The New Method

# Original

In this section, a novel tree-based method is proposed for XAI. Rather than the greedy construction seen with typical tree-based methods (such as CART), the proposed method uses GP to approximate an optimal tree. The tree construction process aims to maximise the reconstruction ability (mimic the predictions of a complex black-box) while minimising the complexity of the trees. The resulting trees are often far simpler while providing equivalent reconstruction ability to current approaches.

To overcome the limitations outlined in Section 1, we use NSGAII [11], paired with strongly-typed GP (STGP) [24], to evolve decision tree-like structures, which simultaneously balance the complexity and the accuracy of the trees, by approximating a global search of the potential trees. An approximation is required as global search would not be possible for any real datasets as the tree construction process is NP-complete. Hence, the goal is to outperform greedy methods, while still being computationally feasible (at the expense of accepting near-optimal trees). Another benefit of such an approach is that rather than producing a single tree, a Pareto front of non-dominated trees is produced, which is particularly important for XAI since the user can select a tree by visualising the trade-off between the complexity and accuracy (examples of such visualisations are given in Section 5).

# Condensed

In this section, a novel tree-based method is proposed for XAI. The proposed method uses GP to approximate an optimal tree. The tree construction process aims to maximise the reconstruction ability (mimic the predictions of a complex black-box) while minimising the complexity of the trees. The resulting trees are often far simpler while providing equivalent reconstruction ability to current approaches.

To overcome the limitations outlined in Section 1, we use NSGAII [11], paired with strongly-typed GP (STGP) [24], to evolve decision tree-like structures, which simultaneously balance the complexity and the accuracy of the trees. Our goal is to outperform greedy methods, while still being computationally feasible. Another benefit of this approach is that a Pareto front of non-dominated trees is produced instead of just a single tree. This is useful for XAI as it allows a user to select a tree for visualisation at a desired complexity to accuracy trade-off point along the front.