

# **A Final Year Project Work Proposal Defense**

**On**

## **MNIST based Handwritten Digit Recognition from Scratch**

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# Presentation Outline

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# About Project Topic

## Statement of Problem

- Handwritten Digit Recognition , a challenge for computer
- Lots of astonishing works have been done but many are based on high-level framework and libraries
- This project aims to design a efficient model from scratch that can classify a handwritten digit as accurately as possible.

## About Project

- The project intends to implement a Feedforward Neural Network model from scratch, that will be able to recognize the handwritten digits.

# About Project Topic

## Objectives

- To design a Multi-Layer FFNN Model that recognizes Handwritten digits (one at a time) with high accuracy.
- To properly analyze and optimize the designed model using different model improvement techniques and optimization algorithms.
- To implement the components of the project from scratch.

# Literature Review

Classifier	Error Rate(%)	Reference
Linear classifier (1-layer NN)	12	LeCun et al. 1998 [1]
K-NN with non-linear deformation (P2DHMDM)	0.52	Keysers et al. 2007 [5]
Virtual SVM, deg-9 poly, 2-pixel jittered	0.56	DeCoste and Scholkopf, 2002 [6]
2-layer NN, 800 HU, cross-entropy [elastic distortions]	0.7	Simard et al. 2003 [2]
6-layer NN 784-2500-2000-1500-1000-500-10 (on GPU) [elastic distortions]	0.35	Ciresan et al. 2010 [4]
Convolutional net Boosted LeNet-4, [distortions]	0.7	LeCun et al. 1998 [1]
Committee of 35 conv. net, 1-20-P-40-P-150-10 [elastic distortions]	0.23	Ciresan et al. CVPR 2012 [7]
Convolutional net With DropConnect	0.21	LeCun et al. ICML 2013 [8]

