LABORATORY REPORT

Application Development Lab
(CS33002)

B.Tech Program in ECSc

Submitted By

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Experiment Title	Stock price prediction using Linear Regression and LSTM models
Date of Experiment	21/01/25
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1. **Objective:-** To perform stock price prediction based on historical stock price data, using linear regression and LSTM (Long short-term model)

2. **Procedure:-**
   1. Collect historical stock price data.
   2. Preprocess the data for analysis (missing data, scaling, splitting into train/test).
   3. Implement Linear Regression to predict future stock prices.
   4. Design and train an LSTM model for time-series prediction.
   5. Compare the accuracy of both models.
   6. Create a Flask backend for model predictions.
   7. Build a frontend to visualize predictions using charts and graphs.

3. **Code:-**

Python code:

```
import numpy as np
import pandas as pd
from flask import Flask, request, jsonify, render_template
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.preprocessing import StandardScaler, MinMaxScaler
import tensorflow as tf
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import LSTM, Dense, Dropout
import os
from werkzeug.utils import secure_filename

app = Flask(__name__)
app.config['UPLOAD_FOLDER'] = 'uploads'
app.config['MAX_CONTENT_LENGTH'] = 16 * 1024 * 1024  # 16MB max
file size
```

```
os.makedirs(app.config['UPLOAD_FOLDER'], exist_ok=True)


linear_model = LinearRegression()
lstm_model = None
scaler = StandardScaler()
mm_scaler = MinMaxScaler()
ALLOWED_EXTENSIONS = {'csv'}

def allowed_file(filename):
    return '.' in filename and filename.rsplit('.', 1)[1].lower() in
ALLOWED_EXTENSIONS

def prepare_data_linear(df):
    """Prepare data for Linear Regression"""

    df['SMA_5'] = df['Close'].rolling(window=5).mean()
    df['SMA_20'] = df['Close'].rolling(window=20).mean()
    df['RSI'] = calculate_rsi(df['Close'])
    df['Price_Change'] = df['Close'].pct_change()
    df['Volatility'] = df['Close'].rolling(window=10).std()



    df.dropna(inplace=True)



    X = df[['SMA_5', 'SMA_20', 'RSI', 'Price_Change', 'Volatility']].values
    y = df['Close'].values

    return X, y

def prepare_data_lstm(df, look_back=30):
    """Prepare data for LSTM"""

    if len(df) < look_back:
        look_back = len(df) // 2



    scaled_data = mm_scaler.fit_transform(df[['Close']].values)

    X, y = [], []
    for i in range(look_back, len(scaled_data)):
        X.append(scaled_data[i-look_back:i, 0])
        y.append(scaled_data[i, 0])
```

```
    X, y = np.array(X), np.array(y)
    X = np.reshape(X, (X.shape[0], X.shape[1], 1))

    return X, y

def calculate_rsi(prices, period=14):
    """Calculate RSI indicator"""
    delta = prices.diff()
    gain = (delta.where(delta > 0, 0)).rolling(window=period).mean()
    loss = (-delta.where(delta < 0, 0)).rolling(window=period).mean()
    rs = gain / loss
    return 100 - (100 / (1 + rs))

def create_lstm_model(input_shape):
    """Create and compile LSTM model"""
    model = Sequential([
        LSTM(50, activation='relu', input_shape=input_shape, return_sequences=True),
        Dropout(0.2),
        LSTM(50, activation='relu'),
        Dropout(0.2),
        Dense(1)
    ])
    model.compile(optimizer='adam', loss='mse')
    return model

def train_linear_model(X, y):
    """Train the linear regression model"""
    X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
    X_train_scaled = scaler.fit_transform(X_train)
    X_test_scaled = scaler.transform(X_test)
    linear_model.fit(X_train_scaled, y_train)
    return linear_model.score(X_test_scaled, y_test)

def train_lstm_model(X, y):
    """Train the LSTM model"""
    X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
    global lstm_model
    lstm_model = create_lstm_model((X.shape[1], 1))
    lstm_model.fit(X_train, y_train, epochs=50, batch_size=32, validation_split=0.1, verbose=0)
    return lstm_model.evaluate(X_test, y_test)

@app.route('/')
```

```
def home():
    return render_template('index.html')

@app.route('/upload', methods=['POST'])
def upload_file():
    if 'file' not in request.files:
        return jsonify({'error': 'No file part'}), 400

    file = request.files['file']
    if file.filename == '':
        return jsonify({'error': 'No selected file'}), 400

    if file and allowed_file(file.filename):
        filename = secure_filename(file.filename)
        filepath = os.path.join(app.config['UPLOAD_FOLDER'], filename)
        file.save(filepath)
        return jsonify({'success': True, 'filename': filename})

    return jsonify({'error': 'Invalid file type'}), 400

@app.route('/predict', methods=['POST'])
def predict():
    try:
        data = request.get_json()
        filename = data.get('filename')
        model_type = data.get('model_type', 'linear')


        df = pd.read_csv(
            os.path.join(app.config['UPLOAD_FOLDER'], filename),
            parse_dates=['Date'],
            date_parser=lambda x: pd.to_datetime(x,
format="%d/%m/%Y %H:%M:%S")
        )
        df.set_index('Date', inplace=True)


        df.index = pd.to_datetime(df.index)

        if model_type == 'linear':

            X, y = prepare_data_linear(df)
            accuracy = train_linear_model(X, y)
            last_data = scaler.transform([X[-1]])
            prediction = linear_model.predict(last_data)[0]
        else:
```

```
            X, y = prepare_data_lstm(df)
            accuracy = train_lstm_model(X, y)


            last_sequence = X[-1:]
            prediction = lstm_model.predict(last_sequence)
            prediction = mm_scaler.inverse_transform(prediction.reshape(-1, 1))[0][0]

        response = {
            'prediction': float(prediction),
         'accuracy': float(1 - accuracy) if model_type == 'lstm' else float(accuracy),
            'historical_data': df['Close'].tolist(),
          'dates': df.index.map(lambda x: x.strftime('%Y-%m-%d')).tolist()  # This should work now
        }

        return jsonify(response)

    except Exception as e:
        return jsonify({'error': str(e)}), 500

if __name__ == '__main__':
    app.run(debug=True)
```

