EXPLORATION OF APPAREL RECOMMENDATION SYSTEMS USING DEEP LEARNING

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Abstract : Nowadays, the internet has been well known as a big data repository consisting of a variety of data types as well as large amount of unseen informative knowledge which can be discovered via a wide range of data mining or machine learning models. Although the development of e-commerce markets results in likely development of search engines, users are still facing a problem with accurate results. Instead, to achieve this problem recommendation engines are mostly helpful. Most e-commerce sites are developing recommendation systems analyze a large amount of transaction data without having any idea of what the items in the transactions mean or what they say about the customers who purchased or browsed items. Apparel fashion recommendation engine that utilizes deep convolutional neural networks using Amazon API to suggest products and provide customers with information to help them find the products. Utilizing deep neural networks enable us to parse such images into a high dimensional feature representation that allows us to recommend a pair from user preference tensor.

IndexTerms **- Neural networks, Recommendation systems, Apparel, Machine learning, Content-based recommendation system, Collaborative recommendation system, Hybrid recommendation system.**

I. INTRODUCTION

The idea of a recommendation system was first proposed in the mid of 1990s [5]. Based on users' behavior the recommendation systems suggest interesting products. Due to the rapid growth of e-commerce, recommendation systems are playing a vital role and even arrested attention from e-business companies like Amazon.com [2].

In point of fact, many companies notice that these systems recommend products that are suitable for customers, take huge effect in transforming browsers into buyers and expands in cross-sell. The business is widespread by adopting recommendation systems [6] .

Present day's product recommendation for clothing products based a lot on the similarity (Cosine/Jaccard) of the items, which in turn depends on the customers who viewed/bought those products, rather than the visual aspects/similarity of the products.

When shopping for apparels on a web, usually we look through several product profiles before we make a decision. Product images provide plentiful particulars, which includes color, pattern, texture, fabric, and so on. Opaqueness and condition of a product can be estimated from the images. Item images play a leading role in clothing recommendation task.

Prevailing apparel recommendation systems makes use of image data with diverse image features. These features are drawn out by convolutional neural networks. The recommendation systems utilize deep convolution neural networks for feature representation and prediction.

Recommendation systems are categorized into three, the content based recommendation, the collaborative recommendation, and the hybrid recommendation systems.

- The content-based recommendation system suggests most alike products to users mostly in terms of internal characteristics of the products, with a specific focus on long-term information filtering these are derived. PicSOM is a good example which recommends images derived on the basis of the shape of the image, color, and so on [7].

- The collaborative recommendation system, usually suggests products by inspecting the opinion of others which is a word of mouth advertisement. Basing on the historical information, it primarily finds friends of a target customer who shares identical attention on the same products. And based on the opinions of his/her friends on a particular product, it predicts the preference of the target customer [8].

- The hybrid recommendation system considers both forms of content-based and collaborative recommendation systems [9] . On the basis of user ratings and product attributes, this system recommends the products. The music recommendation system developed by Li et al. [10] is a good example of a hybrid recommendation system.

Here we recommend alike products from our data set, which is identified from an image, its color and apparel type. To attain this, the raw images are transformed using a neural network, and also for getting the deep features of images.

Lukas et al. [1] introduced a complete pipeline for classifying and recognizing peoples nature scenes in clothing in his paper apparel classification with style. Xiaosong et al. [2] Introduced a hybrid clothes recommender system based on user ratings and product features. Wenhui et al. [4] introduced an aesthetic based clothing recommendation system. Ziwei et al. [3] Introduced the powering robust clothes recognition and retrieval with rich annotations. Here in this paper we are going to analyze and explore the papers introduced by the authors above.

Our work is organized as follows: Section 2 to 5 gives a detailed discussion on different recommendation systems proposed by various authors. Section 6 discusses the performance analysis. Section 7 is a summary of our conclusions regarding our approach.

II. EXPLORATION OF LUKAS ET AL. APPAREL RECOMMENDATION SYSTEM

Lukas et al. mostly focused on the task of classification which is the issue of describing what type of attire is worn in an image. The work is related to visual attributes which are also gained leading significance and their core method consists of a multi-class learner based on Random Forest for type classification and Super Vector Machines for attribute classification.

Their apparel classification mechanism is composed of two parts:

i. One part recounts the overall style/variety of clothing.

ii. Another be made up of the attributes of the style such as “black”, ”synthetic”.

By amalgamating the outputs of these parts the system comes up with the comprehensive elucidation of the clothing style.

This paper did not focus on similarity searching or clothing segmentation, but only on classification, i.e., the task of describing what type of clothing is worn in an image. Their work is only related to learning visual attributes which have been applied in color and pattern naming.

III. EXPLORATION OF ZIWEI ET AL. RECOMMENDATION

Ziwei et al. proposed a new deep model, namely fashionNet, which learns clothing characteristics by jointly predicting landmarks and clothing attributes. Their large-scale experiments reveal the usefulness of deep fashion and effectiveness of fashionNet. They investigated multiple building blocks of proposed fashionNet and also summarized the performance of various methods on category classification and attribute prediction.

The performance drops of 6~9 percent are observed in this model when the clothing landmarks in fashionNet are replaced with human joints and poselets. This model only achieves an accuracy of 76.4%. Using human landmarks instead of clothing landmarks could have helped in increasing the accuracy of the model.

IV. EXPLORATION OF XIAOSONG ET AL. RECOMMENDATION SYSTEM

Xiaosong et al. introduced a hybrid recommender system for uncomplicated clothes shopping. This system recommends clothes in terms of clothing features and user ratings. Experiments in their simulation environment show that the recommender well pleases the needs of customers.

Firstly, this system applies human detection techniques to perceive the clothes field in an image and then analyzes and calculates the percentage of each color. Secondly, by basing on the extended rating matrix it targets the product to be endorsed are selected.

