CHAPTER 5

IMPLEMENTATION AND TESTING

5.1 Implementation

5.1.1 Labeling train and test

The process of labeling the tran data and test data is done by categorizing the images with test and train directories. At the image labeling stage, image processing will be carried out with convert image to array and save, which will result in the output labeling the test and train in binary format.

```
1.    def Process_Image(self):
2.    data = np.asanyarray(self.image_data)
3.    for x in data:
4.    self.x_data.append(x[0])
5. self.y_data.append(x[1])
6.    X_Data = np.asarray(self.x_data) / (255.0)
7.    Y_Data = np.asarray(self.y_data)
8.    X_Data= X_Data.reshape(-1, self.IMAGE_SIZE, self.IMAGE_SIZE,
9.    return X_Data, Y_Data
10.   def pickle_image(self):
11.     X_Data,Y_Data = self.Process_Image()
12.   pickle_out = open('X_Train','wb')
13.   pickle.dump(X_Data, pickle_out)
14.   pickle_out.close()
15.        pickle_out = open('Y_Test', 'wb')
16.   pickle.dump(Y_Data, pickle_out)
17.   pickle_out.close()
18.   return X_Data,Y_Data
```

On line number 2 the train and test data have been categorized into x and y and the process of converting the image to an array is carried out to get the array values from the test and train image.

On lines 3-5, an iteration is carried out to create an index that will determine the conversion of the array values.

Lines 6-7 and normalization is carried out so that the values in the array are only between 0 and 1 by dividing by the maximum pixel value of 255. row 8 is carried out Reshape image data.

Line 9 make outputs the converted image value to the array value, row 10-18 makes the array value saved to binary value using the pickle method.

5.1.2 Image exctraction & Train model

```
1.    def conv2d(x, W):
2.        return tf.nn.conv2d(x, W, strides=[1,1,1,1],
padding='SAME')
3.    def maxpool2d(x):
4.        return tf.nn.max_pool2d (x, ksize=[1,2,2,1],
strides=[1,2,2,1], padding='SAME')
5.    x = tf.compat.v1.placeholder('float', [None,
n_chunks,chunk_size])
6.    y = tf.compat.v1.placeholder('float')
7.    def recurrent_neural_network(x):
8.        weights =
      {'W_conv1':tf.Variable(tf.random_normal([5,5,1,32])),
                                    'W_conv2':tf.Varia
ble(tf.random_normal([5,5,32,64])),
      'W_fc':tf.Variable(tf.random_normal([7*7*4,512])),    '
9.    out':tf.Variable(tf.random_normal([1024,n_classes]))}
10.       biases = {'b_conv1':tf.Variable(tf.random_normal([32])),
11.               'b_conv2':tf.Variable(tf.random_normal([64])),
12.                'b_fc':tf.Variable(tf.random_normal([512])),
13.             'out':tf.Variable(tf.random_normal([n_classes]))}
14.     x = tf.reshape(x, shape=[1, 28, 28, 1])
15.       conv1 = tf.nn.relu(conv2d(x, weights['W_conv1']) +
biases['b_conv1'])
16.       conv1 = maxpool2d(conv1) conv2 =tf.nn.relu(conv2d(conv1,
weights['W_conv2']) + biases['b_conv2']) conv2 = maxpool2d(conv2)
```

On line numbers 1 -2, the image exctratot process will be carried out with a convolutional layer and maxpooling is done to get important information from the incoming data such as valuable pixels. Maxpolling is done with kernel size ksize = [1,2,2,1].

Line 5-14 then the data is entered into the hidden layer and given weight and bias to obtain classification from train and test. The hiding layer uses layers 4 times, 32, 64, 512. Line 15 resizes the data to be readily recognized by the algorithm.

16-17 use relu activation to make values easier for the algorithm to recognize by making judgments if there is data that has a value of 0 then it is not needed.

```
1.      layer =
{'weights':tf.Variable(tf.random_normal([rnn_size,n_classes])),
2.
'biases':tf.Variable(tf.random_normal([n_classes]))}
3.      x = tf.transpose(x, [1,0,2])
4.      x = tf.reshape(x, [-1, chunk_size])
5.      x = tf.split(x, n_chunks, 0)
6.      lstm_cell =
rnn_cell.BasicLSTMCell(rnn_size,state_is_tuple=True)
7.      outputs, states = rnn.static_rnn(lstm_cell, x,
dtype=tf.float32)
8.      output = tf.matmul(outputs[-1],layer['weights']) +
layer['biases']
9.      return output
10.  def train_neural_network(x):
11.      prediction = recurrent_neural_network(x)
12.      cost =
tf.reduce_mean( tf.nn.softmax_cross_entropy_with_logits(prediction
,y) )
13.      optimizer = tf.train.AdamOptimizer().minimize(cost)
14.      with tf.Session() as sess:
15.          sess.run(tf.initialize_all_variables())
16.          for epoch in range(hm_epochs):
17.              epoch_loss = 0
18.              for _ in
range(int(mnist.train.num_examples/batch_size)):
19.                  epoch_x, epoch_y =
mnist.train.next_batch(batch_size)
20.                  epoch_x =
epoch_x.reshape((batch_size,n_chunks,chunk_size))
21.
```

```
22.                     _, c = sess.run([optimizer, cost],
feed_dict={x: epoch_x, y: epoch_y})
23.                 epoch_loss += c
24.
25.             print('Epoch', epoch, 'completed out
of',hm_epochs,'loss:',epoch_loss)
26.         correct = tf.equal(tf.argmax(prediction, 1),
tf.argmax(y, 1))
27.         accuracy = tf.reduce_mean(tf.cast(correct, 'float'))
28.
print('Accuracy:',accuracy.eval({x:mnist.test.images.reshape((-1,
n_chunks, chunk_size)), y:mnist.test.labels}))
29.   train_neural_network(x)
```

On line numbers 1 - 5, it captures the output of the image extractor and becomes a full connected layer to be recognized by the algorithm. On line 6 - 9 the data enters the LSTM cell, the data will be processed with rnn_size which means using a hidden layer of rnn with a value of 128. In this process the incoming data will be recognized by storing the data that is entered into the lstm memory (cell mory) so that the information that is entered can be stored as a reference for future data.