HTML Code:

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Advanced Stock Price Prediction</title>
    <script src="https://cdnjs.cloudflare.com/ajax/libs/Chart.js/3.7.0/chart.min.js"></script>
    <style>
        body {
            font-family: Arial, sans-serif;
            max-width: 1200px;
            margin: 0 auto;
            padding: 20px;
            background-color: darkcyan;
        }
```

```
.container {
    background-color: aquamarine;
    padding: 20px;
    border-radius: 8px;
    box-shadow: 0 2px 4px rgba(0, 0, 0, 0.1);
}

.header {
    text-align: center;
    margin-bottom: 30px;
}

.controls {
    display: flex;
    justify-content: center;
    gap: 20px;
    margin-bottom: 20px;
    align-items: center;
}

.file-upload {
    display: flex;
    align-items: center;
    gap: 10px;
}

.model-select {
    padding: 8px;
    border-radius: 4px;
    border: 1px solid #ddd;
    font-size: 16px;
}

button {
    padding: 8px 16px;
    background-color: #007bff;
    color: white;
    border: none;
    border-radius: 4px;
    cursor: pointer;
    font-size: 16px;
}

button:hover {
    background-color: #0056b3;
}
```

```
        button:disabled {
            background-color: #cccccc;
            cursor: not-allowed;
        }

        .results {
            margin-top: 20px;
            padding: 20px;
            border: 1px solid #ddd;
            border-radius: 4px;
            display: none;
        }

        .chart-container {
            margin-top: 20px;
            height: 400px;
        }

        .loading {
            display: none;
            text-align: center;
            margin: 20px 0;
        }

        .error {
            color: red;
            text-align: center;
            margin: 20px 0;
            display: none;
        }

        .upload-status {
            margin-top: 10px;
            text-align: center;
            color: #666;
        }
    </style>
</head>
<body>
    <div class="container">
        <div class="header">
            <h1>Advanced Stock Price Prediction</h1>
            <p>Upload CSV data and choose prediction model</p>
        </div>

        <div class="controls">
            <div class="file-upload">
```

```
            <input type="file" id="csvFile" accept=".csv">
            <button onclick="uploadFile()" id="uploadBtn">Upload</button>
        </div>
        <select class="model-select" id="modelSelect">
            <option value="linear">Linear Regression</option>
            <option value="lstm">LSTM</option>
        </select>
        <button onclick="predict()" id="predictBtn" disabled>Generate Prediction</button>
    </div>

    <div class="upload-status" id="uploadStatus"></div>
    <div class="loading" id="loading">Processing... Please wait.</div>
    <div class="error" id="error"></div>

    <div class="results" id="results">
        <h2>Prediction Results</h2>
        <p>Predicted Price: $<span id="predictedPrice"></span></p>
        <p>Model Accuracy: <span id="accuracy"></span>%</p>
    </div>

