

RDD: Retrieval-based Demonstration Decomposer for Planner Alignment in Long-Horizon Tasks

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How to Identify Sub-Tasks Close to the Expert-Labeled Ones?

Expert-Labeled Sub-Tasks



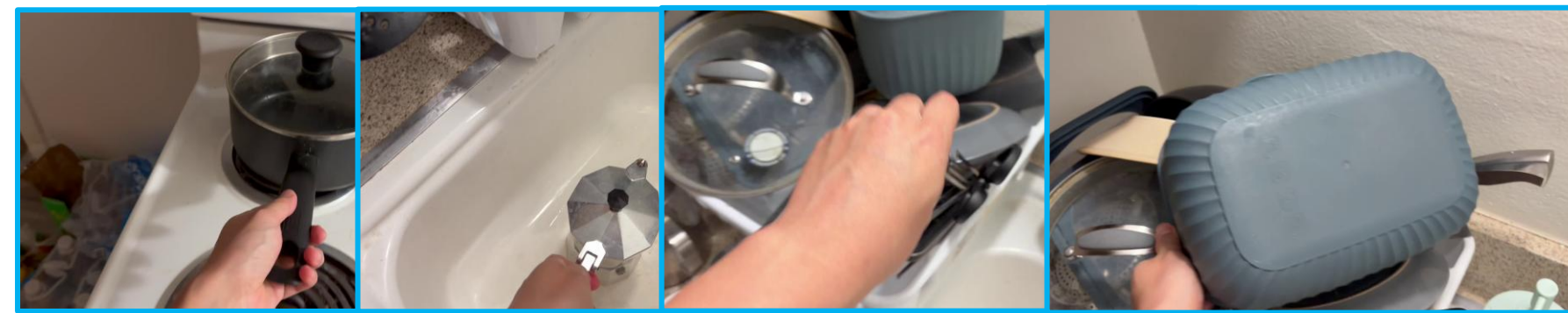
Set Pots Set Coffee Maker Insert Dinnerware Place Bowl

RDD (Ours)



Identified Sub-Tasks

Retrieved as Reference



UVD (Baseline, ICRA'24)



Identified Sub-Tasks

Unlabeled Demo Video



Example Expert-Labeled Sub-Tasks



Sub-Task Identification with Prior

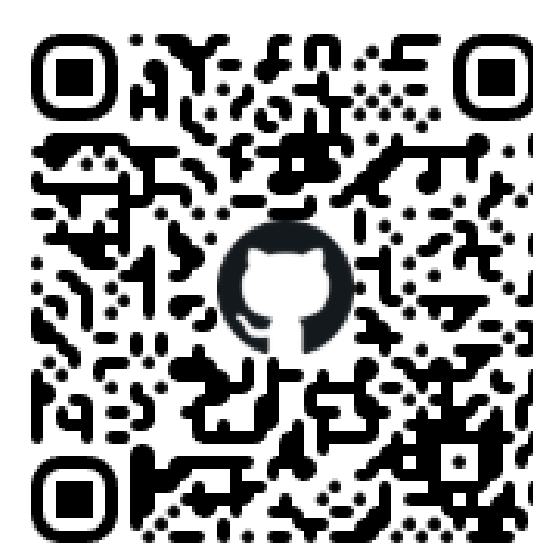
RDD identifies sub-tasks that are close to expert labeled ones, while previous methods may produce unconditioned noisy sub-tasks.