Line 10 creates a function train to build a model. Line 11 is making predictions execution from the recurent neural network. Line 12-17 uses softmax_crossentropy to calculate loss in prediction, Adam optimazer is used to optimize the learing rate. Lines 18-21 create a train step with batch_size 128 on x_train and y_test. Line 22-23 calculates the loss from the prediction. Line 25-29 calculates the d accuracy of the prediction based on the step epoch. And keep the model train based on the accuracy of the epoch.

5.1.3 Load model & Make prediction

```
1.     model = tflearn.DNN(convnet)
2.     model.load('lstm_ocr.model')
3.     def predict(input_img):
4.         img = cv2.imread("sample1.jpg")
5.         gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)
6.         ret, thresh1 = cv2.threshold(gray, 0, 255, cv2.THRESH_OTSU
| cv2.THRESH_BINARY_INV)
```

```
7.      rect_kernel = cv2.getStructuringElement(cv2.MORPH_RECT,
(4, 4))

8.      dilation = cv2.dilate(thresh1, rect_kernel, iterations =
1)

9.      contours, hierarchy = cv2.findContours(dilation,
cv2.RETR_EXTERNAL, cv2.CHAIN_APPROX_NONE)

10.     contours, hierarchy = cv2.findContours(dilation,
cv2.RETR_EXTERNAL, cv2.CHAIN_APPROX_NONE)

11.     im2 = img.copy()

12.     for cnt in contours:

13.         x, y, w, h = cv2.boundingRect(cnt)

14.         rect = cv2.rectangle(im2, (x, y), (x + w, y + h), (0,
255, 0), 1)

15.         cropped = im2[y:y + h, x:x + w]

16.

17.     img2 = cv2.imshow(detect, im2)
```

Line 1-2 reloads the trained model by importing tflearn and reuses it to predict the text in the incoming image. Line 3 uses imread to enter the input image, Line 4-8 applies a filter to the incoming image with a grayscale filter, otsu binarization, and dilation. 9-15 to find the location of the text area using the ROI (region of interest) method based on the contour, width, height coordinate x and y of the image to create a text area marker. Line 17 displays the image with the prediction of the model.

5.2 Testing

5.2.1 Testing Model

Lstm_ocr.model	Pytesseract
Evaluation_01 Size:width =508, height =817	Evaluation_01 Size:width =508, height =817 Font arial black

It was the jackal—Tabaqui, the Dish-licker—and the wolves of India despise Tabaqui because he runs about making mischief, and telling tales, and eating rags and pieces of leather from the village rubbish-heaps. But they are afraid of him too, because Tabaqui, more than anyone else in the jungle, is apt to go mad, and then he forgets that he was ever afraid of anyone, and runs through the forest biting everything in his way, Even the tiger runs and hides when little Tabaqui
goes mad, for madness is the most disgraceful thing that can overtake a wild creature. We call it hydrophobia, but they call it dewanee—the madness—and run.

I was the jackal—Tabaqui, the Dish-licker—and the wolve s of India despise Tabaqui because he runs about making mischief, and telling tales, and eating rags and pieces of leather from the village rubbish-heaps. But they are afraid of him too, because Tabaqui, more than anyone else in the jungle, is apt to go mad, and then he forgets that he was ever afraid of anyone, and runs through the forest biting everything in his way, Even the tiger runs and hides when little Tabaqui
goes mad, for madness is the most disgraceful thing that can overtake a wild creature, We call it hydrophobia, but they call it dewanee—the madness—and run

Font arial black
Word total=108
Word detect=107
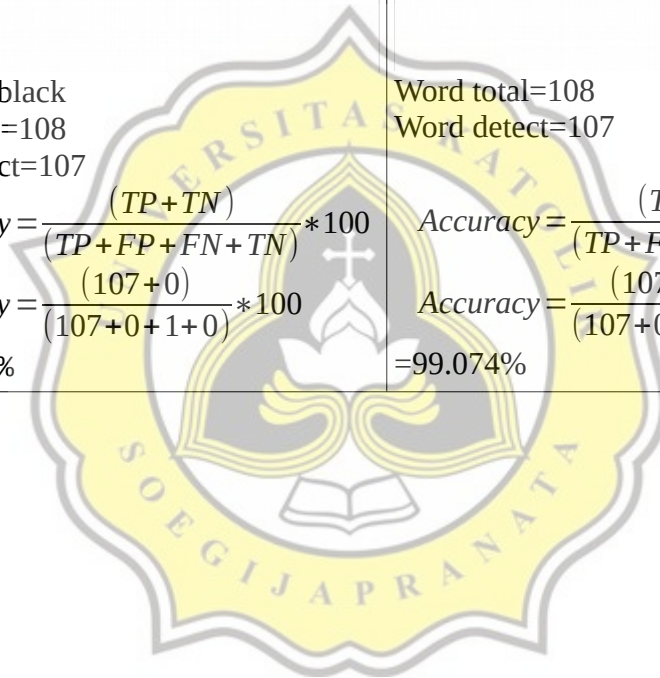
$$Accuracy = \frac{(TP+TN)}{(TP+FP+FN+TN)}*100$$

