



AI-Enabled Predictions of Red Cherries Quality under Fluctuating Storage Conditions



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Introduction

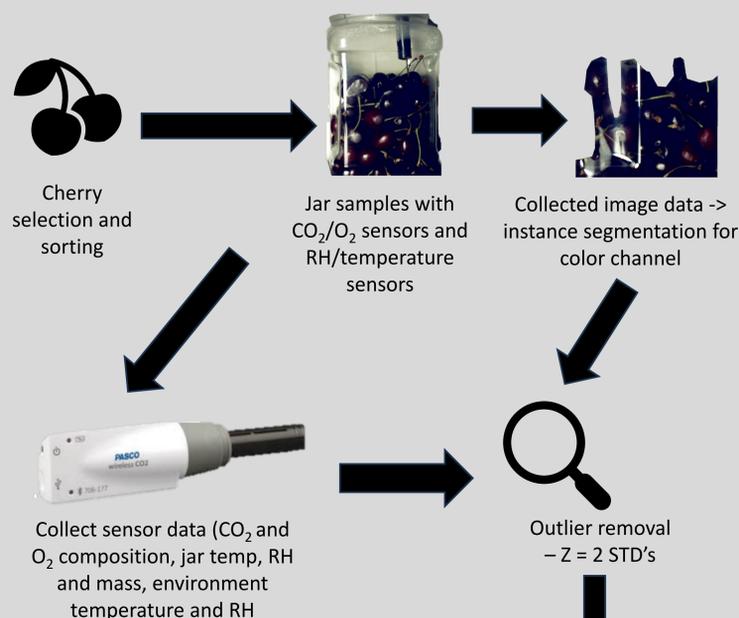
- Improper storage conditions cause up to 40% loss of horticulture crops every year
- Traditional empirical methods of predicting quality/shelf-life are time-consuming and not adaptable to fluctuating storage conditions

Objective

- Use computer vision to determine the effects color has on cherry quality
- Use sensor collected data to determine their effects on cherry quality



Methodology



Sample Name Dictionary

- T = temperature sample stored in
- A = temperature abuse on sample for 2 hrs.
- S = Sample number

