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RECOGNITION OF HANDWRITTEN DIGIT USING CNN

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ABSTRACT

Convolution Neural Network (CNN) is at the center of spectacular advances that mixes Artificial Neural Network (ANN) and up to date deep learning strategies. The goal of this paper is to observe the variation of accuracies of CNN to classify handwritten digits using various numbers of hidden layers and epochs and to make the comparison between the accuracies. For this performance evaluation of CNN, we performed our experiment using Modified National Institute of Standards and Technology dataset. Further, the network is trained using stochastic gradient descent and the back propagation algorithm. In recent times, with the increase of Artificial Neural Network (ANN), deep learning has brought a dramatic twist in the field of machine learning by making it more artificially intelligent.

1.INTRODUCTION

With time the numbers of fields are increasing in which deep learning can be applied. In deep learning, Convolutional Neural Networking (CNN) [1, 2] is being used for visual imagery analyzing. Object detection, face recognition, robotics, video analysis, segmentation, pattern recognition, natural language processing, spam detection, topic categorization, regression analysis, speech recognition, image classification is some of the examples that can be done using Convolutional Neural Networking. In recent times, with the increase of Artificial Neural Network (ANN), deep learning has brought a dramatic twist in the field of machine learning by making it more artificially intelligent. Deep learning is remarkably used in vast ranges of fields because of its diverse range of applications such as surveillance, health, medicine, sports, robotics, drones, etc. In deep learning, Convolutional Neural Network (CNN) is at the center of spectacular advances that mixes Artificial Neural Network (ANN) and up to date deep learning strategies. It has been used broadly in pattern recognition, sentence classification, speech recognition, face recognition, text categorization, document analysis, scene, and handwritten digit recognition.

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2.LITERATURE REVIEW

EXISTING SYSTEM

A simple artificial neural network (ANN) has an input layer, an output layer and some hidden layers between the input and output layer. In 1998, the framework of CNNs is designed by LeCun et al. which had seven layers of convolutional neural networks. It was adept in handwritten digits classification direct from pixel values of images. Here all the neurons are not fully connected. Instead, every neuron in the layer is connected to the local receptive field.

PROPOSED SYSTEM

To recognize the handwritten digits, a seven-layered convolutional neural network is designed. Designed CNN consists of one input layer followed by five hidden layers and one output layer. The input layer consists of 28 by 28-pixel images which mean that the network contains 784 neurons as input data. The kernel size determines the locality of the filters.

3.SYSTEM REQUIREMENTS

HARDWARE REQUIREMENTS :

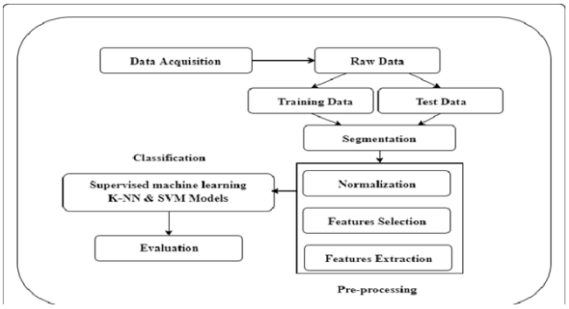
- Processor: P4 or higher
- RAM: 2GB and above
- Hard disk: 4GB and above

These are basic requirements which are needed to implement our project.

SOFTWARE REQUIREMENTS:

- Operating System: Windows/Linux/Mac-Operating system is system software that manages computer hardware, software resources, and provides common services for computer programs
- Technologies: Python: Python is an easy to learn, powerful programming language, PostgreSQL: It is a database which we use to store our data.

4.ARCHITECTURE



Supervised learning is the machine learning task of learning a function that maps an input to an output based on example input-output pairs. It infers a function from labeled training data consisting of a set of training examples.

5.WORKING

The MNIST dataset is an acronym that stands for the Modified National Institute of Standards and Technology dataset. It is a dataset of 60,000 small square 28×28 pixel grayscale images of handwritten single digits between 0 and 9.