$$Accuracy = \frac{(107+0)}{(107+0+1+0)}*100$$

=99.074%

Word total=108
Word detect=107

$$Accuracy = \frac{(TP+TN)}{(TP+FP+FN+TN)}*100$$

$$Accuracy = \frac{(107+0)}{(107+0+1+0)}*100$$

=99.074%

Evaluation_02 Size:width =492, height =815 Font arial italic	Evaluation_02 Size:width =492, height =815 Font arial italic
The bushes rustled a little in the thicket, and Father Wolf dropped with his haunches under him, ready for his leap. Then, if you had been watching, you would have seen the most wonderful thing in the world—the wolf checked in mid-spring. He made his bound before he saw what it was he was jumping at, and then he tried to stop himself. The result was that he shot up straight into the air for four or five feet, landing almost where he left ground. "Man!" he snapped. "A man's cub! Look!" Directly in front of him, holding on by a low branch, stood a naked brown baby who could just walk—as soft and as dimpled a little atom as ever came to a wolf's cave at night. He looked up into Father Wolf's face, and laughed.	The bushes rustled a little in the thicket, and Father Wolf dropped with his haunches under him, ready for his leap. Then, if you had been watching, you would have seen the most wonderful thing in the world—the wolf checked in mid-spring. He made his bound before he saw what it was he was jumping at, and then he tried to stop himself. The result was that he shot up straight into the air for four or five feet, landing almost where he left ground. "Man!" he snapped. "A man's cub! Look!" Directly in front of him, holding on by a low branch, stood a naked brown baby who could just walk—as soft and as dimpled a little atom as ever came to a wolf's cave at night. He looked up into Father Wolf's face, and laughed.
Word total =125 Word detect = 115 $$Accuracy = \frac{(TP+TN)}{(TP+FP+FN+TN)}*100$$ $$Accuracy = \frac{(115+3)}{(115+3+0+3)}*100$$ =97.520%	Word total =125 Word detect = 120 $$Accuracy = \frac{(TP+TN)}{(TP+FP+FN+TN)}*100$$ $$Accuracy = \frac{(120+1)}{(120+1+1+3)}*100$$ =96.8%
Evaluation_03 Size:width =440, height =815 Font arial narrow	Evaluation_03 Size:width =440, height =815 Font arial narrow
Now, Tabaqui knew as well as anyone else that there is nothing so unlucky as to compliment children to their faces. It pleased him to see Mother and Father Wolf look uncomfortable. Tabaqui sat still, rejoicing in the mischief that he had made, and then he said spitefully, "Shere Khan, the Big One, has shifted his hunting grounds. He will hunt among these hills for the next moon, so he has told me." Shere Khan was the tiger who lived near the Waingunga River, twenty miles away,	Now, Tabaqui knew as well as anyone else that there is nothing so unlucky as to compliment children to their faces. It pleased him to see Mother and Father Wolf look uncomfortable. Tabaqui sat still, rejoicing in the mischief that he had made, and then he said spitefully, "Shere Khan, the Big One, has shifted his hunting grounds. He will hunt among these hills for the next moon, so he has told me." Shere Khan was the tiger who lived near the Waingunga River, twenty miles away,
Word total=85 Word detect = 62 $$Accuracy = \frac{(TP+TN)}{(TP+FP+FN+TN)}*100$$ $$Accuracy = \frac{(62+2)}{(62+1+6+2)}*100$$ =90.140%	Word total=85 Word detect = 84 $$Accuracy = \frac{(TP+TN)}{(TP+FP+FN+TN)}*100$$ $$Accuracy = \frac{(84+0)}{(84+0+1+0)}*100$$ =98.823%

Evaluation_04 Size:width =441, height =819 Font calibri light	Evaluation_04 Size:width =441, height =819 Font calibri light
Word total=106 Word detect=95 $$Accuracy=\frac{(TP+TN)}{(TP+FP+FN+TN)}*100$$ $$Accuracy=\frac{(95+4)}{(95+4+3+4)}*100$$ =93.396%	Word total=106 Word detect=94 $$Accuracy=\frac{(TP+TN)}{(TP+FP+FN+TN)}*100$$ $$Accuracy=\frac{(94+2)}{(94+3+7+2)}*100$$ =90.566%
Evaluation_05 Size:width =463, height =809 Font calibri	Evaluation_05 Size:width =463, height =809 Font calibri
Word total=83 Word detect=70 $$Accuracy=\frac{(TP+TN)}{(TP+FP+FN+TN)}*100$$ $$Accuracy=\frac{(70+4)}{(70+4+5+4)}*100$$ =93.396%	Word total=83 Word detect=81 $$Accuracy=\frac{(TP+TN)}{(TP+FP+FN+TN)}*100$$ $$Accuracy=\frac{(81+0)}{(81+0+2+0)}*100$$ =97.590%

Evaluation_06 Size:width =479, height =817 Font courier	Evaluation_06 Size:width =479, height =817 Font courier
The Law of the Jungle, which never orders anything without a reason, forbids every beast to eat Man except when he is killing to show his children how to kill, and then he must hunt outside the hunting grounds of his pack or tribe. The real reason for this is that man-killing means, sooner or later, the arrival of white men on elephants, with guns, and hundreds of brown men with gongs and rockets and torches. Then everybody in the jungle suffers. The reason the beasts give among themselves is that Man is the weakest and most defenseless of all living things, and it is unsportsmanlike to touch him. They say too—and it is true—that man-eaters become mangy, and lose their teeth. The purr grew louder, and ended in the full-throated "Aaarh!" of the tiger's charge.	The Law of the Jungle, which never orders anything without a reason, forbids every beast to eat Man except when he is killing to show his children how to kill, and then he must hunt outside the hunting grounds of his pack or tribe. The real reason for this is that man-killing means, sooner or later, the arrival of white men on elephants, with guns, and hundreds of brown men with gongs and rockets and torches. Then everybody in the jungle suffers. The reason the beasts give among themselves is that Man is the weakest and most defenseless of all living things, and it is unsportsmanlike to touch him. They say too—and it is true—that man-eaters become mangy, and lose their teeth. The purr grew louder, and ended in the full-throated "Aaarh!" of the tiger's charge.
Word total=135 Word detect=115 $$Accuracy=\frac{(TP+TN)}{(TP+FP+FN+TN)}*100$$ $$Accuracy=\frac{(115+7)}{(115+7+6+7)}*100$$ =90.370%	Word total=135 Word detect=134 $$Accuracy=\frac{(TP+TN)}{(TP+FP+FN+TN)}*100$$ $$Accuracy=\frac{(134+0)}{(134+0+1+0)}*100$$ =99.259%
Evaluation_07 Size:width =445, height =800 Font tahoma	Evaluation_07 Size:width =445, height =800 Font tahoma
"He has no right!" Father Wolf began angrily—"By the Law of the Jungle he has no right to change his quarters without due warning. He will frighten every head of game within ten miles, and I—I have to kill for two, these days." "His mother did not call him Lungri [the Lame One] for nothing," said Mother Wolf quietly. "He has been lame in one foot from his birth. That is why he has only killed cattle. Now the villagers of the Waingunga are angry with him, and he has come here to make our villagers angry. They will scour the jungle for him when he is far away, and we and our children must run when the grass is set alight. Indeed, we are very grateful to Shere Khan!"	"He has no right!" Father Wolf began angrily—"By the Law of the Jungle he has no right to change his quarters without due warning. He will frighten every head of game within ten miles, and I—I have to kill for two, these days." "His mother did not call him Lungri [the Lame One] for nothing," said Mother Wolf quietly. "He has been lame in one foot from his birth. That is why he has only killed cattle. Now the villagers of the Waingunga are angry with him, and he has come here to make our villagers angry. They will scour the jungle for him when he is far away, and we and our children must run when the grass is set alight. Indeed, we are very grateful to Shere Khan!"
Word total=132 Word detect=132 $$Accuracy=\frac{(TP+TN)}{(TP+FP+FN+TN)}*100$$ $$Accuracy=\frac{(132+0)}{(132+0+0+0)}*100$$ =100%	Word total=132 Word detect=131 $$Accuracy=\frac{(TP+TN)}{(TP+FP+FN+TN)}*100$$ $$Accuracy=\frac{(131+0)}{(131+0+1+0)}*100$$ =99.242%