Website



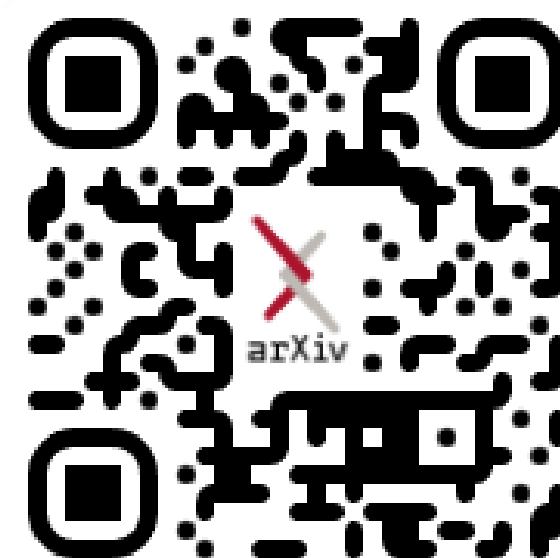
<https://rdd-neurips.github.io/>

Code



<https://github.com/tasl-lab/Retrieval-Demonstration-Decomposer>

Paper



<https://arxiv.org/pdf/2510.14968>



Trustworthy
Autonomous
Systems
Laboratory



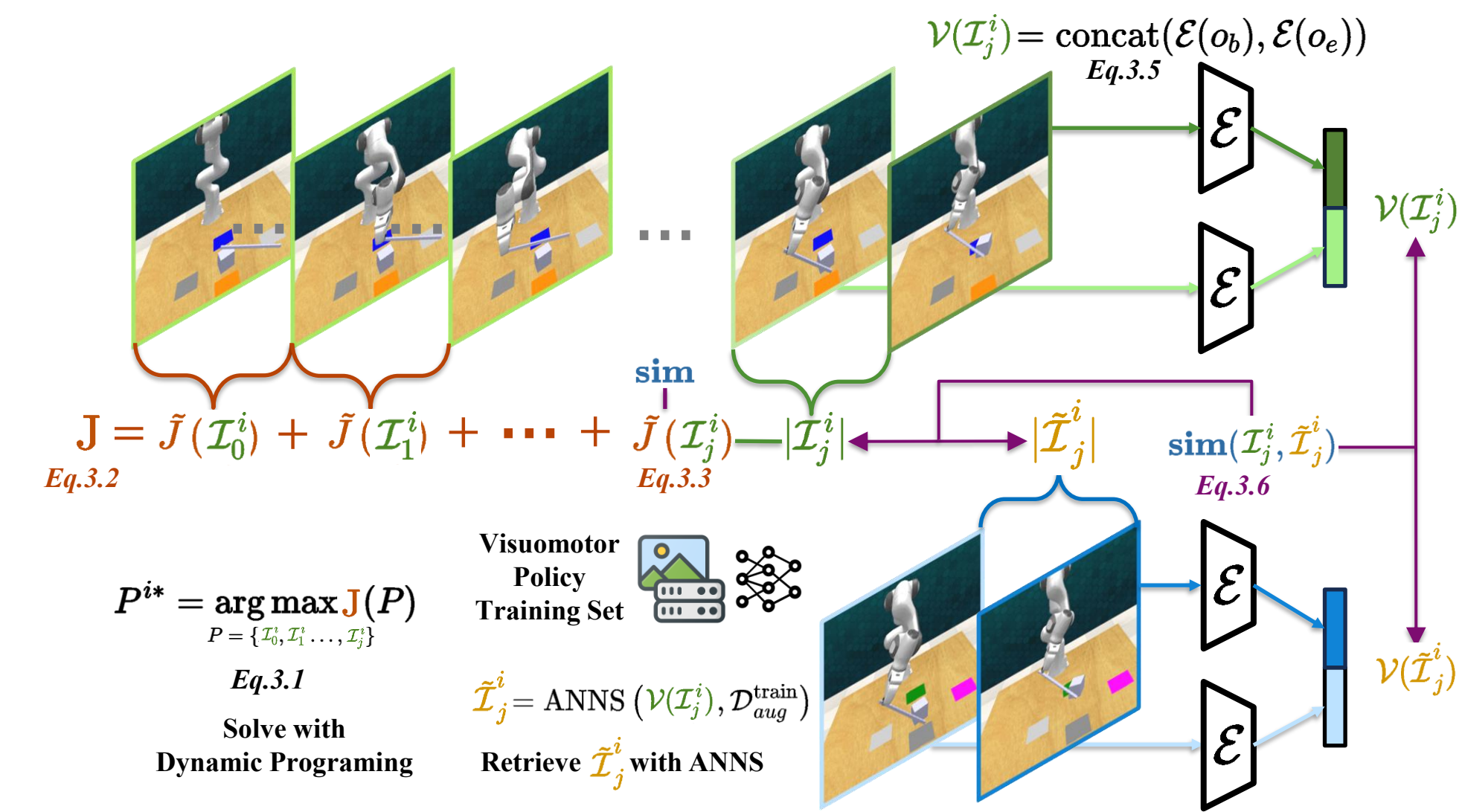
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Method

