

# DexGarmentLab

## Dexterous Garment Manipulation Environment with Generalizable Policy



**Fling Tops**



**Store Tops**



**Fling Trousers**



**Fold Trousers**



**Hang Trousers**



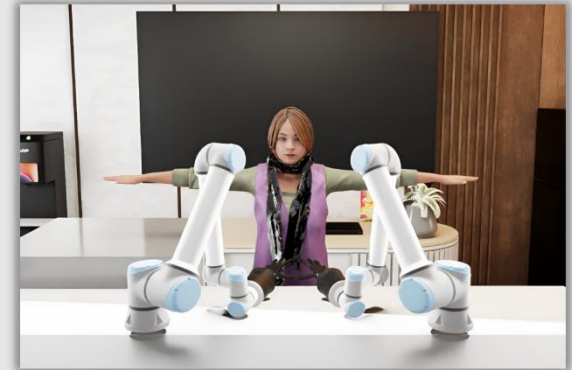
**Fold Dress**



**Wear Bowl Hat**



**Wear Glove**



**Wear Scarf**



**Fold Tops**



**Fling Dress**



**Hang Tops**



**Wear Baseball Cap**



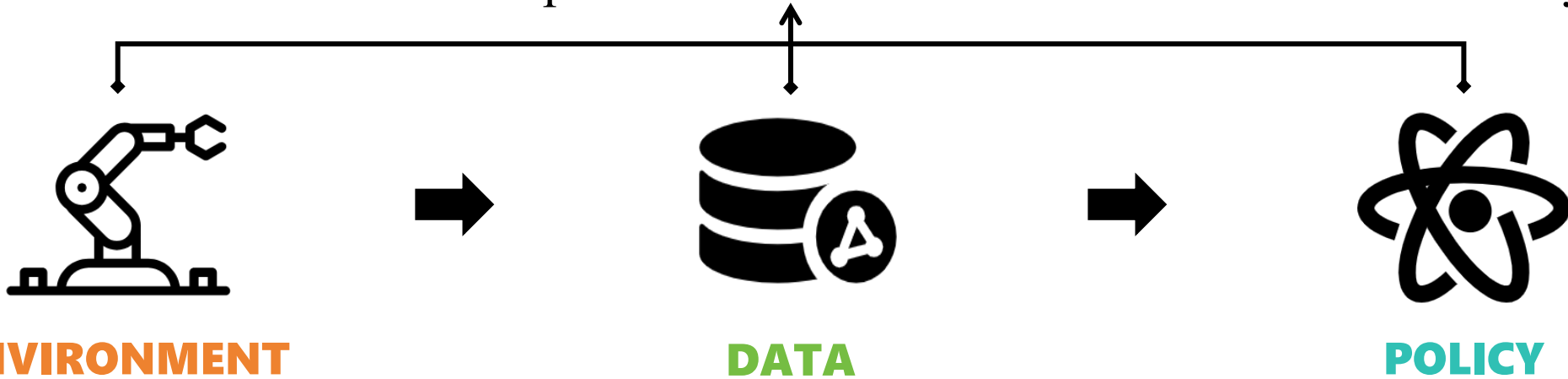
**Hang Coat**



**Hang Dress**

# DexGarmentLab

Dexterous Garment Manipulation Environment with Generalizable Policy





# DexGarmentLab Overview

## ENVIRONMENT

**15 Task Scenes**  
**2500+ Garment**



Glove



Trousers



Coat



Baseball Cap



Bowl Hat