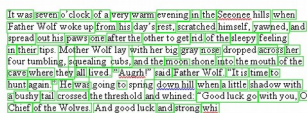|	
Evaluation_08 Size:width =508, height =817 Font arial "Enter, then, and look," said Father Wolf stiffly, "but there is no food here." "For a wolf, no," said Tabaqui, "but for so mean a person as myself a dry bone is a good feast. Who are we, the Gidur-log [the jackal people], to pick and choose?" He scuttled to the back of the cave, where he found the bone of a buck with some meat on it, and sat cracking the end merrily. "All thanks for this good meal," he said, licking his lips. "How beautiful are the noble children! How large are their eyes! And so young too! Indeed, indeed, I might have remembered that the children of kings are men from the beginning." Word total=125 Word detect=99 $$Accuracy = \frac{(TP+TN)}{(TP+FP+FN+TN)} * 100$$ $$Accuracy = \frac{(99+8)}{(99+8+7+8)} * 100$$ =87.704%	Evaluation_08 Size:width =508, height =817 Font arial "Enter, then, and look," said Father Wolf stiffly, "but there is no food here." "For a wolf, no," said Tabaqui, "but for so mean a person as myself a dry bone is a good feast. Who are we, the Gidur-log [the jackal people], to pick and choose?" He scuttled to the back of the cave, where he found the bone of a buck with some meat on it, and sat cracking the end merrily. "All thanks for this good meal," he said, licking his lips. "How beautiful are the noble children! How large are their eyes! And so young too! Indeed, indeed, I might have remembered that the children of kings are men from the beginning." Word total=125 Word detect=118 $$Accuracy = \frac{(TP+TN)}{(TP+FP+FN+TN)} * 100$$ $$Accuracy = \frac{(118+0)}{(118+2+5+0)} * 100$$ =94.4%
Evaluation_09 Size:width =470, height =815 Font times new roman "Shall I tell him of your gratitude?" said Tabaqui. "Out!" snapped Father Wolf. "Out and hunt with thy master. Thou hast done harm enough for one night." "I go," said Tabaqui quietly. "Ye can hear Shere Khan below in the thickets. I might have saved myself the message." Father Wolf listened, and below in the valley that ran down to a little river he heard the dry, angry, snarly, singsong whine of a tiger who has caught nothing and does not care if all the jungle knows it. "The fool!" said Father Wolf. "To begin a night's work with that noise! Does he think that our buck are like his fat Waingunga bullocks?" Word total=113 Word detect=107 $$Accuracy = \frac{(TP+TN)}{(TP+FP+FN+TN)} * 100$$ $$Accuracy = \frac{(107+3)}{(107+3+0+3)} * 100$$ =97.345%	Evaluation_09 Size:width =470, height =815 Font times new roman "Shall I tell him of your gratitude?" said Tabaqui. "Out!" snapped Father Wolf. "Out and hunt with thy master. Thou hast done harm enough for one night." "I go," said Tabaqui quietly. "Ye can hear Shere Khan below in the thickets. I might have saved myself the message." Father Wolf listened, and below in the valley that ran down to a little river he heard the dry, angry, snarly, singsong whine of a tiger who has caught nothing and does not care if all the jungle knows it. "The fool!" said Father Wolf. "To begin a night's work with that noise! Does he think that our buck are like his fat Waingunga bullocks?" Word total=113 Word detect=113 $$Accuracy = \frac{(TP+TN)}{(TP+FP+FN+TN)} * 100$$ $$Accuracy = \frac{(113+0)}{(113+0+0+0)} * 100$$ =100%