# Methodology

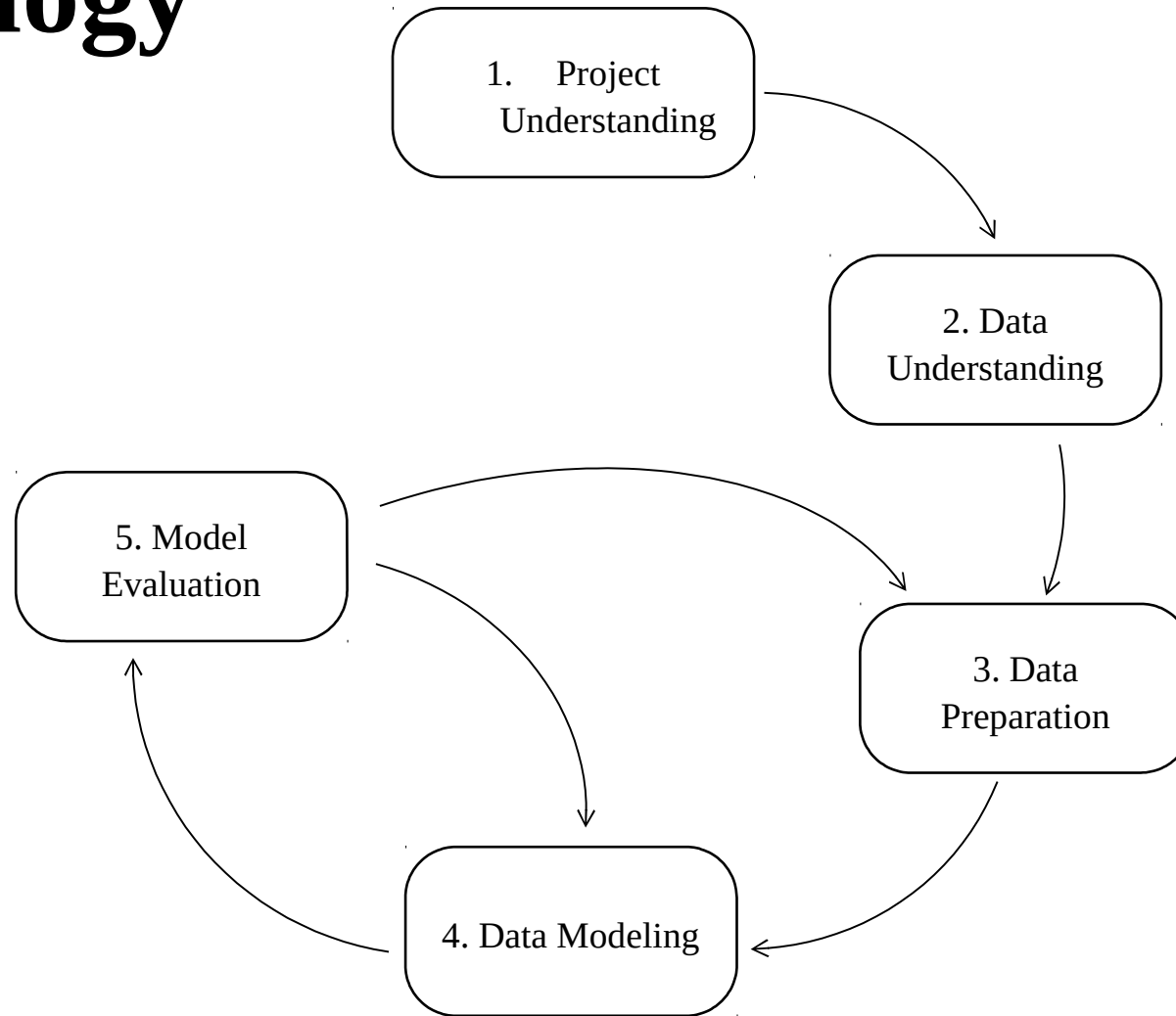
## Resource Requirements

1. **Hardware:** PC with Multi core CPU
2. **Software:** Python Programming Language with Numpy, Matplotlib and Scipy as its core packages, Anaconda Navigator

## Tools and Techniques

1. **Design Tools:** MS Visio ,MS Word 365
2. **Implementation Tools:** Jupyter Platform

# Methodology



CPMAI Based Process Model

# System Analysis

## Functional Requirements

- The model should be able to classify any new image of a handwritten digit with maximum accuracy.
- The model should not classify any alphabets and characters as a digit.



# System Analysis

## Data Description

- MNIST Database used.
- The database was consists of four files in binary(idx) file format
- Data after processing is split into Train/Dev and test set

Dataset	Processed Array size	Original Array Size
Training Set Image	(784, 60000)	(60000, 28, 28)
Training Set Label	(11, 60000)	(1, 60000)
Dev Set Image	(784, 5000)	(5000, 28, 28)
Dev Set Label	(11, 5000)	(1, 10000)
Test Set Image	(784, 5000)	(5000, 28, 28)
Test Set Label	(11, 5000)	(1, 10000)

