

SKILL COMPOSITION

Vaishnava Hari

Dream A marketplace of skills, from which a robot can download a skill. And a framework to decompose a task into subtasks which then is solved using a subset of skills.

1 Hirarchical Reinforcement Learning

Hierarchical Reinforcement Learning (HRL) is a framework for breaking down complex tasks into simpler subtasks. It is accomplished by defining multiple layers of policies, where higher-level policies select subgoals or subtasks for lower-level policies to execute.

Bottom-up approach: Started with a set of low level skills, trained individually and freeze. Introduce a high level policy to select a subset of skills to execute. This method is widely used.

Top-down approach: Train both high level and low level policies together. The main hurdles are:

1. number of low level policies: decomposing a task into a set of skills is still an open problem.
2. credit assignment problem (cap): how to assign credit to the right low level policy.

2 Vision-Language-Action

Vision-Language-Action (VLA) models are a class of models based on the transformer architecture and are designed to process and understand both visual and textual information. They are made up of two parts:

1. VLM (Vision-Language Model): This part of the model is responsible for understanding and processing visual and textual information.

2. Action Head: Made of diffusion transformers and are responsible for generating actions using the embeddings from the VLM. They can also take in additional inputs such as proprioceptive and privileged environment information.

Some of the popular VLA models include: - SoFar [1], state of the art in robot manipulation tasks in the Google SimplerEnv dataset [2].

- OpenVLA [3], a 7B parameter model. It uses Lama 2 as the backbone and is trained on 970k robot demos in Open X-Embodiment dataset [4].

- SAM2ACT [5] is a new model focused on manipulation tasks. It is the leader in the RLbench dataset [6].

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