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DEPARTMENT OF
ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

AD8711 – DEEP LEARNING LABORATORY

ACADEMIC YEAR: 2023 – 24 (ODD SEMESTER)

Name of the Student : _____

Register Number : _____

Roll Number : _____

Year & Semester : _____

PANIMALAR INSTITUTE OF TECHNOLOGY

REGISTER NUMBER:

Certified that this is a bonafide record of practical work done by

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of IV Year / VII Semester of **B.Tech Artificial Intelligence and Data Science** in AD8701 – DEEP LEARNING LABORATORY during the academic year 2023 - 24.

STAFF IN-CHARGE **HEAD OF THE DEPARTMENT**

Submitted for the Anna University practical examination held on _____ at Panimalar Institute of Technology, Chennai – 600 123.

INTERNAL EXAMINER **EXTERNAL EXAMINER**

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EX.NO: 1 SOLVING XOR PROBLEM USING MULTILAYER PERCEPTRON

AIM:

To implement python program for solving XOR problem using Multilayer perceptron model.

ALGORITHM:

1. Import the necessary libraries including tensorflow as tf and numpy as np.
2. Define the XOR input data X and the corresponding labels y.
3. Create the MLP model using the Sequential API from TensorFlow.
4. Add two Dense layers to the model.
    a. The first layer has 4 units and uses the sigmoid activation function.
    b. The second layer has 1 unit (output) and also uses the sigmoid activation function.
5. Compile it using the binary cross-entropy loss function and the stochastic gradient descent (SGD) optimizer with a learning rate of 0.1.
6. Use the trained model to make predictions on the input data X and print the rounded predictions.

PROGRAM:

```
from keras.models import Sequential
from keras.layers import Dense
import numpy as np
import tensorflow as tf
tf.random.set_seed(69)
X_train = np.array([[0, 0], [0, 1], [1, 0], [1, 1]])
y_train = np.array([[0], [1], [1], [0]])
model = Sequential([
   Dense(4, input_dim=2, activation='sigmoid'),
   Dense(1, activation='sigmoid')])
model.compile(loss='binary_crossentropy',
```

```
        optimizer='adam',
        metrics=['accuracy'])
model.fit(X_train, y_train, epochs=2000, verbose=0)
loss, accuracy = model.evaluate(X_train, y_train, verbose=0)
print(f"Loss: {loss:.2f}, Accuracy: {accuracy:.2f}")
X_test = np.array([[0, 0], [0, 1], [1, 0], [1, 1]])
y_pred = (model.predict(X_test, verbose=0) > 0.5).astype("int32")
print("Input\tOutput")
for i in range(len(X_test)):
   print(f"{X_test[i]}\t{y_pred[i][0]}")
```

OUTPUT:

Input	Output
[0 0]	0
[0 1]	1
[1 0]	1
[1 1]	0

RESULT:

Thus the implementation of python program to solve XOR problem using CNN was successfully implemented and executed.

EX.NO: 2 IMPLEMENT CHARACTER AND DIGIT RECOGNITION USING ANN

AIM:

To implement the python program for character and digit recognition using ANN model.

ALGORITHM:

1. Import the necessary libraries, including Tensor Flow and its components.
2. Load the dataset, which contains images of handwritten digits along with their corresponding labels.
3. After loading, preprocess the data by scaling the pixel values to a range of 0 to 1.
4. Create ANN model using sequential API from Keras.
5. Compile the model with Adam optimizer, sparse categorical cross-entropy loss function, and accuracy as the metric to monitor.
6. Train the model using the training data.
7. Evaluate the model's performance on the test data and print the test accuracy.
8. Finally perform predictions on the first five test images and compare the predicted labels with the actual labels.

PROGRAM:

```
# Import Package
import tensorflow as tf
from tensorflow import keras
from tensorflow.keras.datasets import mnist
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense, Flatten

# Load the MNIST dataset
(x_train, y_train), (x_test, y_test) = mnist.load_data()
# Preprocess the data
x_train = x_train / 255.0
x_test = x_test / 255.0

# Create the ANN model
```

```
model = Sequential()
model.add(Flatten(input_shape=(28, 28)))
model.add(Dense(128, activation='relu'))
model.add(Dense(10, activation='softmax'))

# Compile the model
model.compile(optimizer='adam',loss='sparse_categorical_crossentropy',
metrics=['accuracy'])

# Train the model
model.fit(x_train, y_train, epochs=5, batch_size=32, verbose=1)

# Evaluate the model
test_loss, test_acc = model.evaluate(x_test, y_test, verbose=0)
print(f'Test accuracy: {test_acc}')

# Perform predictions
predictions = model.predict(x_test[:5])
predicted_labels = [tf.argmax(prediction).numpy() for prediction in predictions]
print(f'Predicted labels: {predicted_labels}')
print(f'Actual labels: {y_test[:5]}')
```

OUTPUT:

```
Downloading data from https://storage.googleapis.com/tensorflow/tf-keras-datasets/mnist.npz
11490434/11490434 [==============] - 0s 0us/step
Epoch 1/5
1875/1875 [==========] - 9s 3ms/step - loss: 1.1438 - accuracy: 0.7335
Epoch 2/5
1875/1875 [==========] - 5s 3ms/step - loss: 0.4745 - accuracy: 0.8759
Epoch 3/5
1875/1875 [==========] - 5s 3ms/step - loss: 0.3777 - accuracy: 0.8958
Epoch 4/5
1875/1875 [==========] - 5s 3ms/step - loss: 0.3396 - accuracy: 0.9043
```

Epoch 5/5

1875/1875 [==========] - 5s 3ms/step - loss: 0.3180 - accuracy: 0.9092

[8]:

<keras.callbacks.History at 0x79c5e07dc790>

Test accuracy: 0.9135000109672546

1/1 [==========] - 0s 20ms/step

Predicted labels: [7, 2, 1, 0, 4]

Actual labels: [7 2 1 0 4]

RESULT:

Thus the python program for character and digit recognition using ANN model was implemented and executed successfully.

