Branch Dueling Deep Q-Networks for Robotics Applications

Master's Thesis

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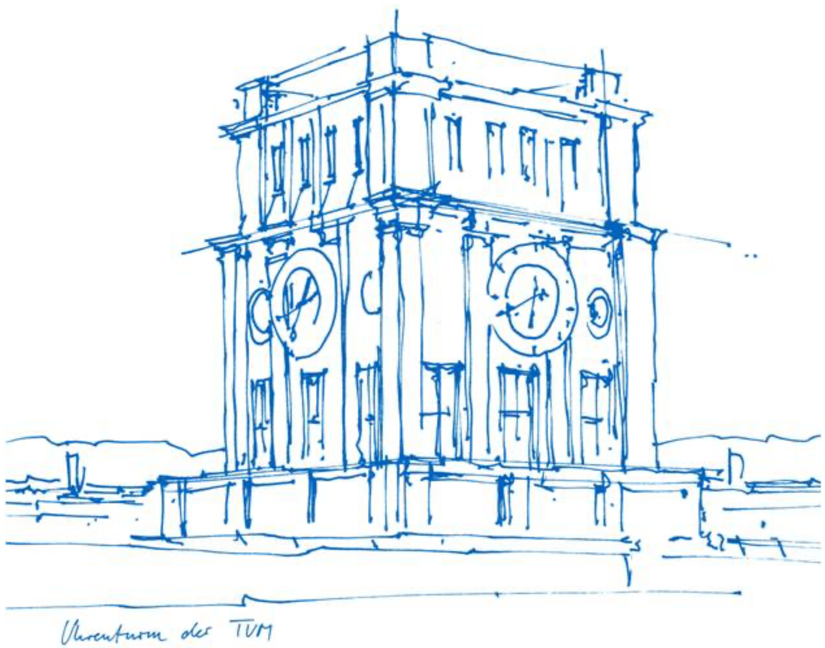
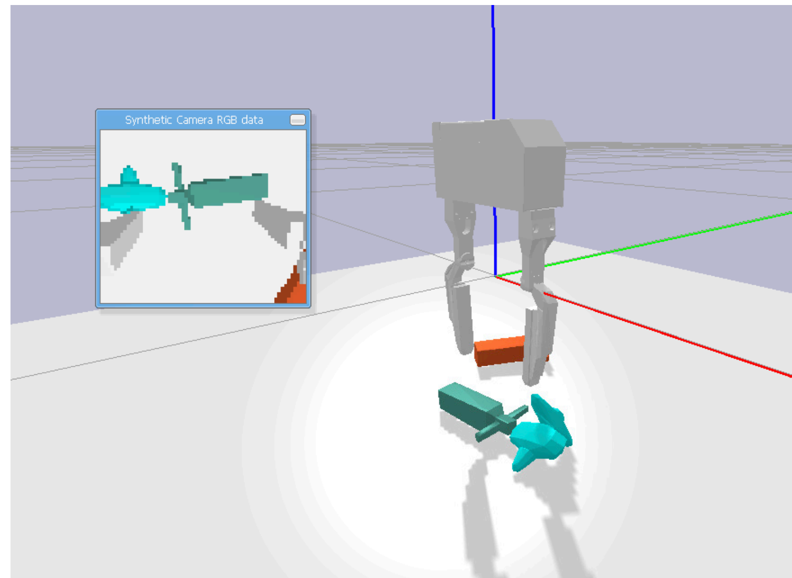
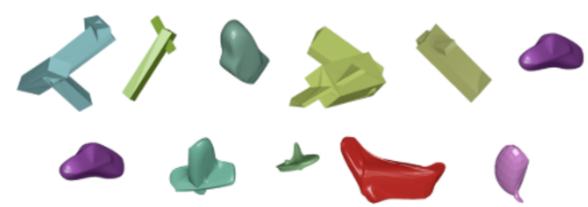


OpenAI Gym-based Grasping Environment

Training with different modules:

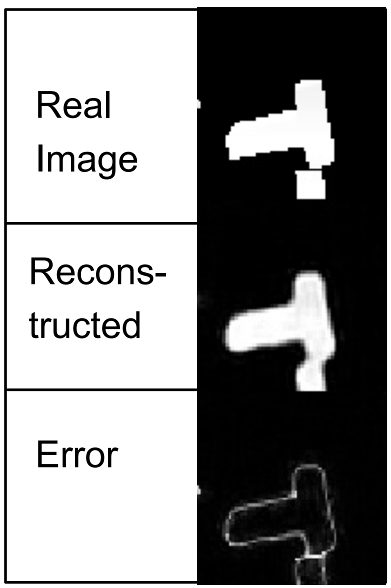
- Curriculum Strategy
- Input and Reward Normalization
- Shaped Reward
- Encoder, depth and RGB-D perception



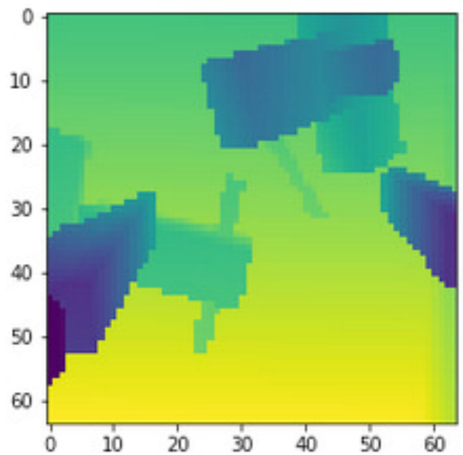


Experiments with Different Perception Layers

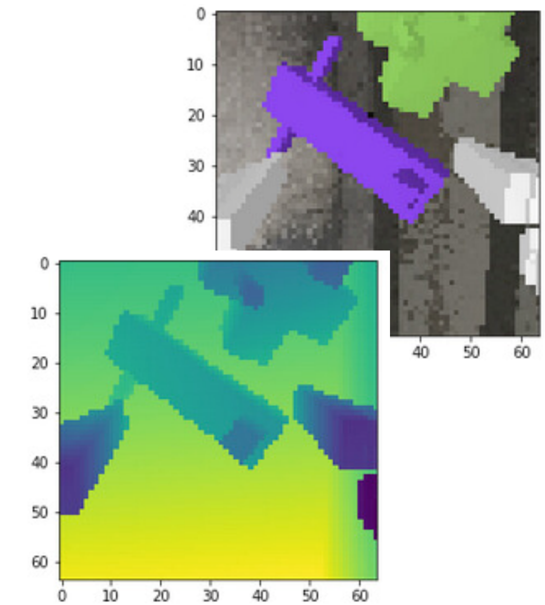
Auto-encoder



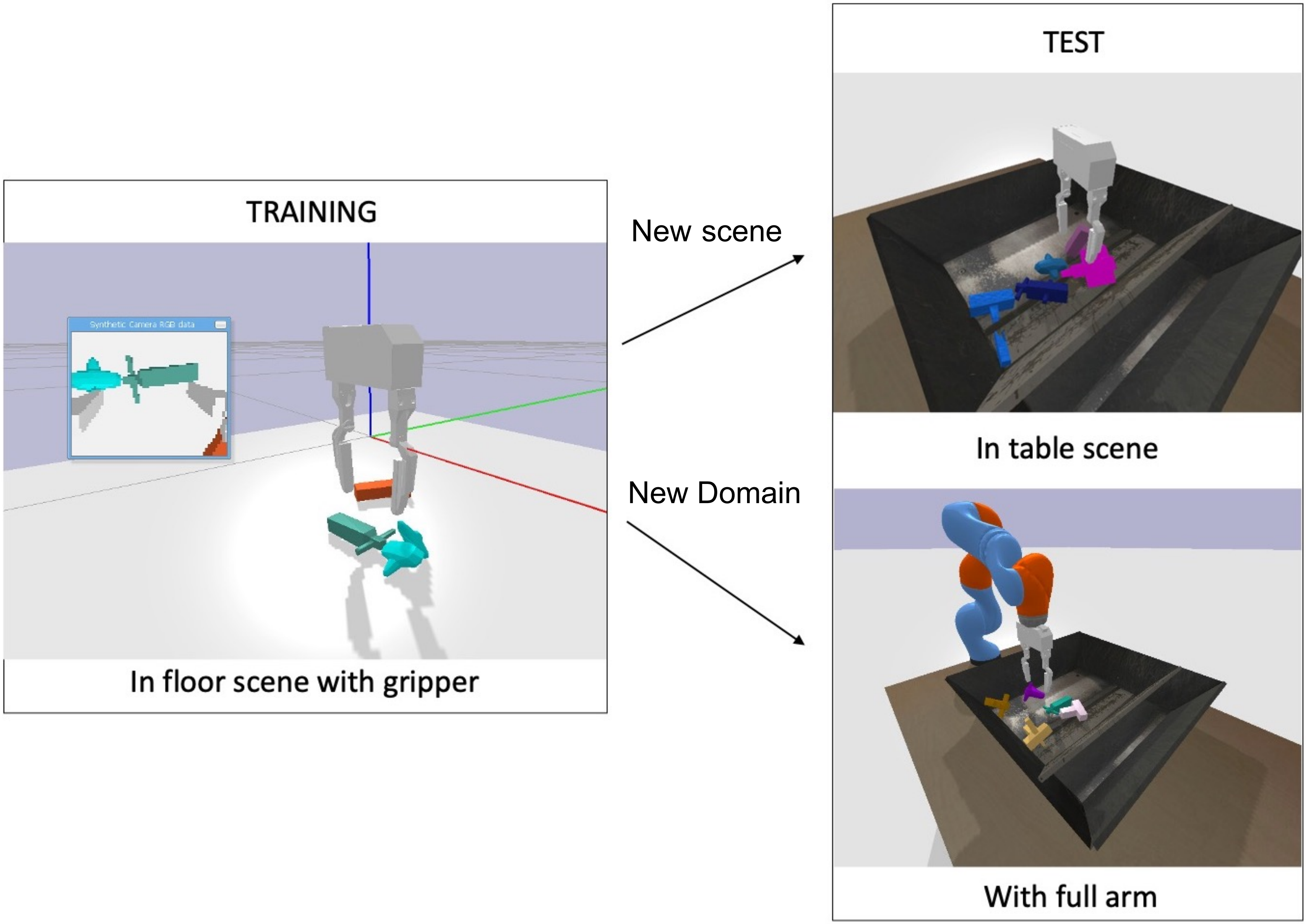
Depth



RGB-D



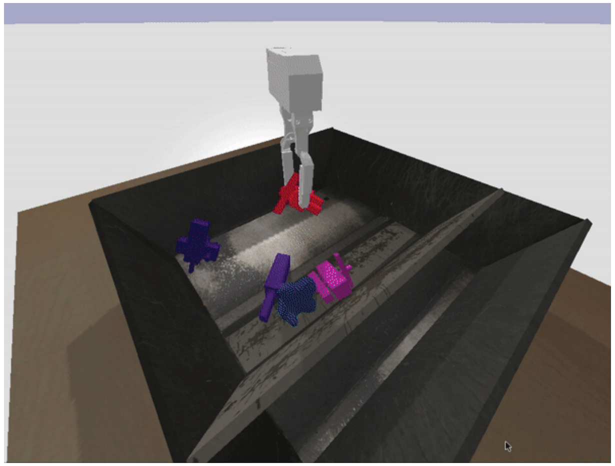
Training and Test Pipeline



SAC Test Results on Gripper Environment

	SAC Gripper Environment			
	Floor Scene		Table Scene	
Models	**Random Objects (%)**	**Wooden Blocks (%)**	**Random Objects (%)**	**Wooden Blocks (%)**
SAC_encoder_50k	65	62	63	59
SAC_encoder_1m	100	95	99	82
SAC_depth	100	95	95	23
SAC_rgbd	91	95	46	17
SAC_depth_no_curr	100	97	97	64
SAC_depth_sparse	99	97	100	72
SAC_depth_no_act	95	75	84	24

