Machine Learning Approach for Mutation Testing

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Abstract : Mutation testing is a type of software testing proposed in the 1970s where program statements are deliberately changed to introduce simple errors so that test cases can be validated to determine if they can detect the errors. Test cases are executed against the mutant code to determine if one fails, detects the error and ensures the program is correct. One major issue with this type of testing was it became intensive computationally to generate and test all possible mutations for complex programs. This paper used reinforcement learning and parallel processing within the context of mutation testing for the selection of mutation operators and test cases that reduced the computational cost of testing and improved test suite effectiveness. Experiments were conducted using sample programs to determine how well the reinforcement learning-based algorithm performed with one live mutation, multiple live mutations and no live mutations. The experiments, measured by mutation score, were used to update the algorithm and improved accuracy for predictions. The performance was then evaluated on multiple processor computers. With reinforcement learning, the mutation operators utilized were reduced by 50 – 100%.

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