



# DESIGN THINKING

## HANDWRITTEN DIGIT RECOGNITION FOR ATTENDANCE ASSISTANCE

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# ABSTRACT

- Handwritten Digit Recognition (HDR) is the process of converting images of handwritten digit into digital format. A lot of money is wasted on converting the information that is in paper to digital format. This problem can be solved by using HDR.
- The heart of our project lies within the ability to develop an efficient algorithm that can recognize the handwritten digits which are scanned and sent as input by the user.
- Our aim is to demonstrate HDR through attendance assistance.

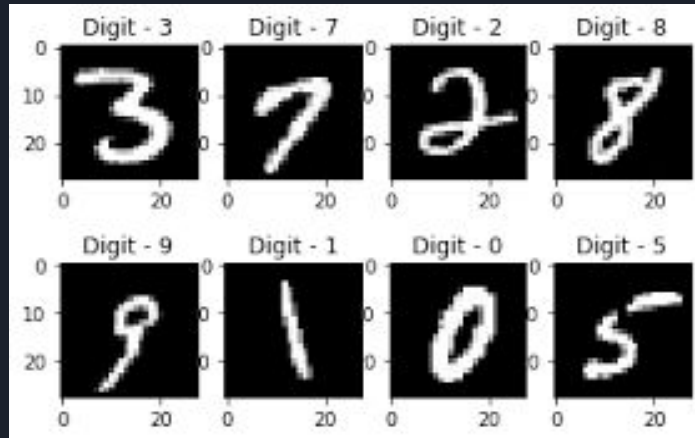


# INTRODUCTION

- Handwritten digit recognition has not only professional and commercial applications, but also has practical application in our daily life and can be of great help to the visually impaired. It also helps us to solve complex problems easily thus making our lives easier .
- Handwritten Digit Recognition (HDR) is the ability of a machine to recognize human handwritten digits. It is a hard task for a machine because handwritten digits are not perfect. So, the solution to this problem is our project that uses the image of a digit and recognizes the digit present in the image.

# OBJECTIVE

- Recognizing roll nos. from pictures would help us to take attendance easily.
- It saves time from marking absent every single time to marking absent all at once.





# TERMINOLOGY

- CNN :- Convolutional Neural Networks are a type of Deep Learning Algorithm that take the image as an input and learn the various features of the image through filters.
- CONVOLUTIONAL LAYER:- A convolutional layer contains a set of filters (or kernels), parameters of which are to be learned throughout the training. Each filter convolves with the image and creates an activation map.
- KERNEL:- Small matrix whose height and width is smaller than the image that needs to be combined.
- POOLING LAYER:- Pooling layers are used to reduce the dimensions of the feature maps. It summarises the features present in a region of the feature map generated by a convolution layer.
- FULLY CONNECTED LAYER (FC LAYER):-The Fully Connected (FC) layer consists of the weights and biases along with the neurons and is used to connect the neurons between two different layers.
- MNIST :-The MNIST database (Modified National Institute of Standards and Technology database) is a large database of handwritten digits that is commonly used for training various image processing systems.



# METHODOLOGY

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 DIGITS

# PICTORIAL REPRESENTATION

A computer sees an image as an array of numbers. The matrix on the right contains numbers between 0 and 225, each of which corresponds to the pixel brightness in the left image. Both are overlaid in the middle image.



0	2	15	0	0	11	10	0	0	0	9	9	0	0	0
0	0	0	4	60	157	236	255	255	177	95	61	32	0	29
0	10	16	119	238	255	244	245	243	250	249	255	222	103	10
0	14	170	255	255	244	254	255	253	245	255	249	253	251	124
2	98	255	228	255	251	254	211	141	116	122	215	251	238	255
13	217	243	255	155	33	226	52	2	0	10	13	232	255	255
16	229	252	254	49	12	0	0	7	7	0	70	237	252	235
6	141	245	255	212	25	11	9	3	0	115	236	243	255	137
0	87	252	250	248	215	60	0	1	121	252	255	248	144	6
0	13	113	255	255	245	255	182	181	248	252	242	208	36	0
1	0	5	117	251	255	241	255	247	255	241	162	17	0	7
0	0	0	4	58	251	255	246	254	253	255	120	11	0	1
0	0	4	97	255	255	255	248	252	255	244	255	182	10	0
0	22	206	252	246	251	241	100	24	113	255	245	255	194	9
0	111	255	242	255	158	24	0	0	6	39	255	232	230	56
0	218	251	250	137	7	11	0	0	0	2	62	255	250	125
0	173	255	255	101	9	20	0	13	3	13	182	251	245	61
0	107	251	241	255	230	98	55	19	118	217	248	253	255	52
0	18	146	250	255	247	255	255	255	249	255	240	255	129	0
0	0	23	113	215	255	250	248	255	255	248	248	118	14	12
0	0	6	1	0	52	153	233	255	252	147	37	0	0	4
0	0	5	5	0	0	0	0	0	14	1	0	6	6	0

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2	98	255	228	255	251	254	211	141	116	122	215	251	238	255
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0	13	113	255	255	245	255	182	181	248	252	242	208	36	0
1	0	5	117	251	255	241	255	247	255	241	162	17	0	7
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0	0	4	97	255	255	255	248	252	255	244	255	182	10	0
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