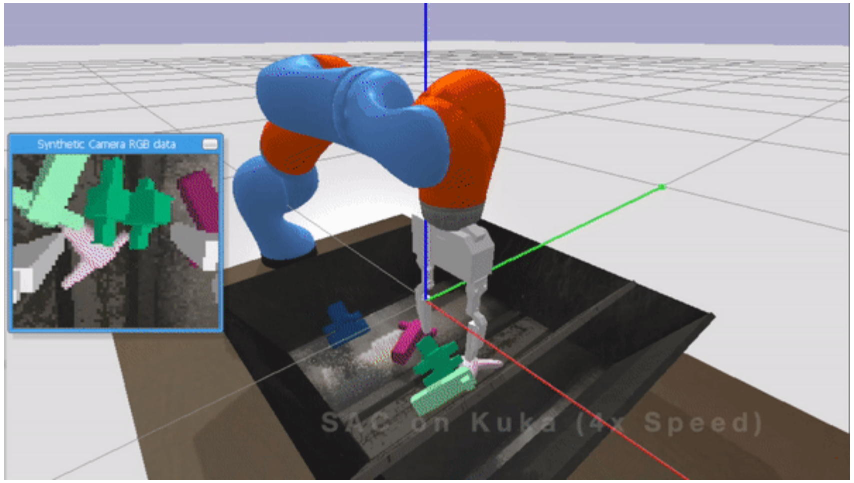
Table 1: SAC test results on gripper environment with new scene and objects set



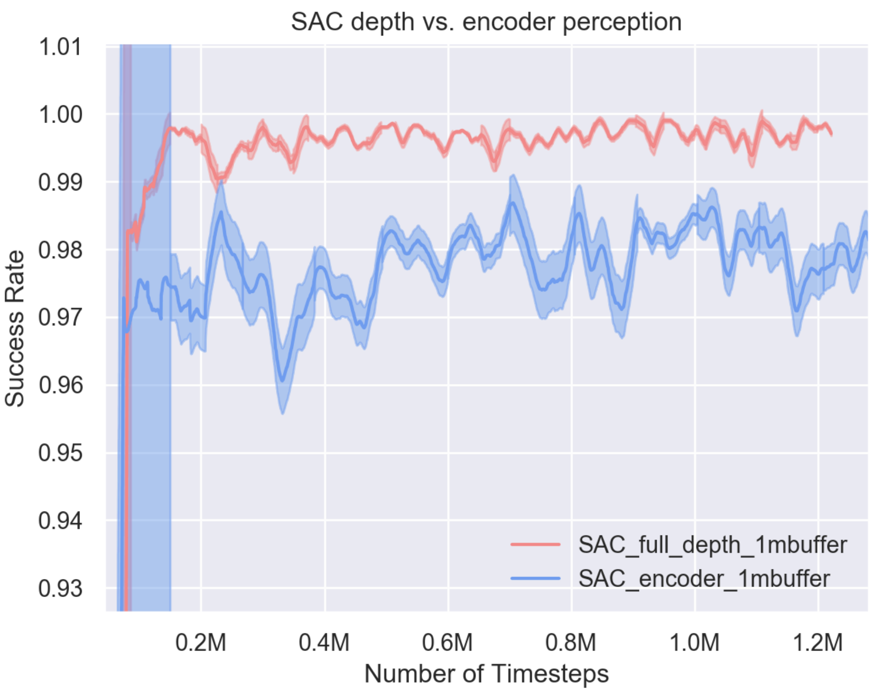
SAC Model Domain Transfer to Kuka

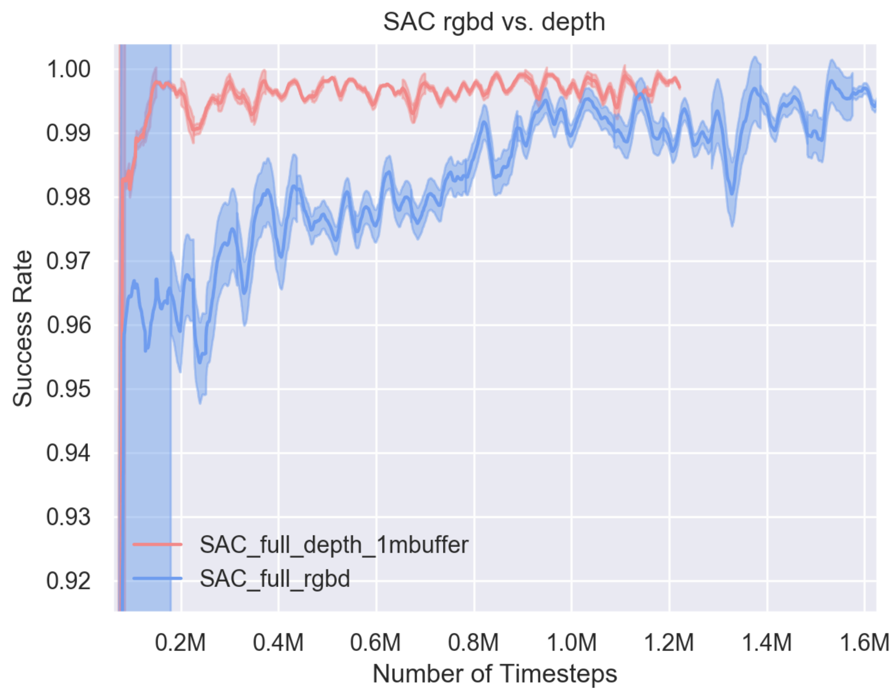
Models	SAC on Kuka	
	Floor Scene (%)	Table Scene (%)
SAC_encoder_50k	62	66
SAC_encoder_1m	84	87
SAC_depth	97	97
SAC_rgbd	77	38
SAC_depth_no_curr	97	90
SAC_depth_sparse	66	28
SAC_depth_no_act	95	48