Dress



Tops



Scarf

### Garment-Hands Interaction



Catch



Cradle

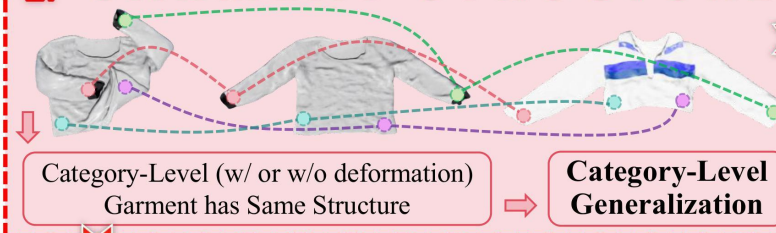


Pinch

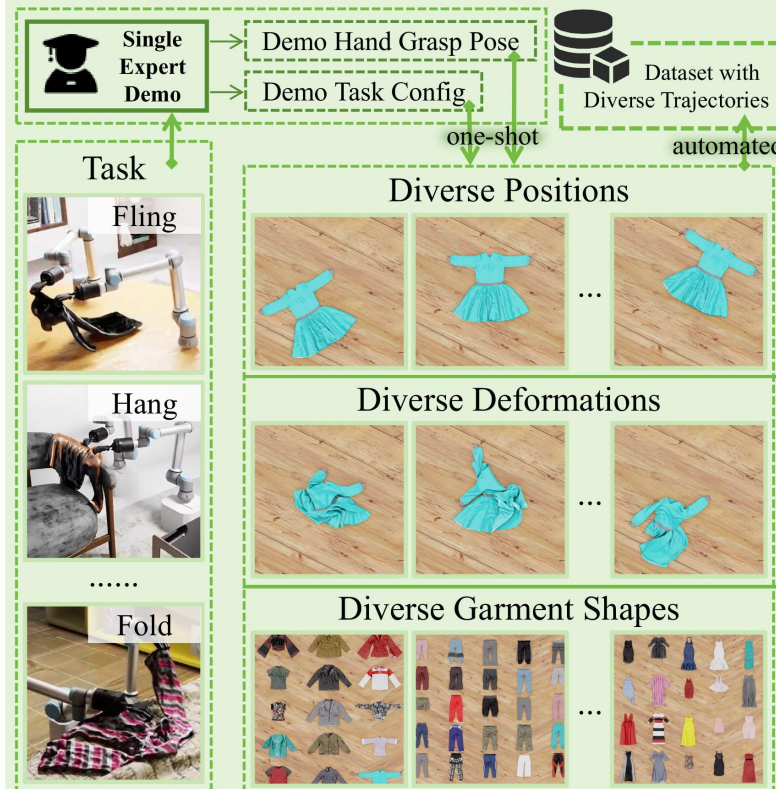


Smoothen

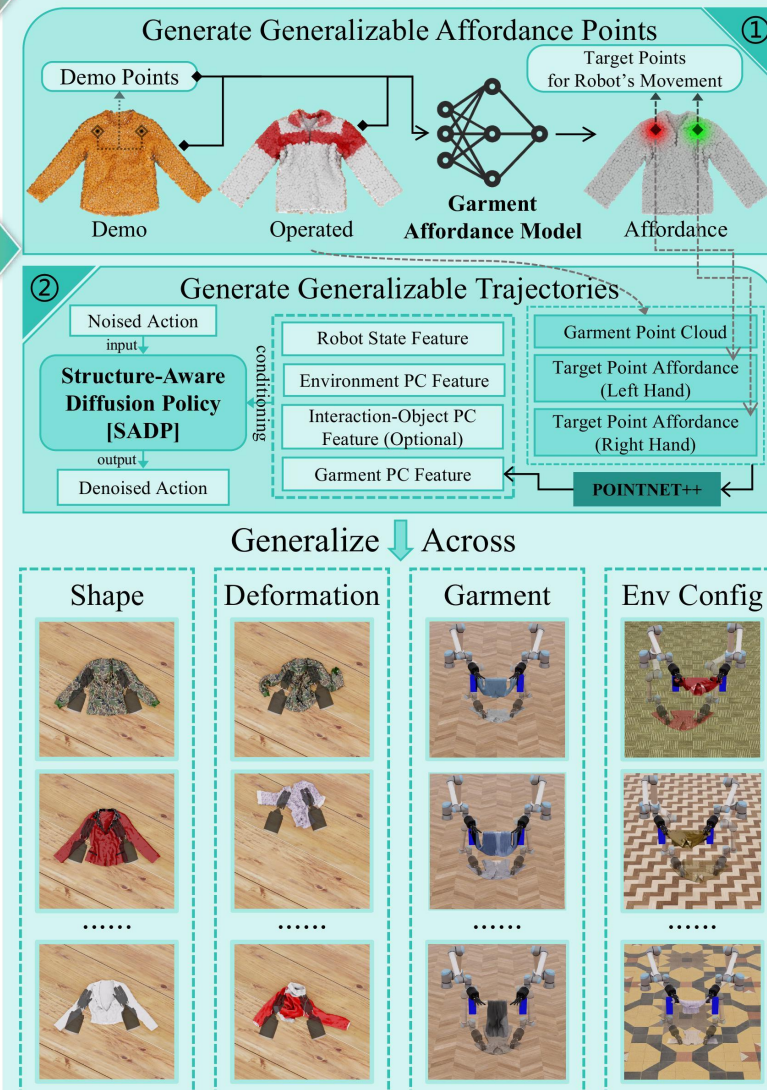
## GARMENT STRUCTURE



## AUTOMATED DATA COLLECTION



## GENERALIZABLE POLICY





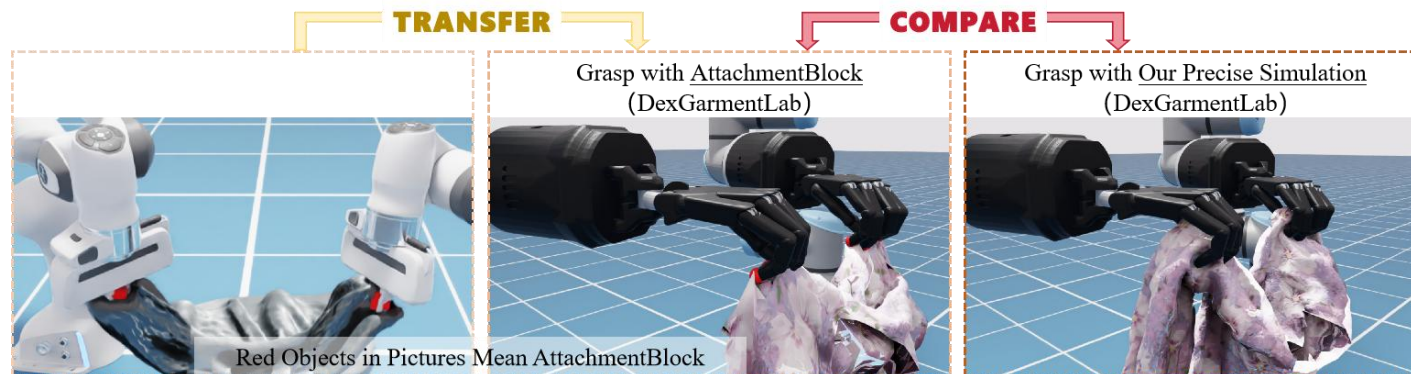
## Simulation Environment Assets



**2500+ Pieces of Garment**  
**across 8 Categories**

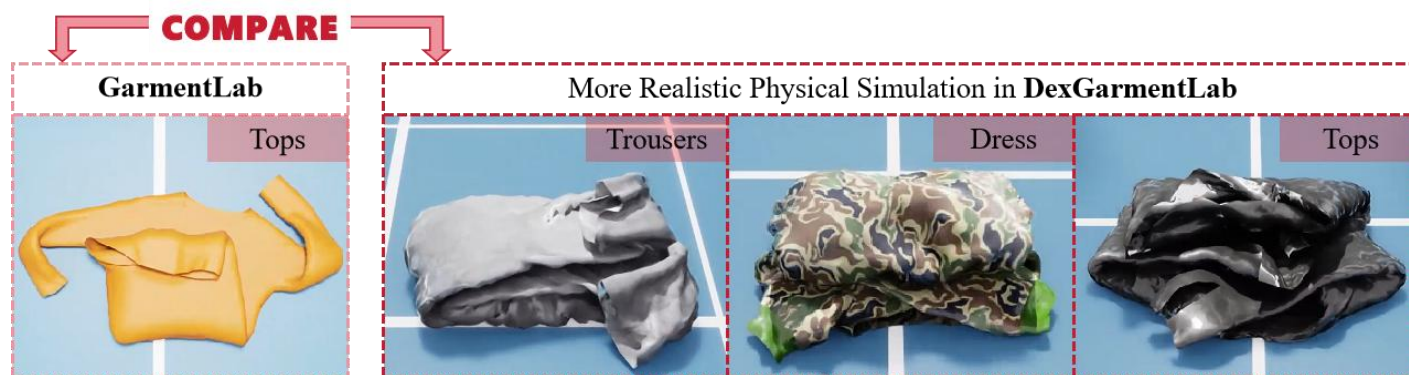
**15 Types of Task Scenes**

## Better Garment-Robot Interactions



GarmentLab use AttachmentBlock to simulate fake grasp.  
DexGarmentLab can simulate better and real Garment-Robot  
Interaction without attachmentblock.

