Automation Integration Via Machine Learning: Dermason Bean Classification

By: Andrew Reusche

Business Problem

Area of concern: Bean production is a labor intensive and expensive process.

Goal of model: Automated bean classification to improve manufacturing efficiency and reduce human labor.

Implementation: Pair the model with computer vision and actuation to optimize bean sorting and reduce required manual labor.

The Data

Contains

(7) bean types   Converted to (1)
                                  Dermason
                                  binary classifier

13,611 data instances

16 dimensional variables

The Data

Limitations

Unconfirmed classifications

Unconfirmed measurements

Lack of additional descriptive metrics

Data and Model Manipulation Methodology

Step 1:
Data
Preprocessing

Step 2:
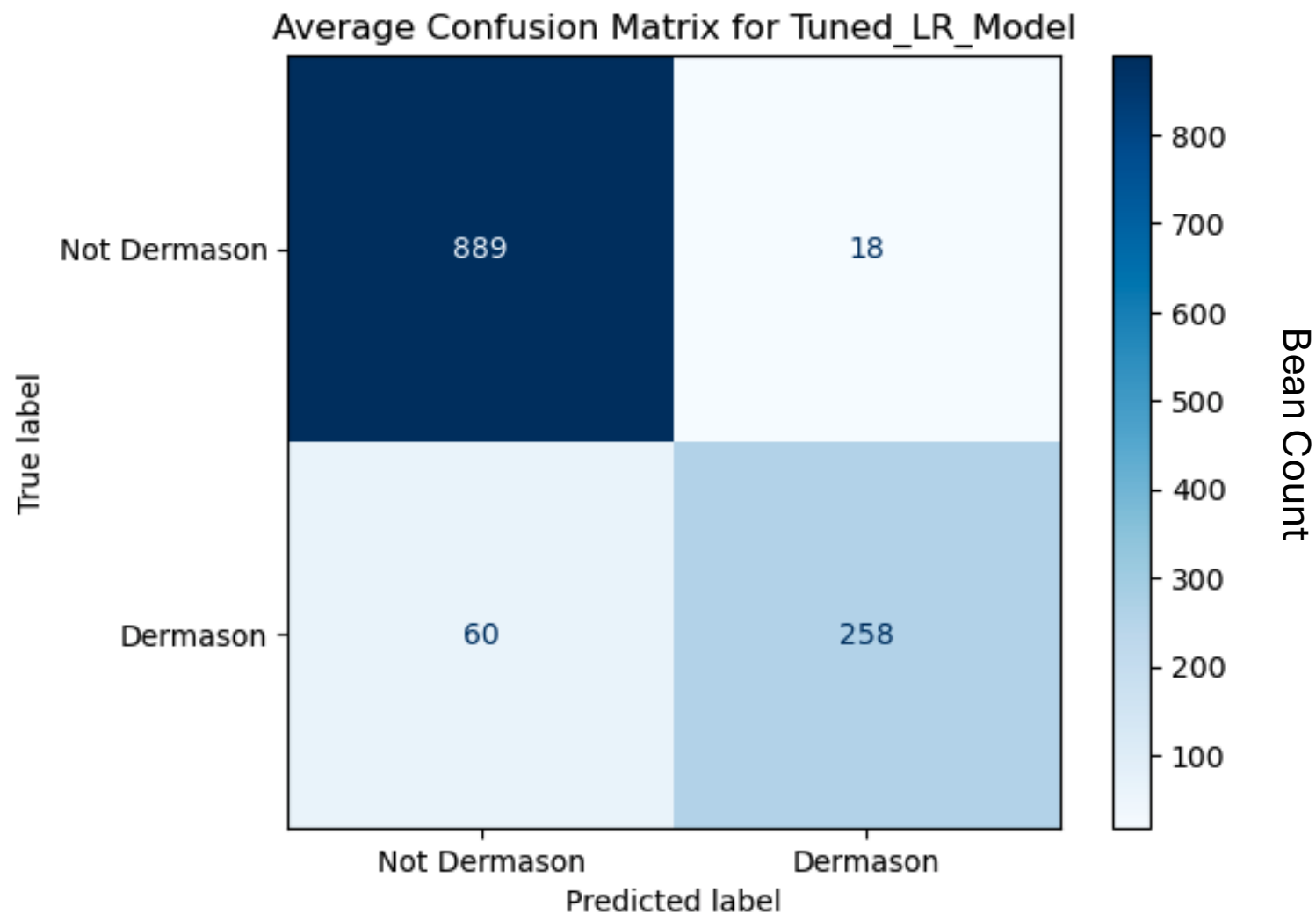Hyperparameter Tuning
- Logistic Regression
- Decision Tree

