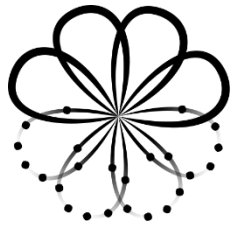

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Model-Based and Model-Free Learning

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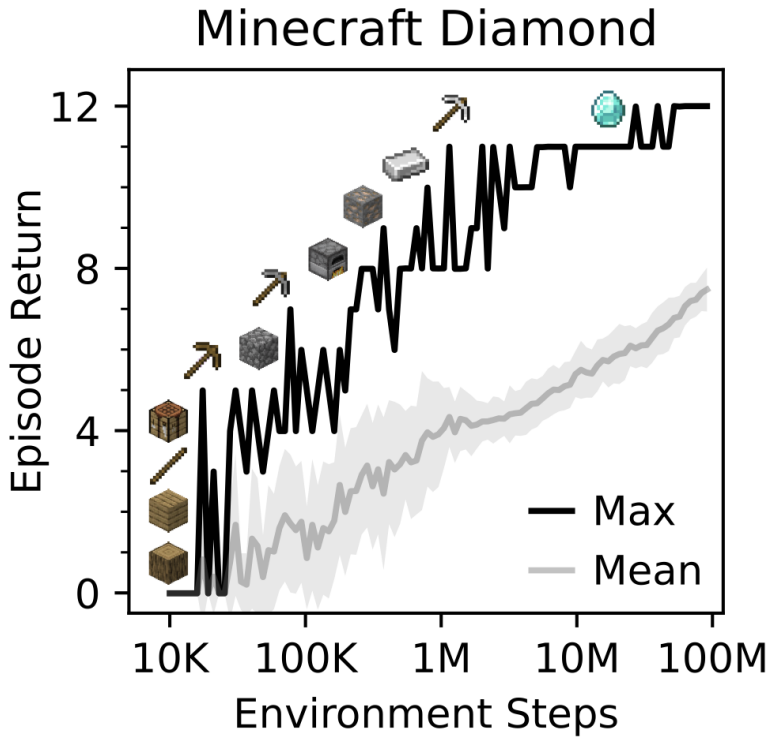
Model-Based Learning vs. Model-Free Learning

Comparison Metric	Model-Based Learning	Model-Free Learning
Description	- Builds a model of the env based on interactions - Agent can "plan" further actions based on predictions from the model	- Directly learns the value function/policies without building a model of the env - Agent has to carry out action multiple times in order to estimate rewards
Focus	- Understanding and or simulating underlying environment	- Being more flexible on a task with flexible environment
Advantages	- Is able to plan future actions before executing them - Needs less interactions	- Flexible on non-static environments
Disadvantages	- Environment has to be accurately modelled - If environment is not captured properly, generalization will suffer	- Requires more experiences - Learns slower due to trial-and-error strategy - Can have worse generalization
Example Applications	- Chess	- Autonomous Driving
Principle	- Predictive model on static environments	- Learning on outcomes of actions based on existing model

Dreamer V3

- Dreamer-V3 is the first algorithm that could learn to mine diamonds in Minecraft from scratch
- Learns a world model without human data
- Could outperform model-free and model-based approaches
- Generally learns tasks from diverse domains with fixed parameters
- Training process encodes sensory inputs into discrete values
- Only achieves to mine diamonds sometimes and not in every episode (24 times in across 40 seeds)
  - Previously the SOTA was a success rate of 2.5%
- Consists of 3 neural networks
  - **World-model**: predicts future outcomes based on possible actions
  - **The critic:** judges the value of each situation
  - **The actor:** learns to reach valuable situations



[Hafner et al.2023]