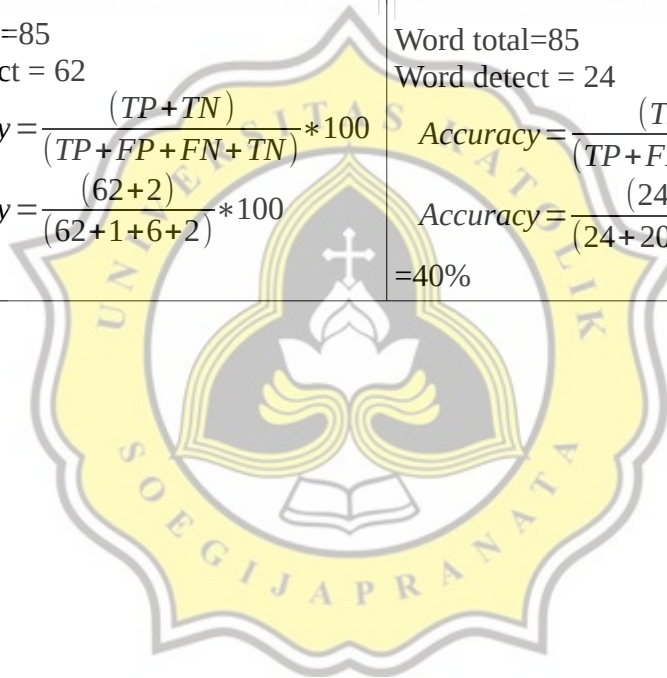| Evaluation_10 Size:width =492, height =815	Evaluation_10 Size:width =492, height =815
It was seven o'clock of a very warm evening in the Seeonee hills when Father Wolf woke up from his day's rest, scratched himself, yawned, and spread out his paws one after the other to get rid of the sleepy feeling in their tips. Mother Wolf lay with her big gray nose dropped across her four tumbling, squealing cubs, and the moon shone into the mouth of the cave where they all lived. "Augrh!" said Father Wolf. "It is time to hunt again." He was going to spring down hill when a little shadow with a bushy tail crossed the threshold and whined. "Good luck go with you, O Chief of the Wolves. And good luck and strong whi	It was seven o'clock of a very warm evening in the Seeonee hills when Father Wolf woke up from his day's rest, scratched himself, yawned, and spread out his paws one after the other to get rid of the sleepy feeling in their tips. Mother Wolf lay with her big gray nose dropped across her four tumbling, squealing cubs, and the moon shone into the mouth of the cave where they all lived. "Augrh!" said Father Wolf. "It is time to hunt again." He was going to spring down hill when a little shadow with a bushy tail crossed the threshold and whined. "Good luck go with you, O Chief of the Wolves. And good luck and strong whi
Font calibri body italic Word total=119 Word detect=77 $Accuracy = \dfrac{(TP+TN)}{(TP+FP+FN+TN)}*100$ $Accuracy = \dfrac{(77+15)}{(77+15+14+15)}*100$ =76.033%	Font calibri body italic Word total=119 Word detect=117 $Accuracy = \dfrac{(TP+TN)}{(TP+FP+FN+TN)}*100$ $Accuracy = \dfrac{(117+0)}{(117+0+2+0)}*100$ =98.319%

Table 5.1: Evaluation&Testing

5.2.2 Testing Without Convolutional Layer

Convolutional Layer	Without Convolutional Layer
Size:width =508, height =817	Size:width =508, height =817

It was the jackal—Tabaqui, the Dish-licker—and the wolves of India despise Tabaqui because he runs about making mischief, and telling tales, and eating rags and pieces of leather from the village rubbish-heaps. But they are afraid of him too, because Tabaqui, more than anyone else in the jungle, is apt to go mad, and then he forgets that he was ever afraid of anyone, and runs through the forest biting everything in his way. Even the tiger runs and hides when little Tabaqui
goes mad, for madness is the most disgraceful thing that can overtake a wild creature. We call it hydrophobia, but they call it dewanee—the madness—and run.

Font arial black
Word total=108
Word detect=107

$$Accuracy = \frac{(TP+TN)}{(TP+FP+FN+TN)}*100$$

$$Accuracy = \frac{(107+0)}{(107+0+1+0)}*100$$

=99.074%

It was the jackal—Tabaqui, the Dish-licker—and the wolves of India despise Tabaqui because he runs about making mischief, and telling tales, and eating rags and pieces of leather from the village rubbish-heaps. But they are afraid of him too, because Tabaqui, more than anyone else in the jungle, is apt to go mad, and then he forgets that he was ever afraid of anyone, and runs through the forest biting everything in his way. Even the tiger runs and hides when little Tabaqui
goes mad, for madness is the most disgraceful thing that can overtake a wild creature. We call it hydrophobia, but they call it dewanee—the madness—and run.

Font arial black
Word total=108
Word detect=86

$$Accuracy = \frac{(TP+TN)}{(TP+FP+FN+TN)}*100$$

$$Accuracy = \frac{(86+7)}{(86+7+8+7)}*100$$

=86.111%

Size:width =492, height =815
Font arial italic

The bushes rustled a little in the thicket, and Father Wolf dropped with his haunches under him, ready for his leap. Then, if you had been watching, you would have seen the most wonderful thing in the world—the wolf checked in mid-spring. He made his bound before he saw what it was he was jumping at, and then he tried to stop himself. The result was that he shot up straight into the air for four or five feet, landing almost where he left ground.

"Man!" he snapped. "A man's cub. Look!"

Directly in front of him, holding on by a low branch, stood a naked brown baby who could just walk—as soft and as dimpled a little atom as ever came to a wolf's cave at night. He looked up into Father Wolf's face, and laughed.

Word total =125
Word detect = 115

$$Accuracy = \frac{(TP+TN)}{(TP+FP+FN+TN)}*100$$

$$Accuracy = \frac{(115+3)}{(115+3+0+3)}*100$$

=97.520%

Size:width =492, height =815
Font arial italic

The bushes rustled a little in the thicket, and Father Wolf dropped with his haunches under him, ready for his leap. Then, if you had been watching, you would have seen the most wonderful thing in the world—the wolf checked in mid-spring. He made his bound before he saw what it was he was jumping at, and then he tried to stop himself. The result was that he shot up straight into the air for four or five feet, landing almost where he left ground.

"Man!" he snapped. "A man's cub. Look!"

Directly in front of him, holding on by a low branch, stood a naked brown baby who could just walk—as soft and as dimpled a little atom as ever came to a wolf's cave at night. He looked up into Father Wolf's face, and laughed.