EX.NO: 3.A) IMPLEMENT THE ANALYSIS OF HANDWRITTEN IMAGES USING AUTOENCODERS

AIM:

To implement python program to analysis images using auto encoders.

ALGORITHM:

1. Import the necessary libraries, including Tensor Flow and its components.
2. Load the dataset, which contains images of handwritten along with their corresponding labels.
3. After loading, normalize the pixel values between 0 and 1.
4. Define an auto encoder model using Tensor flow's Keras API.
5. Compile the auto encoder model with the Adam optimizer and binary cross-entropy loss function.
6. Train the model using training data set.
7. After training, use the trained auto encoder to reconstruct the images from the test set.
8. Finally plot original and reconstructed images for visual comparison.

PROGRAM:

```
#Import Packages
import tensorflow as tf
import numpy as np
import matplotlib.pyplot as plt

# Load the MNIST dataset
(x_train, _), (x_test, _) = tf.keras.datasets.mnist.load_data()

# Normalize the pixel values between 0 and 1
x_train = x_train.astype('float32') / 255.
x_test = x_test.astype('float32') / 255.

# Reshape the input images
x_train = x_train.reshape((len(x_train), np.prod(x_train.shape[1:])))
x_test = x_test.reshape((len(x_test), np.prod(x_test.shape[1:])))
```

```
# Define the autoencoder model
input_dim = x_train.shape[1]
encoding_dim = 32
input_img = tf.keras.Input(shape=(input_dim,))
encoded = tf.keras.layers.Dense(encoding_dim, activation='relu')(input_img)
decoded = tf.keras.layers.Dense(input_dim, activation='sigmoid')(encoded)
autoencoder = tf.keras.Model(input_img, decoded)

# Compile the autoencoder model
autoencoder.compile(optimizer='adam', loss='binary_crossentropy')

# Train the autoencoder
autoencoder.fit(x_train, x_train, epochs=50, batch_size=256, shuffle=True,
validation_data=(x_test, x_test))

# Use the autoencoder to reconstruct the X-ray image
reconstructed_images = autoencoder.predict(x_test)

# Plot the original and reconstructed images
n = 10  # Number of images to display
plt.figure(figsize=(20, 4))
for i in range(n):

# Display original images
ax = plt.subplot(2, n, i + 1)
plt.imshow(x_test[i].reshape(28, 28))
plt.gray()
ax.get_xaxis().set_visible(False)
ax.get_yaxis().set_visible(False)

# Display reconstructed images
ax = plt.subplot(2, n, i + 1 + n)
plt.imshow(reconstructed_images[i].reshape(28, 28))
plt.gray()
```

```
ax.get_xaxis().set_visible(False)
ax.get_yaxis().set_visible(False)
plt.show()
```

OUTPUT:

```
Downloading data from https://storage.googleapis.com/tensorflow/tf-keras-datasets/mnist.npz
11490434/11490434 [==============================] - 0s 0us/step

Epoch 1/10
235/235 [==============================] - 2s 6ms/step - loss: 0.0040 - val_loss: 0.0041
Epoch 2/10
235/235 [==============================] - 1s 5ms/step - loss: 0.0040 - val_loss: 0.0041
Epoch 3/10
235/235 [==============================] - 1s 5ms/step - loss: 0.0040 - val_loss: 0.0041
Epoch 4/10
235/235 [==============================] - 1s 5ms/step - loss: 0.0040 - val_loss: 0.0040
Epoch 5/10
235/235 [==============================] - 1s 6ms/step - loss: 0.0040 - val_loss: 0.0040
Epoch 6/10
235/235 [==============================] - 1s 5ms/step - loss: 0.0040 - val_loss: 0.0040
Epoch 7/10
235/235 [==============================] - 1s 5ms/step - loss: 0.0040 - val_loss: 0.0040
Epoch 8/10
235/235 [==============================] - 1s 5ms/step - loss: 0.0040 - val_loss: 0.0040
Epoch 9/10
235/235 [==============================] - 1s 5ms/step - loss: 0.0040 - val_loss: 0.0040
Epoch 10/10
235/235 [==============================] - 1s 5ms/step - loss: 0.0040 - val_loss: 0.0040
                                                                                [10]:
<keras.callbacks.History at 0x798a8145f9d0>
```

RESULT:

Thus the implementation of python program to analyse images using auto encoders was successfully implemented andexecuted.

EX. NO: 3)B IMPLEMENT THE ANALYSIS OF MEDICAL X-RAY IMAGE CLASSIFICATION USING CNN

AIM:

To implement python program for classifying medical X-RAY images using CNN Model.

ALGORITHM:

1. Import all necessary packages including tensorflow as tf and and keras.
2. Rescale the scales array of the original image pixel values to be between [0,1].
3. Transformation techniques are applied randomly to the images, except for the rescale.
4. Load the X-Ray images.
5. Set the path of test, train and valid folder.
6. Set the target size of the image, Each image will be resized to this size.
7. Number of images to be generated by batch from the generator. Define the batch size as 16
8. Set "binary" if only two classes to predict, if not set to "categorical," both input and output are likely to be the same image, set to "input" in this case.

