

EVALUATION OF HANDWRITTEN MATHEMATICAL EQUATIONS

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Abstract: During the lockdown we find difficulties a lot in offline education. So, we will develop an algorithm using machine learning, neural networks in python to recognize the handwritten mathematical expression, digits and symbols. We will check for the hand written mathematical equation on paper, and algorithm will validate each step using neural network and machine learning. The final answer will be shown when the algorithm will finish its task that if the hand written equation on the paper is correct or not.

Keywords: - Neural Network, Deep Learning, MATLAB, OpenCV

I INTRODUCTION

Machine learning and deep learning is giving a new aspect of living the life. In terms of technology, education and in every industry, ML has made lot easier for human which makes learning more practical and reliant. Machine learning and deep learning is at the boom in terms of development and making tasks lot easier. From face recognition to solving complex problem, in medicine. During the time of Covid-19 machine learning has helped lot in medical enhancement and increasing the rate of research. We have only begun to scratch of the surface of the possibilities of machine learning for education and training purpose. we will develop an algorithm using machine learning, neural networks in python to recognize the handwritten mathematical expression, digits and symbols

II. PROPOSED SYSTEM

A. Neural Network Model

The proposed model is a single deep and wide neural network architecture that offers near performance like ensemble models on various image classification challenges, such as MNIST. [2]

Wide architecture the proposed model utilizes a large number of maps per layer, stacked in both horizontal and vertical layers. These vertical layers allow the model to see two versions of input at the same time thereby preventing the network from loss of information.

Pooling via Convolutional Subsampling using max-pooling reduces the dimensions of the image thereby reducing the no of parameters but at the cost of losing some important features. Instead, some of the max-pooling layers are replaced by convolutional layers with increased strides.

Variable Kernel size All forked convolutional layers which accept a pre-processed image possess a 5x5 kernel. This improves the convergence speed and the accuracy of the network. All middle tier fork layers utilize either a 3x3 kernel, while simultaneously increasing the number of maps. The final tier fork and merge layer use a 3x3 kernel to improve performance, and often have the largest map size.[7]

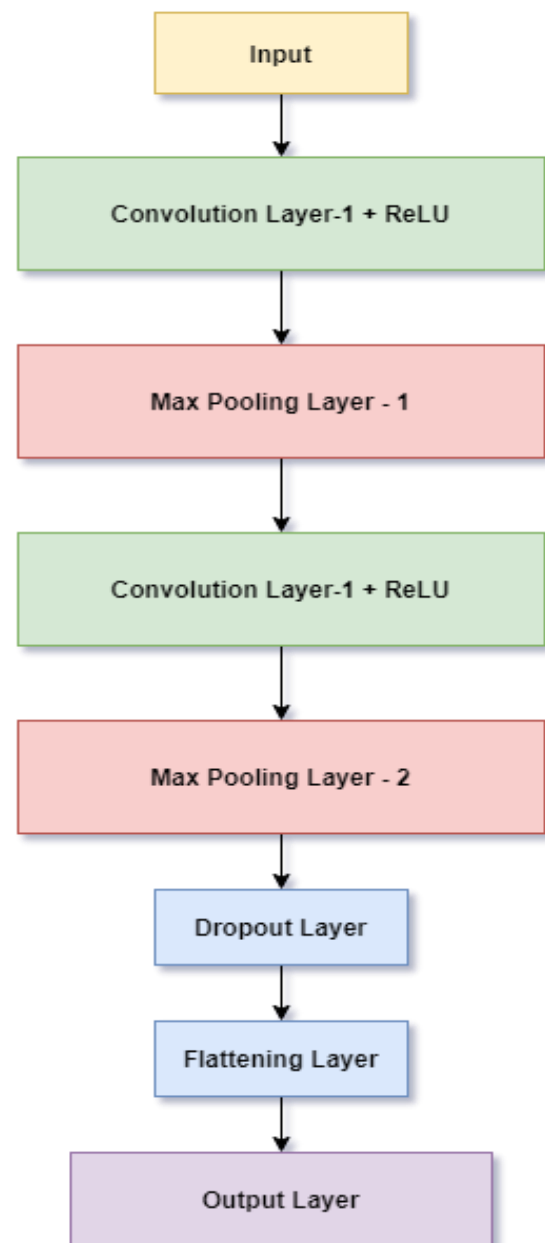


Fig 1: Neural Network [8]

