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*Monte Carlo tree search with optimal computing budget allocation*

We analyze the tree policy in Monte Carlo tree search problem with the objective to select the best action at the root that achieves the highest cumulative reward. We propose a new tree policy that optimally allocates a limited computing budget to maximize a lower bound on the probability of correctly selecting the best action. The new tree policy takes a more balanced approach to manage the exploration and exploitation trade-off compared to the widely used Upper Confidence Bound (UCB) type of tree policies when the sampling budget is limited. In addition, the new policy does not need to know the support of reward distribution, which UCB requires in order to function. Another advantage of the new tree policy is it can be applied to game trees with mild modifications. We illustrate the efficiency of our algorithm using a widely used benchmark problem.