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Kannada Handwritten Character Recognition using Deep Learning

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ABSTRACT: Handwritten characters are still a long way from being replaced with the digital form. The event of handwritten text is plentiful. With a wide degree, the issue of handwritten letter recognition using computer vision and machine learning strategies has been a very much contemplated upon point. The field has gone through marvelous turn of events, since the development of machine learning strategies. This work on a significant scale devises to overcome any issues between the best in class innovation, of deep learning, to robotize the answer for handwritten character recognition, using convolutional neural networks. Convolutional neural networks have been known to have performed incredibly indeed, on the vintage classification issue in the field of computer vision. Utilizing the benefits of the design and utilizing on the preprocessing free deep learning techniques, we present a powerful, dynamic and quick strategy to tackle the issue of handwritten character recognition, for Kannada language.

KEYWORDS: Deep learning, neural network, transfer learning, Kannada character recognition, handwritten characters recognition, handwritten characters, convolution neural networks.

I. INTRODUCTION

The progression of data in the field of example acknowledgment has generally taken steep turns recently, after the ascent of deep learning methods. Unlike to include feature recognition and extraction is totally based on the data, enabling the utilization of the techniques as a response for a wide exhibit of problem statement, including manually handwritten character recognition. Convolutional neural network have become the face of deep learning because of their flexibility and adaptability. The method is achievable to issues which oversee the spatial spatial arrangements of patterns , henceforth written by handwritten character recognition. Rather than other conventional methods that have been used for other languages such as english, Chinese, Arabic and etc ,

Convolutional Neural Networks, perform activities with the possibility of the most grounded highlights. In like manner, traditional strategies that have been utilized with English language transcribed person acknowledgment are not relevant to dialects like Kannada, due to the differentiations between the characters of the language. This makes deep learning methods incredibly helpful in dealing with the issue. With observable responsibilities to the field, from various authors, the problem statements, including other international languages, like English, Chinese, Arabic, Japnese have been quickly worked upon with good performance.

The improvement in the availability of information and platform, with the assistance of cloud-based handling strategy, has turned up the quality, subsequently, representing top tier developments like Convolutional Neural Networks. This work focuses on the usage of Convolutional Neural Networks to address the issue of Kannada handwritten character recognition.

II. RELATED WORK

In [1] the author have used KNNs main component analysis classifier and reported an average 81 percentage of recognition rate.

In [2] the author have used Support Vector Machine as a classifier for the recognition of characters using dataset that is provided by MILE Lab and recorded 56preliminary segmentation (PS) output and accuracy of 62Feed-Based Segmentation (AFS) output. Yungang Zhang et al.,

In [3]the author present the overview of OCR on the Telugu language. The authors explore various techniques, methodologies which have been used in the process of solving the problem of handwritten character recognition for

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Telugu script. The script is quite similar to Kannada, is also, divided into vowels and consonants. The script provides a clear depth of the technological advancements, for starting off with the research in this field.

In [4] Here the Recognition of printed and handwritten Kannada numerals using SVM (Support Vector Machine) technique. Authors have worked on identifying handwritten numerals by mixing both printed and handwritten dataset and classified them using SVM. The experiment was concentrating only on numerals but not on how to train for whole language.

In [5] The author Proposed a Framework for Recognition of Handwritten Cursive English Characters using CNN In this paper a new deep learning techniques, namely Convolutional Neural Network (CNN) is used for handwritten character recognition. Where in our work we will be using the same for kannada handwritten words.

III. PROBLEM STATEMENT

The problem considered in the proposed work is to recognize kannada handwritten words.

The main objectives considered are:

1) To achieve better specificity of words and characters.
2) To achieve better accuracy in training and recognition.

IV. PROPOSED SYSTEM

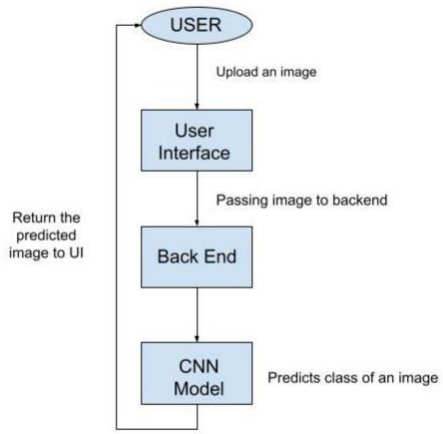

Fig 1 : System Architecture

User : The user uploads the image which consists of handwritten kannada words for recognising will be taken as a input image.