As the recommendation system based on users past preferences, and ratings, the cold start problem occurs in this type of systems when a new user or item enters the system. In hybridization strategies, there is an adaptive switching of weights based on the user model, context and meta-features which is a complex task.

V. EXPLORATION OF WENHUI ET AL. AESTHETIC BASED RECOMMENDATION SYSTEM

Wenhui et al. proposed a novel model trained with coupled matrices. Then combine it with additional image features and term the method as Dynamic Collaborative Filtering model with Aesthetic features. Aesthetic information which is most pertinent with user preference, into clothing recommender systems.

They extracted the aesthetic features by a pre-trained neural network trained for the aesthetic assessment task which is a brain-inspired deep structure. They investigated the serviceability of aesthetic features for personalized recommendation an feedback data set.

The extremely large and sparse matrix used for filtering could bring out the challenges in the performance of recommendation. In this model, we first propose a dynamic collaborative filtering model and then a dynamic collaborative filtering model with aesthetic features, these extensive experiments consumes more time.

VI. PERFORMANCE ANALYSIS

The recommendation systems have been a favored topic ever since the omnipresence of the internet made it comprehensible that people from various backgrounds would be able to query and access the underlying data. The various machine learning technologies used for filtering and can predict that whether the user like a recommended resource.

One of the major aspects of a recommendation system is that according to the users" preference it can personalize the website for a user by proposing the items and suggests the top products to the user by predicting the rating that a user would give to a product. This has a number of engrossing applications which includes online advertising, helps e-commerce websites by attracting more customers to buy more products.

Various algorithms have been executed and explored to drive peak conversion rate versus non-personalized product recommendations. There exist more advanced and traditional methods to boost up recommendation process. Namely, deep learning, machine learning, neural networks, and social learning. These Cognitive computing methods can take the worth of your recommendation systems to next level.

S.No.	AUTHOR	METHODS CONSIDERED	DATA SET	ACCURACY
1	Lukas et al. Recommendation system	SVM's, Random Forest	80,000	41.36%
2	Ziwei et al. Recommendation system	Neural Networks	8,00,000	76.40%
3	Wenhui et al. Recommendation system	Neural Networks	2,50,000	80%
4	Xiasong et al. Recommendation system	Group Rating Matrix	1783	82%

Table 1: Comparative Study of Various Apparel Recommendation Systems.

The table above represents the various methods considered by various authors. Lukas et al. considered support vector machines, random forest with a data set of 80,000 and achieved an accuracy of 41.36%. Ziwei et al. considered neural networks with a data set of 8,00,000 and achieved an accuracy of 76.40%. Wenhui et al. considered neural networks with a data set of 2,50,000 and achieved an accuracy of 80% approximately. Xiasong et al. considered group rating matrix with a data set of 1783 rating record and achieved an accuracy of 82% approximately.

VII. CONCLUSION

In this paper, we explored and analyzed various approaches of recommendation systems. Almost, we take a look at all the approaches of recommendation systems. Due to the overburden of information in a web, and a significant increase in the number of users, it becomes important for companies to search and map the relevant information which meets user's preferences. In such situations, the ease of access to similar information recommendation systems provides suggestions for

products to be of use for the users. The essential requirements of recommendation systems to give rise to efficacious solutions are evolved. These systems study the past behavior of users and recommend the products.

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VIII. REFERENCES

[1] Bossard L., Dantone M., Leistner C., Wengert C., Quack T., Van Gool L. (2013) Apparel Classification with Style. In: Lee K.M., Matsushita Y., Rehg J.M., Hu Z. (eds) Computer Vision – ACCV 2012. ACCV 2012. Lecture Notes in Computer Science, vol 7727. Springer, Berlin, Heidelberg

[2] Hu, Xiaosong, Wen Zhu and Qing Li. "HCRS: A hybrid clothes recommender system based on user ratings and product features." *CoRR* abs/1411.6754 (2013): n. pag.

[3] Z. Liu, P. Luo, S. Qiu, X. Wang and X. Tang, "DeepFashion: Powering Robust Clothes Recognition and Retrieval with Rich Annotations," *2016 IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, Las Vegas, NV, 2016, pp. 1096-1104.

[4] Yu, Wenhui, Huidi Zhang, Xiangnan He, Xu Chen, Li Xiong and Zheng Qin. "Aesthetic-based Clothing Recommendation." *WWW* (2018).

[5] Hill, W., Stead, L., Rosenstein, M., & Furnas, G. Recommending and evaluating choices in a virtual community of use. In *Proceedings of the SIGCHI conference on Human factors in computing systems*, pages 194-201, 1995.

[6] Schafer, J. B., Konstan, J. A., & Riedl, J. E-commerce recommendation applications. In *Applications of Data Mining to Electronic Commerce*, pages 115-153, 2001.

[7] Laaksonen, J., Koskela, M., Laakso, S., & Oja, E. PicSOM–content-based image retrieval with self-organizing maps. *Pattern Recognition Letters*, 21(13): 1199-1207, 2000

[8] Breese, J. S., Heckerman, D., & Kadie, C. Empirical analysis of predictive algorithms for collaborative filtering. In *Proceedings of the Fourteenth conference on Uncertainty in artificial intelligence*, pages 43-52, 1998.

[9] Kim, B. M., Li, Q., Park, C. S., Kim, S. G., & Kim, J. Y. A new approach for combining content-based and collaborative filters.*Journal of Intelligent Information Systems*, 27(1): 79-91, 2006.

[10] MacQueen, J. Some methods for classification and analysis of multivariate observations. In *Proceedings of the fifth Berkeley symposium on mathematical statistics and probability*, 1(281-297): 14, 1967.