

DEEP LEARNING APPROACH ON WRITER RECOGNITION

Project by

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Introduction

Writer recognition refers to the process of identifying or verifying the identity of an individual based on their unique writing style or handwriting. It involves analyzing various characteristics and features of a person's writing, such as the shape, size, slant, spacing, pressure, and rhythm of their handwriting, as well as their choice of words, grammar, punctuation, and overall writing style.

Writer recognition plays a significant role in several fields due to its importance in forensic analysis, document examination, and machine learning applications. writer recognition has significant implications in forensics, document analysis, identity verification, machine learning, and even historical and literary research. Its applications help establish authorship, detect fraud, ensure document integrity, and automate various processes that involve the analysis of handwriting or writing style.

Motivation

- ▶ Shortage of Research in Native Indian Language Recognition
- ▶ Authentication of Manuscripts
- ▶ Forensic Analysis and Law Enforcement
- ▶ Plagiarism Verification

Deep Learning

Deep learning is a subfield of machine learning that focuses on training artificial neural networks to learn and make predictions or decisions from large amounts of data. It is inspired by the structure and function of the human brain and aims to mimic the learning process of the brain's neural networks.

Convolutional Neural Network

Convolutional Neural Network(CNN) is a specialized type of neural network commonly used for analyzing visual data, such as images or videos. CNNs are designed to automatically learn and extract relevant features directly from the raw input data, without the need for explicit feature engineering.

ReLU

ReLU stands for Rectified Linear Unit. It is an activation function commonly used in neural networks, especially in deep learning models. The ReLU function introduces non-linearity to the network, allowing it to learn complex patterns and make more accurate predictions.

Software Used

- ▶ Python 3.8
- ▶ TensorFlow 2.0
- ▶ Keras
- ▶ NumPy
- ▶ Pandas
- ▶ Matplotlib
- ▶ SeaBorn

Hardware Used

- ▶ HP Pavilion with 2.7GHz Quad-Core Intel i5, Integrated Graphics Card, 8GB RAM
- ▶ Dell G3 with 2.6GHz Hexa-Core Intel i7 Processor, Integrated Graphics Card, 8GB RAM
- ▶ Asus Vivobook 2GHz Quad-Core AMD Ryzen 5 Processor, Integrated Graphics Card, 8GB RAM

Significance of the Hardware

- ▶ RAM and Processor for Processing Speed
- ▶ GPU Might Help
- ▶ Cloud Platforms is a great alternative

Our Contribution through Present Work

Our key contribution has been the development of a model that uses advanced techniques to try recognize writers based on their handwriting.

DATASET

- ▶ Dataset provided by CSE Department
- ▶ Language: Bangla
- ▶ Handwritten Passage
- ▶ Passages scanned into images

Preparation of Data Set

- ▶ Data Segmented into Word-Sized Images
- ▶ Number of writers: 100 for Bangla language
- ▶ 5 Sets of Data for Each Author
- ▶ 3 Training Sets and 2 Testing Sets
- ▶ Tagged Image File Format(TIFF)
- ▶ Format: <Writer Code>_<Set Number>_<Image Number>

Example of Word Segmented Data



Fig 2.
0000_01_0.tiff

Image Pre-processing



About VGG16 Model

- ▶ Proposed by Simonyan and Zisserman in 2014 [2]
- ▶ 92.7% accuracy with the ILSVRC subset of ImageNet Database
- ▶ 1st and 2nd place in ILSVRC 2014
- ▶ VGG = Visual Geometry Group
- ▶ 16 Neural Network Layers
- ▶ 13 Convolutional Networks
- ▶ 3 Dense Networks
- ▶ Takes 224 x 224 pixel Images with RGB as an Input

