EFFICIENT FASHION PREDICTION USING MNIST DATASET BY IMAGE CLASSIFICATION USING SUPPORT VECTOR MACHINE COMPARED WITH LINEAR REGRESSION WITH IMPROVED ACCURACY

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ABSTRACT

Aim: Efficient fashion Novel Prediction using MNIST dataset by image classification using a support vector machine and Linear Regression.
Materials and Methods: This study contains two groups Support Vector Machine and Linear Regression. Each group consists of a sample size of 10 using G-power setting parameters: (α=0.05 and power=0.86) power value 0.4 respectively
Results: The Support Vector machine is 91.2% which is more accurate than Linear Regression of 76.9% in Fashion detection and attained the significant value 0.651 **Conclusion:** The Support vector machine model is significantly better than the Linear Regression in fashion detection.

Keywords: Support Vector Machine, Linear Regression,Classification, Novel Prediction, Accuracy,Machine Learning

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1. Introduction

MNIST's popularity stems from its small size, which allows deep learning researchers to easily test and prototype their methods. Additionally, all machine learning libraries such as scikit-learn and deep learning frameworks Tensorflow, Pytorch contain auxiliary functions. MNIST comes with a number of functions and examples that you can use right away (Kayed, Anter, and Mohamed 2020). On the Fashion MNIST dataset, a CNN(Convolution Neural Network) based LeNet-5 architecture is suggested for training CNN parameters (Tseëlon 2018). The findings of the experiments demonstrate that LeNet-5 is effective. The accuracy of the model was over 98 percent. As a result, it performs better than both the initial CNN model and other cutting-edge models reported in the research (Anuradha et al. 2019). How to build a reliable test framework for assessing the quality of the model, how to investigate model enhancements, and how to store and load the system to produce innovative predictions based on new data (Kadam, Adamuthe, and Patil 2020). Application of Fashion trend forecasting is a multi-industry technique that includes autos, pharmaceuticals, food and drinks, literature, and home furnishings. Fashion forecasters are in charge of enticing customers and assisting retailers and designers in selling their products (Shakeri et al. 2021).

There are about 195 articles in IEEE xplore and in 130 Scopus related to this study. In a study by (Zhang, n.d.)**.** The paper shows how a convolutional neural network can be used to solve an image categorization challenge. The CNN model was tested using the MNIST and Fashion MNIST datasets in deep learning. Five distinct architectures are shown in this paper, each with various convolutional layers, filter sizes, and fully linked layers. (Shakeri et al. 2021) This is a crucial component in systems that try to assure the proper operation of a model. Individual symbols, i.e. pixels, are not easily interpretable for high-dimensional input data such as photographs. As a result, rule-based techniques are rarely employed to deal with high-dimensional data. (Ciresan, Meier, and Schmidhuber 2012) provide a GPU implementation of Convolutional Neural Network variations that is fast and completely parameterizable (Tschodu et al. 2022). (Parakh et al. 2020; Pham et al. 2021; Perumal, Antony, and Muthuramalingam 2021; Sathiyamoorthi et al. 2021; Devarajan et al. 2021; Dhanraj and Rajeshkumar 2021; Uganya, Radhika, and Vijayaraj 2021; Tesfaye Jule et al. 2021; Nandhini, Ezhilarasan, and Rajeshkumar 2020; Kamath et al. 2020)

Our institution is passionate about high quality evidence based research and has excelled in various domains (Vickram et al. 2022; Bharathiraja et al. 2022; Kale et al. 2022; Sumathy et al. 2022; Thanigaivel et al. 2022; Ram et al. 2022; Jothi et al. 2022; Anupong et al. 2022; Yaashikaa, Keerthana Devi, and Senthil Kumar 2022; Palanisamy et al. 2022).The drawbacks of recognizing a visual item from a picture is a simple task for a human, it is extremely difficult for a computer system to do so with human-level accuracy (Hadanny et al. 2022). To correctly recognise and categorise the photos, the method must be invariant to a lot of modifications. For example, various lighting conditions, scale and perspective alterations, deformations, and occlusions may cause the system to forecast the picture class incorrectly. The goal of parametric regression analysis is to find the idea of classifying Fashion MNIST images with variants of convolutional neural networks in deep learning (Albert-Weiss and Osman 2022). The classic form of regression analysis is parametric regression analysis, which is referred to simply as regression analysis in this section (Masvekar et al. 2022).

2. Materials and Methods

The proposed study was conducted under the supervision of professors in the artificial intelligence lab at the Saveetha School of Engineering. Two groups were selected to participate in this study. Table 1 shows group 1 as the SVM and group 2 as the linear regression. Clinical analysis was used to calculate the sample size, keeping the G power constant at 80%, 10 sample sizes estimated for each group, totaling 20, 94% confidence, the enrollment ratio constant at 1, the maximum acceptable error constant at 0.05, and the pretest power constant at 80%. The accuracy of two classifiers, SVM and Linear regression, was compared. Images contain independent factors such as picture, vocabulary, colour, and image size. Images, attire, and outfits are dependent variables.