Table 2: SAC model transfer to Kuka domain

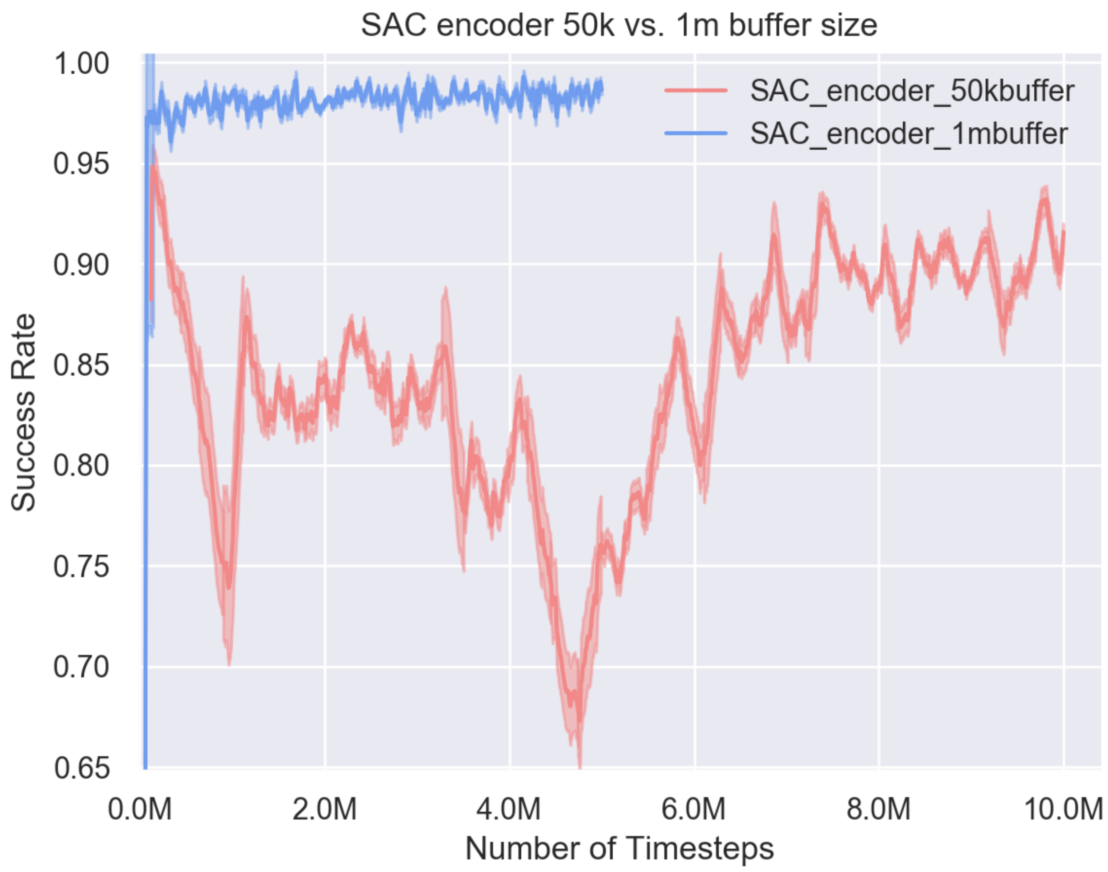


SAC Plots– Perception Comparison