Architecture of VGG16 Model

**1.Input:
224 x 224
RGB
Images**

1.2
ConvNets
with 64
filters and
ReLU
Activation
Function;
Output is
MaxPooled

2
ConvNets
with 128
filters and
ReLU
Activation
Function;
Output is
MaxPooled

3
ConvNets
with 256
filters and
ReLU
Activation
Function;
Output is
MaxPooled

3
ConvNets
with 512
filters and
ReLU
Activation
Function;
Output is
MaxPooled

3
ConvNets
with 512
filters and
ReLU
Activation
Function;
Output is
MaxPooled

2 Dense
Neural
Nets with
4096 units
and ReLU
Activation
Function

1 Dense
Neural Net
with 1000
units and
SoftMax
Activation
Function

**1.Output:
Category
(1000 in
the
ImageNet
Database)**

Benefits of VGG16

- ▶ Very accurate
- ▶ Simple and Uniform
- ▶ Popular

Challenges of VGG16

- ▶ Slow to Train
- ▶ Huge Weights
- ▶ Exploding gradients problem

Accuracy

- ▶ After patiently training all our writers with VGG16, we have achieved the stratified outcome given below:

Model	Accuracy
VGG16	62.75%

Table 1. Stating accuracy of the given model

VGG16: Graphical Interpretation

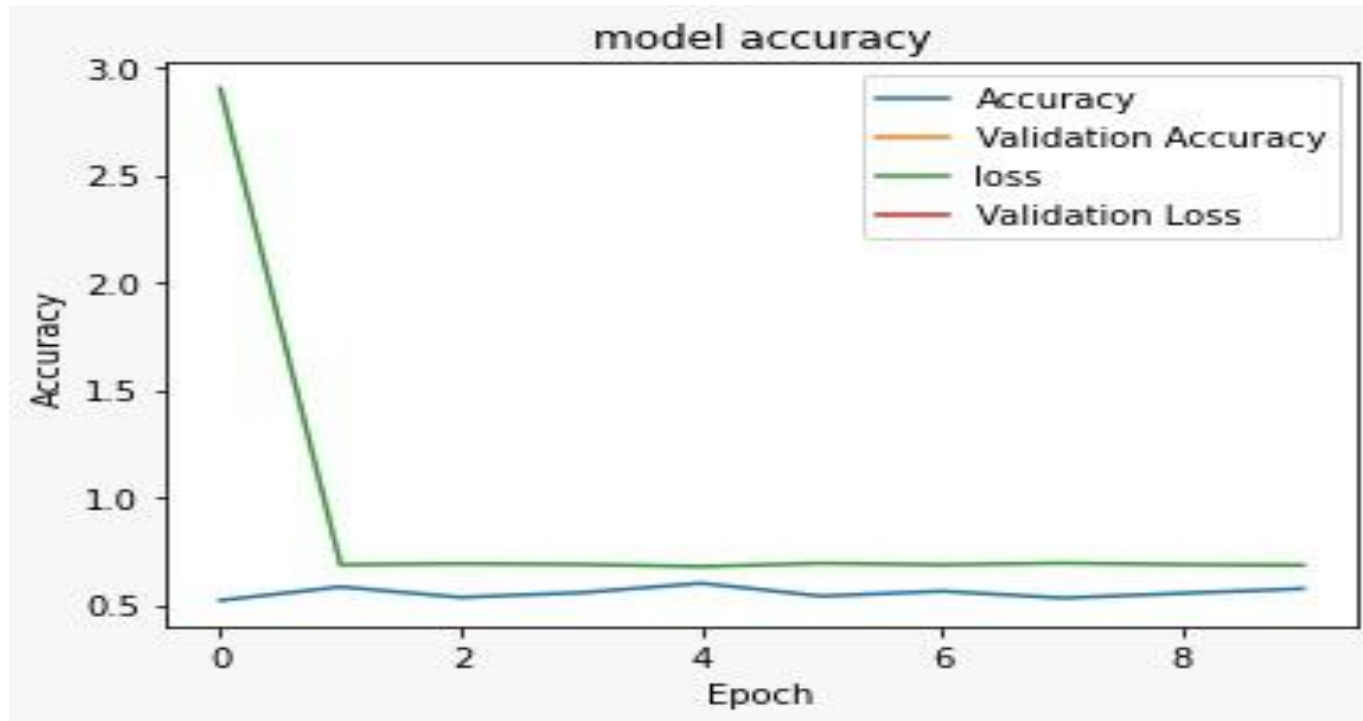


Fig 1. Graph depicting accuracy, validation accuracy, loss and validation loss over multiple epochs

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THANK YOU!