K. J. Somaiya College of Engineering, Mumbai

(A Constituent College of Somaiya Vidyavihar University)

ANNFS IA1

Pattern Classification for Recognition of Handwritten Characters

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Real Life Applications

Where?

•Reading support for the blind
•Recording bank cheque numbers
•Reading documents in academic institutes
•Vehicle number plate recognition at toll booth

•Validating signatures

How?

- Feature extraction using Multilayer Feed Forward Neural Network
- Character separation
- Scaling of each character
- Space detection
- Line detection

Steps in implementation of HCR

1. Pre Processing
    1. Denoising
    2. Scanning and Skeletonization (reducing to thin lines)
    3. Normalization (equal matrix dimensions)
2. Feature Extraction (boundary detection)
    1. Segmentation, Scaling and Space detection
3. Neural Network Classification

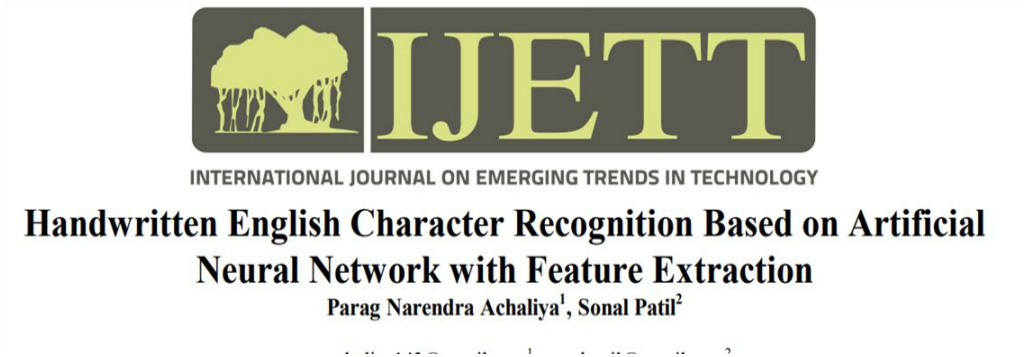
Feature Extraction...

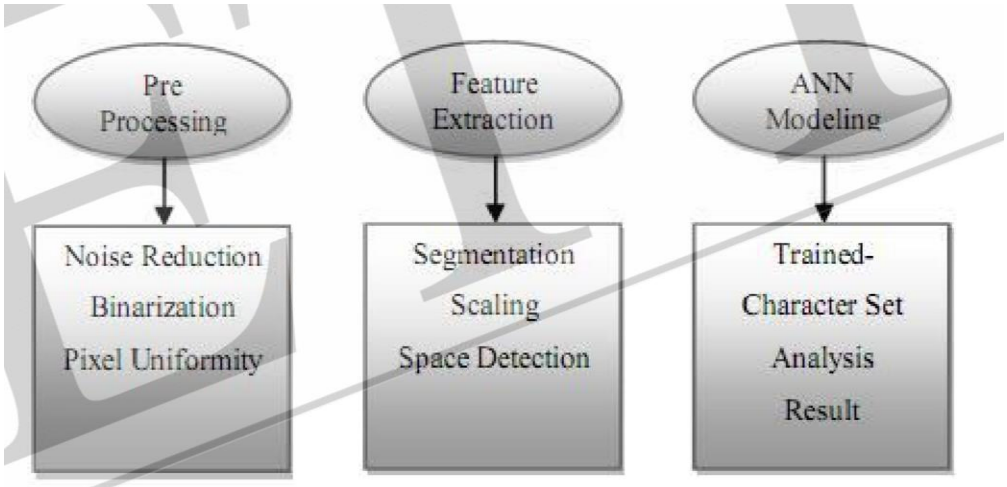
- Too much data, not much information

- Special form of dimensionality reduction

- Transforming the input data into the set of features

- Input data transformed into a reduced representation set





- 3 methods for HCR:
  - Single Voting
  - Multiple Voting
  - Class Distance

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Handwritten English Character Recognition Using Neural Network

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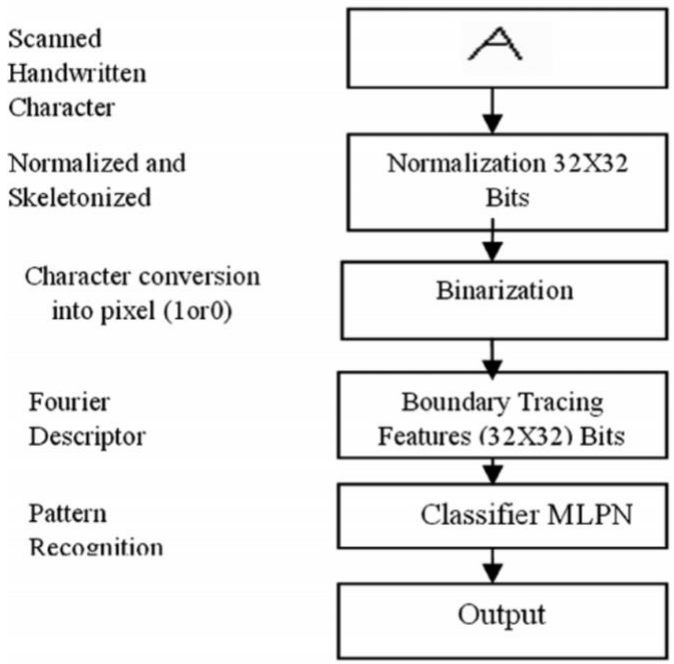

