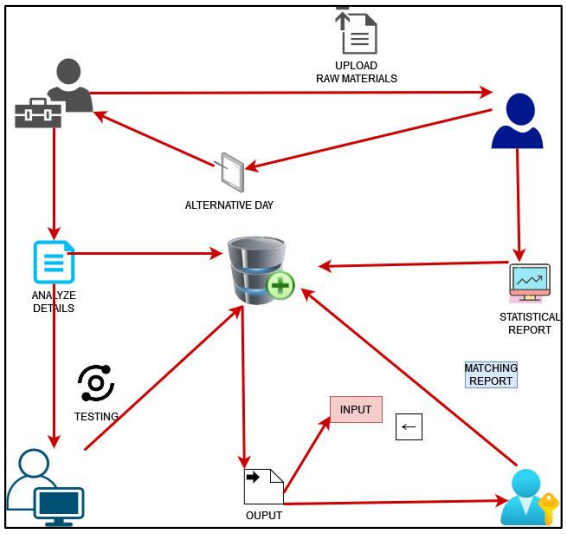

Fig. 2. System Architecture

In this present study, we help a process the best recommendation system called collaborative filtering, with this one's output is fed in to the others input. First, 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. 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. Then the supplier lets the company manager know whether he can provide the unsent quantity of raw material on a particular date. Get not-ready stock materials and get an alternative day for raw materials from the vendor module. After receiving an alternative date the company will fix the date of production to start the process. 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, so that the recommendation system works better with this concept of collaborative filtering, in this module analyze the report and then upload the raw materials for a testing report.

VI. EXPERIMENTAL RESULTS

We use the datasets for natural rubber and synthetic rubber in our experiment. Consider the datasets for natural and synthetic rubber as my first and second datasets, respectively. In order to analyse the data, we first read the dataset and put it into a specific structure with the use of libraries like Numpy, Pandas, and others.

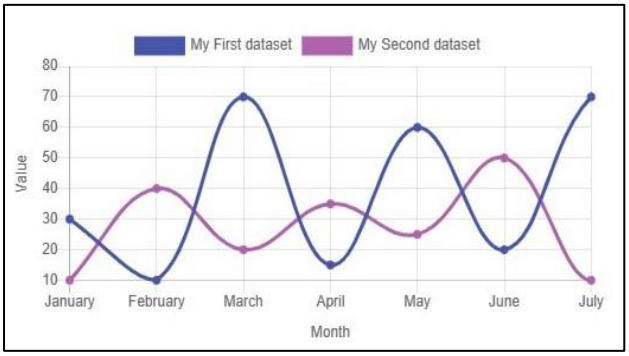

Fig 3. Analysis of natural and synthetic production rate

We examine the monthly production rates of natural and synthetic rubber in fig 3. Months are shown on the x-axis, and tonnes representing product production are listed on the y-axis. The graph up top demonstrates that natural rubber was produced at a higher rate than synthetic rubber.

We must forecast the raw material to improve the synthetic rubber's quality through collaborative filtering that could perhaps contribute to a rise in synthetic rubber output. Neural network learning's multi-layer classifier aids in categorising similarities and making recommendations for the creation of materials or products in accordance with customer demand.

Property	**Recycle**	**Compound**	**Mixing**	**Type**	**Analyze/ Output**
Oil resistance	**No**	**Hydrophobic**	**Carbon**	**syn**	**Butyl**
Soft	**Yes**	**Hydrophobic**	**Base gums**	**syn**	**silicone**
Heat aging	**Yes**	**Chloroprene**	**Carbon**	**syn**	**Neoprene**

Table 1. Output of the prediction

Table 1 displays the results of comparing the characteristics of natural rubber and synthetic rubber. The ideas might help in improving the synthetic rubber's quality.

VII. CONCLUDING REMARKS

In the present study, the multi-layer classifier of neural network learning helps to categorize the similarities and the recommendation for the production of the material or product according to the client need. Collaborative filtering is the most famous application suggestion engine and is based on calculated guesses; the people who liked the product will enjoy the same product in the future. In future we will switch to the content-based filter, because in this the recommendations are unique to the user, the model does not require any information about other users. This makes scaling to a large number of users easier.

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