PROGRAM:

```
import matplotlib.pyplot as plt          #For Visualization
import numpy as np                       #For handling arrays
import pandas as pd                      # For handling data

#Define Directories for train, test & Validation Set
train_path ='D://Babisha//train'
test_path ='D://Babisha//test'
valid_path ='D://Babisha//val'
batch_size = 16

#The dimension of the images we are going to define is 500x500 img_height = 500
img_width = 500
from tensorflow.keras.preprocessing.image import ImageDataGenerator

# Create Image Data Generator for Train Set
image_gen = ImageDataGenerator(
```

```
                    rescale = 1./255,
                    shear_range = 0.2,
                    zoom_range = 0.2,
                    horizontal_flip = True, )
test_data_gen = ImageDataGenerator(rescale = 1./255)
train = image_gen.flow_from_directory(
    train_path,
    target_size=(99, 128),
    color_mode='grayscale',
    class_mode='binary',
    batch_size=batch_size)
test = test_data_gen.flow_from_directory(
    test_path,
    target_size=(99, 128),
    color_mode='grayscale',
    shuffle=False,
```

#setting shuffle as False just so we can later compare it with predicted values without having indexing problem

```
    class_mode='binary',
    batch_size=batch_size)
valid = test_data_gen.flow_from_directory(
    valid_path,
    target_size=(99,128),
    color_mode='grayscale',
    class_mode='binary',
    batch_size=batch_size)
plt.figure(figsize=(12, 12))
for i in range(0, 10):
  plt.subplot(2, 5, i+1)
  for X_batch, Y_batch in train:
    image = X_batch[0]
    dic = {0:'NORMAL', 1:'PNEUMONIA'}
    plt.title(dic.get(Y_batch[0]))
```

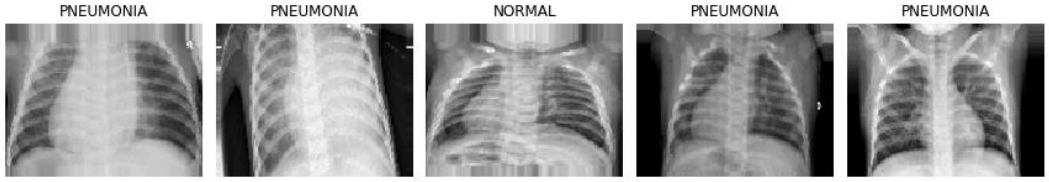
```
        plt.axis('off')
        plt.imshow(np.squeeze(image),cmap='gray',interpolation='nearest')
        break
plt.tight_layout()
plt.show()
```

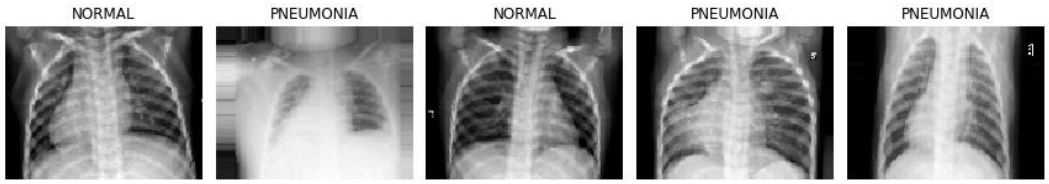
OUTPUT:

Found 4192 images belonging to 2 classes.

Found 624 images belonging to 2 classes.

Found 1040 images belonging to 2 classes.





RESULT:

Thus the classification of medical X-RAY images using CNN model was implemented and verified successfully.

EX.NO: 4 IMPLEMENT SPEECH RECOGNITION USING NLP

AIM:

To write a python program to implement speech recognition using NLP.

ALGORITHM:

1. Import the necessary packages for speech recognition.
2. Load the audio file to perform speech recognition.
3. Install the needed packages and functions for speech recognizer.
4. Read three different audio file for converting audio to text.
5. Using recognize_google(audio) function convers audio file to text
6. Print the text file.

PROGRAM:

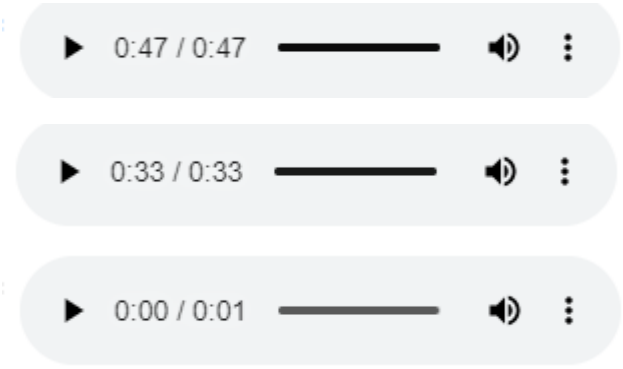
```
#Install the packages
!pip install librosa
!pip install SpeechRecognition
!pip install googletrans
!pip install gTTs
!pip install PyAudio
!pip install googletrans==3.1.0a0
!pip install googletrans==4.0.0-rc1


import numpy as np          # linear algebra
import pandas as pd         # data processing, CSV file I/O (e.g. pd.read_csv)
from tqdm import tqdm
pd.options.display.max_colwidth = 200
import warnings
warnings.filterwarnings('ignore')
import os
for dirname, _, filenames in os.walk('/kaggle/input'):
    for filename in filenames[:2]:
        print(os.path.join(dirname, filename))
```

```
import librosa
import IPython.display as ipd
import speech_recognition as sr
from googletrans import Translator
from gtts import gTTS
ipd.Audio('/kaggle/input/nlp-specialization-data/harvard.wav')
ipd.Audio('/kaggle/input/nlp-specialization-data/testSpeech.wav')
ipd.Audio('/kaggle/input/nlp-specialization-data/singleEnglishWord.wav')
r = sr.Recognizer()
harvard = sr.AudioFile('/kaggle/input/nlp-specialization-data/testSpeech.wav')
with harvard as source:
    audio = r.record(source)
type(audio)
speech_recognition.AudioData
text=r.recognize_google(audio)
text
```

