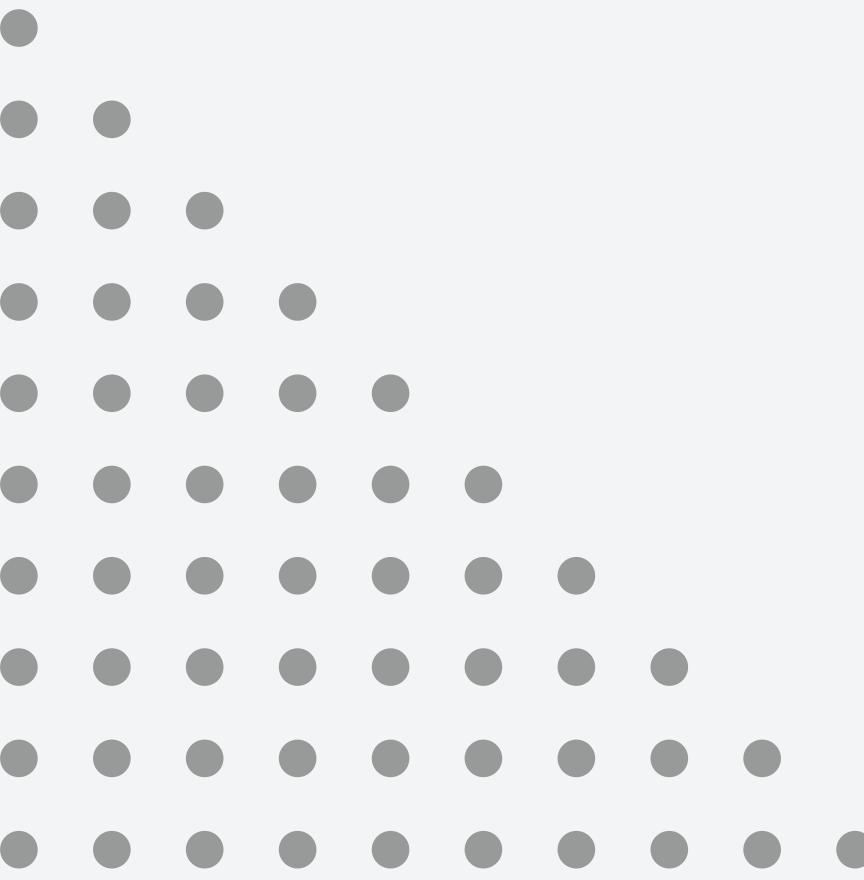


HANDWRITTEN TEXT RECOGNITION USING DEEP LEARNING

**SAVIO K JAMES
M22CA002**

CONTENT

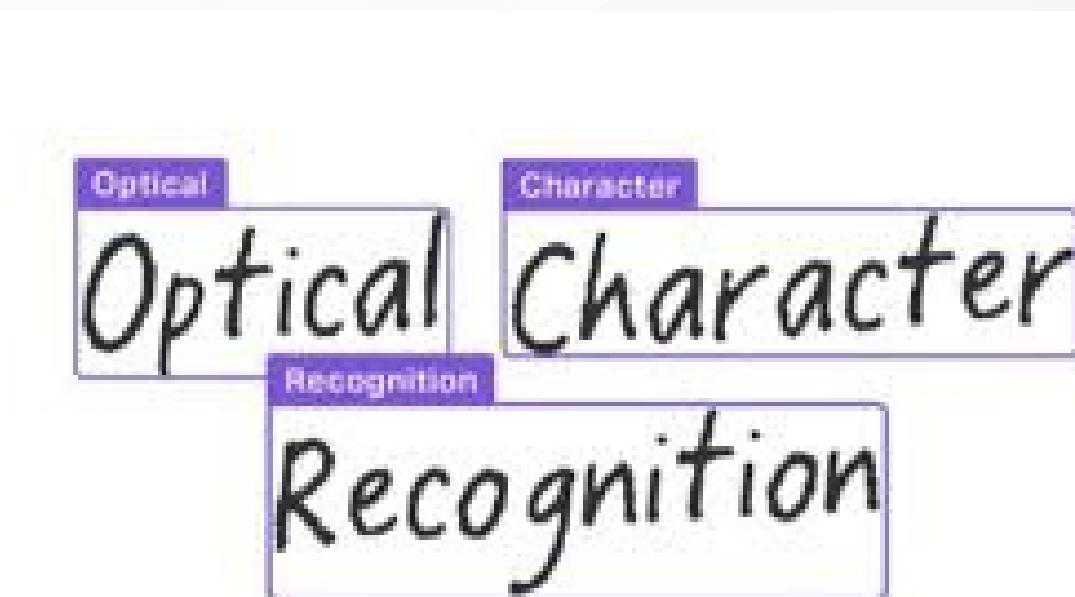
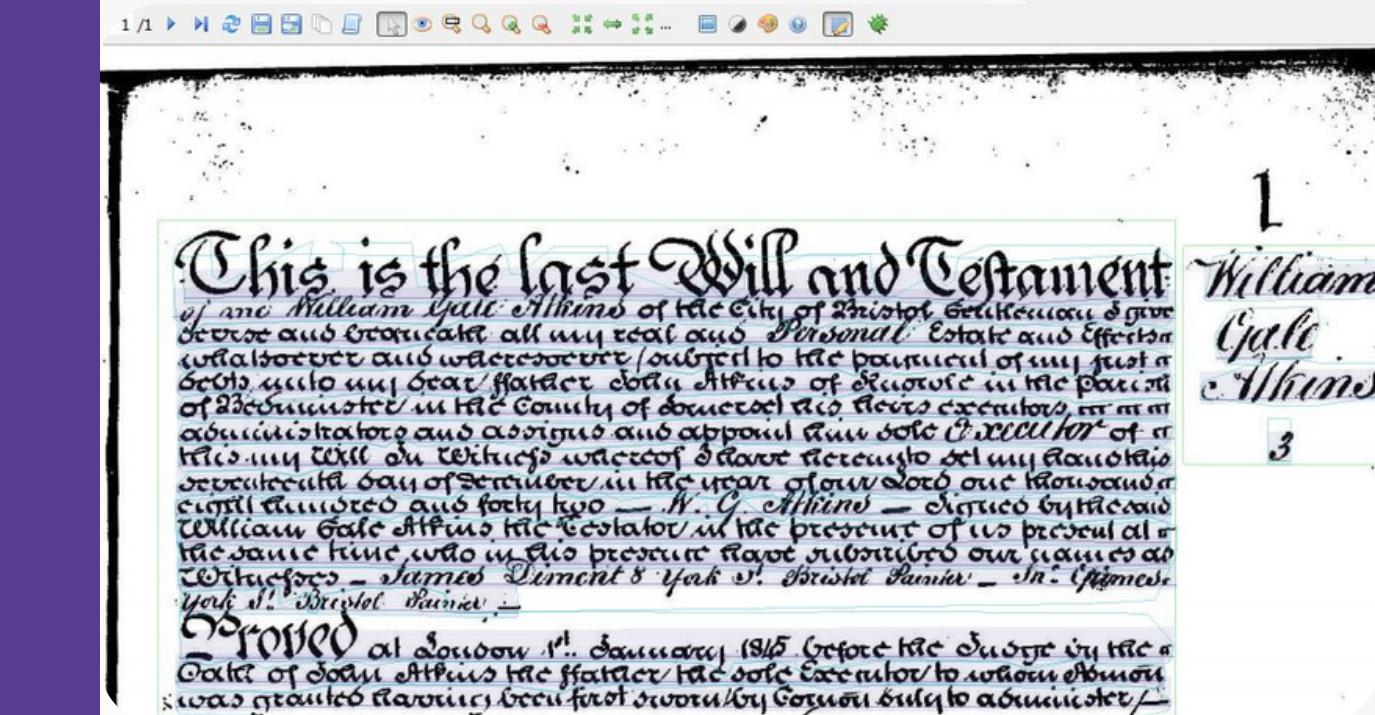
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INTRODUCTION

Handwritten text recognition(HTR) is the technique of recognizing and interpreting handwritten data into machine-readable output.