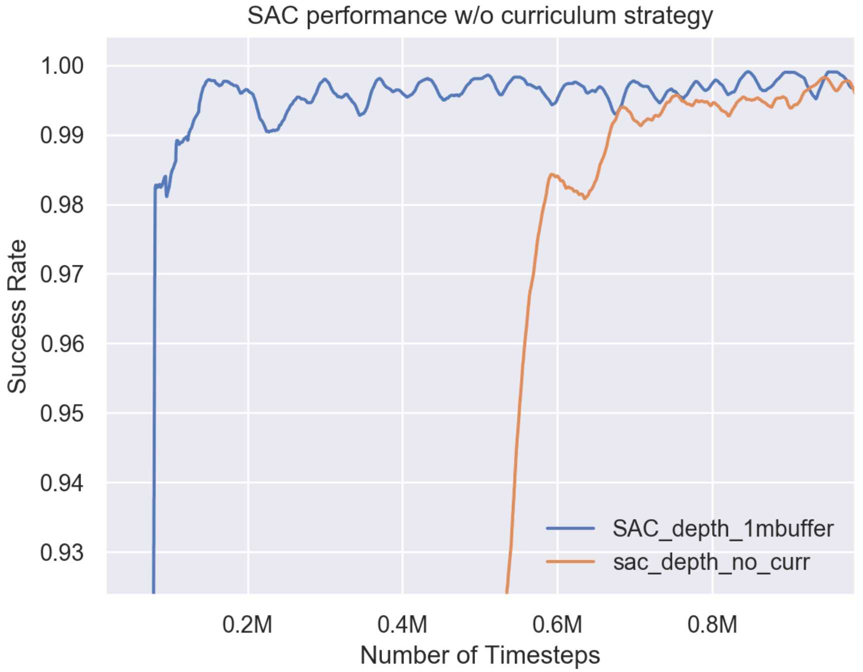


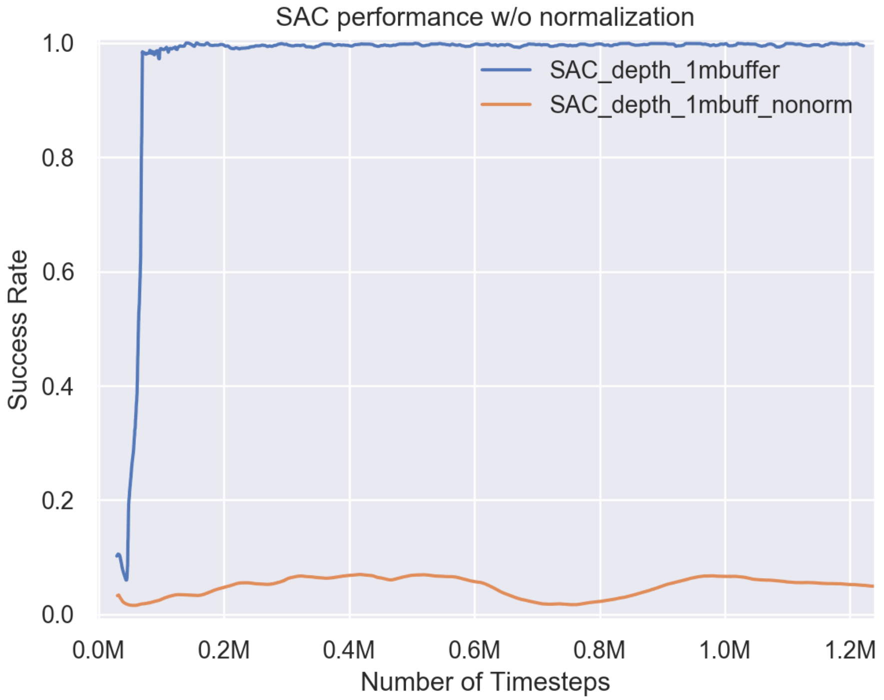


SAC Encoder Result



SAC Ablation Studies





SAC Ablation Studies