

# Multilevel preconditioners for temporal-difference learning methods related to recommendation engines

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In many areas of retail and especially e-business recommendation engines are applied to increase the usability of the store or portal. Advanced recommendation engines use approaches from control theory for adaptive learning. At the forefront of these algorithms reinforcement learning is applied which however requires large transaction numbers to converge. To overcome this problem, we propose a hierarchical approach of reinforcement learning for recommendation engines by combining a multilevel preconditioner with the temporal-difference learning method, the most important algorithm class of reinforcement learning. The multilevel preconditioner works on a combined hierarchy of states and actions. We describe the preconditioner, prove its convergence and present results on real-life data.

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