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Contents

Sl.No.	Paper ID	Paper Title
1	2	Heating and Cooling Jacket for Military for Optimal Comfort
2	6	Classification of Cognitive Stress with Stress GAN-GP
3	17	Smart Lock for Enhancing Luggage Security Using Internet of Things
4	21	Suppression of Mutual coupling and cross-polarization between Closely Spaced Microstrip MIMO Antennas by using a planar frequency-selective surface structure
5	28	Mouse Cursor Control Using Dynamic Hand Gesture Recognition
6	30	EPD-ECNN: Enhanced PCOS Detection with Preprocessed Ultrasound Images and Ensemble CNN Model
7	32	An IoT and Machine Learning Approach to In-Home Elderly Care
8	44	Efficient Information Digest: Exploring AI-Driven PDF Summarization through Stream lit, Open API, and Lang Chain
9	49	IoT Enabled Biomedical Smart Waste Bin Monitoring System
10	50	5G Managed Services Induced Changes in Telecom Value Chain
11	52	5G Advanced: A Step Towards 6G
12	54	Vyoma-ADS : An AI-Driven Tool for Adaptive Monitoring and Anomaly Detection for Space Agriculture
13	64	An Intelligent Cyber Security System Approach using Machine Learning Techniques on KDD-99 Dataset
14	69	Sustainable Solar Powered Bluetooth Enabled Smart Home Automation System Using Internet-of-Things
15	70	VDTA and CDTA based Grounded Flux Controlled Meminductor
16	71	Artificial Intelligence Technique in Next Generation Healthcare Systems
17	72	Artificial Intelligence, Cyber Security and Vedic Scripture Integrated Sustainable Global Youth Leadership Development
18	74	Feature Selection for Cotton Leaf Disease Using Deep Learning
19	75	Circular Shaped Meta-Surface Embedded Monopole Antenna for Ultra-Wideband MIMO Applications with Frequency Notched Characteristics.
20	78	Attention-based Deep Learning model for Indoor Object Recognition Framework for Visually Impaired Individuals
21	80	Fusion SegNet: Integrating Modalities for Enhanced Brain Tumor Detection and Segmentation
22	84	Two-order Wavelet Transform-Based Dual-Tamper Detection and Self-Restoration
23	87	Machine Learning Approaches in Optical Sensing for Precision Kidney Function Analysis
24	92	Smart Card-Based Mutual Authentication Mechanism for UAV Networks
25	93	Enhancing Network Security: Deep Learning-Powered Intrusion Detection with Data Engineering Techniques
26	95	Prevention from Road Accidents due to Drunk Driver using IOT
27	97	Biotic Stress and Severity Classification of Pear Leaves Disease with Ensemble Learning
28	98	Design of Antenna Array for Microwave Medical Imaging