B. SYSTEM ARCHITECTURE:

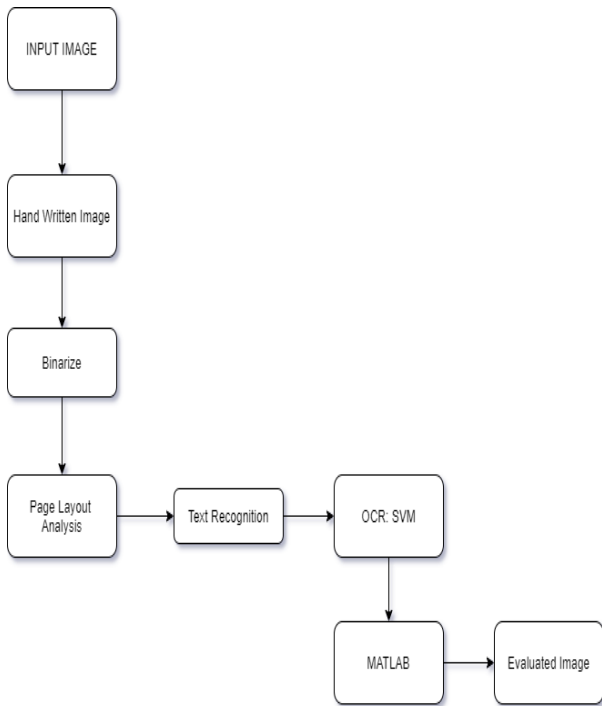


Fig 2: SYSTEM ARCHITECTURE

C. UML Diagrams

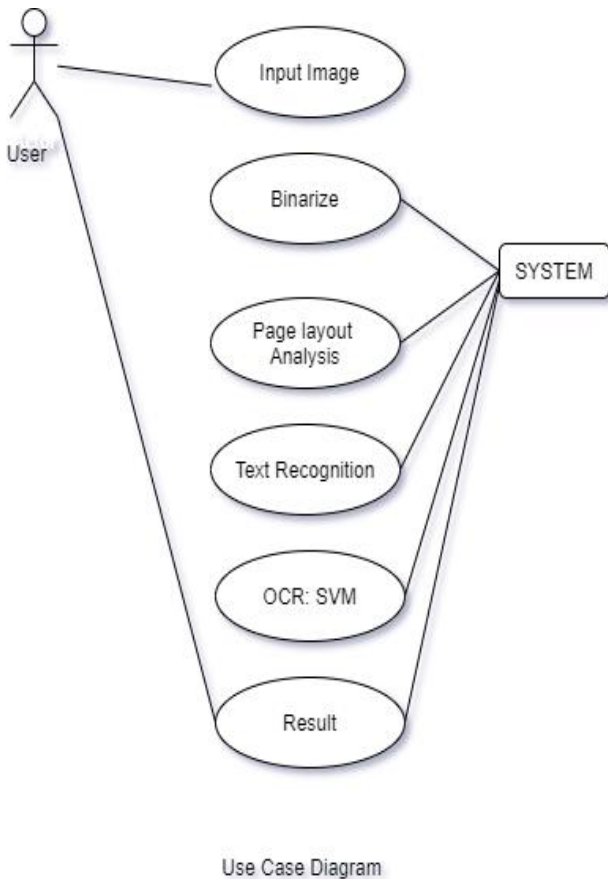


Fig 3: Usecase diagram

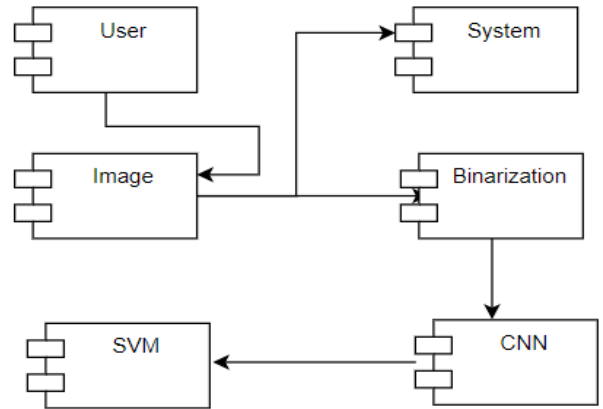


Fig 4: COMPONENT DIAGRAM

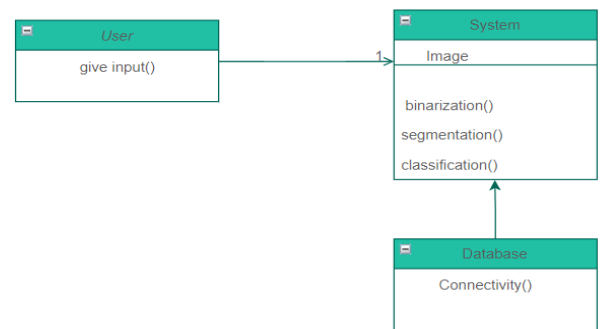
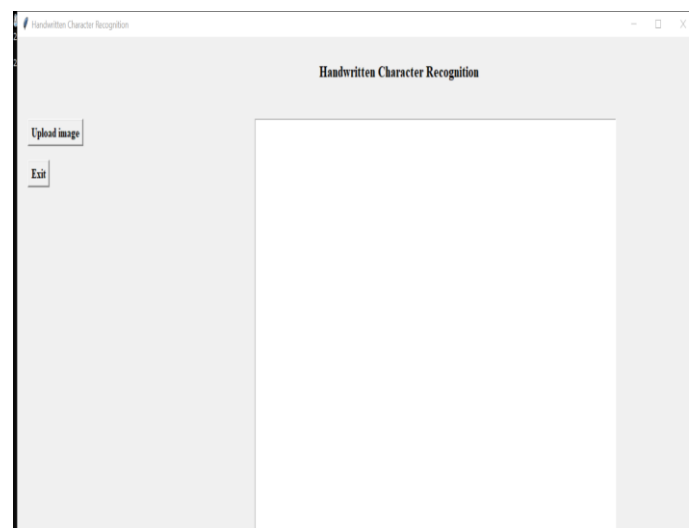


Fig 5: CLASS DIAGRAM



Interface

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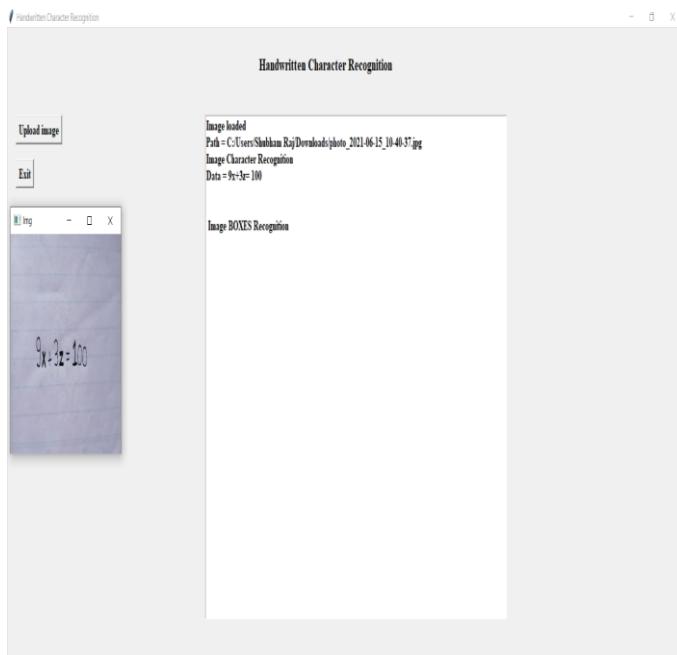
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Interface predicting the output

III GOALS AND OBJECTIVE

1. It helps teachers and create a comfortable learning experience for students.
2. In future we can extend the work to develop mobile application through which user can scan input from camera of the mobile device. The accuracy of the project can be increased by further research on neural networks and using the most efficient way to recognize mathematical symbols.

IV CONCLUSION

In this paper our main focus is on recognizing handwritten mathematical equation and recognition of the handwritten equation on the paper. The scanned sheet is processed through number of modules and finally for each step predicting the steps are right or wrong. This algorithm can be developed for predicting the correctness of more complex mathematical problems, chemical equations and handwritten text.

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