**Literature Survey:**

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| **Sr. No** | **Title of Paper** | **Name of Authors** | **Published Year** | **Remarks** |
| 1 | Handwritten Digit Recognition Using CNN | Mayank Jain, Gagandeep Kaur, Muhammad Parvez Quamar, Harshit Gupta | 2021 | * MNIST data contains about 70,000 images of handwritten digits from 0-9. So, it is a class 10 classification model. This dataset is divided into 2 parts i.e. Training and Test dataset. Image representation as 28\*28 matrix where each cell contains grayscale pixel value. * For pre-processing the data, the image is converted from RGB to Gray scale for easy computation by dividing with 255-pixel value to get the value between 0-1. * The layers of CNN are (a) Convolutional Layer (b) ReLu Layer (c) Pooling Layer (d) FullySo, taken a batch of 200 with The nun class of 10 (because we have images from 0-9) and an epoch of 5 Connected Layer. * The preparation boundary utilized here has a learning pace of 0.02 and epochs of 5. * The most elevated acknowledgment exactness accomplished is with CNN design having four layers, is 99.16% for the component. * The model is working up to the mark with the prediction rate at 99% accurate. * Acknowledgment pace of 99.89% is accomplished with the Adam analyzer for the MNIST information base, which is superior to all recently revealed outcomes. |
| 2 | Mobile Client- Server Approach for Handwriting  Digit Recognition | Hasbi Ash Shiddieqy, Trio Adiono,  Infall Syafalni | 2019 | * The advantage of using client- server approach is reducing power and time for processing handwriting recognition in client device. * It also speeds up the time of development and implementation of algorithm on the Server. * Pattern recognition applied is based on a neural network with backpropagation training. * Development is divided into two parts. First is training model in server side and the second is user interface with android client. * The images sent to Server via TCP connection. The recognition engine consists of 2 architecture ANN and CNN. * The proposed CNN model is based on Lecun2 architecture with decreased parameter for faster respond without losing accuracy. * Testing of CNN model with real user data from android and resulted 56% accuracy. * The accuracy of CNN is nearly 1, while ANN is around 0.93. * The system operates and is capable to classify handwritten digits with an accuracy of 99% in the test data MNIST and 56% in real user data from android. |
| 3 | HDSR-Flor: A Robust End-to-End System to Solve the Handwritten Digit String Recognition Problem in Real Complex Scenarios | ARTHUR FLOR DE SOUSA NETO,  BYRON LEITE DANTAS BEZERRA, ESTANISLAU BAPTISTA LIMA, ALEJANDRO HÉCTOR TOSELLI2 | 2020 | * A new Gated Convolutional Recurrent Neural Network using CTC (Gated-CRNN-CTC) as optical model for HDSR. * CNNs have been used to overcome the limitations of HMMs, as well as the BLSTM Layers has been widely used for the propagation of features, due to its low complexity and high performance achieved. * The proposed optical model is a three-step pipeline based on HTR systems, applied to the HDSR context. * The three steps are composed by capture, propagation, and decoding of features. * The arrangement of the CAR-A dataset that provided the best precision results were 90%/10%, forcthe proposed optical model and Puigcerver model, while 80%/20% for Bluche model. * The optical models reached 97.49%, 96.82% and 94.57%, respectively. * It is worth mentioning that the proposed optical model maintained high precision even with low data, as in the case of arrangements 20%/80% and 10%/90%, with only 402 and 201 data for training, respectively. * The authors have used RMSprop optimizer with the learning rate of 0.001 and mini-batches of 8 images per step. * Reduce Learning Rate on Plateau (factor 0.1) and Early Stopping mechanisms were also applied after 10 and 20 epochs, respectively, without improving the value of the loss of validation. |