Step 3:
Run Model
And Evaluate

Grid Search
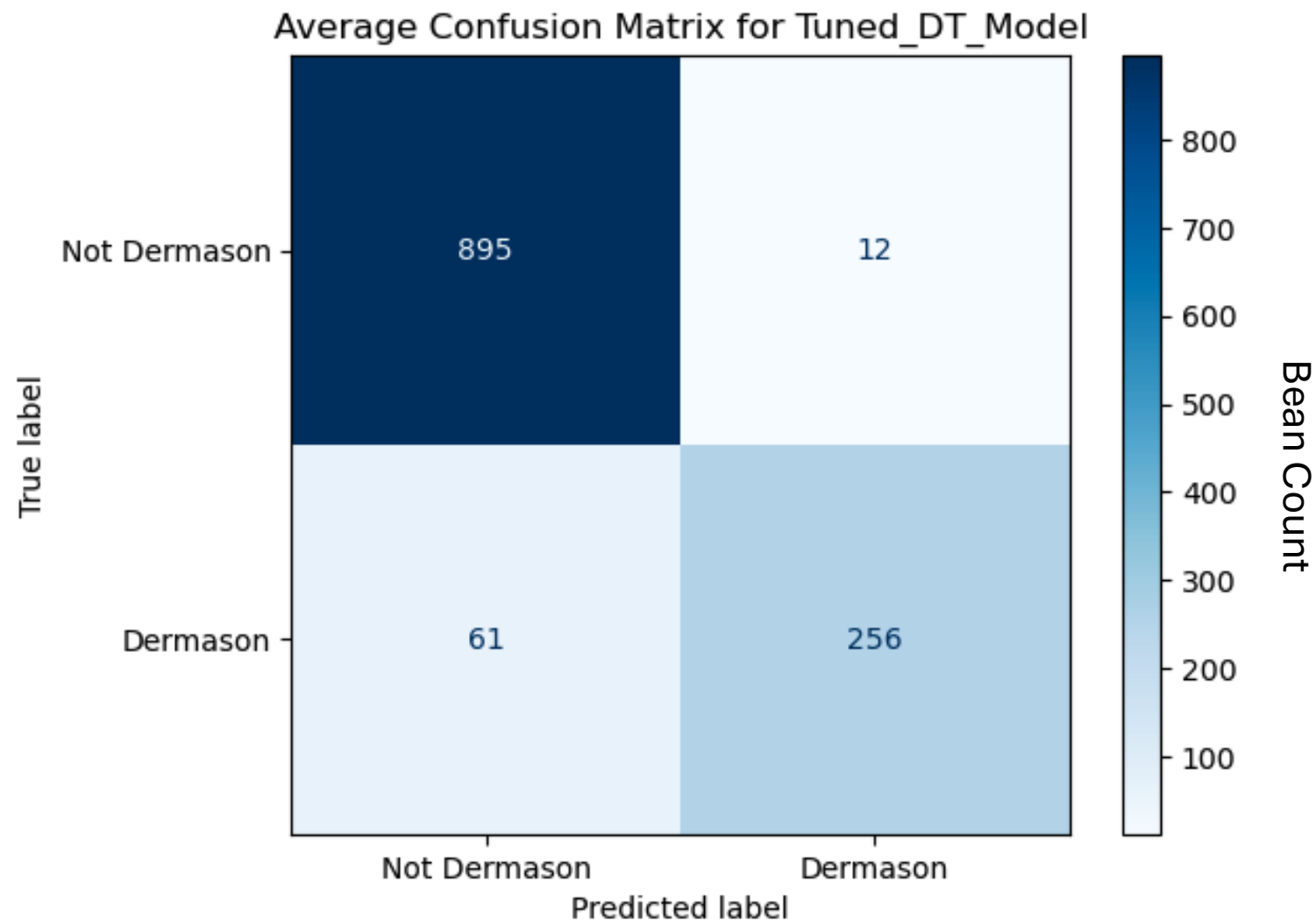
Tuned Model Results: Logistic Regression