# System Analysis

## Process Modeling

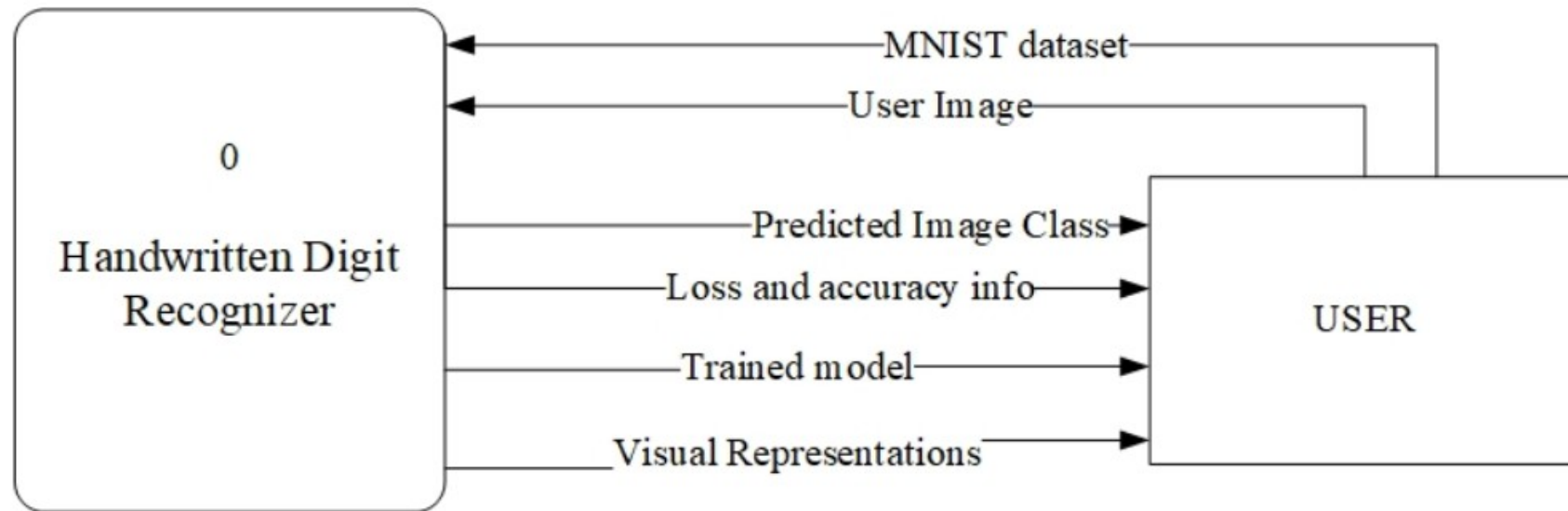


Fig: Context Diagram

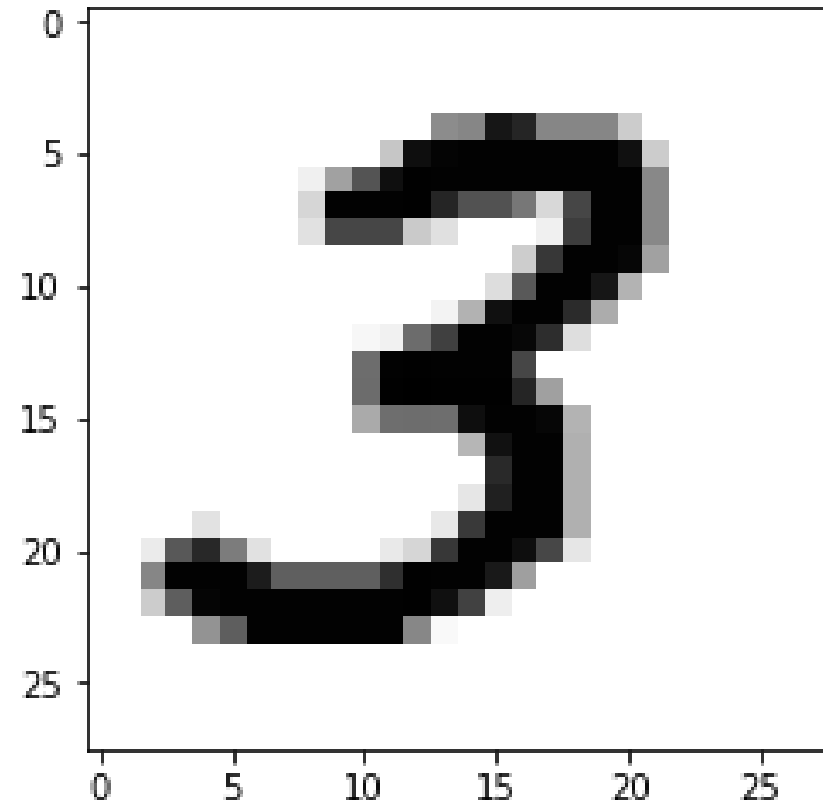
# Project Scheduling Plan

ID	Task Name	Start	Finish	Duration	Feb 2020		Mar 2020				Apr 2020				May 2020					
					16/2	23/2	1/3	8/3	15/3	22/3	29/3	5/4	12/4	19/4	26/4	3/5	10/5	17/5	24/5	
1	Project Selection	2/17/2020	2/23/2020	7d	<div></div>															
2	Domain Study and Collection of Literature	2/24/2020	3/4/2020	10d	<div></div>															
3	Proposal Preparation	3/5/2020	3/11/2020	7d	<div></div>															
4	Data Collection and Processing	3/14/2020	3/20/2020	7d	<div></div>															
5	Base Model Preparation	3/21/2020	4/4/2020	15d	<div></div>															
6	Mid-term Report Preparation	4/5/2020	4/11/2020	7d	<div></div>															
7	Model Analysis and Optimization	4/12/2020	5/12/2020	31d	<div></div>															
8	Documentation	2/17/2020	5/10/2020	84d	<div></div>															
9	Final Report Preparation	5/13/2020	5/22/2020	10d	<div></div>															

Fig: Gantt Chart

# Conclusion

The final model should be able to classify any new image of a handwritten digit with maximum accuracy.



Actual Label: 3, Predicted Label: 3

# References

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# Appendix

