

# Stock Sentiment Analysis Using LSTM

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## Abstract

This project explores the relationship between financial news sentiment and stock price movement using machine learning. We used news headlines from NewsAPI and stock data from Yahoo Finance to predict short-term stock trends. Several models were implemented including Logistic Regression, SVM, and LSTM, with LSTM achieving the best accuracy of 80%.

## Problem Statement

The goal is to predict stock price movement using sentiment extracted from financial news. By labeling price direction as binary (up/down), we aim to assess whether sentiment is a strong predictor of short-term market movement.

## Tools and Data Sources

- NewsAPI was used to collect financial news related to HDFC Bank for June 2025.
- Yahoo Finance (via yfinance library) was used to collect corresponding stock prices.
- TextBlob was used for sentiment analysis.
- Libraries: pandas, numpy, matplotlib, scikit-learn, tensorflow.keras

## Methodology

1. News headlines were collected and cleaned.
2. Sentiment scores were computed using TextBlob.
3. Daily sentiment was averaged and merged with stock Close prices.
4. Stock prices were labeled as 1 (up) or 0 (down/no change) for the next day.
5. Models were trained using these features to predict the label.

## Models Implemented

- Logistic Regression: Baseline model, achieved 60% accuracy.
- Support Vector Machine (SVM): Achieved 80% accuracy with RBF kernel.
- Long Short-Term Memory (LSTM): Used past 3–5 days of sentiment to predict next day. Accuracy reached 80%.

## Results

Model	Accuracy
Logistic Regression	60%
SVM (RBF Kernel)	80%

LSTM (window size 3)	80%
LSTM (window size 5)	80%

## Conclusion

Sentiment analysis on financial news can be a strong indicator of short-term stock movement. LSTM performed best due to its ability to learn from sequences of past sentiment data. This project demonstrates how even a basic sentiment scoring system can support financial prediction.