## Better Garment Properties



Garment in GarmentLab can't main stable folded state.  
With Better simulation in DexGarmentLab, garment can main  
stable state and act more like garment in real-world.



## Environment

Some Simulation Demo Vedios Here to Show **Excellent Simulation Performance in DexGarmentLab**:



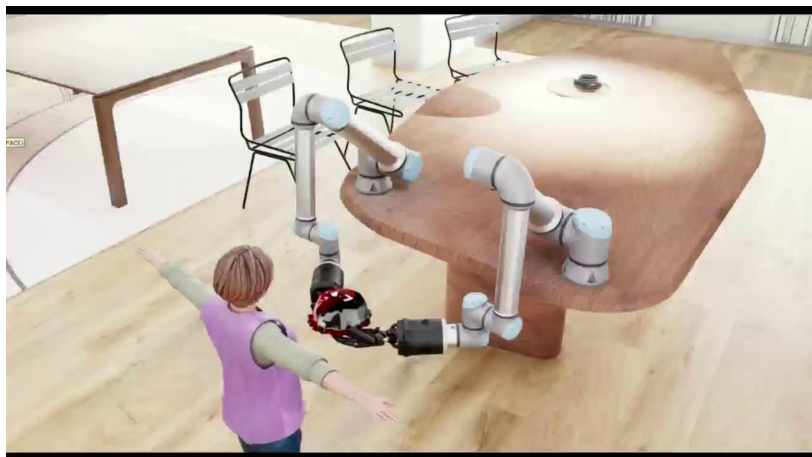
Fling Tops



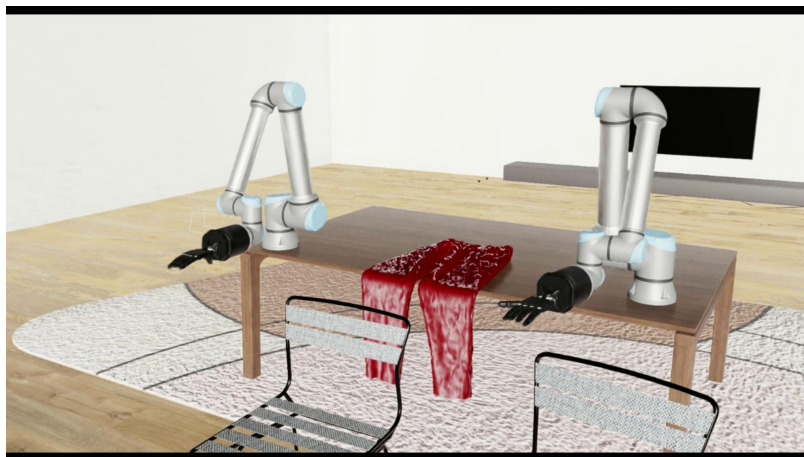
Wear Gloves



Fold Dress



Wear Hat



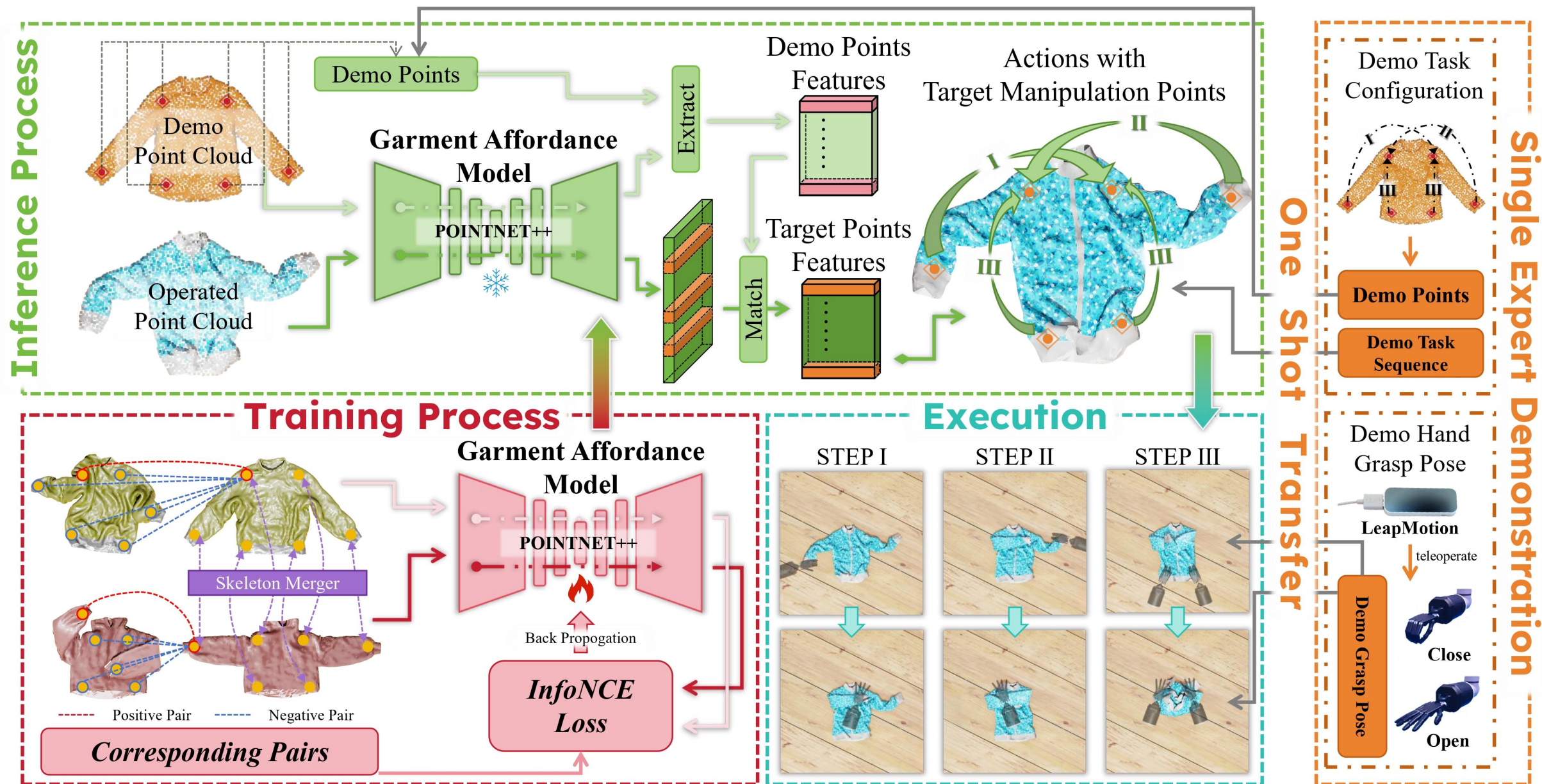
Hang Trousers



Open Tops

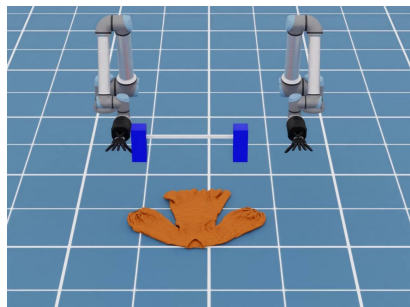


# Automated Data Collection Pipeline

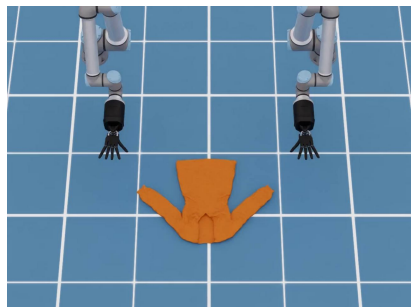




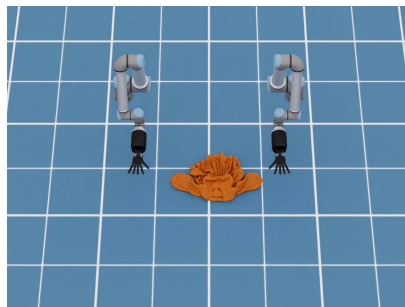
# Task Trajectories in Automated Data Collection Pipeline