Support Vector Machine

One of the most popular supervised learning deep learning approaches, the support vector machine, is used for both classification and regression problems. However, it is mostly used in machine learning to address categorisation problems. The SVM algorithm's goal is to identify the ideal set point or line that can categorize n-dimensional space, enabling us to rapidly classify new data points in the hereafter. This best decision boundary is known as a hyperplane. SVM chooses the maximum vectors and points to help build the hyperplane. Due to these severe circumstances, also known as qs support vectors, the method is referred to as a Support Vector Machine.

Pseudocode for Support Vector Machine

Input: Training Dataset
Output: Accuracy
Step 1: Importing the necessary packages.
Step 2: After using the extraction feature, convert the audio recordings into numerical numbers.
Step 3: Allocate the data to the variables X train, y train, X test, and y test.
Step 4: Provide the training and testing data to the train test split() method.
Step 5: Use the parameters test size and random state to divide the information using SVM training.
Step 6: Loading the SVC classifier from the library package.
Step 7: Predict the results of the testing information using the SVC classifier.
Step 8: Determine the model's accuracy.

Linear Regression

Linear regression is a type of deep learning model. The algorithm for linear regression shows a correlation between the dependent variable (x) and one or more independent variables (x). Linear regression can be used to assess how the outcome of the dependent variable changes in proportion to the impact of the independent component because it exhibits a linear connection.

Pseudocode for Linear regression

INPUT: Training Dataset
OUTPUT: Classifier accuracy
Step 1: Import the necessary packages.
Step 2: After using the extraction feature, transform sets of data into numerical values.
Step 3: Assign data to the variables for the X train, Y train, X test, and Y test.
Step 4: Pass the training and testing parameters using the train test split() method.
Step 5: Use the parameters test size and random state to partition the data using linear training method.
Step 6: Compiling model using matrices as accuracy.
Step 7: Calculate accuracy of model.

STATISTICAL ANALYSIS

The software package Statistical Package for the Social Sciences, Version 26, was used to carry out the statistical analysis. A distinct sample T-test was carried out for correctness. Standard deviation and standard mean errors were also calculated using the SPSS Software tool. The importance ratings for proposed and existing algorithms are shown in Table 3. It includes the statistical totals of all suggested and used algorithms

3. Results

Using a sample size of 10, Anaconda Navigator was used to perform the proposed SVM method and linear regression at various intervals. Based on encoder decoder model predictions, Table 2 shows the identification of novel caption production and the expected accuracy of picture captioning. To obtain statistical values that may be used for comparison, the 10 data samples can be used for each method together with their corresponding loss values. According to the findings, linear regression had a mean accuracy of 76.9% while the SVM method had a mean accuracy of 91%. For SVM and linear regression, Table 3 shows the mean accuracy values. The mean value of SVM performs better when compared to linear regression with standard deviations of 2.57388 and 3.27763, respectively. The data from SVM and linear regression's independent sample T-test are displayed in Table 4 with a significant value of 0.651.

Figure 1 compares SVM and linear regression analysis is based on mean accuracy and loss. In deep learning, the group statistics value for the two algorithms is also supplied, along with the mean, standard deviation, and standard error mean. The loss between two methods, The graphical comparison analysis classifies SVM and linear regression. This demonstrates that SVM's classified accuracy of 91% is significantly greater than linear regression's accuracy of 76.9%. . As seen in Fig. 1, the standard deviation error bars are +/- 1 SD.

4. Discussion

Given that the study's significance value was 0.651, it can be concluded that Generator utilising Generative Adversarial is preferable to Support Vector Machine. In order to determine the appropriate new fashion prediction type based on encoder-decoders model, it was shown that Linear Regression works better than the Support Vector Machine Algorithm. The information is acquired by the execution of numerous iterations in order to distinguish different scales of accuracy rates. An independent sample t-test was carried out based on the accuracy rates, and the accuracy results were examined. Support Vector Machine has a mean accuracy of 91%, while Linear Regression Algorithm has a mean accuracy of 76.9%.

The similar fashion trend is an important aspect in earning a sale. However, in many firms, the Fashion Prediction process is not visible to the public (Cob, Cobb, and Scully 2012). In this work, a prediction approach is developed in order to give colour trends to companies in advance (Agarwal, Xu, and Osgood 2015). The opposite fuzzy c-means approach was used to split the obtained colour data, then the minimal mean-square error was used to group comparable colour clusters from various time points, and the grey model was used for prediction (Blakely 2012). The classic form of regression analysis is parametric regression analysis, which is referred to simply as regression analysis in this section.

The disadvantage of following the latest fashions is that it may be harmful to our environment. In truth, every material thing that must be made pollutes the environment and frequently contributes to global warming. Excessive consumption also contributes to significant resource depletion. The system's future aim is to improve, to cover a larger number of photos while taking less time in training the data set. In future work, the fashion industry that is concerned with predicting new fashion trends, colors, styling methods, fabric textures, and other elements that will stimulate consumer attention is known as fashion forecasting.

