

## **ABSTRACT**

The increasingly real climate change has a major impact on various aspects of life, including national security, geopolitics, and food production. Therefore, real-time weather monitoring is very important. However, existing weather monitoring systems often face obstacles such as high costs, complicated installation, and limited data access for users.

As a solution, a Smart Weather Station system has been developed that is integrated with a mobile application and website. This system uses an ESP32 microcontroller together with a DHT11 sensor to measure temperature and humidity, a BMP180 sensor for air pressure, and a raindrop sensor to detect rainfall. Data from these sensors is sent to the cloud using Firebase, which allows seamless integration with websites and mobile applications.

The mobile application and website offer a user-friendly interface, making it easy for users to access real-time weather data and obtain accurate information. The test results show that this system is able to provide weather data with high accuracy, low latency, and efficient costs. The test results on accuracy show an average value of 89.44% for temperature parameters, 78.15% for humidity parameters, 99.73% for pressure parameters, and the success of detecting water for rain parameters with more optimal detection in normal weather. The latency test results show the stability of data reception and data delivery with a range of 3-7 seconds for reception on the mobile application and website. The speed test results on the web obtained values for each parameter above 50, which means it shows very good performance. While the results of functional testing and the System Usability Scale (SUS) method on the mobile application with an effectiveness value of 71 indicate that the application is effective to use. With the implementation of Smart Weather Station, it is hoped that various applications that require real-time weather information, such as in the fields of agriculture and disaster mitigation, can be helped and get more effective and efficient weather monitoring solutions.

**Keywords:** Climate, Realtime, Smart Weather Station