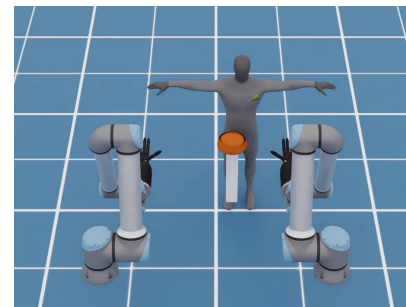
Hang Dress



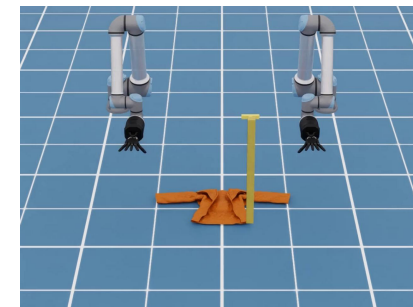
Fold Dress



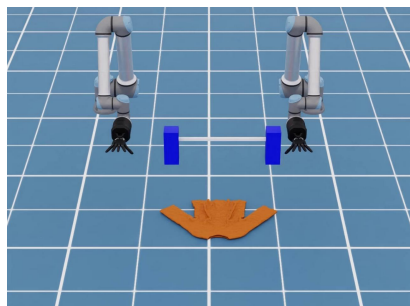
Fling Dress



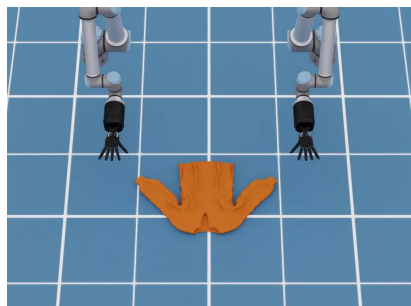
Wear Bowl Hat



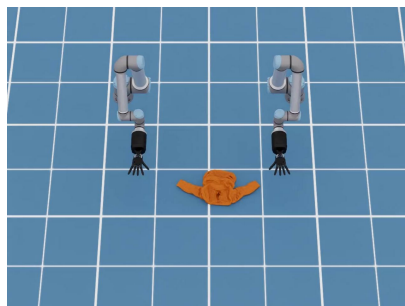
Hang Coat



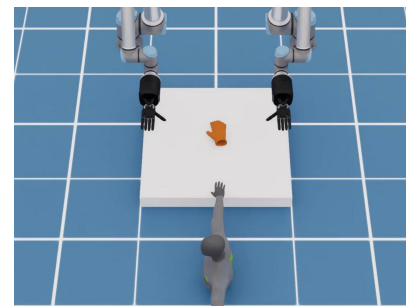
Hang Tops



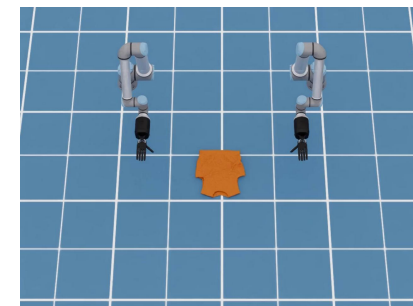
Fold Tops



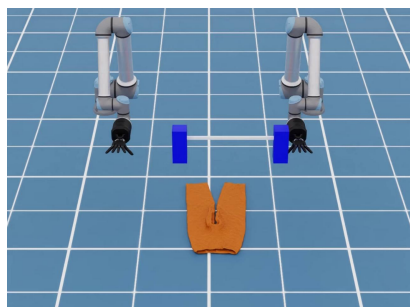
Fling Tops



