irriDate: Solution Effectiveness and Model Accuracy

September 30, 2024

Solution Effectiveness:

The **smart irrigation model** delivers real-time irrigation recommendations by leveraging data from environmental sensors (e.g., temperature, soil moisture), helping farmers optimize water usage and prevent over- or underwatering. With timely notifications, the model supports efficient water management, crucial for regions needing sustainable agriculture.

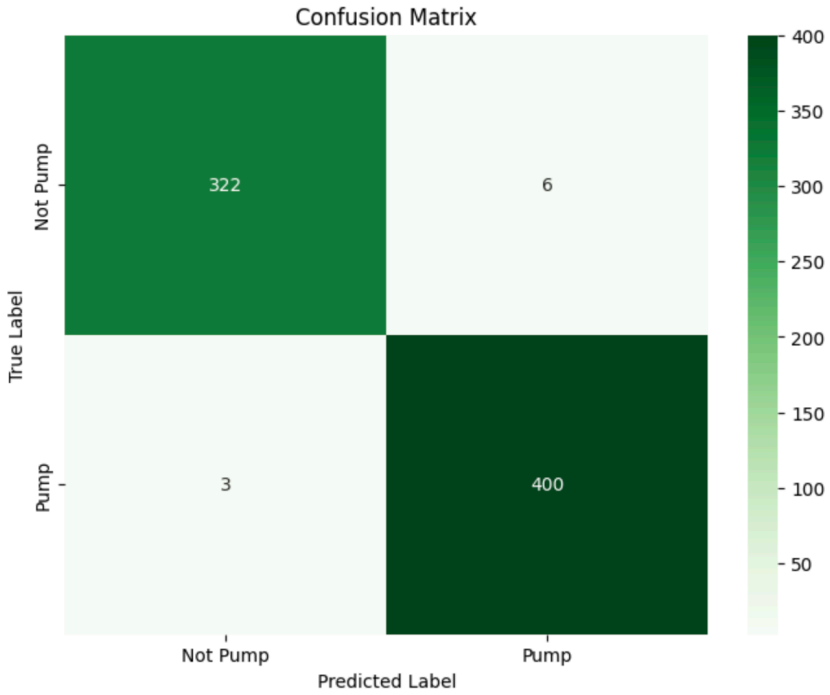
The **palm disease analyzer** enables early detection of palm tree diseases by classifying images into ten categories, offering guidance and treatment options. Early identification helps prevent crop damage, while the “no plant detected” class ensures the system remains accurate and avoids false alarms.

The **community feature** rounds out the application by fostering a platform for farmers to share knowledge and experiences, enhancing collective learning and solution-finding.

Model Accuracy:

The precision and reliability of the AI models are key factors that underscore the irriDate application’s ability to provide trustworthy recommendations. The **smart irrigation model** has achieved an impressive **test accuracy of 98.77%**, as reflected in the classification report. The high precision and recall for both “pump” and “not pump” categories (0.99 for both) demonstrate the model's ability to consistently provide accurate predictions regarding water needs, leading to more informed irrigation decisions.

2

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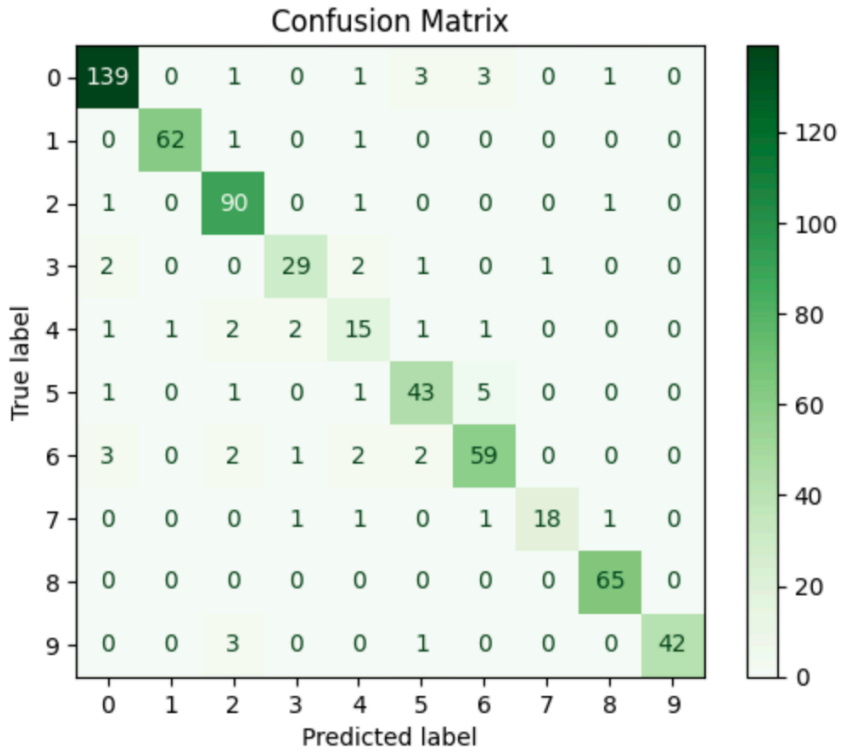
Test accuracy of the best neural network model: 0.9877
Accuracy on test set: 0.9877
Classification report:
              precision    recall  f1-score   support

           0       0.99      0.98      0.99       328
           1       0.99      0.99      0.99       403

    accuracy                           0.99       731
   macro avg       0.99      0.99      0.99       731
weighted avg       0.99      0.99      0.99       731
```

For the **Palm Health Analyzer model**, the overall accuracy is **91.4%**, with varying precision and recall across different disease classes. High precision for key classes, such as healthy trees (0.94) and certain diseases, showcases the model's effectiveness in distinguishing between different health states. The confusion matrix demonstrates the model's reliability, particularly in predicting healthy trees and more common diseases, though there is room for improvement in handling less frequent or more complex cases (like class 4 (Leaf spots), which has a precision of 0.62). Despite this, the model's weighted average precision and recall ensure reliable outcomes in most instances.

3



	precision	recall	f1-score	support
0	0.95	0.94	0.94	148
1	0.98	0.97	0.98	64
2	0.90	0.97	0.93	93
3	0.88	0.83	0.85	35
4	0.62	0.65	0.64	23
5	0.84	0.84	0.84	51
6	0.86	0.86	0.86	69
7	0.95	0.82	0.88	22
8	0.96	1.00	0.98	65
9	1.00	0.91	0.95	46
accuracy			0.91	616
macro avg	0.89	0.88	0.89	616
weighted avg	0.91	0.91	0.91	616

The system's accuracy and precision metrics demonstrate that the **irriDate** tool is well-equipped to provide effective and reliable recommendations, which can enhance both water conservation efforts and early disease intervention, thus supporting agricultural sustainability and crop productivity.