Output:

```
/kaggle/input/nlp-specialization-data/Wikipedia_Toxicity_Dataset.csv
/kaggle/input/nlp-specialization-data/Medical_Notes/Medical_Notes/1893.txt
/kaggle/input/nlp-specialization-data/Medical_Notes/Medical_Notes/1711.txt
/kaggle/input/nlp-specialization-data/pubmed2018_w2v_200D/pubmed2018_w2v_200D/README.txt
/kaggle/input/nlp-specialization-data/pubmed2018_w2v_200D/pubmed2018_w2v_200D/pubmed2018_w2v_200D.bin
Requirement already satisfied: librosa in /opt/conda/lib/python3.7/site-packages (0.8.1)
Requirement already satisfied: numpy>=1.15.0 in /opt/conda/lib/python3.7/site-packages (from librosa) (1.19.5)
Requirement already satisfied: scikit-learn!=0.19.0,>=0.14.0 in /opt/conda/lib/python3.7/site-packages (from librosa) (0.23.2)
Requirement already satisfied: pooch>=1.0 in /opt/conda/lib/python3.7/site-packages (from librosa) (1.4.0)
```

Requirement already satisfied: scipy>=1.0.0 in /opt/conda/lib/python3.7/site-packages (from l
ibrosa) (1.6.3)
Requirement already satisfied: resampy>=0.2.2 in /opt/conda/lib/python3.7/site-packages (fro
m librosa) (0.2.2)
Requirement already satisfied: decorator>=3.0.0 in /opt/conda/lib/python3.7/site-packages (fr
om librosa) (5.0.9)
Requirement already satisfied: soundfile>=0.10.2 in /opt/conda/lib/python3.7/site-packages (f
rom librosa) (0.10.3.post1)
Requirement already satisfied: audioread>=2.0.0 in /opt/conda/lib/python3.7/site-packages (fr
om librosa) (2.1.9)
Requirement already satisfied: numba>=0.43.0 in /opt/conda/lib/python3.7/site-packages (fro
m librosa) (0.53.1)



speech_recognition.AudioData

result2:

{ 'alternative': [{ 'confidence': 0.78671092,

'transcript': 'Birch canoe slid on the smooth plank '

'glue the sea to a dark blue '

'background it is easy to tell the '

'depth of the well these days a '

'chicken leg of a variegated price is '

"often served in Randall's the juice "

'of lemons makes find the boxes on '

'the side the pump truck the ha '

'grimstead top corn and garbage for '

```
                'hours of City Works in a large size '
                'and stockings and hard to sell'},
    {   'transcript': 'Birch canoe slid on the smooth plank '
                'glue the sea to a dark blue '
                'background it is easy to tell the '
                'depth of the well these day the '
                'chicken leg of a variegated price is '
                "often served in Randall's the juice "
                'of lemons makes find the boxes down '
                'beside the pump truck the ha '
                'grimstead top corn and garbage for '
                'hours of City Works in a large size '
                'and stockings and hard to sell'},
    {   'transcript': 'Birch canoe slid on the smooth plank '
                'glue the sea to a dark blue '
                'background it is easy to tell the '
                'depth of the well these days a '
                'chicken leg of a variegated price is '
                'often served in roundels the juice '
                'of lemons makes find the boxes down '
                'beside the pump truck the ha '
                'grimstead top corn and garbage for '
                'hours of City Works in a large size '
                'and stockings and hard to sell'},
    {   'transcript': 'Birch canoe slid on the smooth plank '
                'glue the sea to a dark blue '
                'background it is easy to tell the '
```

'depth of the well these days a '

'chicken leg of a variegated price is '

"often served in Randall's the juice "

'of lemons makes find the boxes down '

'beside the pump truck the ha '

'grimstead top corn and garbage for '

'hours of City Works in a large size '

'and stockings and hard to sell'},

{ 'transcript': 'Birch canoe slid on the smooth plank '

'glue the sea to a dark blue '

'background it is easy to tell the '

'depth of the well these days a '

'chicken leg of a variegated price is '

"often served in Randall's the juice "

'of lemons makes find the boxes down '

'beside the pump truck the ha '

'grimstead topcon and garbage for '

'hours of City Works in a large size '

'and stockings and hard to sell'}],

'final': True}

"Birch canoe slid on the smooth plank glue the sea to a dark blue background it is easy to tell the depth of the well these days a chicken leg of a variegated price is often served in Randall's the juice of lemons makes find the boxes on the side the pump truck the ha grimstead top corn and garbage for hours of City Works in a large size and stockings and hard to sell"

RESULT:

Thus the implementation of speech recognition using NLP was successfully implemented and executed.

EX. NO: 5 DEVELOP A CODE TO DESIGN OBJECT DETECTION AND CLASSIFICATION FOR TRAFFIC ANALYSIS USING CNN

AIM:

To develop a code to design object detection and classification for traffic analysis using CNN model.

ALGORITHM:

1. Gather a large dataset of labeled images that contain various traffic objects you want to detect and classify.
2. Preprocess the collected data to ensure consistency and compatibility for training.
3. Choose a CNN architecture suitable for object detection and classification tasks.
4. Initialize the chosen CNN model with random weights and train it on your labeled dataset.
5. During training, the model learns to detect objects and classify them correctly based on the provided annotations.
6. Split your dataset into training and validation sets. After training, evaluate the performance of the model on the validation set.
7. Fine-tune the trained model to improve its performance. This can involve adjusting hyperparameters, exploring different network architectures.
8. Once the model is trained and optimized, it can be used for object detection and classification in new, unseen images.
9. To refine the detected bounding boxes, post-processing techniques can be applied.
10. Utilize the detected and classified objects for traffic analysis purposes. This can involve counting the number of vehicles, estimating traffic flow, analyzing vehicle types, tracking vehicle trajectories, or detecting traffic violations.