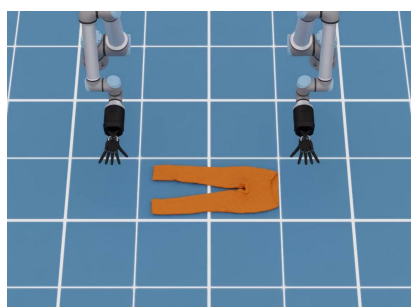
Wear Glove



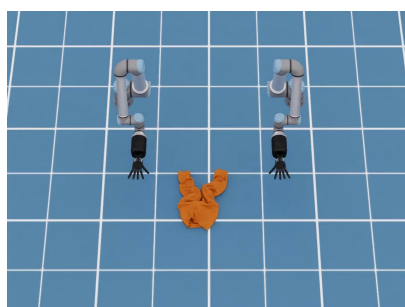
Store Tops



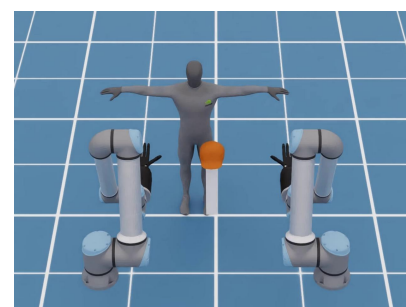
Hang Trousers



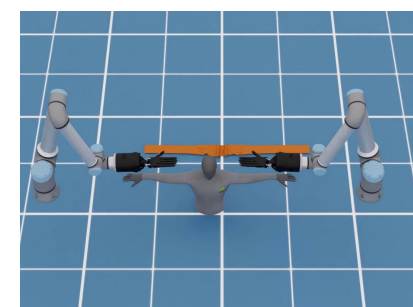
Fold Trousers



Fling Trousers



Wear Baseball Cap

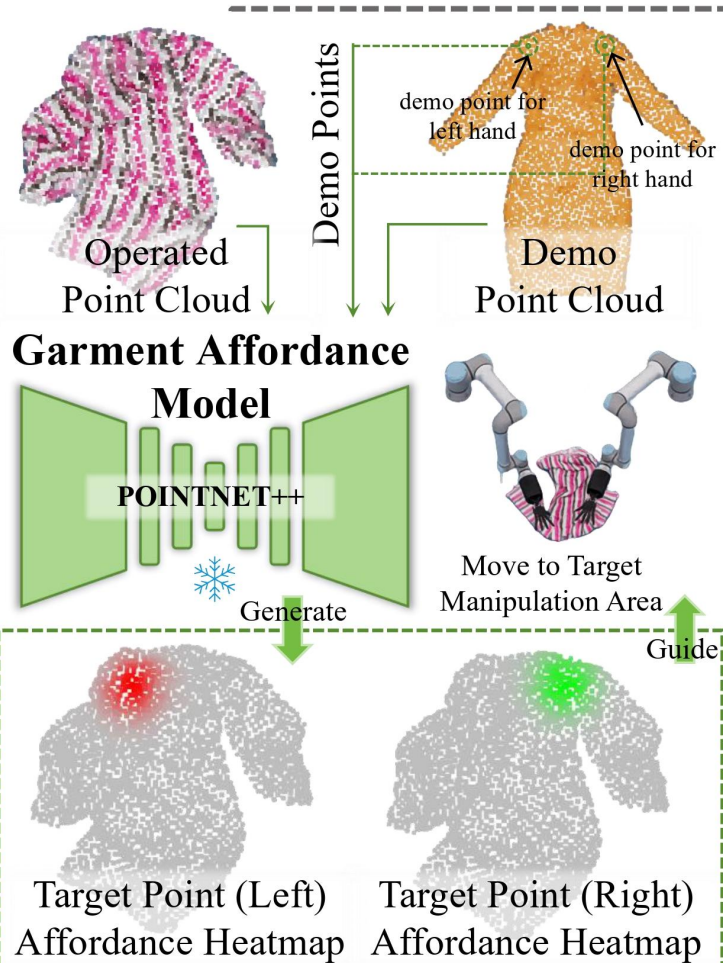


Wear Scarf

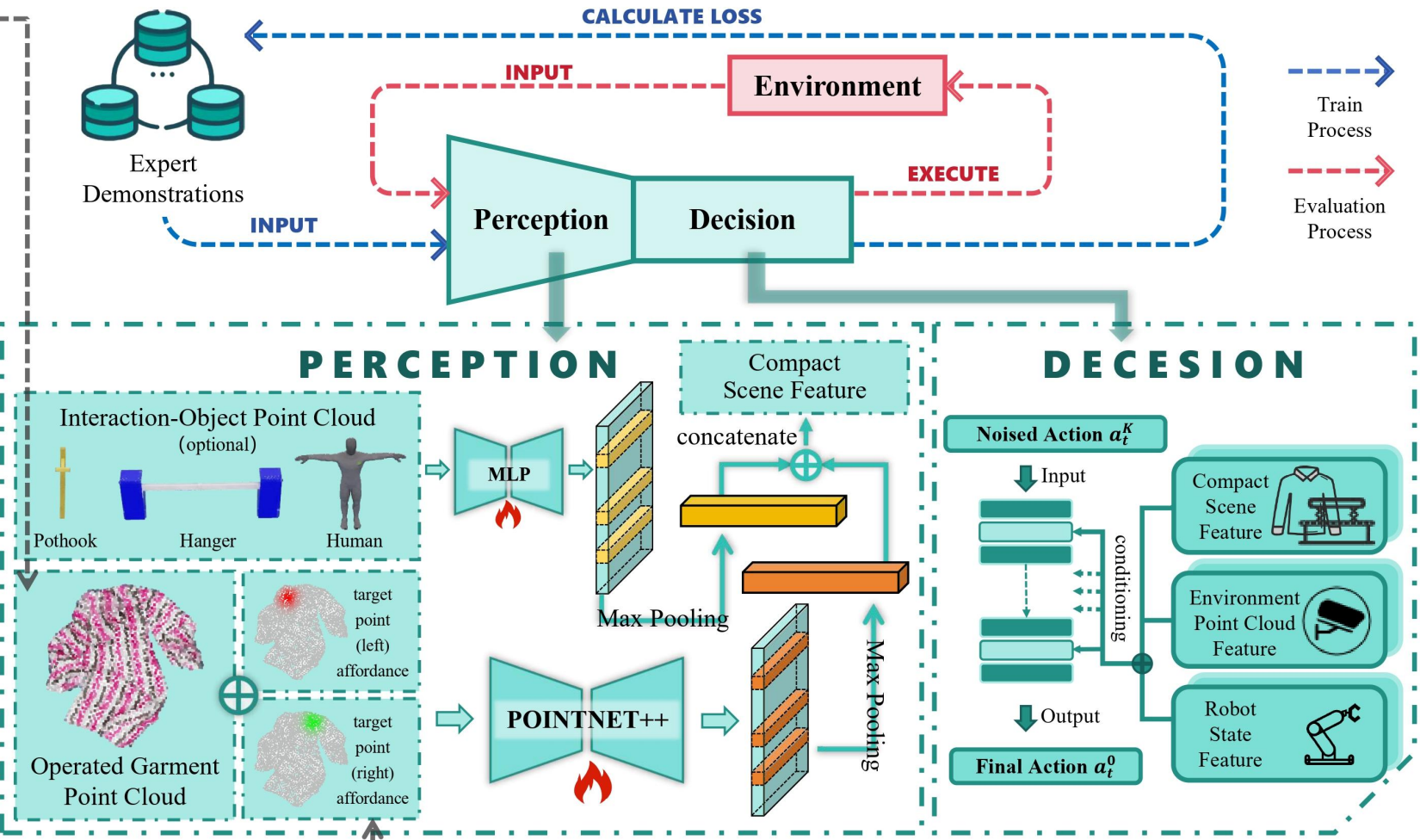


# Hierarchical gArment-manipuLation pOlicy (HALO)

## STAGE I Generalizable Affordance Points

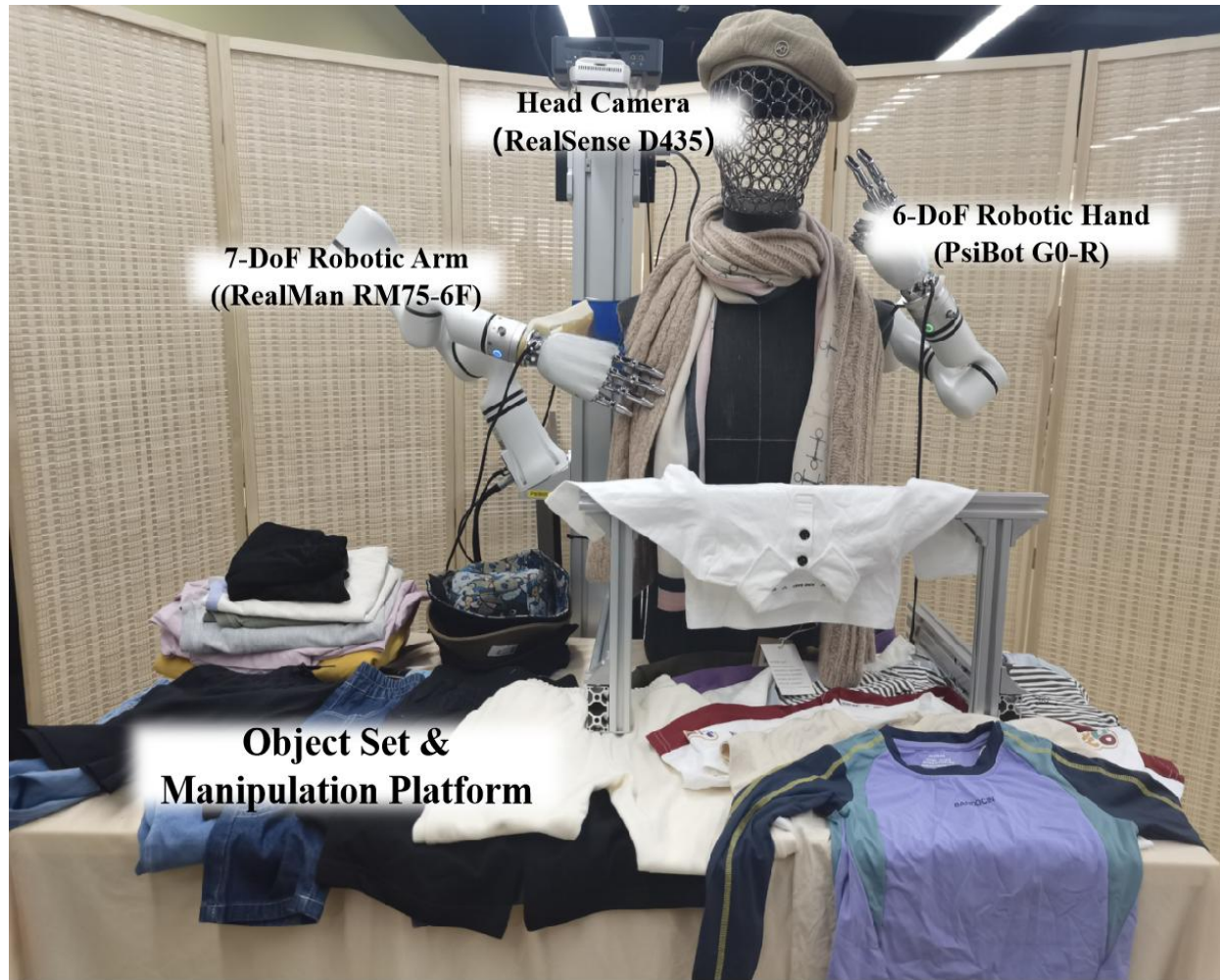


## STAGE II Generalizable Trajectories → Structure-Aware Diffusion Policy





# RealWorld Experiment



## Real-World Env Setting



Test Samples  
(Fold Tops Task)



Test Samples  
(Hang Tops Task)



Test Samples  
(Wear Scarf Task)



Test Samples  
(Wear Hat Task)

The test samples have different shapes, length, deformations while position of garments and interaction objects are variable.