Results

Figure 1 – Rate of change of features vs Time for all samples

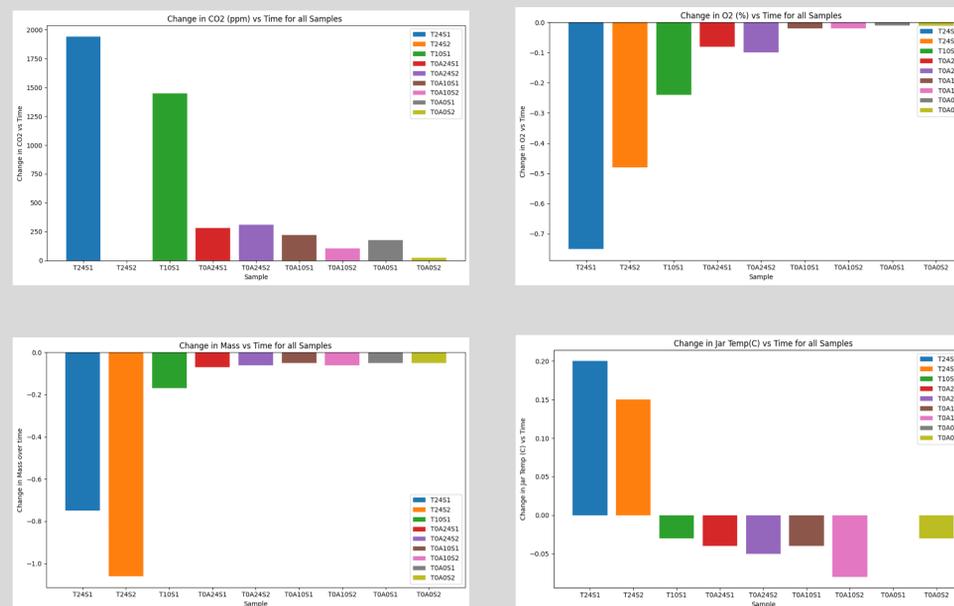


Figure 2 – Correlation matrix for sensor data and color data

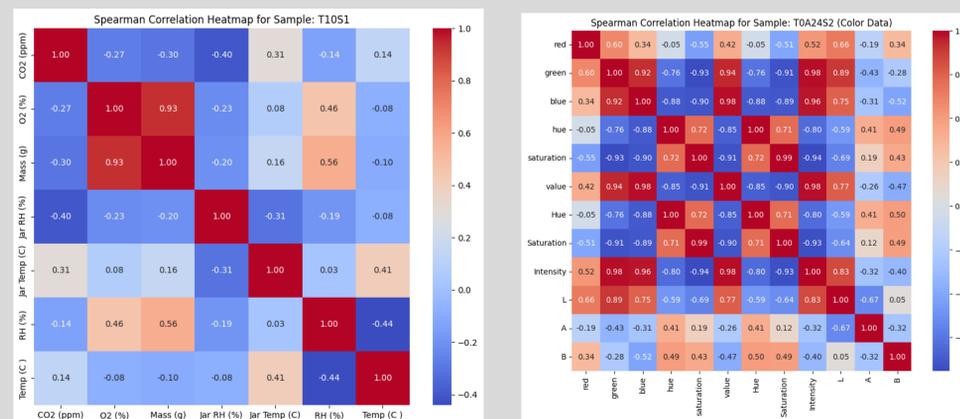
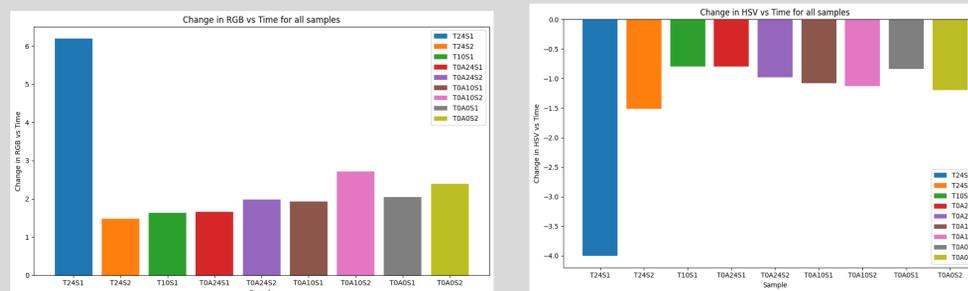


Figure 3 – Change in color (RGB, HSV) over time for all samples



- Nine total jar samples, reduced to seven after day 13 due to complete rot
- Samples labeled based on environment and abuse and multimodal data from sensors were collected daily
- Manual annotation performed through CVAT, and masking and instance segmentation done using Python
- Color channel value extraction done through OpenCV2 (RGB, HSV, HSI, LAB)
- Removed outliers using Z-score threshold and correlation analysis (Spearman Rho) was performed

Conclusion

- Graphs depict significant difference between, 24 (C) storage conditions had a rate 2 times compared to any other sample.
- Unconclusive to for all other samples under controlled abuse conditions.
- Heatmaps show correlation between different sensor and color features.
- Uncorrelated features are significant because this will help move redundancies while training the model

Future Work

- Preprocessing will be applied
- Other models will be tested and optimized (SVM, Linear Regression, RNN, GRU, LSTM)
- Research will be expanded to other fruits
- An app will be created

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Citations

Gast, Karen L.B. "Bulletin #4135, Storage Conditions: Fruits and Vegetables - Cooperative Extension Publications - University of Maine Cooperative Extension." *Cooperative Extension Publications*, 23 May 2024, extension.umaine.edu/publications/4135e/?utm_source=chatgpt.com.

Du, Cheng-jin, and Da-Wen Sun. Review of *Recent Developments in the applications of image processing techniques for food quality evaluation*, Wu, Di, and Da-Wen Sun. Review of *Color Measurements by computer vision for food quality control*.