    <div class="chart-container">
        <canvas id="priceChart"></canvas>
    </div>
</div>

<script>
    let chart;
    let currentFileName = '';

    async function uploadFile() {
        const fileInput = document.getElementById('csvFile');
        const file = fileInput.files[0];

        if (!file) {
            showError('Please select a file first');
            return;
        }

        const formData = new FormData();
        formData.append('file', file);

        showLoading(true);
        hideError();
        clearUploadStatus();

        try {
            const response = await fetch('/upload', {
```

```
            method: 'POST',
            body: formData
        });

        const data = await response.json();

        if (data.error) {
            showError(data.error);
            return;
        }

        currentFileName = data.filename;
        document.getElementById('uploadStatus').textContent = 'File uploaded successfully!';
        document.getElementById('predictBtn').disabled = false;
    } catch (error) {
        showError('Error uploading file: ' + error.message);
        document.getElementById('predictBtn').disabled = true;
    } finally {
        showLoading(false);
    }
}

async function predict() {
    if (!currentFileName) {
        showError('Please upload a file first');
        return;
    }

    const modelType = document.getElementById('modelSelect').value;
    showLoading(true);
    hideError();
    hideResults();

    try {
        const response = await fetch('/predict', {
            method: 'POST',
            headers: {
                'Content-Type': 'application/json',
            },
            body: JSON.stringify({
                filename: currentFileName,
                model_type: modelType
            })
        });

        const data = await response.json();
```

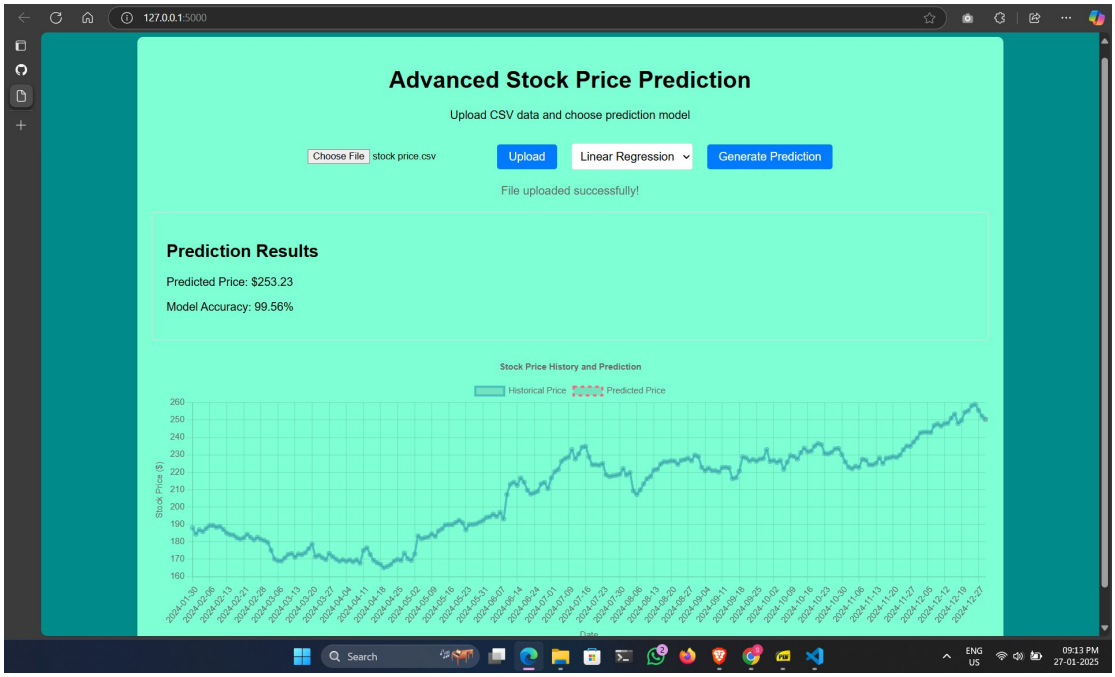
```
        if (data.error) {
            showError(data.error);
            return;
        }

        updateResults(data);
        updateChart(data);
        showResults();
    } catch (error) {
        showError('Error generating prediction: ' + error.message);
    } finally {
        showLoading(false);
    }
}

function updateResults(data) {
    document.getElementById('predictedPrice').textContent =
        data.prediction.toFixed(2);
    document.getElementById('accuracy').textContent =
        (data.accuracy * 100).toFixed(2);
}