User Interface : The user interface (UI) is the point at which human users interact with a computer, website or application. The goal of effective UI is to make the user's experience easy and intuitive, requiring minimum effort on the user's part to receive maximum desired outcome

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Back end : The back end refers to parts of a computer application or a program's code that allow it to operate and that cannot be accessed by a user. Most data and operating syntax are stored and accessed in the **back end** of a computer system.

Pre-processing :Pre-processing is the method to convert the data image to a picture that is bettersuited for extracting features.

CNN Model : A Convolutional Neural Network (ConvNet/**CNN**) is a Deep Learning algorithm which can take in an input image, assign importance (learnable weights and biases) to various aspects/objects in the image and be able to differentiate one from the other.

V. RESULTS

In this section, we discuss the results achieved by our Convolutional Neural Network model. The primary goal of our approach was to Recognise Kannada handwritten characters among the images given by the users . The system infrastructure used to perform training and testing was an Intel core i5 10 th generation, 8 GB of RAM, with Windows 10 system without a graphical processing unit (GPU). In the training and testing processes, each individual image is fed into the Convolutional Neural Network model as the input at a time. Where we have label the data manually, Images from the dataset is independently split into two subsets of training and testing sets. The training set is further divided into 80% training set and 20% validation set, in each of the CNN training phase. With successive epochs we aim to increase the accuracy.

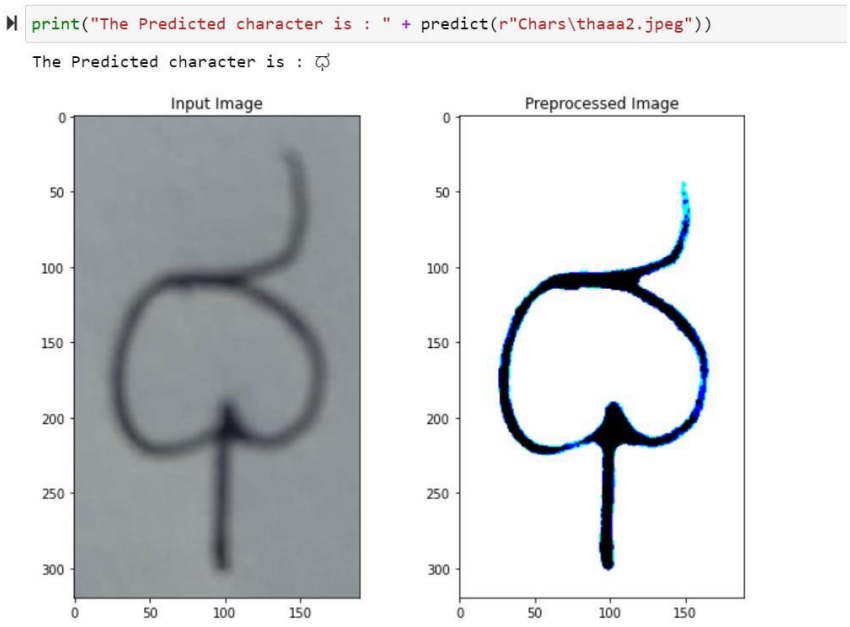

Fig 2:Sample Outputs

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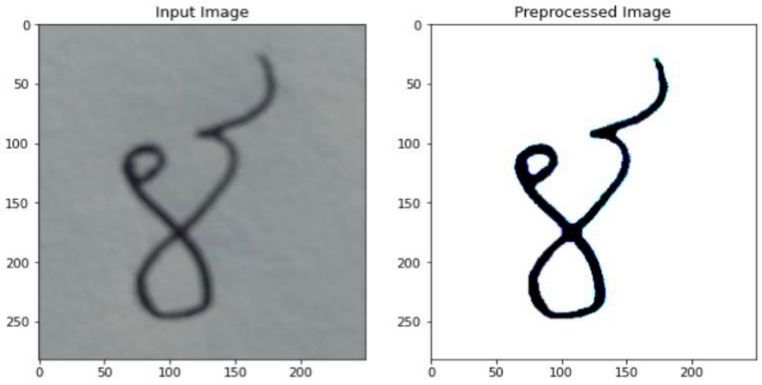
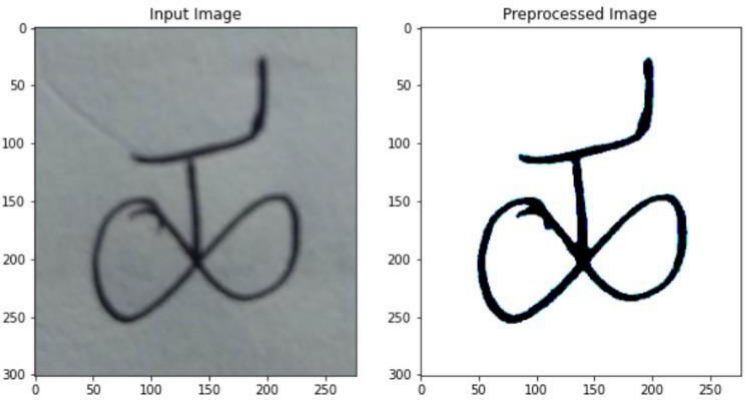
```
print("The Predicted character is : " + predict(r"Chars\laa2.jpeg"))
```

```
The Predicted character is : ಳ
```