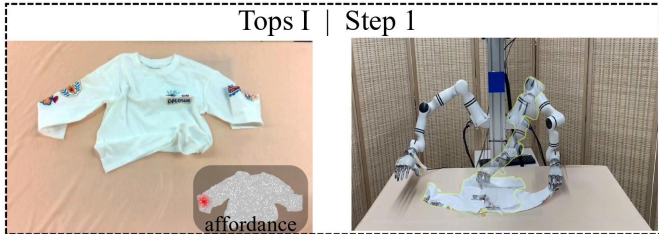
# RealWorld Experiment

Fold Tops

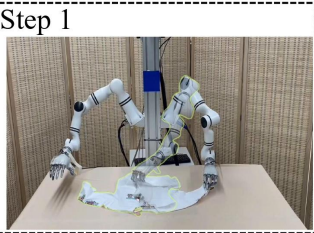
Test Sample



Initial State



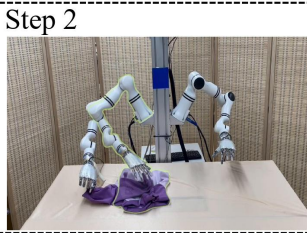
Execution



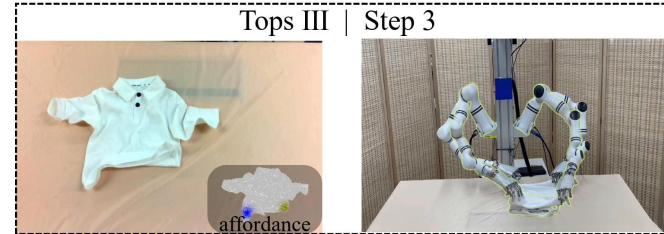
Initial State



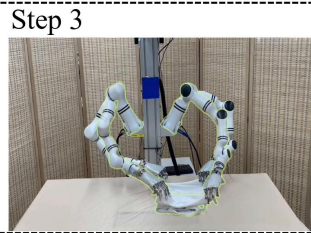
Execution



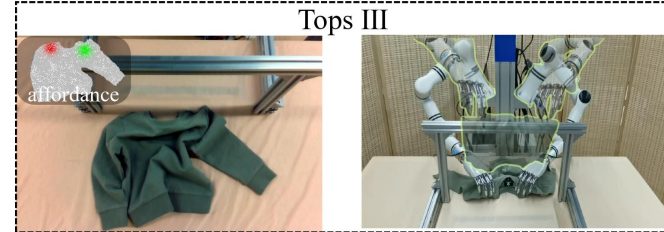
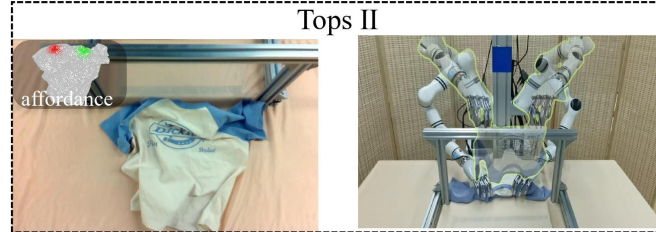
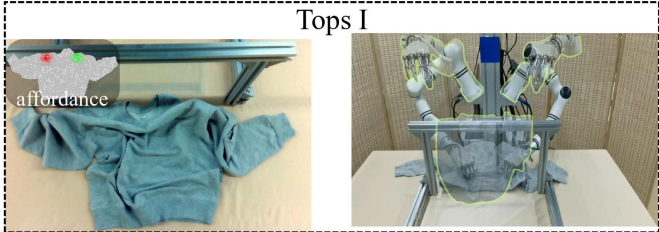
Initial State



Execution



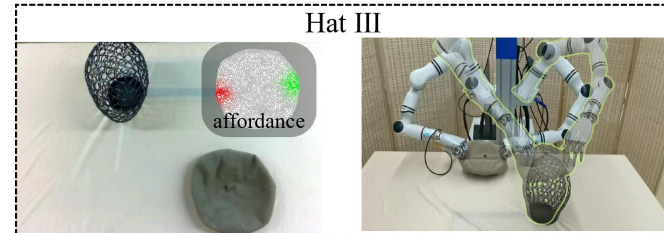
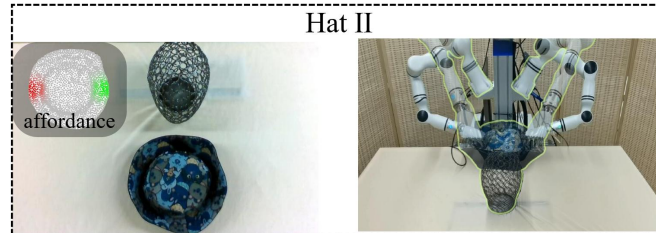
Hang Tops



Wear Scarf



Wear Hat

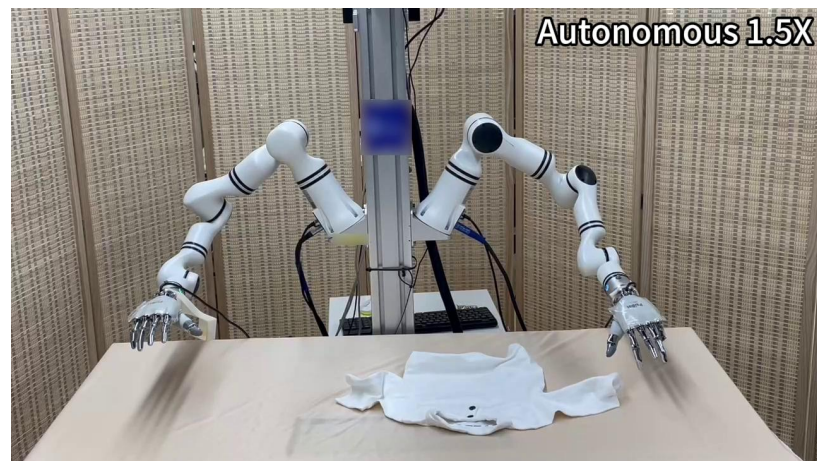
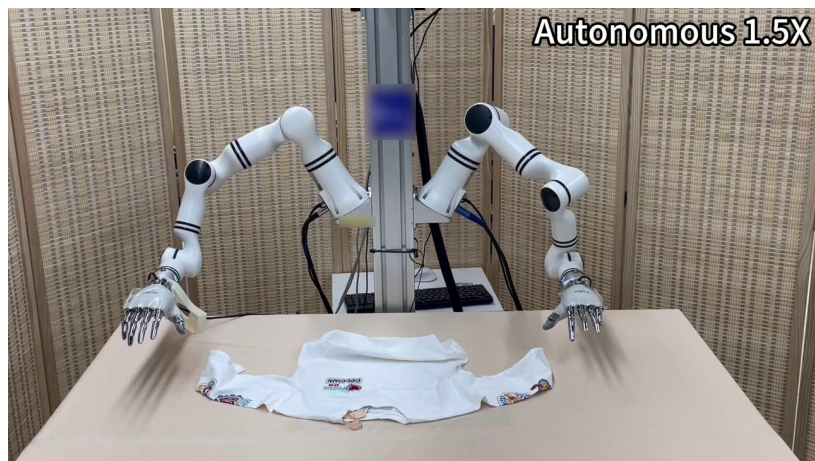