PROGRAM:

```
import os
import matplotlib.pyplot as plt
import numpy as np
from keras.layers import Conv2D, MaxPooling2D, Flatten, Dense
from keras.models import Sequential
from keras.utils import load_img, img_to_array, to_categorical
from sklearn.model_selection import train_test_split
```

```
dataset_path = 'datasets/5-TRAFFIC-ANALYSIS-CNN'
image_width, image_height = 64, 64
num_classes = len(os.listdir(dataset_path))
X, y = [], []
class_names = {}
for class_name in os.listdir(dataset_path):
    if class_name not in class_names:
        class_names[class_name] = len(class_names)
    class_path = os.path.join(dataset_path, class_name)
    for image_name in os.listdir(class_path):
        image_path = os.path.join(class_path, image_name)
        image = load_img(image_path, target_size=(image_width, image_height))
        image = img_to_array(image)
        X.append(image)
        y.append(class_names[class_name])
X = np.array(X) / 255.0
X_train, X_test, y_train, y_test = train_test_split(X, to_categorical(y, num_classes=num_classes), test_size=0.2)
model = Sequential([
    Conv2D(32, (3,3), activation='relu', input_shape=(image_width, image_height, 3)),
    MaxPooling2D(2,2),
    Conv2D(64, (3,3), activation='relu'),
    MaxPooling2D(2,2),
    Conv2D(128, (3,3), activation='relu'),
    MaxPooling2D(2,2),
    Flatten(),
    Dense(512, activation='relu'),
    Dense(num_classes, activation='sigmoid')])
model.compile(optimizer='adam', loss='categorical_crossentropy', metrics=['accuracy'])
model.summary()
model.fit(X_train, y_train, epochs=10, batch_size=32,verbose=0)
score, acc = model.evaluate(X_test, y_test, verbose=0)
print(f"Score: {(score*100):.2f}% | Accuracy: {(acc*100):.2f} %")
random_indexes = np.random.choice(len(X_test), size=9)
```

```
reverse_map = {v:k for k,v in class_names.items()}
y_pred = model.predict(X_test[random_indexes], verbose=0)
y_pred_class = [reverse_map[np.argmax(y)] for y in y_pred]
y_test = np.argmax(y_test[random_indexes], axis=1)
y_test_class = [reverse_map[y] for y in y_test]
fig, ax = plt.subplots(3,3, figsize=(10,10))
for i, index in enumerate(random_indexes):
    ax[i // 3, i % 3].imshow(X_test[index])
    ax[i // 3, i % 3].set_title(f"Predicted: {y_pred_class[i]}\nActual: {y_test_class[i]}")
    ax[i // 3, i % 3].axis('off')
plt.tight_layout()
plt.show()
```

OUTPUT:

Model: "sequential"

Layer (type)	Output Shape	Param #
conv2d (Conv2D)	(None, 62, 62, 32)	896
max_pooling2d (MaxPooling2D)	(None, 31, 31, 32)	0
conv2d_1 (Conv2D)	(None, 29, 29, 64)	18496
max_pooling2d_1 (MaxPooling 2D)	(None, 14, 14, 64)	0
conv2d_2 (Conv2D)	(None, 12, 12, 128)	73856
max_pooling2d_2 (MaxPooling 2D)	(None, 6, 6, 128)	0
flatten (Flatten)	(None, 4608)	0
dense (Dense)	(None, 512)	2359808
dense_1 (Dense)	(None, 7)	3591

Total params: 2,456,647

Trainable params: 2,456,647

Non-trainable params: 0

RESULT:

Thus the implementation of python program design object detection and classification for traffic analysis using CNN model was executed and verified successfully.

EX.NO:6 IMPLEMENT ONLINE FRAUD DETECTION OF SHARE MARKET DATA USING DATA ANALYTICS TOOLS.

AIM:

To implement online fraud detection of share market data using data analytics tool.

ALGORITHM:

1. Import the necessary libraries, including tensorflow as tf, pandas as pd, and numpy as np.
2. Load the stock market data using pd.read_csv() and extract the relevant features and labels from the data.
3. Normalize the features by subtracting the mean and dividing by the standard deviation using (features - features.mean()) / features.std().
4. Define the MLP model using the Sequential API from TensorFlow.
5. Add three dense layers to the model,
    a. First two layers have ReLU activation.
    b. Last layer uses sigmoid activation for binary classification.
6. Train the model using model.fit() on the normalized features and labels.
7. After training, we predict the fraud probabilities using model.predict() on the normalized features.
8. Add the predictions as a new column named 'FraudProbability' to the original data using data['FraudProbability'] = predictions.
9. Finally, we print the fraudulent activities by filtering the data based on the predicted fraud probabilities using data[data['FraudProbability'] > 0.5].

