**Chapter 4**

**RESULTS AND ANALYSIS**

**4.1 Introduction :-**

In this Chapter, a brief discussion about the System Specifications as well as the UI is done with the functionalities related to them. At last of the Chapter, the advantages as well as the disadvantages of the system developed has been discussed.

**4.2 System Specifications:-**

* Processor: 11th Gen Intel(R) Core(TM) i5-11400 @ 2.60GHz 2.59 GHz
* RAM: 8 GB
* System Type: 64-bit operating system, x64-based processor
* Operating System: Windows 10/11.

**4.3 Software Interface**

* Front End: React, python
* Backend : MERN (Mongodb, express, react, nodejs)
* Local Access Link: <http://localhost:3000>

**Performance Metrics**

Performance of the software is measured on following performance metrics

The performance of the plant disease detection, classification, and treatment system can be evaluated using several performance metrics, including:

**Accuracy:** The accuracy of the system in correctly identifying and classifying different plant diseases from the input images is a crucial performance metric. The accuracy can be calculated by comparing the predicted disease class with the actual disease class in the dataset.

**Precision and Recall:** Precision and recall are important metrics for evaluating the effectiveness of the system in detecting and classifying different diseases. Precision measures the fraction of correctly classified positive samples out of all samples classified as positive, while recall measures the fraction of correctly classified positive samples out of all actual positive samples.

**F1-Score:** The F1-score is a harmonic mean of precision and recall, which provides a single value for evaluating the overall performance of the system. A higher F1-score indicates better performance.

**Processing Time:** Processing time is an essential metric for evaluating the efficiency of the system. The time taken to process an input image and provide feedback on the disease and recommended treatments should be minimal.

**Resource Utilization:** The system should not consume excessive computing resources such as CPU and memory during operation, as this could impact the overall performance of the system and potentially affect other applications running on the same system.

Overall, evaluating the performance of the proposed system on these metrics will help to ensure that it provides accurate and efficient disease detection, classification, and treatment recommendations, and can be effectively used by farmers and growers to manage plant diseases.

**Or**

The performance of the proposed system for plant disease detection, classification, and treatment can be measured using metrics such as accuracy, precision, recall, and F1 score.

The system's ability to process images quickly and efficiently without requiring excessive computational resources is also a key performance metric.

To optimize the system's performance on your hardware configuration, multi-threading and parallel processing should be utilized to take advantage of the 11th Gen Intel(R) Core(TM) i5-11400 @ 2.60GHz processor's processing power.

Benchmarks should be conducted on a variety of images and disease types, with the metrics and resource usage monitored and analyzed to evaluate the system's performance.

Based on the results of these benchmarks, optimizations can be made to improve the system's performance and resource usage on this particular hardware configuration.

The system should be designed to operate efficiently within the 8GB RAM capacity, and any memory leaks or other performance issues should be identified and addressed during testing and optimization.

**Advantages:-**

* Improved accuracy in disease detection and classification
* Faster processing time for large datasets
* Increased efficiency in resource usage
* Enhanced ability to detect and diagnose diseases in plants
* User-friendly interface for ease of use and accessibility
* Potential for increased crop yield and reduced crop losses
* Cost-effective alternative to traditional manual disease detection methods
* Improved ability to treat plant diseases with targeted treatments
* Potential for integration with other agricultural technologies
* Scalable system architecture for future expansion and growth
* Query resolution of user

**Limitation:-**

* Dependence on quality and quantity of input data
* Limitations of current machine learning algorithms and technology
* Variability in environmental factors affecting plant growth and health
* Difficulty in identifying and diagnosing certain rare or obscure plant diseases
* Limited availability of trained experts to answer user queries
* Potential for biases or errors in algorithmic decision-making
* Technical requirements and potential costs associated with implementation and maintenance
* User adoption and engagement with the system
* Limitations in scalability for large-scale commercial agricultural operations.