Decision Making for Fused Filament Fabrication

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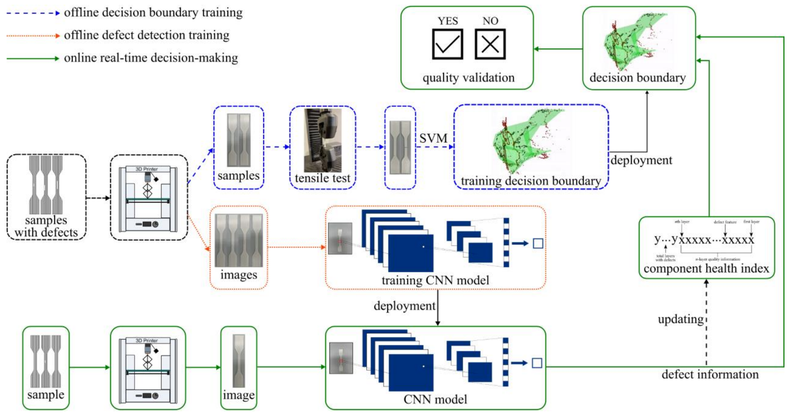
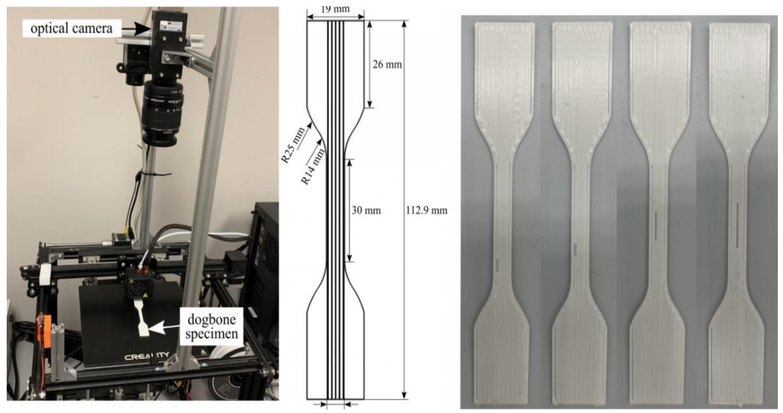
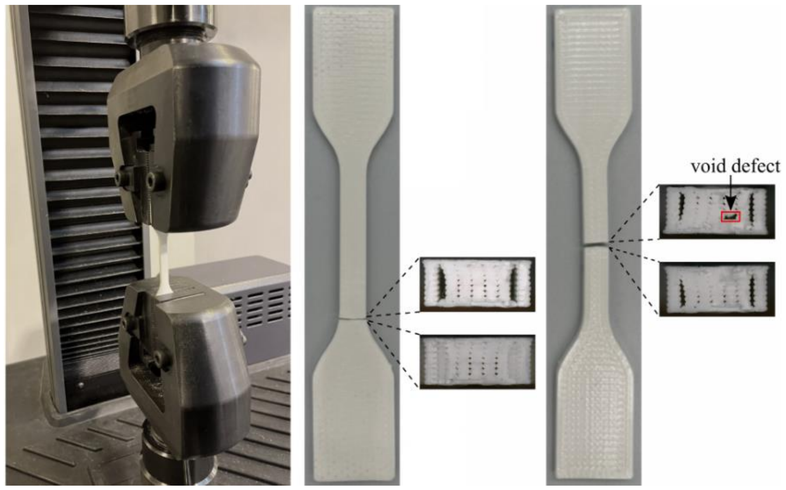
Diagram for the Decision Making



Data Gathering



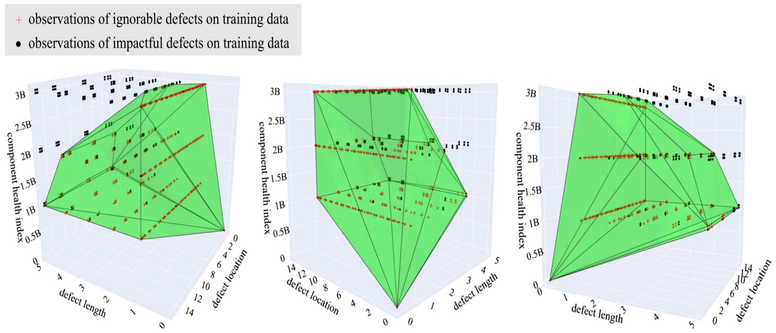
Tensile Test



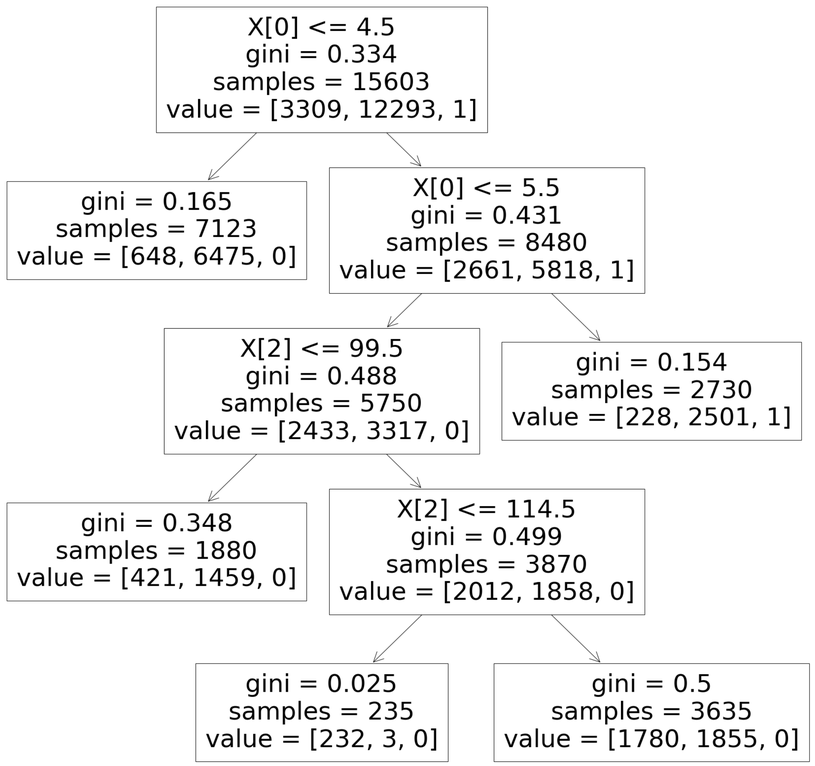
Decision Boundary

The original method of decision making was based on a 3D decision boundary made with support vector machine, which is . dependent on 3 variables.

- Component health index
- Defect location
- Defect length



Decision Tree With Gini Impurity



Results

Decision Tree Classification Report

	precision	recall	F1-score
Ignorable Defect	0.57	0.62	0.59
Impactful Defect	0.89	0.87	0.88
Accuracy			0.82
Macro avg	0.73	0.49	0.49
Weighted avg	0.83	0.83	0.82

Decision Boundary Classification Report

	precision	recall	F1-score
Ignorable Defect	0.83	0.34	0.48
Impactful Defect	0.85	0.98	0.91
Accuracy			0.85
Macro avg	0.84	0.66	0.69
Weighted avg	0.84	0.85	0.82

Conclusions

- The confusion matrices for both the decision tree and the decision boundary methods are very similar in spread. Most difference values are in false positive and false negative.
- Accuracy scores for both models are very similar.
- The decision tree is not as visibly comprehensive as the decision boundary for this dataset and problem.
- The decision tree has a good potential for more than three variables, otherwise, decision boundary can only handle for three variables.