PROGRAM

```
import tensorflow as tf
import pandas as pd
import numpy as np

# Load the stock market data
data = pd.read_csv('D:\Babisha\stock1.csv')

# Extract the features (e.g., price, volume, etc.) from the data
features = data[['Open','Close']].values
```

```
# Define the labels (fraud or not fraud)
labels = np.array(data['Adj Close'])

# Normalize the features
normalized_features = (features - features.mean()) / features.std()

# Define the MLP model
model = tf.keras.models.Sequential([
    tf.keras.layers.Dense(64, activation='relu', input_shape=(2,)),
    tf.keras.layers.Dense(32, activation='relu'),
    tf.keras.layers.Dense(1, activation='sigmoid')
])

# Compile the model
model.compile(loss='binary_crossentropy', optimizer='adam', metrics=['accuracy'])

# Train the model
model.fit(normalized_features, labels, epochs=10, batch_size=32, validation_split=0.2)

# Predict the fraud probabilities
predictions = model.predict(normalized_features)

# Add the predictions as a new column in the data
data['FraudProbability'] = predictions

# Print the fraudulent activities
fraudulent_activities = data[data['FraudProbability'] > 0.5]
print("Fraudulent Activities:")
print(fraudulent_activities)
```

OUTPUT

```
Epoch 1/10
43/43 [==============================] - 2s 5ms/step - loss: -86.1644 - accuracy: 0
.0000e+00 - val_loss: -429.2317 - val_accuracy: 0.0000e+00
Epoch 2/10
43/43 [==============================] - 0s 1ms/step - loss: -405.5972 - accuracy:
0.0000e+00 - val_loss: -1608.5574 - val_accuracy: 0.0000e+00
```

Epoch 3/10

43/43 [==============================] - 0s 1ms/step - loss: -1365.9751 - accuracy : 0.0000e+00 - val_loss: -4702.0205 - val_accuracy: 0.0000e+00

Epoch 4/10

43/43 [==============================] - 0s 1ms/step - loss: -3519.1863 - accuracy : 0.0000e+00 - val_loss: -10974.2188 - val_accuracy: 0.0000e+00

Epoch 5/10

43/43 [==============================] - 0s 1ms/step - loss: -7582.8442 - accuracy : 0.0000e+00 - val_loss: -21873.9551 - val_accuracy: 0.0000e+00

Epoch 6/10

43/43 [==============================] - 0s 1ms/step - loss: -14148.5811 - accuracy : 0.0000e+00 - val_loss: -39032.0312 - val_accuracy: 0.0000e+00

Epoch 7/10

43/43 [==============================] - 0s 1ms/step - loss: -23938.2207 - accuracy: 0.0000e+00 - val_loss: -63014.4492 - val_accuracy: 0.0000e+00

Epoch 8/10

43/43 [==============================] - 0s 1ms/step - loss: -37390.9531 - accuracy: 0.0000e+00 - val_loss: -95703.1016 - val_accuracy: 0.0000e+00

Epoch 9/10

43/43 [==============================] - 0s 822us/step - loss: -55393.1602 - accuracy: 0.0000e+00 - val_loss: -137511.5938 - val_accuracy: 0.0000e+00

Epoch 10/10

43/43 [==============================] - 0s 1ms/step - loss: -78131.5859 - accuracy: 0.0000e+00 - val_loss: -191255.2500 - val_accuracy: 0.0000e+00

53/53 [==============================] - 0s 538us/step

Fraudulent Activities:

	Date	Open	High	Low	Close	Volume
0	6/29/2010	19.000000	25.000000	17.540001	23.889999	18766300
1	6/30/2010	25.790001	30.420000	23.299999	23.830000	17187100
2	7/1/2010	25.000000	25.920000	20.270000	21.959999	8218800
3	7/2/2010	23.000000	23.100000	18.709999	19.200001	5139800
4	7/6/2010	20.000000	20.000000	15.830000	16.110001	6866900
...	...	...	...	...	...	...
1687	3/13/2017	244.820007	246.850006	242.779999	246.169998	3010700

1688	3/14/2017	246.110001	258.119995	246.020004	258.000000	7575500
1689	3/15/2017	257.000000	261.000000	254.270004	255.729996	4816600
1690	3/16/2017	262.399994	265.750000	259.059998	262.049988	7100400
1691	3/17/2017	264.000000	265.329987	261.200012	261.500000	6475900

	Adj Close	FraudProbability
0	23.889999	1.0
1	23.830000	1.0
2	21.959999	1.0
3	19.200001	1.0
4	16.110001	1.0
...	...	...
1687	246.169998	1.0
1688	258.000000	1.0
1689	255.729996	1.0
1690	262.049988	1.0
1691	261.500000	1.0

RESULT:

Thus the implementation of online fraud detection of share market data using data analytics tool was implemented and verified successfully.

EX.NO: 7A IMPLEMENT IMAGE AUGMENTATION USING TENSOR FLOW

AIM:

To write a python program to implement image augmentation using Tensor flow.

ALGORITHM:

1. Import the packages necessary for image augmentation using tensor flow.
2. Load the dataset for training the data.
3. Reshape the input data to 4D (samples, height, width, channels).
4. Convert the pixel values to float and normalize to the range [0, 1].
5. Define the image augmentation parameters.
6. Generate augmented images from the training dataset.
7. Convert the augmented images and labels to NumPy arrays.
8. Display some examples of original and augmented images.