5. Conclusion

In this study, it was found that the SVM-based prediction of the accuracy percentage of a fashion novel was more accurate (91.2%) than the linear regression (76.9%). Several fashion new forecasts' accuracy estimates have been successfully produced for the images. Linear Regression has an accuracy of 76.9%, whereas the Support Vector Machine has an accuracy of 91.2%. The main emphasis was on the algorithmic substance of various attention processes, as well as an overview of how they are used. As a result, we can conclude that we have succeeded in developing a model that outperforms all previous novel fashion prediction generators. This model may be used to provide precise colour and computations for each image.

Declarations

Conflicts of Interest

No conflicts of interest in this manuscript.

Author Contributions

Data collection, data analysis, data extraction, and manuscript writing were all done by author Gopi Ramesh. Conceptualization, data validation, and critical review of the manuscript were all done by author Amanullah M.

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TABLES AND FIGURES

Table 1. Group, Accuracy, and Loss value uses 8 columns with 8 width data for image caption generator.

SI.NO	Name	Type	Width	Decimal	Columns	Measure	Role
1	Group	Numeric	8	2	8	Nominal	Input
2	Accuracy	Numeric	8	2	8	Scale	Input
3	Loss	Numeric	8	2	8	Scale	Input

Table 2. Accuracy and Loss Analysis of SVM and Linear Regression

<table>
<tr><th>S.No</th><th>GROUPS</th><th>ACCURACY</th><th>LOSS</th></tr>
<tr><td rowspan="10">1</td><td rowspan="10">SVM</td><td>94.89</td><td>5.11</td></tr>
<tr><td>94.42</td><td>5.58</td></tr>
<tr><td>91.33</td><td>8.67</td></tr>
<tr><td>93.00</td><td>7.00</td></tr>
<tr><td>93.94</td><td>6.06</td></tr>
<tr><td>93.42</td><td>6.58</td></tr>
<tr><td>89.85</td><td>10.15</td></tr>
<tr><td>93.21</td><td>6.79</td></tr>
<tr><td>89.12</td><td>10.88</td></tr>
<tr><td>87.12</td><td>12.88</td></tr>
<tr><td></td><td></td><td>78.74</td><td>21.26</td></tr>
</table>

2	**Linear Regression**	**78.12**	**21.88**
		77.12	**22.88**
		75.54	**24.46**
		74.16	**25.84**
		70.00	**30.00**
		68.85	**31.15**
		74.67	**25.33**
		76.35	**23.65**
		76.65	**23.35**

Table 3. Group Statistical Analysis of SVM and Linear Regression. Mean, Standard Deviation and Standard Error Mean are obtained for 10 samples. SVM has higher mean accuracy and lower mean loss when compared to Linear Regression.

	GROUP	**N**	**Mean**	**Std.Deviation**	**Std.Error Mean**
ACCURACY	**SVM**	10	92.0300	2.57388	.81393
	Linear Regression	10	76.0200	3.27763	1.03648
LOSS	**SVM**	10	7.9700	2.57388	.81393
	Linear Regression	10	24.9800	3.27763	1.03648

Table 4. Independent Sample T-test: SVM is insignificantly better than Linear Regression with p value 0.651

		F	Sig.	test	difference	Mean Diffencene	Std.Error difference	Lower	Upper
ACCURACY	Equal variances assumed	.212	0.651	12.907	18	17.01000	1.31787	14.24126	19.77874
	Equal Variances not assumed	.212	0.651	12.907	17.042	17.01000	1.31787	14.23006	19.78994
LOSS	Equal variances assumed	.212	0.651	-12.907	18	-17.01000	1.31787	-19.77874	-14.24126
	Equal Variances not assumed			-12.907	17.042	-17.01000	1.31787	-19.78994	-14.23006

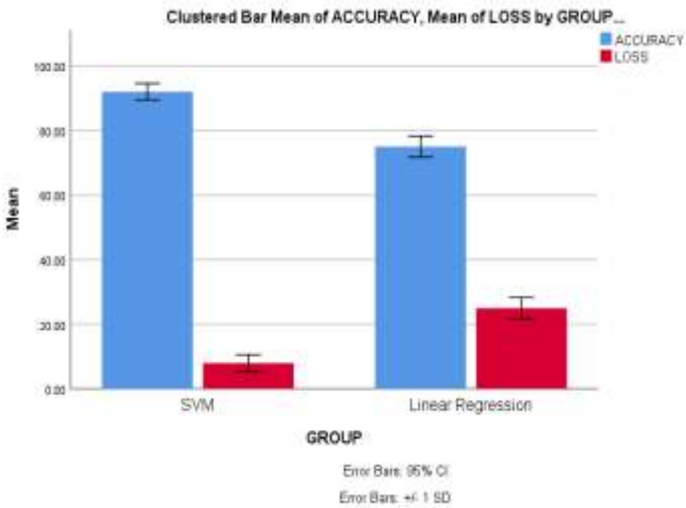

Fig. 1. Comparison of SVM and Linear Regression Classifier in terms of mean accuracy and loss. The mean accuracy of SVM is better than Linear Regression Classifier Standard deviation of SVM is slightly better than Linear Regression. X Axis: SVM Vs Linear Regression Classifier and Y Axis: Mean accuracy of detection ± 1 SD