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Fashion-MNIST Clothing Classification using Deep Learning

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ABSTRACT

Online fashion market is constantly growing, and an algorithm capable of identifying garments can help companies in the clothing sales sector to understand the profile of potential buyers and focus on sales targeting specific niches, as well as developing campaigns based on the taste of customers and improve user experience. Artificial Intelligence approaches able to understand and label humans' clothes are necessary, and can be used to improve sales, or better understanding users. Convolutional Neural Network models have been shown efficiency in image c1assification. It presents four different Convolutional Neural Networks models that used Fashion-MNIST dataset. Fashion-MNIST is a dataset made to help researchers finding models to classify this kind of product such as clothes, and the paper that describes it presents a comparison between the main classification methods to find the one that better label this kind of data. The main goal of this project is to provide future research with better comparisons between classification methods.

Keywords : Fashion-MNIST, Clothing Classification, Deep Learning

I. INTRODUCTION

Recognition of the clothing image helps major in fashion for every day that online buyers who can take pictures to search for anything, returning search results without typing is the main task of recognizing the image which functions as a search engine. The problem of defining the picture of clothing can potentially be formulated as a question of classification. Fundamental approaches to recognizing the image of clothing can be grouped into different algorithms for machine learning. Earlier work mostly relied on decision tree classification, logistic regression, random forest and linear SVM that does not achieve higher performance, still, there is room for improvement [1].

Deep learning approaches have recently been introduced for the classification of large-scale objects and substantial output has been achieved. Generic neural networks could provide a solution with high precision for the recognition of clothing image. To test our system for recognition of comprehensive experiments on publicly available data set, MNIST style, for multiple feature clothing photo. The experimental results demonstrate the specific method proposed to identify the clothing pictured in a competitive and rapid manner.

The neural networks of MLP and CNN have different hidden layers, each followed by the nonlinearity of ReLU with a non-saturating property, and a softmax of

final 10 way. Dropout a modern technique of regularisation is used to reduce overfitting. Among the few different optimizers, the performance is compared to train the network and prove that Adam outperforms the others. ELM theories and mechanisms for learning were used in increasingly deep learning algorithms. The ELM algorithm is closely related to other neural networks with some crucial differences:

- Typically, the number of secret units is greater than in other deep learning which are trained using backpropagation.
- Weights are randomized from source to concealed layer, commonly using values from a continuous even distribution.
- The outcome neurons are linear instead of sigmoidal, which means that regression of least square errors to handle the target weights can be used.
- Online fashion market is constantly growing, and an algorithm capable of identifying garments can help companies in the clothing sales sector to understand the profile of potential buyers and focus on sales targeting specific inches, as well as developing campaigns based on the taste of customers and improve user experience.
- Artificial Intelligence approaches "able to understand and label humans clothes" are necessary, and can be used to improve sales, or better understanding of users [2].
- Convolutional Neural Network models have been shown efficiency in image c1assification.

II. Literature Survey

A literature review is the identification and examining of the existing research work in the chosen field to gain valuable information. Literature review was performed to understand the existing learning algorithms and to choose the suitable supervised and unsupervised method for image classification. As the study was made to compare supervised and unsupervised algorithms, the literature review was performed to identify the most effective algorithm of each kind.

[1] A comparative research on clothing images classification based on neural network models

Author: Wang Di

Wang Di designed the fully connected neural network CNN Mobile Net V1 and mobile net V2 neural network models to build a classify and compare experiments separately on the Fashionist dataset. The results show that CNN and Fully connected neural network single-wheel training speed will be faster than mobile net under the same loss function and batch size, but the accuracy of mobilenet in the testing dataset will increase by almost 4%. While using the improved mobilenet V2 version will increase the accuracy of about 1% compared to V1 in the context of the same 20 rounds training. Mobilenet significantly reduces a large number of parameters with little impact on accuracy. An effective solution is proposed for mobile and embedded version applications, laying the foundation for the subsequent implementation of pattern recognition on the mobile side.

[2] Clothing Image Recognition Based on Multiple Features Using Deep Neural Networks

Author: S Shubathra, PCD Kalaivaani, S Santhoshkumar

S Shubatra et al. main focus is to identify image of clothing with the best comparative methods based on multiple features. Build the clothing category taking into account the reliability and training time. Experiments on MNIST Fashion data collection on clothing photos show that the device proposed is extremely competitive, particularly in order to balance time and accuracy of recognition. Finally, the incremental growth of the testing accuracy is inferred as an experimental outcome from this application of neural network models. The precision of the classification of images is concluded as a performance of deep neural networks and reported by plotting the results using graphical representation. In which relative to other two methods, ELM succeeds with a good precision result of 97.5%. For image recognition

in clothing is based on multiple features, there are still several interesting issues to be investigated in the future. The work will be considered in future research to be extended with other deep learning techniques to achieve greater accuracy for computer vision in MNIST clothing.