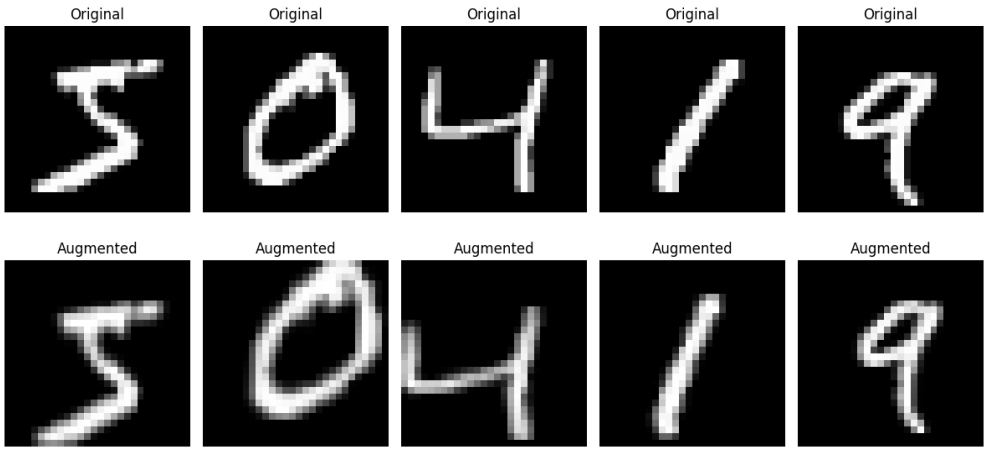
PROGRAM:

```
import tensorflow as tf
from tensorflow.keras.datasets import mnist
from tensorflow.keras.preprocessing.image import ImageDataGenerator
import matplotlib.pyplot as plt
(x_train, y_train), (x_test, y_test) = mnist.load_data()
x_train = x_train.reshape(x_train.shape[0], 28, 28, 1)
x_test = x_test.reshape(x_test.shape[0], 28, 28, 1)
x_train = x_train.astype('float32') / 255.0
x_test = x_test.astype('float32') / 255.0
datagen = ImageDataGenerator(
    rotation_range=10,
    width_shift_range=0.1,
    height_shift_range=0.1,
    shear_range=0.2,
    zoom_range=0.2,
    fill_mode='nearest')
augmented_images = []
```

```
augmented_labels = []
for x, y in zip(x_train, y_train):
    x = tf.expand_dims(x, 0)
    augmented_iterator = datagen.flow(x, batch_size=1)
    augmented_image = next(augmented_iterator)[0]
    augmented_images.append(augmented_image)
    augmented_labels.append(y)
augmented_images = np.array(augmented_images)
augmented_labels = np.array(augmented_labels)
fig, axes = plt.subplots(2, 5, figsize=(12, 6))
for i, ax in enumerate(axes.flat):
    if i < 5:
        ax.imshow(x_train[i].reshape(28, 28), cmap='gray')
        ax.set_title('Original')
    else:
        ax.imshow(augmented_images[i - 5].reshape(28, 28), cmap='gray')
        ax.set_title('Augmented')
    ax.axis('off')
plt.tight_layout()
plt.show()
```

OUTPUT:

Downloading data from https://storage.googleapis.com/tensorflow/tf-keras-datasets/mnist.npz
11490434/11490434 [==============================] - 0s 0us/step



RESULT:

Thus the program to implement image augmentation using Tensor flow was successfully implanted and executed.

EX.NO:7B IMPLEMENT RBM MODELING TO UNDERSTAND HAND WRITTEN DIGITS

AIM:

To write a python program to implement RBM modeling to understand hand written digits.

ALGORITHM:

1. Import the necessary packages needed for RBM modeling.
2. Load the input file for processing.
3. Get the pixel value of the image.
4. Read the handwritten digits for min-max scaling to convert the image pixel from 0 to 255 range 0 to 1.
5. Import BernoulliRBM package and execute the RBM modeling for 10 iteration over the training data set.
6. Perform Gibbs Sampling over the dataset,
7. Print the handwritten images produced by RBM model.

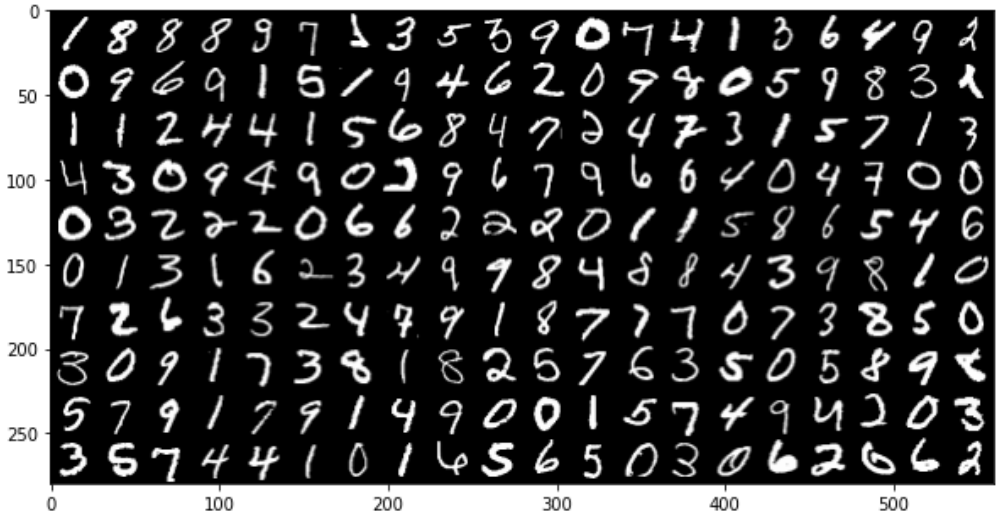
PROGRAM:

```
import numpy as np # linear algebra
import pandas as pd # data processing, CSV file I/O (e.g. pd.read_csv)
import os
for dirname, _, filenames in os.walk('/kaggle/input'):
    for filename in filenames:
        print(os.path.join(dirname, filename))
import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline
plt.rcParams['image.cmap'] = 'gray'
import pandas as pd
def gen_mnist_image(X):
    return np.rollaxis(np.rollaxis(X[0:200].reshape(20, -1, 28, 28), 0, 2), 1, 3).reshape(-1, 20 *
28)
X_train = pd.read_csv('../input/mnist-digit-recognizer/train.csv').values[:,1:]
X_train = (X_train - np.min(X_train, 0)) / (np.max(X_train, 0) + 0.0001)  # 0-1 scaling
```

```
plt.figure(figsize=(10,20))
plt.imshow(gen_mnist_image(X_train));
from sklearn.neural_network import BernoulliRBM
rbm = BernoulliRBM(n_components=100, learning_rate=0.01, random_state=0, verbose=True)
rbm.fit(X_train)
xx = X_train[:40].copy()
for ii in range(1000):
    for n in range(40):
        xx[n] = rbm.gibbs(xx[n])
plt.figure(figsize=(10,20))
plt.imshow(gen_mnist_image(xx))
xx = X_train[:40].copy()
for ii in range(10000):
    for n in range(40):
        xx[n] = rbm.gibbs(xx[n])
plt.figure(figsize=(10,20))
plt.imshow(gen_mnist_image(xx))
```