- Inputs include paper document, handwritten photograph or from input devices



CHALLENGES IN HANDWRITING RECOGNITION

01

Huge variability and ambiguity of strokes from person to person

02

Handwriting style of an individual person also varies time to time and is inconsistent

03

Cursive handwriting makes separation and recognition of characters challenging

04

Poor quality of the source document/image due to degradation over time

05

Text in printed documents sit in a straight line whereas humans need not write a line of text in a straight line on white paper

06

Text in handwriting can have variable rotation to the right which is in contrast to printed text where all the text sits up straight

Literature Review Paper 1

Bora, Mayur & Daimary, Dinthisrang & Amitab, kh & Kandar, Debdatta. (2020). Handwritten Character Recognition from Images using CNN-ECOC. *Procedia Computer Science.* 167. 2403-2409. [10.1016/j.procs.2020.03.293](https://doi.org/10.1016/j.procs.2020.03.293)

Name of the Architecture	Training Accuracy	Testing accuracy
LeNet of Type 1	74.63%	73.78%
LeNet-ECOC of Type 1	67.43%	67.43%
LeNet of Type 2	89.00%	85.86%
LeNet-ECOC of Type 2	85.88%	85.88%
AlexNet	98.97%	97.06%
AlexNet-ECOC	97.71%	97.71%
ZfNet	99.65%	97.65%
ZfNet-ECOC	97.71%	97.71%

Architecture

- LeNet-ECOC
- AlexNet-ECOC
- ZfNet-ECOC

Dataset Used

- NIST handwritten character dataset

Conclusion

- **AlexNet is the most suitable CNN for combining with ECOC**

Literature Review Paper 2

R. Parthiban, R. Ezhilarasi, and D. Saravanan, "Optical Character Recognition for English Handwritten Text Using Recurrent Neural Network," 2020 International Conference on System, Computation, Automation and Networking (ICSCAN), Pondicherry, India, 2020, pp. 1-5, doi: 10.1109/ICSCAN49426.2020.9262379.

Architecture	Dataset Used	Conclusion
• RNN (LSTM)	• IAM handwritten dataset	• ACCURACY OF 90%

Literature Review Paper 3

Nikitha, Amala et al. "Handwritten Text Recognition using Deep Learning." 2020 International Conference on Recent Trends on Electronics, Information, Communication \& Technology (RTEICT) (2020): 388-392.

Methods	Character Error Rate	Word Error Rate
2DLSTM	8.2	27.5
CNN-1DLSTM- CTC	6.2	20.5

Architecture

- 2DLSTM
- CNN-1DLSTM- CTC

Dataset Used

- IAM handwritten dataset

Conclusion

- CNN-1DLSTM- CTC has lower error rate

COMPARISION OF PAPERS

TITLE	YEAR	PUBLISHER	SUMMARY
HANDWRITTEN CHARACTER RECOGNITION FROM IMAGES USING CNN-ECOC	2020	ELSEVIER	AlexNet is the most suitable CNN for combining with ECOC
OPTICAL CHARACTER RECOGNITION FOR ENGLISH HANDWRITTEN TEXT USING RECURRENT NEURAL NETWORK	2020	IEEE	LSTM has an accuracy of 90%
HANDWRITTEN TEXT RECOGNITION USING DEEP LEARNING	2020	IEEE	CNN-1DLSTM- CTC has lower error rate

PROJECT PROPOSAL

The project involves integrating well-established CNN architectures (AlexNet, LeNet, and ZfNet) with Long Short-Term Memory (LSTM) networks, creating a hybrid model capable of recognizing intricate features and temporal dependencies in handwritten text.

Each CNN-LSTM architecture will be trained and fine-tuned using the IAM dataset, a benchmark in the field of handwritten text recognition

IAM HANDWRITTEN DATASET



657 WRITERS
CONTRIBUTED
SAMPLES OF
THEIR
WRITINGS.



13353
ISOLATED AND
LABELED TEXT
LINES



115320
ISOLATED AND
LABELED
WORDS.

EXAMPLES FROM DATASET

Label: with

with

Label: Miss

Miss

Label: Mr.

Mr.

Label: service

service

Label: as

as

Label: along

along

Label: trial

trial

Label: that

that

Label: secret

secret

Label: Robert

Robert

Label: Naples

Naples

Label: comically

comically

Label: the

the

Label: realism

realism

Label: qualities

qualities

Label: death

death

APPLICATIONS

HEALTHCARE AND PHARMACEUTICALS

- Patient prescription digitization
- patient enrollment and form digitization

BANKING

- cheque processing
- Verify the entries like signature and date

ONLINE LIBRARIES

- key role in bringing alive the medieval and 20th century documents, postcards, research studies etc. into modern day technology

INSURANCE

- delay in processing the claim can impact the company terribly.

CONCLUSION

This project aims to contribute a reliable Handwritten Text Recognition Android application by evaluating and comparing the performance of CNN-LSTM architectures

THANK YOU