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IoT-Enabled Weather Monitoring and Rainfall Prediction using Machine Learning Algorithm

S. Indhumathi
Department of CSE - Artificial Intelligence and Machine Learning,
Sphoorthy Engineering College,
Hyderabad, Telangana, India
indhume11@gmail.com

S. Aghalya
Department of Electronics and Communication Engineering,
St. Joseph's College of Engineering,
Chennai, Tamil Nadu, India
aghalyas1970@gmail.com

Smitha J. A
Department of Computer Science and Engineering,
Sri Sairam College of Engineering,
Bengaluru. Karnataka, India
smitha.as2004@gmail.com

Presitha Aarthi M
Department of Computer Science and Engineering,
Shree Sathyam College of Engineering and Technology,
Salem, Tamilnadu, India.
presithacse@gmail.com

***Abstract*— The proposed weather monitoring system utilizes the Internet of Things (IoT) to make real-time data accessible to everyone. Various sensors are deployed to gather weather-related information such as temperature, humidity, wind speed, rainfall, and atmospheric pressure. The collected data is transmitted to a cloud server through the IoT, where it is stored and processed. Web page users from any global location may view the uploaded information. Support Vector Machine (SVM) then analyzes the data and predicts rainfall patterns based on historical records and current weather conditions. The data is then represented graphically and displayed for the user. Integrating machine learning algorithms enhances the accuracy of rainfall predictions, allowing for better preparation and planning in various sectors such as agriculture, weather stations, water resource management, marine industries, and disaster response. For improving weather forecasting systems, enabling more informed decision-making and proactive measures in various domains impacted by weather conditions.**

Keywords*— *Support vector machine, Cloud, Sensors, Weather monitoring, Real-time prediction

I. Introduction

Many fundamental industries, including farming, utilize weather for produce. Old weather forecast systems must be more accurate and complicated since the environment changes rapidly. Weather forecast technologies must be developed and trustworthy to address these issues. These forecasts affect a nation's economy and citizens [1]. Random forest classification and other data analytics and machine learning techniques forecast weather. A low-cost, portable weather forecast method is presented in this research. It examines weather forecasting using deep learning and compares its performance with other prediction models.

Fresenius norm determines model forecasting accuracy [2]. For nations like India, where agriculture plays a significant role in the economy, the accuracy of rainfall forecasts is crucial. Because the atmosphere is dynamic, Forecasting rainfall using statistical methods needs to be more accurate. Since rainfall information is not linear, an artificial neural network provides an efficient method [3].

An innovative machine-learning fusion approach is suggested for smart cities' real-time rainfall forecast systems [4]. It includes four supervised machine learning methods that are commonly utilized, i.e., Support Vector Machine (SVM) [5], decision trees, Naive Bayes, and K-Nearest Neighbors (KNN). Fuzzy logic, also known as fusion, is introduced into the framework for effective rainfall prediction to combine the predictive accuracy of machine learning approaches. According to the Indian meteorological department, using traditional forecasting techniques resulted in a percentage in the departure of rainfall for June 2019, ranging from 46 to 91%. However, a subsequent machine learning examination revealed that forecasts could predict rainfall more accurately than statistical methods.

Weather forecasting uses scientific measurements to predict the weather in a specific location. In other terms, it predicts cloud cover, rain, snow, wind speed, and temperature before events occur [6]. Perfect weather forecasts are essential for everyday operations, yet multidimensional and nonlinear data make it one of the world's most significant problems. According to the survey, data mining algorithms used for weather prediction include supervised and unsupervised machine learning algorithms, FP Growth Algorithms, artificial neural networks, Naive Bayes algorithms, Support Vector Algorithms, Hadoop with map reduces, decision tree classification algorithms, and K-medoids algorithms.

