Learning from Tactic Steps in Formal Proofs

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TacticToe is a machine-learning guided tactical prover which works as follows. By mining a proof assistant library and modifying its proof scripts, tactic invocations are recorded. Abstraction and orthogonalization techniques improve the quality of the created database. A predictor trained on these examples guides TacticToe proof attempts by biasing its searches towards the most promising tactics for each situation. The efficiency of TacticToe is demonstrated on the HOL4 standard library and part of CakeML. By construction, proof scripts generated by TacticToe can be easily inspected and analyzed.