- Feature extraction using 8 neighbour adjacent method (boundary detection)
- Boundary coordinates are stored in an array to compute Fourier Descriptors

Handwritten Character Classification and Recognition using Neural Network

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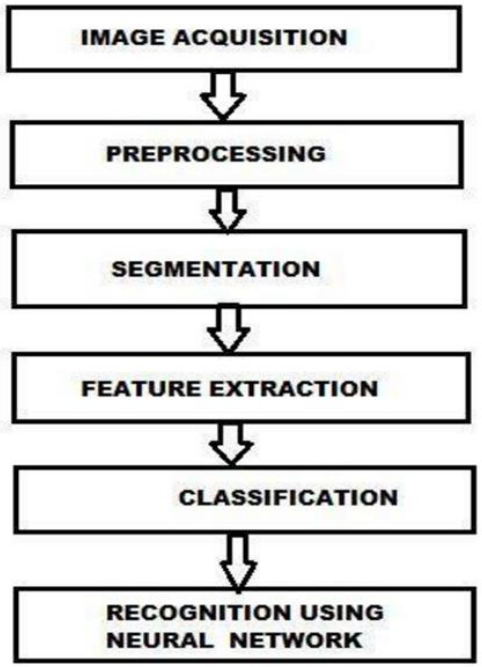
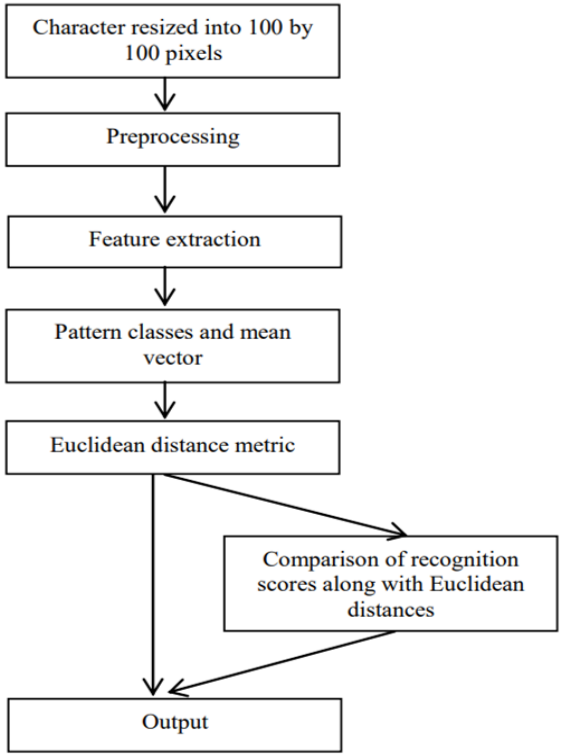


- Segmentation
  - Dividing an image into its constituent regions or objects
  - Point, line & edge detection methods

Improving the Recognition of Handwritten Characters using Neural Network through Multiresolution Technique and Euclidean Distance Metric

D. K. Patel T. Som M. K. Singh



- Feature extraction
  - Multiresolution using wavelet transform
- Minimum Distance Classifier
- Fusion of input image with weight matrix to generate recognition score in case of misclassification

International Conference on Computational Intelligence and Data Science (ICCIDS 2019)

Handwritten Character Recognition from Images using CNN-ECOC

Mayur Bhargab Bora, Dinthisrang Daimary, Khwairakpam Amitab*, Debdatta Kandar

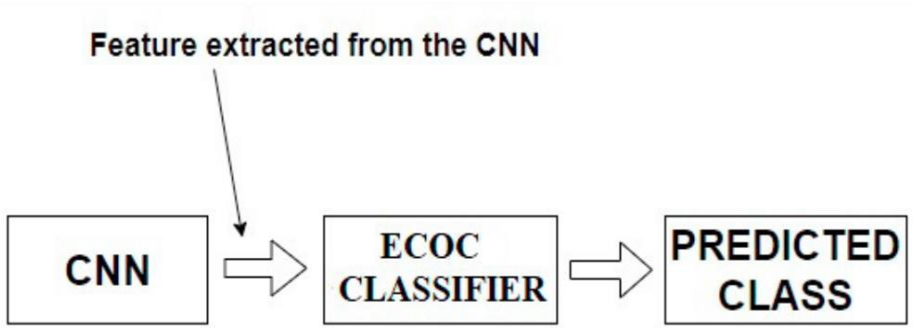


Fig. 1: CNN-ECOC Classifier

- CNN for feature extraction and ECOC for recognition of characters
- ECOC - Error Correcting Output Codes
  - Reframing multi-class classification problem to multiple binary classification problem
- ReLU - activation function
- Pooling layer
  - To reduce spatial size of each feature map
  - Min, avg and max pooling
- Popular CNN Architectures:
  - AlexNet
  - ZfNet
  - LeNet

Future Scope

- Electric form Filling
- Automated music symbol notation reader
- Solving handwritten mathematical equations
- Biometrics and forensics

References ...

1. D K Patel, T. Som, M.K Singh ‘Improving the Recognition of Handwritten Characters using Neural Network through Multiresolution Technique and Euclidean Distance Metric’
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3. Sujithsree P S, Prof: C Venugopal ‘Handwritten Character Classification and Recognition using Neural Network’
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THANK YOU!

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