29	101	Estimation And Analysis of Average Power Consumption & Gate Delay of a Prototype Circuit Based on a Product of Sum Function for The Design of Integrated Circuits
30	104	Creating a Broadband Matching Network for a Low Noise Amplifier: Design and Optimization
31	106	Automated Design of CMOS-DACML Circuit
32	107	An Unified PSO and Fuzzy Satisfaction Framework for Power Flow Optimization
33	110	Blockchain: Tools, Challenges and Benefits
34	112	Applying Machine Learning Models for Heart Disease Prediction: A Comparative Analysis
35	113	Machine Learning Models for Early Heart Disease Prediction: A Comparative Analysis
36	115	BlindBattle: Tactile Game For Blind
37	119	Automatic Lung Tumor Volume Estimation Using PSO-TSVM Method
38	122	Metamaterials: The future matter
39	128	2 x 2 Microstrip Patch Antenna Array for Improving the Power Conversion Efficiency of RF Energy Harvesting
40	129	IoT Enabled Anti-Child Trafficking System Using Data Analysis
41	130	Extensive Review of Epileptic Seizure Detection Techniques: Performance, Achievements, and Future Directions
42	133	Android Malware Detection Using Deep Transfer Learning Model for IoT Applications
43	134	Indoor 3D REM Design using Ordinary Kriging Interpolation
44	137	Advancements in Neural Network-Based Text Summarization Techniques
45	139	An Effective and Accurate Ensemble Model with Transfer Learning for Automatic Currency Detection
46	143	Discovering Roads from High-Resolution Satellite Imagery
47	144	A Modified Linknet Architecture for Attack Detection in Internet of Things
48	145	Judging the Psychological Impact of News Articles on Rehab Patients: A Deep Learning Approach
49	146	VisionaryX-9: Efficient plant disease prediction model
50	147	Enhanced Diabetes Prediction Using Salivary Enzymes and Machine Learning Techniques: A Comprehensive and Explainable Approach
51	148	An Amalgamation of RNN and Transformers for Identifying Depression at the Preliminary Stage
52	150	A Brief Review of TOPCon Solar Cell and Its Future Perspectives
53	155	Enhancing SMS Classification with Ensemble Machine Learning Techniques
54	156	Enhancement of Gain of Rectangular Microstrip Antenna Through Metamaterial Inclusion
55	158	Towards Sustainable Waste Management: EfficientNetB0 Garbage Classification Model
56	159	Scalable Fire Classification with MobileNetV2-Driven Convolutional Neural Networks
57	160	Unveiling CAPTCHAs: Advanced CNN Techniques for High-Accuracy Recognition
58	161	Optimizing White Blood Cell Classification with ResNet50 Neural Network
59	162	Classification of Cassava Leaf Diseases Using a Pre-trained EfficientNet Model
60	168	Modelling and Design of ANN-based MPPT Controller of SEPIC Converter for SPV Application.

61	170	A Novel Approach for Detection of Autism Using Neural Transformer
62	173	Zenvgg1X: An Advance Hybrid framework based on Gene sequencing for Analysis and prediction of Lung cancers using KNN-GNN and Custom VGG19
63	174	Tuning of Photocurrent by Magnetic Field in p-Si/NiFe ₂ O ₄ /CuPc/Au Heterostructure
64	175	Metamaterial Inspired Planar Multi-band Antenna for Wireless Application
65	176	Variance Score and Pearson Similarity based Unsupervised Feature Selection (VPUFS) for Sample Clustering in Microarray Gene Expression Data
66	177	Optimizing Student Performance Prediction: A Comparative Analysis Using Machine Learning
67	179	Probabilistic and Interpretable Approach for Malaria Transmission Forecasting via ARIMA
68	180	Evolutionary Approach-Based Hybrid CNN and SVM for Effective Plant Disease Classification
69	182	Machine Learning and Neural Network based Early Prediction of Corona Virus and Diagnosing the Status of heart diseases
70	184	Prediction of User Behaviour of Electric Vehicles Utilizing Ensembled Machine Learning Technique
71	186	Optimization of Computation Offloading in Mobile-Edge Computing Networks with Deep Reinforcement Approach
72	194	A non linear system controlling by using artificial neural network
73	195	Voltage profile enhancement and harmonic reduction in power system network using fuzzy logic controller
74	196	Enhancing Scalability and Performance in IoT Networks through Off Chain Data Processing and Blockchain Integration
75	198	Automatic Detection of Cardiac Arrhythmias using Discrete Wavelet Transform and Support Vector Machine
76	201	Ant Lion Optimizer for Robust UWSNs Communication Protocols
77	202	Improving Beamforming in 5G Networks Using Reinforcement Learning
78	203	Predictive Analytics for 5G Network Performance Using Bayesian Networks
79	204	Adaptive Beamforming in MIMO Systems Using Deep Learning
80	205	Real-time Traffic Prediction in 5G Networks Using LSTM Networks
81	206	Energy Efficiency in 5G Networks Using Gaussian Mixture Models
82	207	Enhancing 5G Network Throughput Using Reinforcement Learning
83	208	AI-Enabled Dynamic Spectrum Sharing in Next-Generation Networks
84	209	Bioinspired Routing Protocols for UWSNs Using Particle Swarm Optimization
85	210	Seagull Optimization Algorithm for Underwater Sensor Network Localization
86	211	Moth-Flame Optimization for Improving UWSNs Performance
87	212	Applying Artificial Bee Colony Algorithm to Improve UWSNs Communication
88	213	Adaptive Modulation and Coding in 5G Networks with Deep Learning
89	214	Bioinspired Clustering in UWSNs Using Monarch Butterfly Optimization
90	215	Jellyfish Search Algorithm for UWSNs Energy Management
91	216	User Mobility Prediction in 5G Networks Using Recurrent Neural Networks
92	217	Hybrid Bioinspired Algorithms for UWSNs: Combining Genetic Algorithm and PSO
93	218	Adaptive Bioinspired Protocols for UWSNs Using Spider Monkey Optimization
94	219	Leveraging Grey Wolf Optimizer for Reliable Data Transmission in UWSNs