Word total =125
Word detect = 82

$$Accuracy = \frac{(TP+TN)}{(TP+FP+FN+TN)}*100$$

$$Accuracy = \frac{(82+10)}{(82+13+20+10)}*100$$

=73.6%

Size:width =440, height =815 Font arial narrow	Size:width =440, height =815 Font arial narrow
Now, Tabaqui knew as well as anyone else that there is nothing so unlucky as to compliment children to their faces. It pleased him to see Mother and Father Wolf look uncomfortable. Tabaqui sat still, rejoicing in the mischief that he had made, and then he said spitefully, "Shere Khan, the Big One, has shifted his hunting grounds. He will hunt among these hills for the next moon, so he has told me." Shere Khan was the tiger who lived near the Waingunga River, twenty miles away.	Now, Tabaqui knew as well as anyone else that there is nothing so unlucky as to compliment children to their faces. It pleased him to see Mother and Father Wolf look uncomfortable. Tabaqui sat still, rejoicing in the mischief that he had made, and then he said spitefully: "Shere Khan, the Big One, has shifted his hunting grounds. He will hunt among these hills for the next moon, so he has told me." Shere Khan was the tiger who lived near the Waingunga River, twenty miles away.
Word total=85 Word detect = 62 $$Accuracy = \frac{(TP+TN)}{(TP+FP+FN+TN)}*100$$ $$Accuracy = \frac{(62+2)}{(62+1+6+2)}*100$$ =90.140%	Word total=85 Word detect = 24 $$Accuracy = \frac{(TP+TN)}{(TP+FP+FN+TN)}*100$$ $$Accuracy = \frac{(24+13)}{(24+20+31+10)}*100$$ =40%

Size:width =441, height =819 Font calibri light	Size:width =441, height =819 Font calibri light
Word total=106 Word detect=95 $Accuracy = \dfrac{(TP+TN)}{(TP+FP+FN+TN)}*100$ $Accuracy = \dfrac{(95+4)}{(95+4+3+4)}*100$ =93.396%	Word total=106 Word detect=65 $Accuracy = \dfrac{(TP+TN)}{(TP+FP+FN+TN)}*100$ $Accuracy = \dfrac{(65+8)}{(65+12+21+8)}*100$ =68.867%
Size:width =463, height =809 Font calibri	Size:width =463, height =809 Font calibri
Word total=83 Word detect=70 $Accuracy = \dfrac{(TP+TN)}{(TP+FP+FN+TN)}*100$ $Accuracy = \dfrac{(70+4)}{(70+4+5+4)}*100$ =93.396%	Word total=83 Word detect=31 $Accuracy = \dfrac{(TP+TN)}{(TP+FP+FN+TN)}*100$ $Accuracy = \dfrac{(31+6)}{(31+17+29+6)}*100$ =44.578%

Size:width =479, height =817 Font courier	Size:width =479, height =817 Font courier

Size:width =479, height =817
Font courier

The Law of the Jungle, which never orders anything without a reason, forbids every beast to eat Man except when he is killing to show his children how to kill, and then he must hunt outside the hunting grounds of his pack or tribe. The real reason for this is that man-killing means, sooner or later, the arrival of white men on elephants, with guns, and hundreds of brown men with gongs and rockets and torches. Then everybody in the jungle suffers. The reason the beasts give among themselves is that Man is the weakest and most defenseless of all living things, and it is unsportsmanlike to touch him. They say too--and it is true--that man-eaters become mangy, and lose their teeth.

The purr grew louder, and ended in the full-throated "Aaarh!" of the tiger's charge.

Word total=135
Word detect=115

$$Accuracy = \frac{(TP+TN)}{(TP+FP+FN+TN)} * 100$$

$$Accuracy = \frac{(115+7)}{(115+7+6+7)} * 100$$

=90.370%

Size:width =479, height =817
Font courier

The Law of the Jungle, which never orders anything without a reason, forbids every beast to eat Man except when he is killing to show his children how to kill, and then he must hunt outside the hunting grounds of his pack or tribe. The real reason for this is that man-killing means, sooner or later, the arrival of white men on elephants, with guns, and hundreds of brown men with gongs and rockets and torches. Then everybody in the jungle suffers. The reason the beasts give among themselves is that Man is the weakest and most defenseless of all living things, and it is unsportsmanlike to touch him. They say too--and it is true--that man-eaters become mangy, and lose their teeth.

The purr grew louder, and ended in the full-throated "Aaarh!" of the tiger's charge.

Word total=135
Word detect=59

$$Accuracy = \frac{(TP+TN)}{(TP+FP+FN+TN)} * 100$$

$$Accuracy = \frac{(59+13)}{(59+24+39+13)} * 100$$

=53.333%

Size:width =445, height =800
Font tahoma

"He has no right!" Father Wolf began angrily--"By the Law of the Jungle
he has no right to change his quarters without due warning. He will
frighten every head of game within ten miles, and I--I have to kill for
two, these days."

"His mother did not call him Lungri [the Lame One] for nothing," said
Mother Wolf quietly. "He has been lame in one foot from his birth. That
is why he has only killed cattle. Now the villagers of the Waingunga are
angry with him, and he has come here to make our villagers angry.
They will scour the jungle for him when he is far away, and we and our
children must run when the grass is set alight. Indeed, we are very
grateful to Shere Khan!"

Word total=132
Word detect=132

$$Accuracy = \frac{(TP+TN)}{(TP+FP+FN+TN)} * 100$$

$$Accuracy = \frac{(132+0)}{(132+0+0+0)} * 100$$

=100%

Size:width =445, height =800
Font tahoma

"He has no right!" Father Wolf began angrily--"By the Law of the Jungle
he has no right to change his quarters without due warning. He will
frighten every head of game within ten miles, and I--I have to kill for
two, these days."

"His mother did not call him Lungri [the Lame One] for nothing," said
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is why he has only killed cattle. Now the villagers of the Waingunga are
angry with him, and he has come here to make our villagers angry.
They will scour the jungle for him when he is far away, and we and our
children must run when the grass is set alight. Indeed, we are very
grateful to Shere Khan!"

