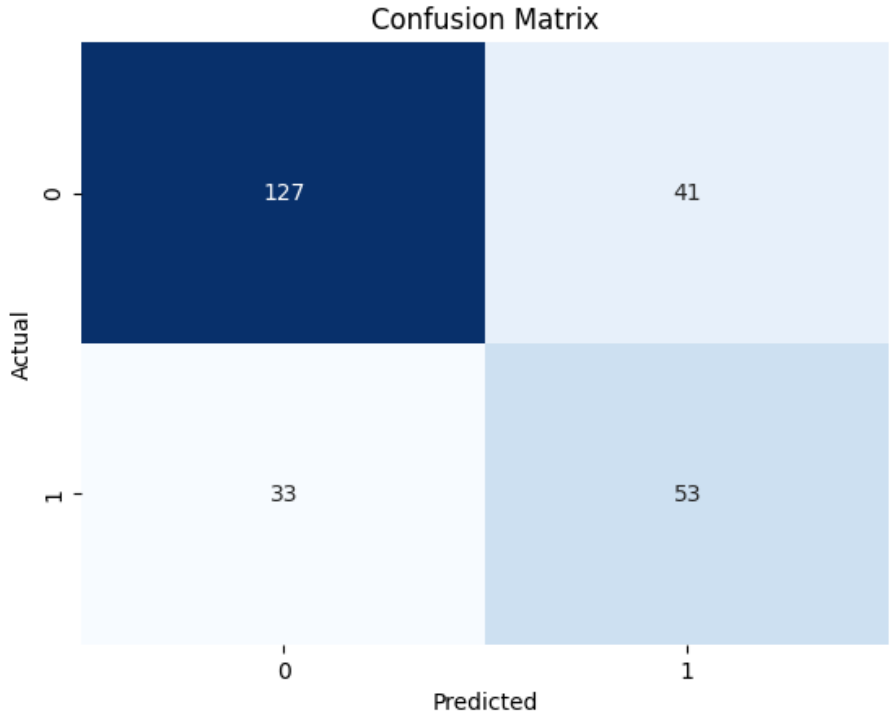
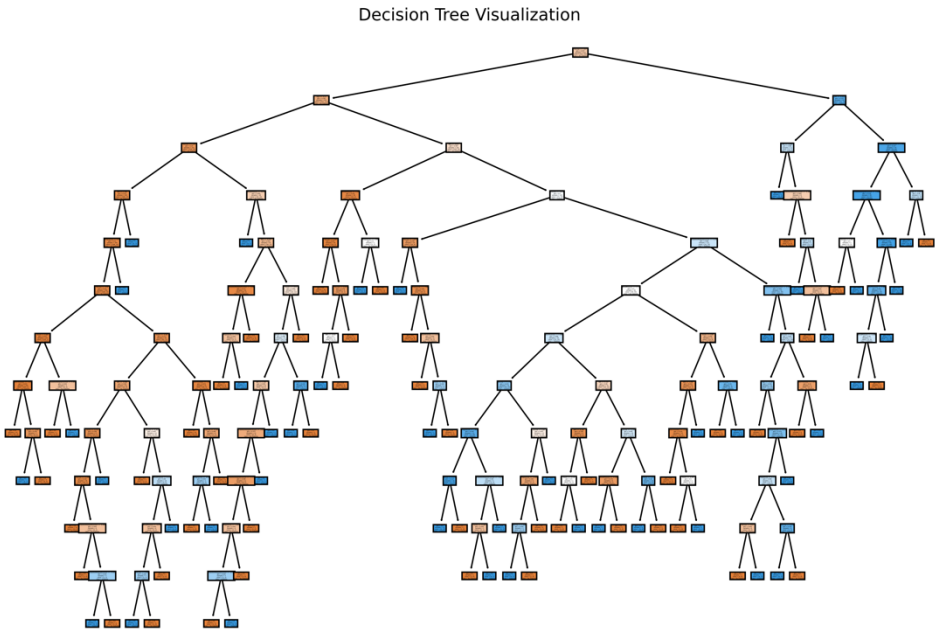
2.1 Tree

Uni-variate Tree Method





Model Performance:

- The univariate Decision Tree achieved a 70.87% accuracy on the test set.
- The confusion matrix details True Positives (53), True Negatives (127), False Positives (41), and False Negatives (33).

Tree Complexity:

- The Decision Tree comprises 177 nodes, indicating decision points in the structure.
- A depth of 12 suggests a relatively complex model, potentially prone to overfitting.

Visualizations:

- The confusion matrix provides a clear breakdown of prediction outcomes.
- The Decision Tree visualization visually represents feature usage in predictions.