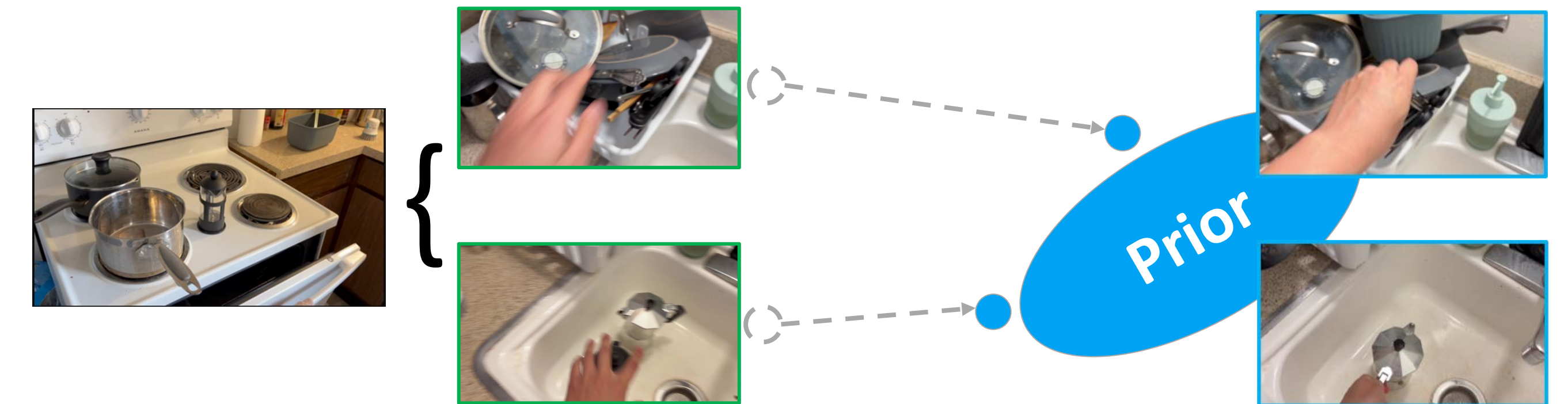


RDD formulates demonstration decomposition as an **optimal partitioning problem**, using approximate nearest neighbor search (ANNS) and dynamic programming to efficiently find the optimal decomposition strategy in **O(N)** with bounded sub-task durations.

Use Case I: Sub-Task Dataset Generation with Prior

What should a sub-task look like? *Up to you!*

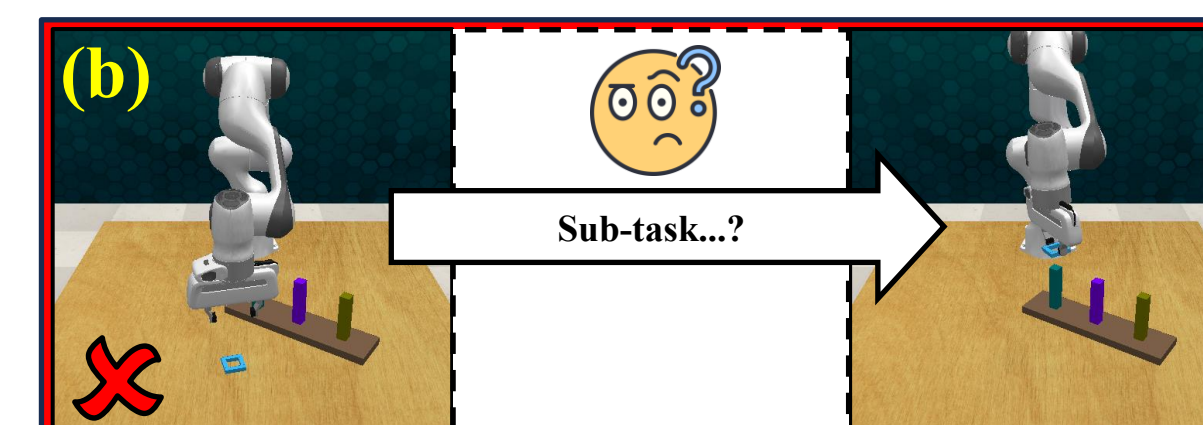
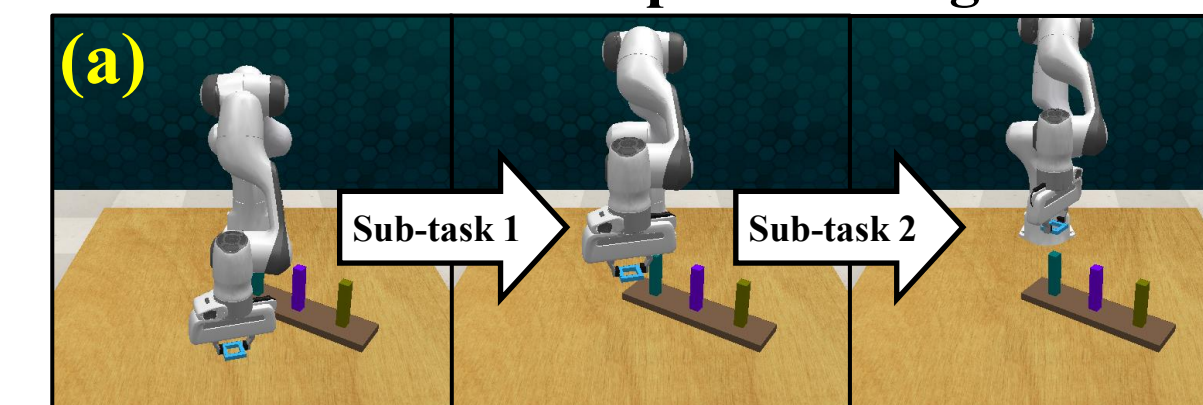
$$\text{Easy to extend} \text{ --- } \text{sim}(\mathcal{I}_j^i, \tilde{\mathcal{I}}_j^i) = \underbrace{-\delta(\mathcal{V}_e(\mathcal{I}_j^i), \mathcal{V}_e(\tilde{\mathcal{I}}_j^i))}_{\text{retrieval}} + \underbrace{\beta G(\mathcal{I}_j^i)}_{\text{general}}$$



Use Case II: Planner-Visuomotor Dataset Alignment

Please scan our website QR code for details!

Decomposition following the same rule in visuomotor pre-training



Align sub-tasks to the training set of visuomotor