function updateChart(data) {
    const ctx = document.getElementById('priceChart').getContext('2d');

    if (chart) {
        chart.destroy();
    }

    chart = new Chart(ctx, {
        type: 'line',
        data: {
            labels: data.dates,
            datasets: [{
                label: 'Historical Price',
                data: data.historical_data,
                borderColor: 'rgb(75, 192, 192)',
                tension: 0.1
            }, {
                label: 'Predicted Price',
                data: [...Array(data.historical_data.length - 1).fill(null),
                    data.historical_data[data.historical_data.length - 1],
                    data.prediction],
                borderColor: 'rgb(255, 99, 132)',
                borderDash: [5, 5],
                tension: 0.1
            }]
```

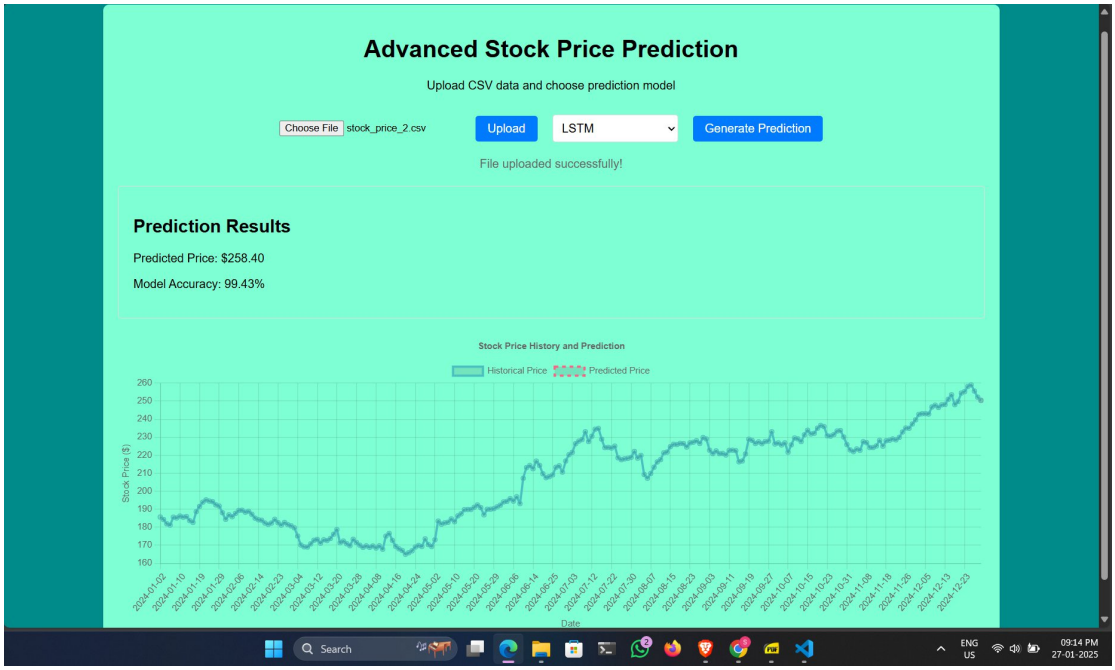
```
            },
            options: {
                responsive: true,
                maintainAspectRatio: false,
                scales: {
                    y: {
                        beginAtZero: false,
                        title: {
                            display: true,
                            text: 'Stock Price ($)'
                        }
                    },
                    x: {
                        title: {
                            display: true,
                            text: 'Date'
                        }
                    }
                },
                plugins: {
                    title: {
                        display: true,
                        text: 'Stock Price History and Prediction'
                    }
                }
            }
        });
    }

    function showLoading(show) {
        document.getElementById('loading').style.display = show ? 'block' :
'none';
    }

    function showError(message) {
        const errorDiv = document.getElementById('error');
        errorDiv.textContent = message;
        errorDiv.style.display = 'block';
    }

    function hideError() {
        document.getElementById('error').style.display = 'none';
    }

    function clearUploadStatus() {
        document.getElementById('uploadStatus').textContent = '';
    }
```

```
        function showResults() {
            document.getElementById('results').style.display = 'block';
        }

        function hideResults() {
            document.getElementById('results').style.display = 'none';
        }
    </script>
</body>
</html>
```

GitHub Repo ink: [AD-LAB-Files/Experiment-3 at- diptarkasarkar/AD-LAB-Files]

4. Output:-





5. Remarks:-

Diptarka Sarkar

(Name of the Student)

Signature of the Lab Coordinator

(Name of the Coordinator)