95	220	AI-Powered Network Intrusion Detection Systems
96	221	Transforming Crime Scene Investigations Through the Integration of Artificial Intelligence in Digital Forensics
97	222	Learning from Time-Tracking Data: Gaussian Process Regression for Efficient Time Management Systems
98	224	Segmentation of Liver Tumors in CT Scans Using Active Contour Models and Machine Learning
99	225	Behavioral Time Management Analysis: Clustering Productivity Patterns using K-Means
100	226	Detection of Barrett's Esophagus in Endoscopic Images Using Machine Learning Algorithms
101	227	Cancer Genomics: Identifying Biomarkers for Early Detection and Treatment
102	228	Time Management Recommendations with Bayesian Neural Networks: An Intelligent Assistant Approach
103	229	Detection of Stroke in CT Scans Using Deep Learning and Image Processing Techniques
104	230	Machine Learning Techniques for Protein Structure Prediction in Bioinformatics
105	231	Intelligent Time Management Recommendations Using Bayesian Optimization
106	232	Developing Algorithms for Predicting Gene-Disease Associations
107	233	Detection of Gastric Cancer in Endoscopic Images Using Deep Convolutional Neural Networks
108	234	Next-Generation Sequencing Data Compression and Storage Solutions
109	236	Segmentation of Retinal Blood Vessels in Fundus Images Using Fully Convolutional Networks (FCNs)
110	237	Predictive Analytics for Network Traffic Management
111	238	Machine Learning for Predicting Protein-Protein Interaction Sites
112	239	Breast Cancer Classification in Mammograms Using Support Vector Machines (SVMs) and Histogram of Oriented Gradients (HOG)
113	241	ML-Based Financial Forecasting in ERP: Improving Budgeting Accuracy with Long Short-Term Memory Networks
114	244	Interconnection of SDN node with conventional network using an ONOS controller
115	245	Regeneration Sites Selection and Regenerator Assignment Strategies for Translucent Elastic Optical Networks: Survey and Analysis
116	247	Multi-Criteria Decision Analysis Framework for Optimal Combination of Blockchain to Determine Scalability in IoT
117	257	A high isolation SIW based Self-diplexing antenna
118	258	Precision Segmentation and Feature Extraction of Blood Vessels of Retina using Automated Algorithm
119	259	Mathematical Models of Heterogeneous Machine Learning Techniques for Ransomware Protection in Cyber-Physical Systems
120	260	NLP and ML for real-time sentiment analysis in Finance
121	261	Emerging Applications of FinFET's in Artificial Intelligence and Machine Learning Hardwares
122	262	Embedded Soft Computing Applications Using Low Power VLSI Techniques
123	263	Machine Learning-Based Design Optimization of FinFET Transistors for Energy-Efficient Computing
124	264	Comparing The Absorption Characteristics Of Different Fractal Shapes As Unit Cells For THz Metasurface