Average Confusion Matrix for Tuned_LR_Model

Validation Data Results

Specificity: 97.983%   Precision: 93.396%   Recal: 81.172%

Tuned Model Results: **Decision Tree**
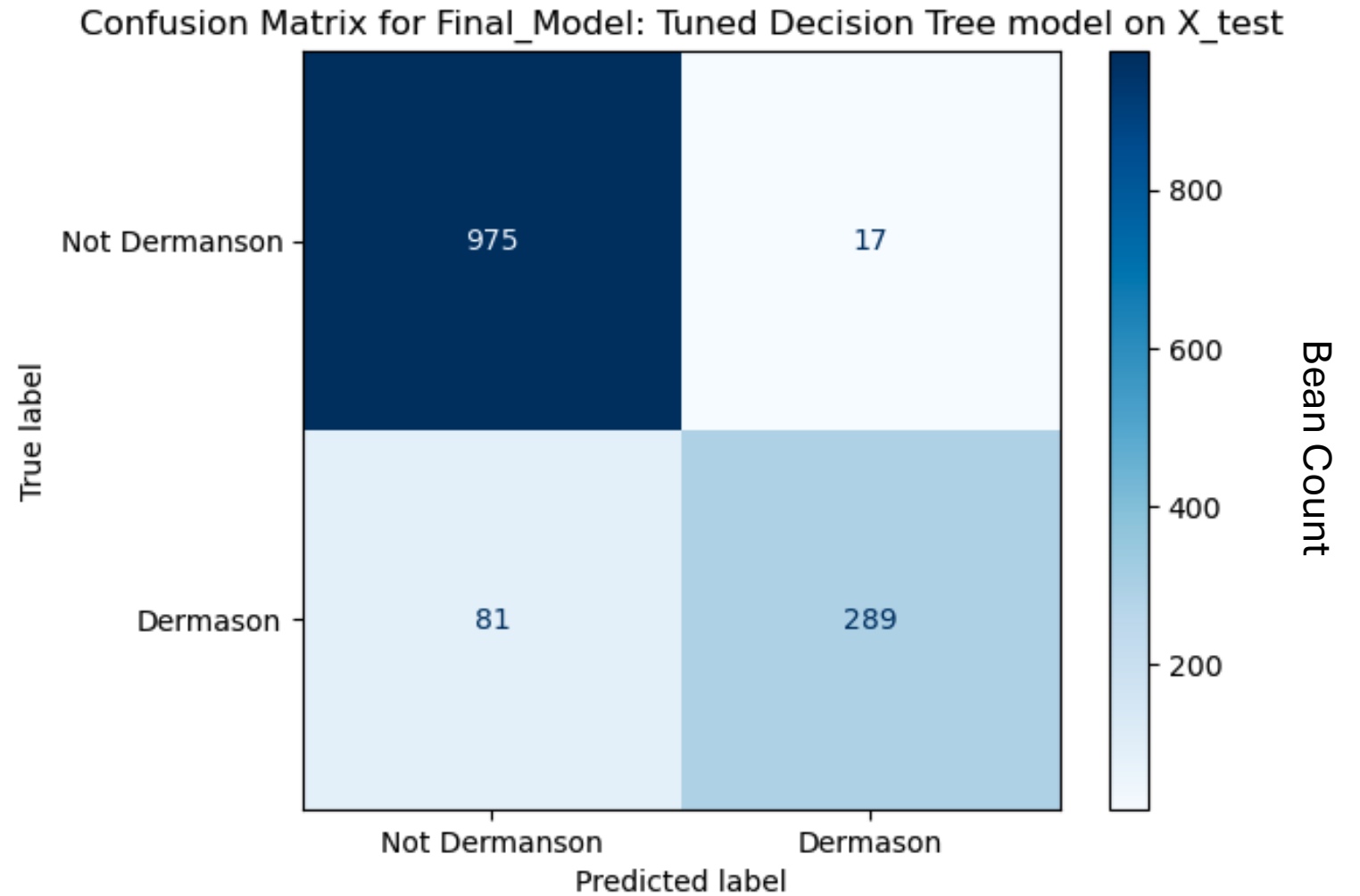
Average Confusion Matrix for Tuned_DT_Model

Validation Data Results

Specificity: 98.677%   Precision: 95.563%   Recal: 80.668%

Confusion Matrix for Final_Model: Tuned Decision Tree model on X_test

Final Model Results

Specificity: 98.286%   Precision: 94.444%   Recal: 78.108%

Conclusions

<2% of non-Dermason beans are falsely classified

<6% of beans classified as Dermason are falsely classified

78% of the total Dermason beans are identified

Business Implications

The need for manual bean filtering could be significantly reduced, but maybe yet not completely eliminated.

Next Steps

 More Sensors

 Multi-Class Bean Prediction

 Bean Quality Classifications

Thank you

- Email: A.J.Reusche@gmail.com
- Github: https://github.com/AndrewReusche
- LinkedIn: https://www.linkedin.com/in/andrew-reusche-1397bb311/