Word total=132
Word detect=129

$$Accuracy = \frac{(TP+TN)}{(TP+FP+FN+TN)} * 100$$

$$Accuracy = \frac{(129+0)}{(129+0+3+0)} * 100$$

=97.727%

Size:width =508, height =817 Font arial	Size:width =508, height =817 Font arial
"Enter, then, and look," said Father Wolf stiffly, "but there is no food here." "For a wolf, no," said Tabaqui, "but for so mean a person as myself a dry bone is a good feast. Who are we, the Gidur-log [the jackal people], to pick and choose?" He scuttled to the back of the cave, where he found the bone of a buck with some meat on it, and sat cracking the end merrily. "All thanks for this good meal," he said, licking his lips. "How beautiful are the noble children! How large are their eyes! And so young too! Indeed, indeed, I might have remembered that the children of kings are men from the beginning."	"Enter, then, and look," said Father Wolf stiffly, "but there is no food here." "For a wolf, no," said Tabaqui, "but for so mean a person as myself a dry bone is a good feast. Who are we, the Gidur-log [the jackal people], to pick and choose?" He scuttled to the back of the cave, where he found the bone of a buck with some meat on it, and sat cracking the end merrily. "All thanks for this good meal," he said, licking his lips. "How beautiful are the noble children! How large are their eyes! And so young too! Indeed, indeed, I might have remembered that the children of kings are men from the beginning."
Word total=125 Word detect=99 $$Accuracy = \frac{(TP+TN)}{(TP+FP+FN+TN)}*100$$ $$Accuracy = \frac{(99+8)}{(99+8+7+8)}*100$$ =87.704%	Word total=125 Word detect=62 $$Accuracy = \frac{(TP+TN)}{(TP+FP+FN+TN)}*100$$ $$Accuracy = \frac{(62+14)}{(62+22+27+14)}*100$$ =60.8%
Size:width =470, height =815 Font times new roman	Size:width =470, height =815 Font times new roman
"Shall I tell him of your gratitude?" said Tabaqui. "Out!" snapped Father Wolf. "Out and hunt with thy master. Thou hast done harm enough for one night." "I go," said Tabaqui quietly. "Ye can hear Shere Khan below in the thickets. I might have saved myself the message." Father Wolf listened, and below in the valley that ran down to a little river he heard the dry, angry, snarly, singsong whine of a tiger who has caught nothing and does not care if all the jungle knows it. "The fool!" said Father Wolf. "To begin a night's work with that noise! Does he think that our buck are like his fat Waingunga bullocks?"	"Shall I tell him of your gratitude?" said Tabaqui. "Out!" snapped Father Wolf. "Out and hunt with thy master. Thou hast done harm enough for one night." "I go," said Tabaqui quietly. "Ye can hear Shere Khan below in the thickets. I might have saved myself the message." Father Wolf listened, and below in the valley that ran down to a little river he heard the dry, angry, snarly, singsong whine of a tiger who has caught nothing and does not care if all the jungle knows it. "The fool!" said Father Wolf. "To begin a night's work with that noise! Does he think that our buck are like his fat Waingunga bullocks?"
Word total=113 Word detect=107 $$Accuracy = \frac{(TP+TN)}{(TP+FP+FN+TN)}*100$$ $$Accuracy = \frac{(107+3)}{(107+3+0+3)}*100$$ =97.345%	Word total=113 Word detect=93 $$Accuracy = \frac{(TP+TN)}{(TP+FP+FN+TN)}*100$$ $$Accuracy = \frac{(93+0)}{(93+4+16+0)}*100$$ =82.300%

Size:width =492, height =815 Font calibri body italic	Size:width =492, height =815 Font calibri body italic
It was seven o'clock of a very warm evening in the Seeonee hills when Father Wolf woke up from his day's rest, scratched himself, yawned, and spread out his paws one after the other to get rid of the sleepy feeling in their tips. Mother Wolf lay with her big gray nose dropped across her four tumbling, squealing cubs, and the moon shone into the mouth of the cave where they all lived. "Augrh!" said Father Wolf. "It is time to hunt again." He was going to spring down hill when a little shadow with a bushy tail crossed the threshold and whined: "Good luck go with you, O Chief of the Wolves. And good luck and strong whi	*It was seven o'clock of a very warm evening in the Seeonee hills when Father Wolf woke up from his day's rest, scratched himself, yawned, and spread out his paws one after the other to get rid of the sleepy feeling in their tips. Mother Wolf lay with her big gray nose dropped across her four tumbling, squealing cubs, and the moon shone into the mouth of the cave where they all lived. "Augrh!" said Father Wolf. "It is time to hunt again." He was going to spring down hill when a little shadow with a bushy tail crossed the threshold and whined: "Good luck go with you, O Chief of the Wolves. And good luck and strong whi*
Word total=119 Word detect=77 $Accuracy = \dfrac{(TP+TN)}{(TP+FP+FN+TN)}*100$ $Accuracy = \dfrac{(77+15)}{(77+15+14+15)}*100$ =76.033%	Word total=119 Word detect=35 $Accuracy = \dfrac{(TP+TN)}{(TP+FP+FN+TN)}*100$ $Accuracy = \dfrac{(35+12)}{(35+25+47+12)}*100$ =39.495%

Table 5.2: Table Evaluation Comparison

5.2.3 Analysis Table Accuracy,Precission,Recall,F1-Score

For the Accuracy, Precission, Recall, F1-Score analysis using the formula

Accuracy = (TP + TN) / (TP+FP+FN+TN)

Precission = (TP) / (TP+FP)

Recall = (TP) / (TP + FN)

F1 Score = 2 * (Recall*Precission) / (Recall + Precission)

