

Progress Presentation-I

e-Yantra Summer Internship-2018
Machine Learning and It's Application

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Overview of Project

Progress
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Overview of
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Overview of Task

Task
Accomplished

Results Obtained

Challenges Faced

Future Plans

Thank You

- Project Name : **Machine Learning and It's Application**
- Objective : To study machine learning and to work on its practical applications of Character Recognition, Automated Reply, Face Recognition along with documentation
- Deliverables :
 - 1 Learning ML and implement Applications
 - 2 Well commented code and documentation

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Progress
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Overview of Task

Task
Accomplished

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Challenges Faced

Future Plans

Thank You

Task no.	Task	Deadline
Week 1		
1	Learning Basics of ML	3 days
2	Get familiar with Tensorflow(and python)	3 days
Week 2		
3	Character recognition using logistic regression	3 days
4	Character recognition using neural network	3 days
Week 3 and Week 4		
5	Automated Reply	12 days
Week 5		
6	Face Recognition	6 days
Week 6		
7	Documentation	6 days

Dataset Description

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Overview of Task

Task
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Results Obtained

Challenges Faced

Future Plans

Thank You

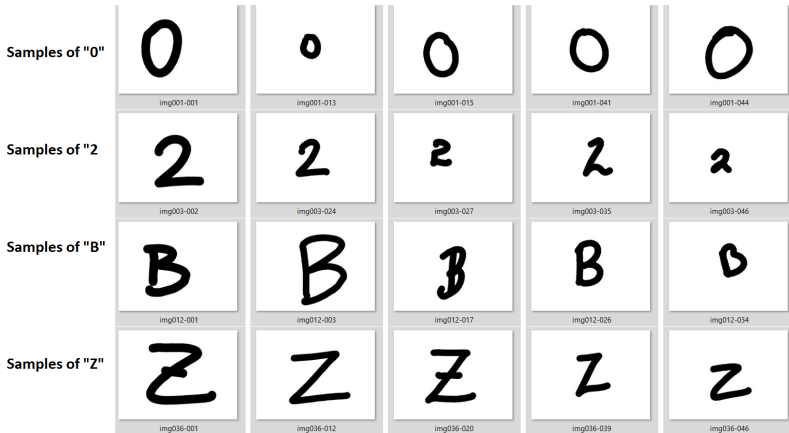
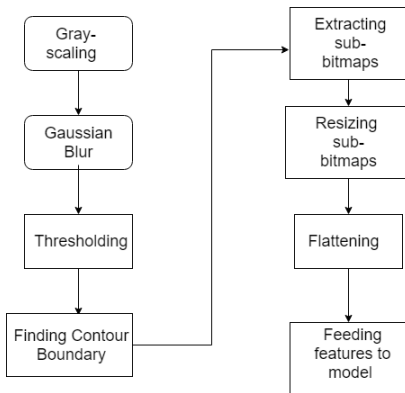


Figure: Dataset of 3410 samples (55 samples of each category)

Task Accomplished

- Image Preprocessing for recognition based on an image or a camera frame:



Logistic Regression

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Project

Overview of Task

Task
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■ Character Recognition using Logistic Regression:

- 1 Formatting Dataset for detection of characters and storing the classifications and flattened images in a text file
- 2 Selecting Solver, algorithm used in the optimization problem

Table: Grid-Search Results

Solver	Validation Accuracy(%)
newton-cg	84.8516%
lbfgs	85.1402%
liblinear	83.6721%
sag	85.2901%
saga	85.5486%

- 3 k-Fold cross-validation results for model trained on English handwriting dataset (k=10):
 - Mean Accuracy = 85.29%
 - Standard Deviation = 0.04166

Artificial Neural Networks

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Overview of Task

Task
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Challenges Faced

Future Plans

Thank You

- Input-image: Flattened vector with 600 features
- Neurons in hidden layer has uniform weights initialization and rectifier activation function associated
- Neurons in output layer has softmax activation function
- Now, for Real-Time data augmentation:
 - 1 2D array required, instead of only threshold image information in 600 feature's vector
 - 2 Pooling is required before flattening the images

