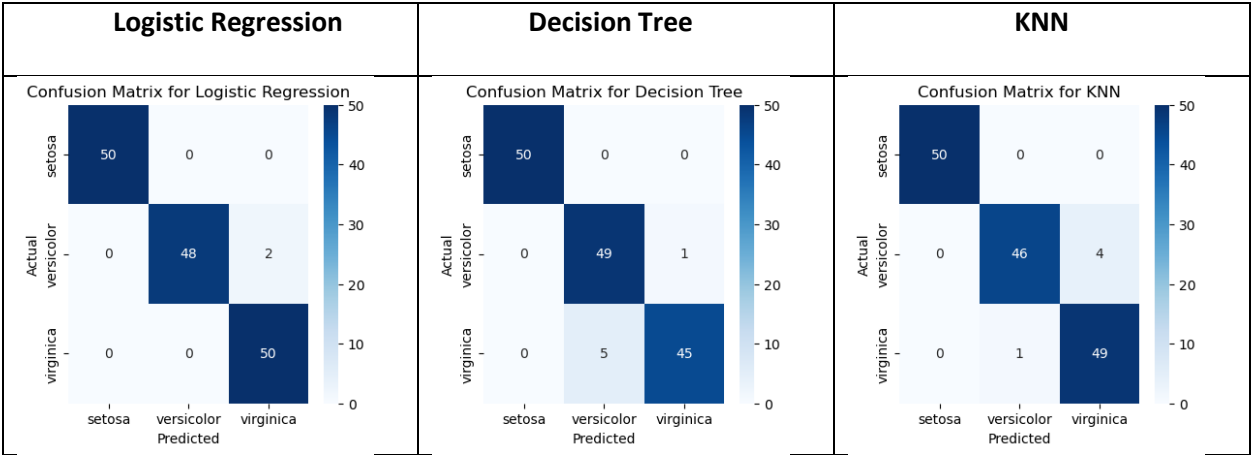# Report:

Performance Metrics

Model	Best Parameters	Cross Entropy Score	Precision (Weighted)	F1 Score (Weighted)	Recall (Weighted)
Logistic Regression	C=10	1.0	1.0	1.0	1.0
Decision Tree	max_depth=2	0.9667	0.9690	0.9658	0.9667
KNN	n_neighbors=9	1.0	1.0	1.0	1.0

Confusion Matrix

Logistic Regression	Decision Tree	KNN

Insights

1. **Logistic Regression**: Achieved perfect scores across all metrics, including cross entropy, accuracy, precision, F1 score, and recall. The confusion matrix shows no misclassifications, indicating excellent generalization.

2. **Decision Tree**: While the decision tree performed well with a high accuracy of 96.67% and decent precision (96.9%) and recall (96.67%), it had slightly worse results in comparison to Logistic Regression and KNN. The confusion matrix shows that the model struggled slightly with one misclassification in the second class and a few in the third class.

3. **KNN**: Like Logistic Regression, KNN achieved perfect scores with no misclassifications in the confusion matrix, and its performance metrics matched those of Logistic Regression. This indicates that KNN is a very effective model for this dataset, especially when tuned properly.

Recommendation

- **Best Model**: Logistic Regression, followed closely by KNN, performed best with perfect accuracy and no misclassifications. Logistic Regression tends to be more interpretable and works well for linear decision boundaries, which is the case with this dataset.

- **Decision Tree**: Though it performed well, its performance was slightly lower than Logistic Regression and KNN. If interpretability is a priority or if the data were more complex, decision trees could be a good option. However, based on this dataset, Logistic Regression and KNN are recommended.