TP:True Positve

TN:True Negative

FP:False Positive

FN:False Negative

No	Word			With Convolutional Layer			
	Total	**Detect**	**Font**	**Accuracy**	**Precission**	**Recall**	**F1-Score**
1	108	107	Arial Black	99.07407407%	100%	99.07407407%	99.53488372%
2	125	115	Arial Italic	97.52066116%	97.4576271186411%	100%	98.71244635%
3	85	62	Arial Narrow	90.14084507%	98.4126984126984%	91.17647059%	94.65648855%
4	106	95	Calibri Light	93.39622642%	95.9595959595596%	96.93877551%	96.44670051%
5	83	70	Calibri	89.15662651%	94.5945945945946%	93.33333333%	93.95973154%
6	135	115	Courier	90.37037037%	94.2622950819672%	95.04132231%	94.65020576%
7	132	132	Tahoma	100%	100%	100%	100%
8	125	99	Arial	87.70491803%	92.5233644859813%	93.39622642%	92.95774648%
9	113	107	Times New Romans	97.34513274%	97.2727272727273%	100%	98.61751152%
10	119	77	Calibri Body Italic	76.03305785%	83.6956521739130%	84.61538462%	84.15300546%

Table 5.3: Analysis Table Accuracy,Precission,Recall,F1-Score

5.2.4 Analysis Table Accuracy,Precission,Recall,F1-Score

No	Word			Without Convolutional Layer			
	Total	Detect	Font	Accuracy	Precission	Recall	F1-Score
1	108	86	Arial Black	86.111111111111%	92.473118279569%	91.4893617021277%	91.9786096256685%
2	125	82	Arial Italic	73.6%	86.3157894736842%	80.3921568627451%	83.248730964467%
3	85	24	Arial Narrow	40%	54.5454545454545%	43.6363636363636%	48.4848484848485%
4	106	65	Calibri Light	68.8679245283019%	84.4155844155844%	75.5813953488372%	79.7546012269939%
5	83	31	Calibri	44.5783132530121%	64.5833333333333%	51.6666666666667%	57.4074074074074%
6	135	59	Courier	53.33333333333333%	71.0843373493976%	60.2040816326531%	65.1933701657459%
7	132	129	Tahoma	97.727272727272727%	100%	97.7272727272727%	98.8505747126437%
8	125	62	Arial	60.8%	73.8095238095238%	69.6629213483146%	71.6763005780347%
9	113	93	Times New Romans	82.3008849557522%	95.8762886597938%	85.3211009174312%	90.2912621359223%
10	119	35	Calibri Body Italic	39.4957983193277%	58.3333333333333%	42.6829268292683%	49.2957746478873%

Table 5.4: Analysis Table without Convolutional Layer Analysis Accuracy,Precission,Recall,F1-Score

5.2.3 Analysis without Convolutional Layer

Basically the Convolutional Layer is used to create a feature map for the incoming image, the way the Convolutional Layer works is to provide a filter in this evaluation, a gray filter is given to make the incoming image from RGB format which has 3 color channels to Black and White format which has 2 color chanel. The process of applying filters produces a feature map that is used to determine the pixel value in the image. In the convolutional layer feature map process, it will produce patterns, lines and positions that are formed by pixels to produce a character letter based on the highest value, namely 1.The feature map process is very important for the maxpooling process which will look for pixel information from the incoming image to be used as data. how to find the highest pixel value, which is 1 in the feature map generated by the convolutional layer. In evaluations without using the Convolutional layer, the maxpooling process does not work well because there is no feature map generated from the Convolutional Layer. The incoming image without going through the Convolutional Layer process is still in RGB format which has a value from 0-255 so the maxpooling process to find and identify the highest pixel value to detect the character area in the image becomes difficult.

5.2.4 Analysis Accuracy,Precission,Recall,F1-Score

The calculation of Accuracy, Precission, Recall, F1-Score in the LSTM (Long Short Term Memory) and Tesseract models has the same evaluation data based on the size of the text image, font type, font size. In the comparison of LSTM (Long Short Term Memory) and tesseract in OCR (Optical Character Recognition) in terms of Accuracy, it has a high level of accuracy in detecting text images. Of the 10 evaluation data, the LSTM (Long Short Term Memory) model has the lowest accuracy rate in the Calibri Body Italic font with 64.70% Accuracy and has the highest Accuracy for Tahoma fonts with 100% Accuracy level, Tesseract has the lowest level at Calibri Light font with 88.67% Accuracy. In comparison Accuracy, Precission, Recall, F1-Score in LSTM (Long Short Term Memory)and LSTM

(Long Short Term Memory) without Convolutional Layer using the same evaluation data, based on image size, font type, font size. The comparison results of Accuracy, Precession, Recall, F1-Score have much differences as in the analysis table, LSTM (Long Short Term Memory) without Convolutional Layer has a low level of Accuracy, Precission, Recall, F1-Score compared to LSTM (Long Short Term Memory) with a Convolutional Layer. There are 3 types of fonts in LSTM (Long Short Term Memory) without Convolutional Layer which have a low level of Accuracy, namely Arial Narrow Accuracy 40%, Precission 54.5454545454545%, Recall 43.63636363636%, F1-Score 48.48484848485%, Calibri Accuracy 44.5783132530121%, Precission 64.5833333333333%, Recall 51.6666666666667%, F1-Score 57.4074074074074%, Calibri Body Italic Accuracy font 39.4957983193277%, Precission 58.3333333333333%, Recall 42.6829268292683%, F1-Score 49.2957746478873%. In LSTM (Long Short Term Memory) with Convolutional Layer, Arial Narrow font type has Accuracy 90.14084507%, Precission 98.4126984126984%, Recall 91.17647059%, F1-Score 94.65648855%, Calibri Accuracy 89.15662651%, Precission 94.5945945945946%, Recall 94.5945945945946 -Score 93.95973154%, in the font Calibri Body Italic Accuracy 76.03305785%, Precission 83.695652173913%, Recall 84.61538462%, F1-Score 84.15300546%. The use of Convolutional Layer in text recognition has an effect on the accuracy of the LSTM (Long Short Term Memory) model with Convolutional Layer and LSTM (Long Short Term Memory) without a Convolutional Layer because the Convolutioanl Layer is in charge of making the feature map required by the Maxpoolong process to find the pixel chrcater form a letter in the incoming image.