Analysis of Results:

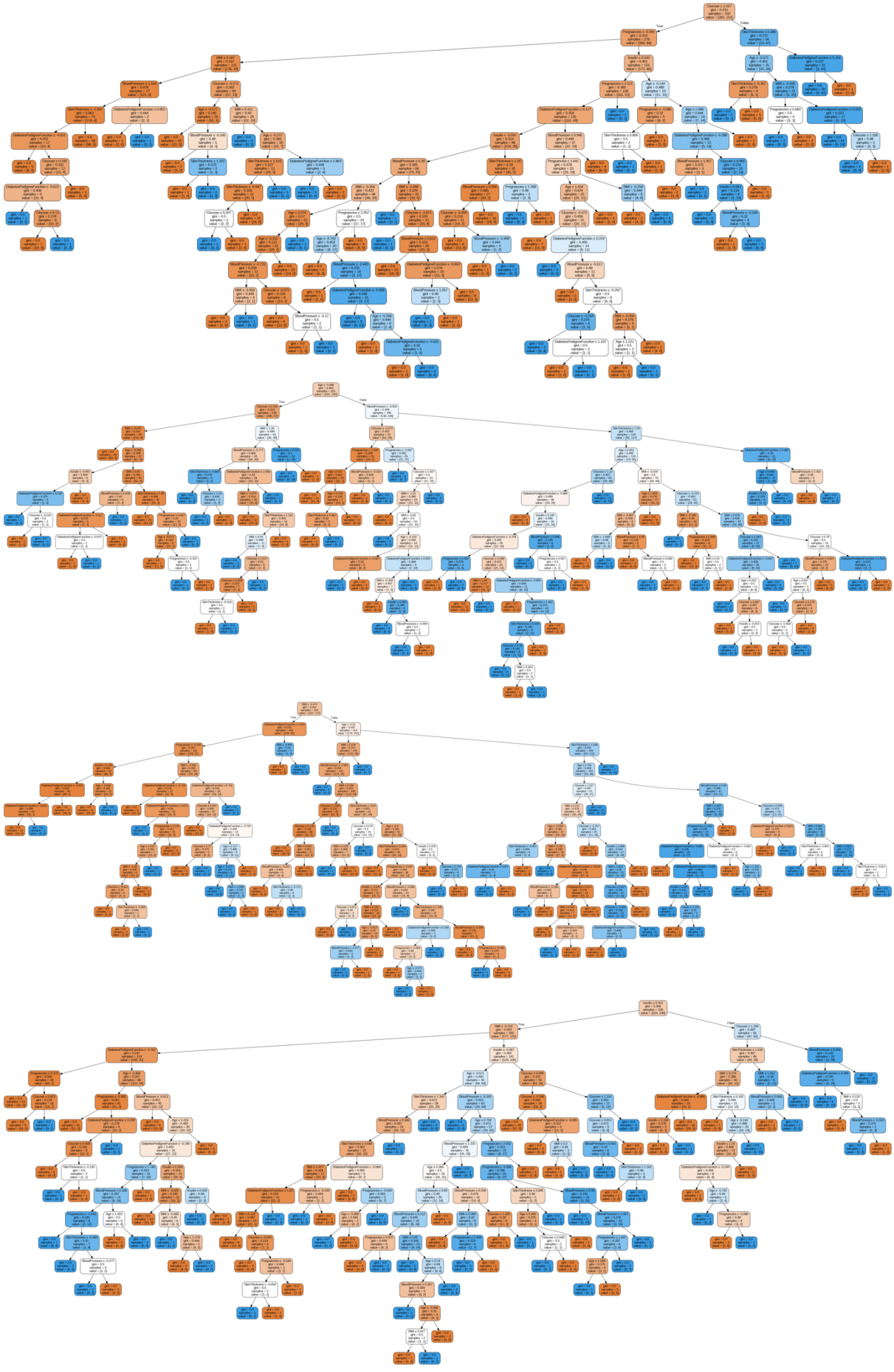
- The model exhibits moderate accuracy, showing promise in diabetes prediction.
- Areas for improvement include addressing false positives and negatives.
- Model complexity may be a concern; tuning hyperparameters or exploring alternatives is advisable.