Convolutional Neural Networks

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Project

Overview of Task

Task
Accomplished

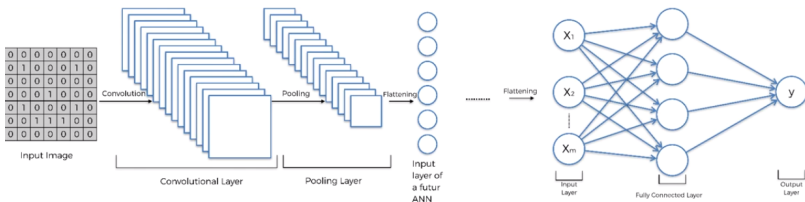
Results Obtained

Challenges Faced

Future Plans

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Network Structure:



- Input-image: 32x32x1 Gray-scale samples
- 32 2x2 filters in Convolution layer
- Rectifier Activation function
- Softmax activation for output layer
- Optimization score function: Categorical Cross-Entropy
- Real-Time Data Augmentation

CNN Accuracies Plot

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Overview of Task

Task
Accomplished

Results Obtained

Challenges Faced

Future Plans

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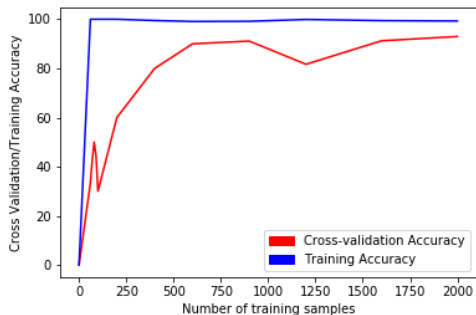


Figure: CNN cross-validation accuracy v/s No. of training examples

Accuracy and Loss Variations

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Project

Overview of Task

Task
Accomplished

Results Obtained

Challenges Faced

Future Plans

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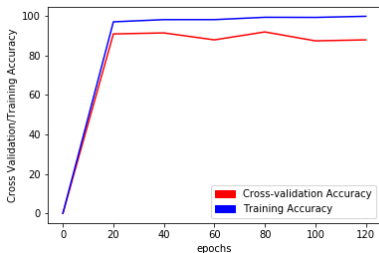


Figure: CNN accuracy variations over number of epochs

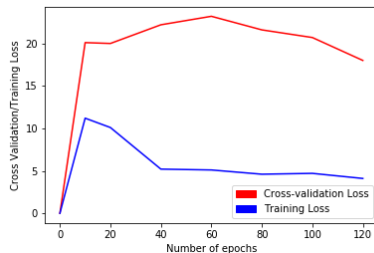


Figure: CNN loss variations over number of epochs

Convolutional Neural Network Results

Below shown are some test Images and their predictions using CNN:



Results from Convolutional Neural Network: =====> 245

Figure: Rotated characters



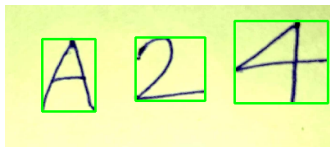
Results from Convolutional Neural Network: =====> A70H5

Figure: Blurred characters



Results from Convolutional Neural Network: =====> A67H5

Figure: Different color characters



Results from Convolutional Neural Network: =====> A24

Figure: Handwritten characters

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Project

Overview of Task

Task
Accomplished

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Challenges Faced

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Thank You

Comparison of Logistic regression and Neural Network

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Overview of
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Overview of Task

Task
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Future Plans

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- An ANN model without hidden layer(s) and with a sigmoidal activation function is the same as an LR model
- Logistic regression is a statistical approach while Neural network mimics the brain's neuron network concept.
- Neural Networks end up solving a non-convex optimization problem while Logistic Regression ends up with a Convex Optimization problem
- ANN will require a larger dataset for its optimization

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Project

Overview of Task

Task
Accomplished

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Challenges Faced

Future Plans

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- Real-Time data augmentation in Artificial Neural Network
- Preprocessing the images in Handwriting Dataset and getting the feature vector
- Finding the best dataset for training the model

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Progress
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Project

Overview of Task

Task
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- Automated reply system for e-mails
- Face Recognition

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Overview of Task

Task
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