Designed CNN consists of one input layer followed by five hidden layers and one output layer. The maximum and minimum accuracies were observed for different hidden layers variation with a batch size of 100

FLOW OF EXECUTION :

1. The first hidden layer is a convolutional layer called a Convolution2D.
2. The layer has 32 feature maps with filter size of 3×3 and a rectifier activation function.

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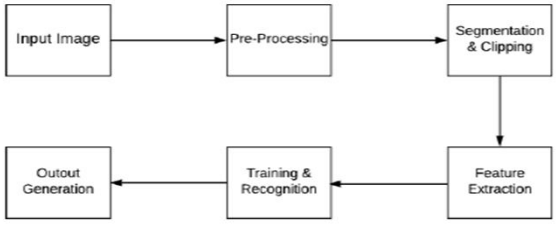
3. This is the input layer, expecting images with the structure outline below [pixels][width][height]..
4. Define a pooling layer that takes the max value called MaxPooling2D. It is configured with a pool size of 2×2 model.add(MaxPooling2D(pool_size=(2,2))
)
5. The next layer is a regularization layer using dropout called Dropout.
6. It is configured to randomly exclude 20% of neurons in the layer in order to reduce overfitting model.add(Dropout(0.2)).
7. Compile the model.
8. Final evaluation of the model/Returns loss and metrics for the model.



Example for data code in dataset:

{
"cell_type": "code", "metadata": {
"colab_type": "code", "id": "uTm1Nr6s9JPQ", "colab": {}
},
"source": [
"# reshape to be [samples][channels][width][height]\n",
"X_train = X_train.reshape(X_train.shape[0], 1, 28, 28) # Including the depth 1\n",
"X_test = X_test.reshape(X_test.shape[0], 1, 28, 28) # Including the depth 1\n",
"X_train = X_train.astype('float32') # Changing dtype to float\n", "X_test = X_test.astype('float32') # Changing the dtype to float\n", "\n",
"# normalize inputs from 0-255 to 0-1\n",
"X_train /= 255 \n",
"X_test /= 255 "
],
"execution_count": 0, "outputs": []
},

6.CONCLUSION

In this project, the variations of accuracies for handwritten digit were observed for 15 epochs by varying the hidden layers. The accuracy curves were generated for the six cases for the different parameter using CNN MNIST digit dataset. The six cases perform differently because of the various combinations of hidden layers. The layers were taken randomly in a periodic sequence so that each case behaves differently during the experiment.. Among all the observation, the maximum accuracy in the performance was found 99.21% for 15 epochs in case 2 (Conv1, pool1, Conv2, pool2 with 2 dropouts). In digit recognition, this type of higher accuracy will cooperate to speed up the performance of the machine more adequately. However, the minimum accuracy among all observation in the performance was found 97.07% in case 6 (Conv1, pool1, Conv2, pool2 with 1 dropout). Moreover, among all the cases, the total highest test loss is approximately 0.049449 found in case 3 without dropout and the total lowest test loss is approximately 0.026303 found in case 2 with dropout. This low loss will provide CNN better performance to attain better image resolution and noise processing.

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8.REFERENCES

1. Y. LeCun et al., "Backpropagation applied to handwritten zip code recognition," Neural computation, vol. 1, no. 4, pp. 541- 551, 1989.

2. Krizhevsky, I. Sutskever, and G. E. Hinton, "Imagenet classification with deep convolutional neural networks," in Advances in neural information processing systems, 2012, pp. 1097-1105.
3. D. Hubel and T. Wiesel, "Aberrant visual projections in the Siamese cat," The Journal of physiology, vol. 218, no. 1, pp. 33- 62, 1971.
4. R. Hecht-Nielsen, "Theory of the backpropagation neural network," in Neural networks for perception: Elsevier, 1992, pp. 65-93.
5. D. Cireşan, U. Meier, and J. Schmidhuber, "Multi-column deep neural networks for image classification," arXiv preprint arXiv:1202.2745, 2012.
6. Y. LeCun, Y. Bengio, and G. Hinton, "Deep learning," nature, vol. 521, no. 7553, p. 436, 2015.