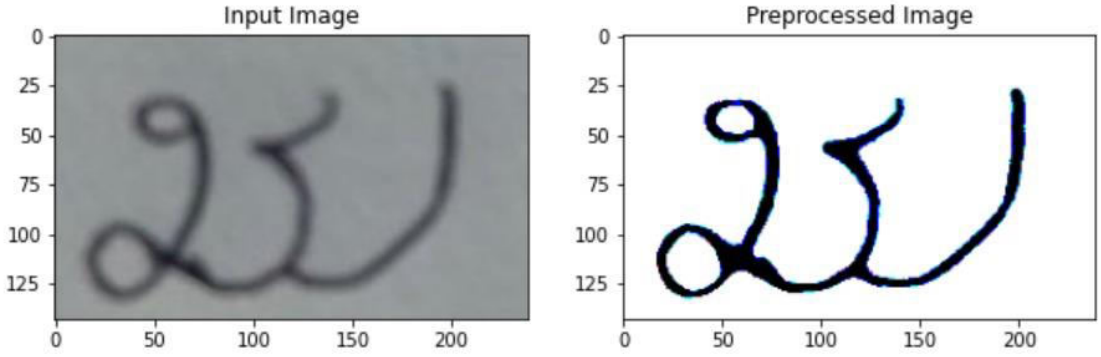

```
print("The Predicted character is : " + predict(r"Chars\Haa2.jpeg"))
```

```
The Predicted character is : ಹ
```




```
print("The Predicted character is : " + predict(r"Chars\Cha2.jpeg"))
```

```
The Predicted character is : ಚ
```



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	A	B	C
1	001	ಅ	Sample001
2	002	ಆ	Sample002
3	003	ಇ	Sample003
4	004	ಈ	Sample004
5	005	ಉ	Sample005
6	006	ಊ	Sample006
7	007	ಋ	Sample007
8	009	ಎ	Sample009
9	010	ಏ	Sample010
10	011	ಐ	Sample011
11	012	ಒ	Sample012
12	013	ಓ	Sample013
13	014	ಔ	Sample014
14	015	ಅಂ	Sample015
15	018	ಕ	Sample018
16	035	ಖ	Sample035
17	052	ಗ	Sample052
18	069	ಘ	Sample069
19	086	ಙ	Sample086
20	103	ಚ	Sample103
21	120	ಛ	Sample120
22	137	ಜ	Sample137
23	154	ಝ	Sample154
24	171	ಞ	Sample171
25	188	ಟ	Sample188

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26	205	ಠ	Sample205
27	222	ಡ	Sample222
28	239	ಢ	Sample239
29	256	ಣ	Sample256
30	273	ತ	Sample273
31	290	ಥ	Sample290
32	307	ದ	Sample307
33	324	ಧ	Sample324
34	341	ನ	Sample341
35	358	ಪ	Sample358
36	375	ಫ	Sample375
37	392	ಬ	Sample392
38	409	ಭ	Sample409
39	426	ಮ	Sample426
40	443	ಯ	Sample443
41	460	ರ	Sample460
42	494	ಲ	Sample494
43	545	ವ	Sample545
44	562	ಶ	Sample562
45	579	ಷ	Sample579
46	596	ಸ	Sample596
47	613	ಹ	Sample613
48	511	ಳ	Sample511

Fig 3: Labelled Data sets

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VI. CONCLUSION AND FUTURE WORK

The proposed method classifies and identifies the kannada handwritten characters using deep learning method. Thismethod gives an easy way to the user . Those works are handled by the Neuralnetwork, which is brain of the deep learning model. This reduces the burden on the user making the work more promising. With capsule network the model trained with a good amount of data is able to recognise the kannada handwritten characters. For features extraction Convolutional Neural Network (CNN) model is used on Chars74K dataset and achieved 98% accuracy for thedocument containing non-overlapping lines of characters.As a measure, improvising the resolution of dataset further may show enhanced accuracy. Also increase in number of instances with respect to every class will further show higher recognition rate.

The future implementations can be to recognise the words and later recognizing sentences. The next stage will be understanding the sentences and giving satisfying answers. Once the network is able to understand the sentences, model can be trained to summarise the context of the given text input or to translate the input into some other languages.

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