Predicting rainfall, which affects society, is difficult and unreliable. Predictions can save human and financial losses [7]. Based on meteorological data for that day, a set of examines utilizes machine learning to forecast whether it will rain tomorrow in major Australian cities. This comparative test evaluates modeling inputs, methodologies, and pre-processing. The findings compare multiple machine learning assessment criteria and their capacity to forecast rainfall by

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Automated Personalized Health Analytics using IoT and Machine Learning Algorithms

T M Sivanesan
Department of Computer Science and Engineering,
Vel Tech Rangarajan Dr.Sagunthala R&D Institute of Science and Technology,
Chennai, Tamil Nadu, India.
research.tmsivanesan@gmail.com

Smitha J A
Department of Computer Science and Engineering,
Sri Sairam College of Engineering,
Anekal, Bengaluru. Karnataka, India
smitha.as2004@gmail.com

U. Arul
Department of Artificial Intelligence and Machine Learning,
Saveetha School of Engineering,
Saveetha Institute of Medical and Technical Sciences,
Chennai, Tamil Nadu. India
arulmee08@gmail.com

K. Balasubramanian
Department of Business Administration,
Kalasalingam Business School,
Kalasalingam Academy of Research and Education,
Srivilliputhur, Tamilnadu, India
kbalamgt@gmail.com

***Abstract*—This research work develops and implements an integrated system using IoT technologies and machine learning algorithm to measure Body Mass Index (BMI) and perform health analytics in hospitals. Obesity, overweight, and chronic diseases are major public health issues. Healthcare workers need accurate and quick BMI readings to monitor weight status and health issues. To overcome these limitations, the proposed system uses IoT sensors to automate BMI evaluations and collect real-time health data. Wireless IoT devices interface with hospital information systems. The Support Vector Machine (SVM) algorithm analyzes BMI, physical activity, and vital sign data. It can identify and predict BMI values from data. SVM can predict BMI for customized weight loss recommendations. The proposed setup helps hospitals to automate BMI measuring, thus reducing medical staff burden and manual intervention. Real-time monitoring and analysis enable early identification and individualized treatment of obesity-related health concerns. IoT devices with the SVM algorithm enable data-driven decision-making, improving patient outcomes and healthcare efficiency.**

Keywords*— *Internet of Things, Support vector machine, Body mass index, Sensors, Health analysis, Machine learning.

I. Introduction

A machine automatically assessing BMI is the standard statistic for analyzing body composition and health. The design, hardware, and software elements of the BMI measuring machine's development are covered in the article. The automated BMI measuring equipment works similarly to manual measures, giving a practical and time-saving option for BMI testing [1]. It includes information on the technical features and operation of the automated BMI calculation equipment [2]. This study aims to develop interpretable machine-learning methods for mapping functions that relate anthropometric measures to BMI. It can precisely estimate BMI using various body measures. To provide insights into the association between anthropometric measurements and BMI, it highlights the interpretability of the machine learning models deployed [3].

The Low-cost automated BMI equipment will be designed, developed, calibrated, tested, and analyzed. The BMI calculator low-cost machine's design, development, calibration, and testing are described. It analyzed the machine's accuracy and efficacy. Based on the analysis's results, the study discusses the biological and clinical uses of the low-cost automated BMI machine [4]. It analyzes BMI that affects nerve conduction. It investigated how BMI, a body weight relative to height, affects nerve conduction investigations. The BMI and nerve conduction study data are discussed in [5]. BMI may affect nerve conduction system interpretation and accuracy. This material helps describe the BMI affects nerve conduction measurements and may impact electro-diagnostic medicine clinical practice.

The patient safety concerns of calculating height, weight, and BMI. The system uses estimated values instead of measured values in medical service and patient care. The system drug dosage, medical choice, and surgical operations are affected by erroneous calculations. To increase study validity and patient safety, height, weight, and BMI measures must be improved [6]. It develops and implements a BMI measurement system utilizing a PIC microcontroller. The authors discuss the system's architecture and functioning, which uses the microcontroller to compute BMI from height and weight inputs. The system's electronics and programming and PIC microcontroller can accurately assess BMI.

The microcontroller based on calculating BMI is discussed in [7]. It evaluates the connection between childhood exercise, BMI, and adult bone mass across 20 years. Childhood exercise and BMI affect bone mass later in life. Childhood fitness, BMI, and adult bone mass are positively correlated. These findings emphasize the