125	265	Direction of Arrival Estimation using Positive and Negative Harmonics of Time-Modulated Array
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NLP and ML for real-time sentiment analysis in Finance

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5
Cites in
Papers

281
Full
Text Views



Abstract

Document Sections

- I. Introduction
- II. Literature Review
- III. Methodology
- IV. Result and Discussion
- V. Conclusion

Authors

Figures

References

Citations

Keywords

Metrics

More Like This

Abstract:

The integration of Natural Language Processing (NLP) and Machine Learning (ML) is pivotal in stock market analysis, enabling the extraction of meaningful insights from vast quantities of news articles, social media feeds, and financial reports. NLP techniques assist in distilling sentiments, tendencies, and crucial market information from unstructured text, thus equipping investors with the knowledge to make well-informed decisions. Machine learning algorithms leverage historical data to forecast market trends, refine trading strategies, and assess risk factors. This synergy of NLP and ML offers investors rapid and precise data analysis, critical for navigating the complex terrain of modern financial markets. This study evaluates the effectiveness of a classification model designed to categories data into distinct groups. Essential metrics used to measure the model's performance include accuracy, precision, recall, F1-score, support, and log loss. The model demonstrates a precision rate of 78% and a recall rate of 94%, indicating its proficiency in correctly identifying and classifying data points. The F1-score, a harmonic mean of precision and recall, stands at 0.85, highlighting the model's balanced capability. The support score, which accounts for the number of occurrences in the dataset, is 31, providing an insight into the dataset's composition. Furthermore, the log loss value of 0.42 reflects the model's predictive accuracy. Collectively, these performance metrics validate the model's effectiveness and relevance in stock market analysis.

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I. Introduction

Investors and traders in the dynamic and rapidly evolving stock market land-scape require precise, real-time information to navigate and make informed decisions[1][2]. The sensitivity of financial markets to the latest news and events underscores the importance of timely and accurate analysis of market-relevant information. In today's era, characterized by many news sources, social media channels, and digital platforms, manually filtering through vast quantities of data to identify impactful market trends and sentiments is a formidable challenge. The manual data analysis and interpretation process remains cumbersome and time-consuming despite the wealth of resources. This study introduces a solution employing Natural Language Processing (NLP) techniques to automatically extract key stock market insights from diverse news sources [3]. NLP, a subset of artificial intelligence, facilitates machines' understanding and processing of human language, enabling them to interpret, analyse, and derive meaningful insights from large volumes of textual data. This research focuses on leveraging NLP to streamline the extraction of vital market information from various rich sources, including financial websites and social media platforms [4]. Applying this technology conserves time and resources and enriches the analysis by incorporating a broader array of data sources, offering a more nuanced view of the market's pulse. A significant aspect of this analysis involves assessing the emotional and psychological state of the market participants – often referred to as market sentiment [5]. The market sentiment reflects the prevailing attitudes and behavioural inclinations of the investors and traders in the market. Sentiment analysis within this framework determines the emotional impact of the text – whether positive, negative, or neutral – thereby providing insights into public perception and mood concerning market-related topics. The methodology involves training a machine learning model with the collected data, encompassing key market-related terms and their sentiment scores. The strength of cloud computing and machine learning lies in their ability to discern patterns and correlations within the data, which can subsequently inform predictions and strategic conclusions. The model is trained to recognize past trends and sentiments through historical market data analysis to predict future market movements. This study aims to develop a predictive model to enhance investors' decision-making processes and potentially increase their market gains [7]. Such a tool, grounded in data-driven sentiment analysis and historical trends, is poised to be an invaluable asset for traders in a market marked by unpredictability and intense competition. The ultimate objective

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Figures v

References v

Citations v

Keywords v

Metrics v

[Back to Results](#)

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