OUTPUT:

```
/kaggle/input/mnist-digit-recognizer/train.csv
```




```
[BernoulliRBM] Iteration 1, pseudo-likelihood = -119.88, time = 9.48s
[BernoulliRBM] Iteration 2, pseudo-likelihood = -104.69, time = 11.60s
```

[BernoulliRBM] Iteration 3, pseudo-likelihood = -97.89, time = 11.29s

[BernoulliRBM] Iteration 4, pseudo-likelihood = -93.03, time = 10.58s

[BernoulliRBM] Iteration 5, pseudo-likelihood = -90.10, time = 10.71s

[BernoulliRBM] Iteration 6, pseudo-likelihood = -88.20, time = 11.41s

[BernoulliRBM] Iteration 7, pseudo-likelihood = -86.16, time = 10.47s

[BernoulliRBM] Iteration 8, pseudo-likelihood = -85.37, time = 10.69s

[BernoulliRBM] Iteration 9, pseudo-likelihood = -83.71, time = 11.40s

[BernoulliRBM] Iteration 10, pseudo-likelihood = -82.54, time = 10.53s

BernoulliRBM(learning_rate=0.01, n_components=100, random_state=0, verbose=True)

```
<matplotlib.image.AxesImage at 0x79a57da1bc50>
```


```
<matplotlib.image.AxesImage at 0x79a57daccc10>
```

RESULT:

Thus the implementation of RBM modeling to understand hand written digits was successfully implemented and executed.

EX.NO: 8 IMPLEMENT SENTIMENT ANALYSIS USING LSTM

AIM:

To write a python program to implement Sentiment analysis using LSTM

ALGORITHM:

1. Import the necessary packages needed for sentiment analysis.
2. Load the input file for processing.
3. Convert each word in your text data into a dense vector representation called word embeddings.
4. Split the dataset into training and testing sets. The training set will be used to train the LSTM model,
5. Pad the input sequences with zeros to make them of equal length. This is necessary because LSTM models require fixed-length input sequences.
6. Construct an LSTM model using a deep learning framework like TensorFlow or PyTorch.
7. Evaluate the performance of your trained LSTM model using the testing set.
8. Calculate metrics like accuracy, precision, recall, and F1-score to measure how well the model predicts sentiment.

PROGRAM:

```
from keras.datasets import imdb
(x_train, y_train), (x_test, y_test) = imdb.load_data(num_words=10000)
from keras.utils import pad_sequences
max_len = 100
x_train = pad_sequences(x_train, maxlen=max_len)
x_test = pad_sequences(x_test, maxlen=max_len)
from keras.models import Sequential
from keras.layers import Embedding, LSTM, Dense
model = Sequential([
   Embedding(10000, 192),
   LSTM(128, dropout=0.2, recurrent_dropout=0.2),
   Dense(1, activation='sigmoid')])
model.compile(loss='binary_crossentropy', optimizer='adam', metrics=['accuracy'])
model.fit(x_train, y_train, batch_size=32, epochs=5, verbose=0)
```

```
score, acc = model.evaluate(x_test, y_test, batch_size=32, verbose=0)
print(f"Test score: {score:.2f} - Test accuracy: {acc:.2f}")
word_index = imdb.get_word_index()
reverse_word_index = {value: key for (key, value) in word_index.items()}
def decode_review(review):
    return ' '.join([reverse_word_index.get(i - 3, '?') for i in review])
import numpy as np
random_indices = np.random.randint(0, len(x_test), 5)
x_sample = x_test[random_indices]
y_sample = y_test[random_indices]
y_pred = model.predict(x_sample, batch_size=5, verbose=0)
for i in range(len(x_sample)):
    print(f"Review: {decode_review(x_sample[i])[0:30]}...")
    print(f"Sentiment: {'Positive' if y_sample[i] == 1 else 'Negative'}")
    print(f"Predicted sentiment: {'Positive' if y_pred[i] > 0.5 else 'Negative'}")
    confidence = y_pred[i] if y_pred[i] > 0.5 else 1 - y_pred[i]
    print(f"Confidence: {confidence[0]:.2f}")
    print('-'*50)
```

OUTPUT:

```
Review: was terrible and the last 25 3...
Sentiment: Negative
Predicted sentiment: Negative
Confidence: 1.00
--------------------------------------------------
Review: his daughters through a pun in...
Sentiment: Negative
Predicted sentiment: Negative
Confidence: 1.00
--------------------------------------------------
Review: the book too and i am being un...
Sentiment: Negative
```

Predicted sentiment: Negative

Confidence: 1.00

Review: huge ? and disregard the envir...

Sentiment: Positive

Predicted sentiment: Positive

Confidence: 0.79

Review: the japanese in korea in medie...

Sentiment: Positive

Predicted sentiment: Positive

Confidence: 0.97

RESULT:

Thus the implement of python program for Sentiment analysis using LSTM was executed and verified successfully.