[3] Classifying Garments from Fashion-MNIST Dataset Through CNNs

Author: A.S Henrique, Anita Maria da Rocha Fernandes, Rodrigo Lyra

A.S Henrique et al. obtained results evidence that classifying fashion products with CNN can be more accurate than by using other conventional machine learning models. In addition, it was observed that the dropout technique together with more convolutive layers are effective when it comes to reducing the bias of model. Using Tensor Flow 2 and GPU for training, we could reach not only a better training time, but also, better accuracies. We also could decrease loss and bias, which were our main problems. We could not evaluate improvements in runtime since we used different hardware than in the original run. Our original work found that the best model was CNN simple, but now with these new results, we discovered that CNN dropout 3 is better. This is good news because this model is faster to train, since it has an extra Max pooling layer that decreases dense layer inputs by a quarter. We could compare obtained results with the ones from original fashion MNIST paper, and they show that CNNs can be great classifiers for garments.

III. SYSTEM ANALYSIS

Abstract design

The system architecture gives high-level overview of the functions and responsibilities of the system. It defines the breakdown of the system into various subsystems and the individual roles played by them [3].

The proposed system predicts the popularity of a talk show using regression analysis. Regression model is built between the variables, the dataset is split into training and test data and the accuracy is predicted. Given a new data sample, the model must be able to predict its estimated accuracy and it is compared with the test data [5].

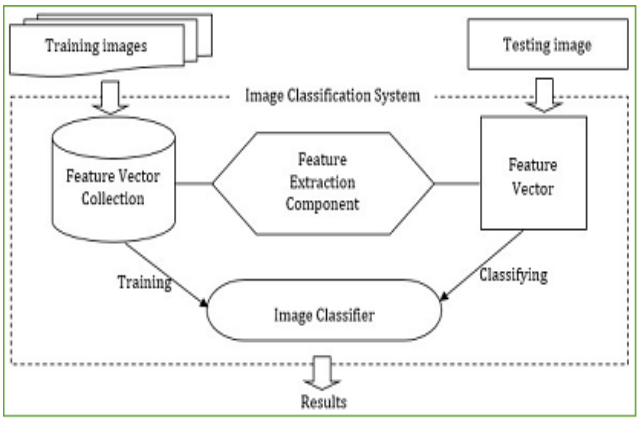
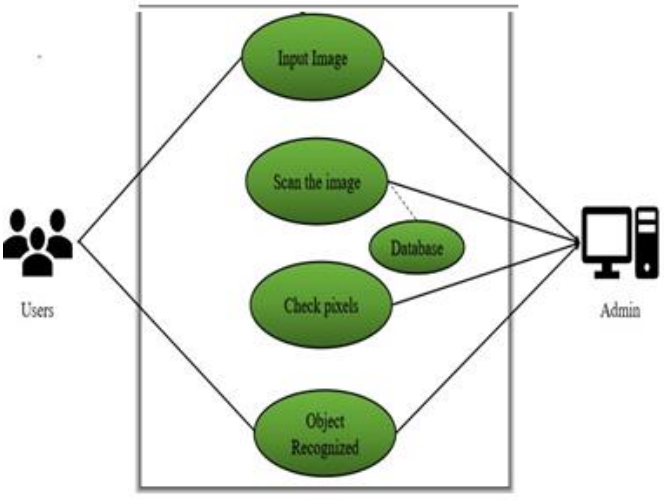


Fig: System Architecture

Use Case Model

A use case defines a goal-oriented set of interactions between external entities and the system under consideration. The external entities which interact with the system are its actors. A set of use cases describe the complete functionality of the system at a particular level of detail and it Can be graphically denoted by the use case diagram. The use case diagram of the proposed system is shown in Figure The system broadly classifies the functionality of the system into seven different use cases.



A use case model consists of a number of a model elements. The most important model elements are use case, actors and the relationships between them. A use case diagram is used to graphically depict a subset of

the model to simply communications. Use case diagram is one of them and its specific purpose is to gather system requirements and actors. Use case diagrams specify the events of a system and their flows. But use case diagram never describes how they are implemented [6].

IV. RESULTS

Obtained results evidence that classifying fashion products with CNN can be more accurate than by using other conventional machine learning models. In addition, it was observed that the dropout technique together with more convolutive layers are effective when it comes to reducing the bias of a model. Using TensorFlow, we could reach not only a better training time, but also, better accuracies.

We also could decrease loss and bias, which were our main problems. We could not evaluate improvements in runtime since we used different hardware than in the original run. Our original work found that the best model was cnn-simple, but now, with these new results, we discovered that cnn-dropout-3 is better (using TF2)[4]. This is good news because this model is faster to train, since it has an extra max-pooling layer that decreases dense layer inputs by a quarter. About our goals, we could compare obtained results with the ones from the original Fashion-MNIST paper, and they show that CNNs can be great classifiers for garments.

V. CONCLUSION

Fashion-MNIST is a dataset made to help researchers finding models to classify this kind of product such as clothes, and the paper that describes it presents a comparison between the main classification methods to find the one that better label this kind of data. The main goal of this project is to provide future research with better comparisons between classification methods.

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