HANDWRITTEN DIGIT RECOGNITION SYSTEM

AI PROJECT 2023

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OBJECTIVES

To recognize handwritten digits using artificial intelligence.

Creating training files, in which the characters are reduced, and presented to the net.

What is Handwriting Recognition?

- Handwriting Recognition (HWR) is the capability of computers and mobile devices to receive and interpret handwritten inputs.
- The inputs might be offline (scanned from paper documents, images, etc.) or online (sensed from the movement of pens on a special digitizer, for example).
- Where traditional techniques focus on segmenting individual characters for recognition, modern techniques focus on recognizing all the characters in a segmented line of text.
- Particularly they focus on machine learning techniques that are able to learn visual features, avoiding the limiting feature engineering previously used.
- State-of-the-art methods use convolutional networks to extract visual features over several overlapping windows of a text line image which a recurrent neural network uses to produce character probabilities.

Challenges of handwriting recognition

Varied language models

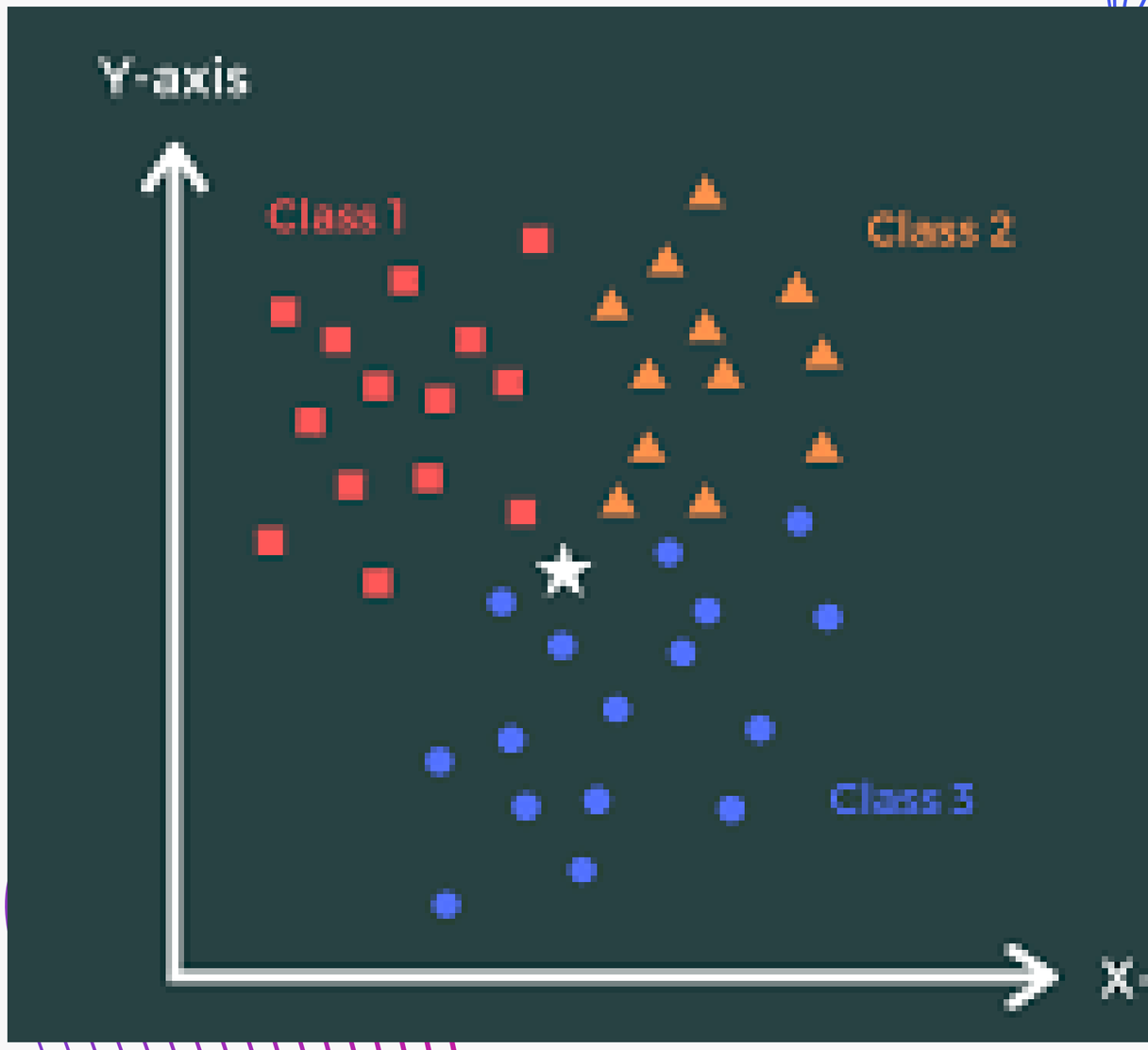
Due to a large set of manuscripts caused by the variety of languages and scripts that differ from region to region, the scope of handwriting recognition is limited and requires a complete review of the converted text to preserve the original manuscript in the electronic format.

Great variability

Handwriting changes from person to person. The strokes, irregularities, spacing of letters and characters, and block or cursive handwriting make it hard for handwriting recognition technologies to achieve accuracy.

Poor image quality

The quality and accuracy of converted text depend on the quality of the image and the noise present, making it harder to process older documents that degrade with time.



Handwriting Recognition Techniques and Supporting Architecture

K-Nearest Neighbor (KNN) Algorithm

1	K-Nearest Neighbour is one of the simplest Machine Learning algorithms based on Supervised Learning technique.
2	K-NN algorithm assumes the similarity between the new case/data and available cases and put the new case into the category that is most similar to the available categories.
3	K-NN algorithm stores all the available data and classifies a new data point based on the similarity. This means when new data appears then it can be easily classified into a well suite category by using K- NN algorithm.
4	K-NN algorithm can be used for Regression as well as for Classification but mostly it is used for the Classification problems.
5	It is also called a lazy learner algorithm because it does not learn from the training set immediately instead it stores the dataset and at the time of classification, it performs an action on the dataset.
6	K-NN is a non-parametric algorithm, which means it does not make any assumption on underlying data.

IMPLEMENTATION

STEPS:

1. Import the libraries and load the dataset
2. Preprocess the data
3. Create the model
4. Train the model
5. Evaluate the model
6. Create GUI to predict text

Numpy

A Python library used for working with arrays. It also has functions for working in domain of linear algebra, fourier transform, and matrices.

Pandas

A Python library used for working with data sets. It has functions for analyzing, cleaning, exploring, and manipulating data

Seaborn

Seaborn is a Python data visualization library based on matplotlib. It provides a high-level interface for drawing attractive and informative statistical graphics.

Matplotlib

Matplotlib is a comprehensive library for creating static, animated, and interactive visualizations in Python.

APPLICATIONS IN REAL LIFE

Multiple industries have already started adopting this technology including banking, retail, insurance, healthcare and even logistics companies.

- **A** Assistive technology for blind and visually impaired users
- **B** Handwritten form recognition
- **C** Storage of bills and customer transaction history in retail industry
- **D** National ID number recognition system
- **E** Automatic license plate recognition system for parking lot management system
- **F** Online banking
- **G** Extracting business card information into contact list
- **H** Make electronic images of printed documents searchable

CONCLUSION

- Handwriting recognition technology is at the forefront of AI research.
- It’s useful across multiple industries, allowing for better data storage, quicker information retrieval, accessibility, and more effective business processes.
- New advances in machine learning are constantly improving the accuracy of handwriting recognition.

THANK YOU