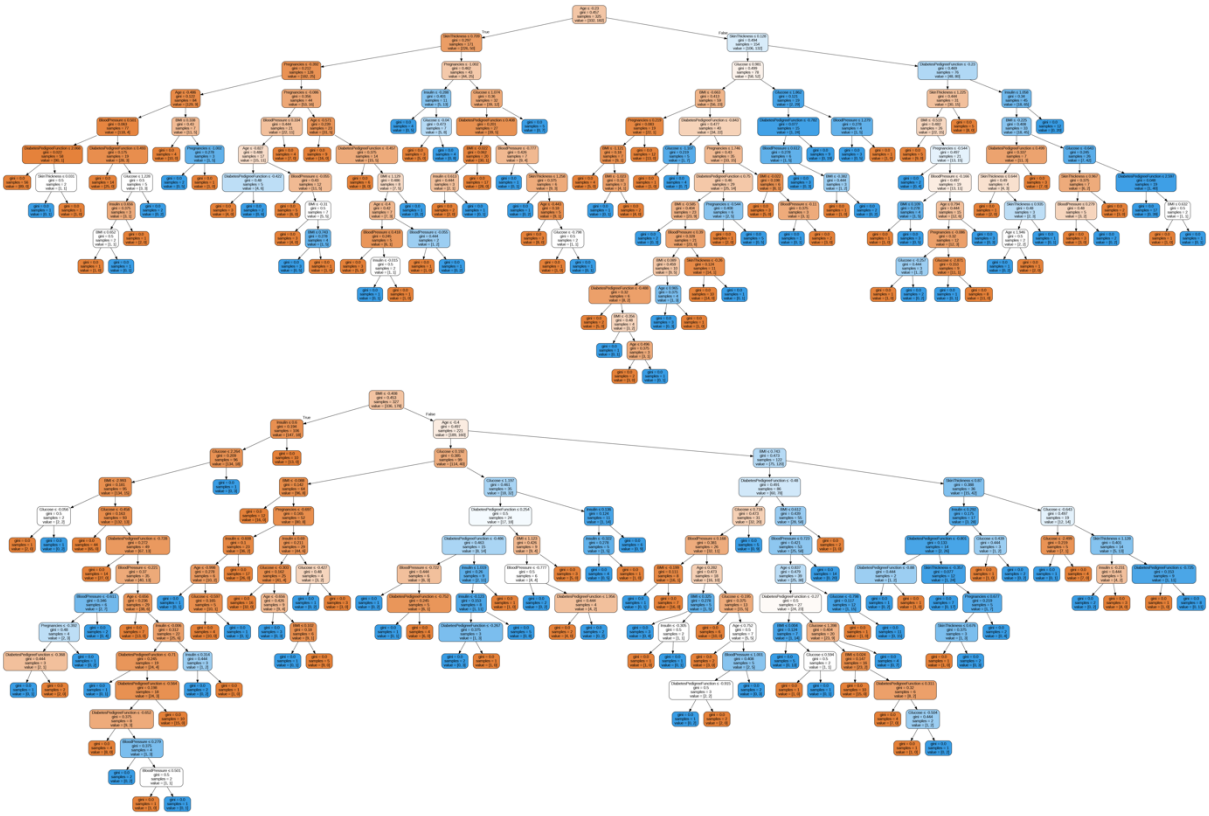
Personal Considerations:

- Decision Trees offer interpretability but may struggle with data complexities.
- Further experimentation, like hyperparameter tuning, can enhance model robustness.
- Balancing interpretability and complexity is crucial in practical applications.

- In summary, the analysis guides refining the Decision Tree model, emphasizing areas of improvement for more effective diabetes prediction.

Random Forest





Model Performance:

- The Random Forest achieved a higher accuracy of 75.20% compared to the Decision Tree.
- The confusion matrix highlights 139 True Positives, 29 True Negatives, 34 False Positives, and 52 False Negatives.

Random Forest Complexity:

- The ensemble comprises 100 trees with an average of 173.82 nodes per tree.

Visualizations:

- The confusion matrix provides a detailed breakdown of predictions for evaluation.
- Decision Trees within the Random Forest offer insights into individual tree contributions.

Analysis of Results:

- The Random Forest demonstrates improved accuracy, addressing some issues observed in the Decision Tree.
- False positives and negatives are reduced, indicating enhanced predictive performance.
- The ensemble nature contributes to a more robust and stable model.

Personal Considerations:

- The Random Forest's ensemble approach proves effective in handling complexities.
- Improved accuracy signifies enhanced predictive power for diabetes cases.
- The ensemble's average node count suggests a balance between complexity and generalization.

- In conclusion, the Random Forest outperforms the individual Decision Tree, showcasing improved accuracy and a reduction in misclassifications. The ensemble nature enhances model robustness, making it a promising choice for diabetes prediction. Further analysis and optimization can refine the model's performance.