## Real-World Experiment Sequence

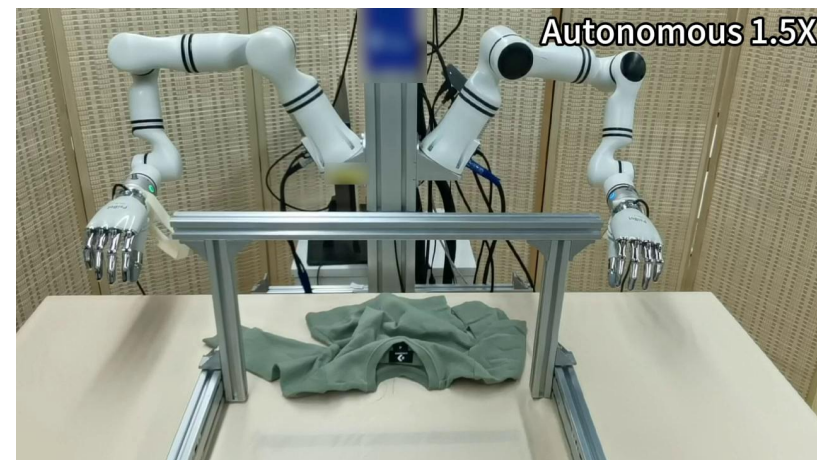
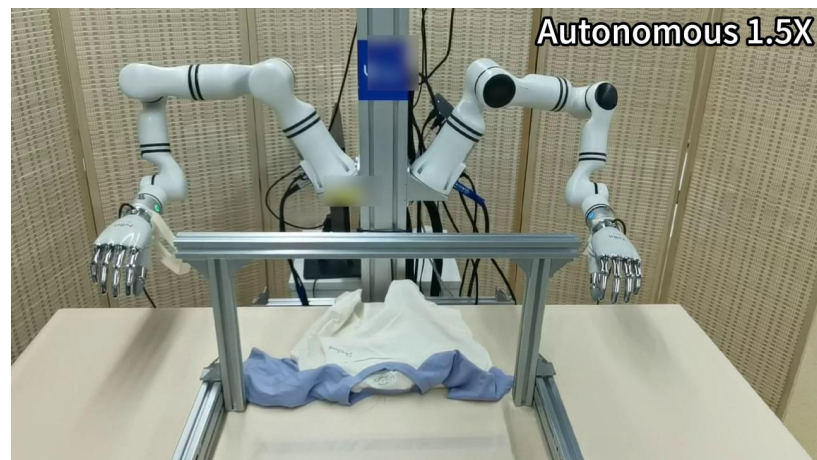
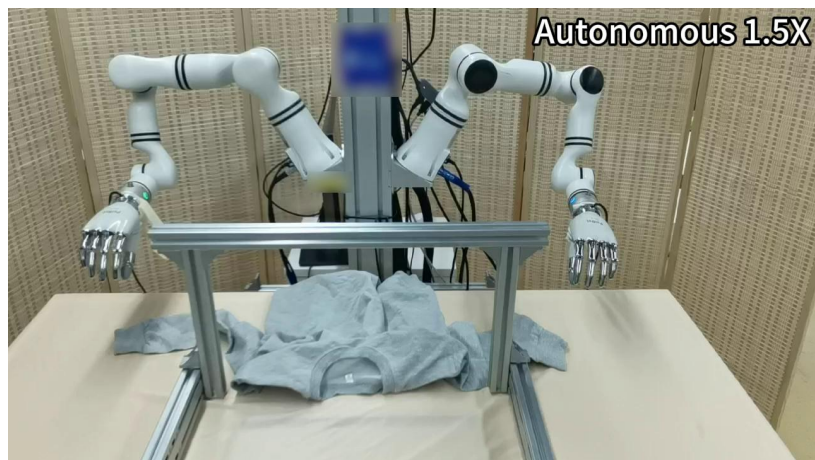


# RealWorld Experiment

## Fold Tops Real-World Videos



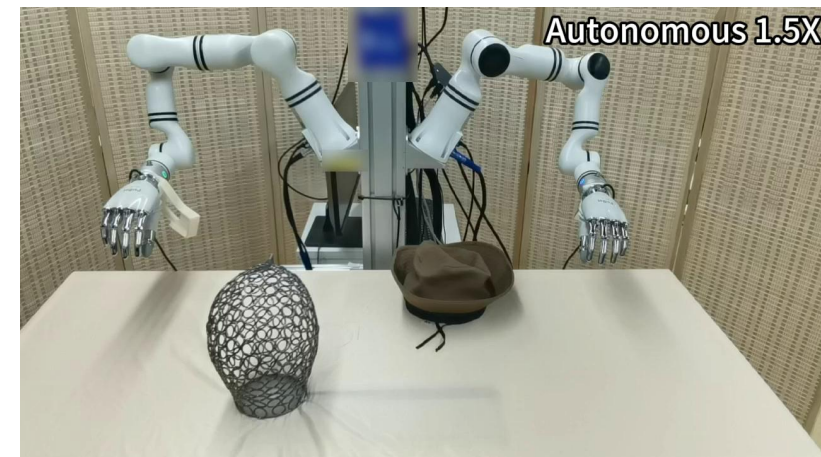
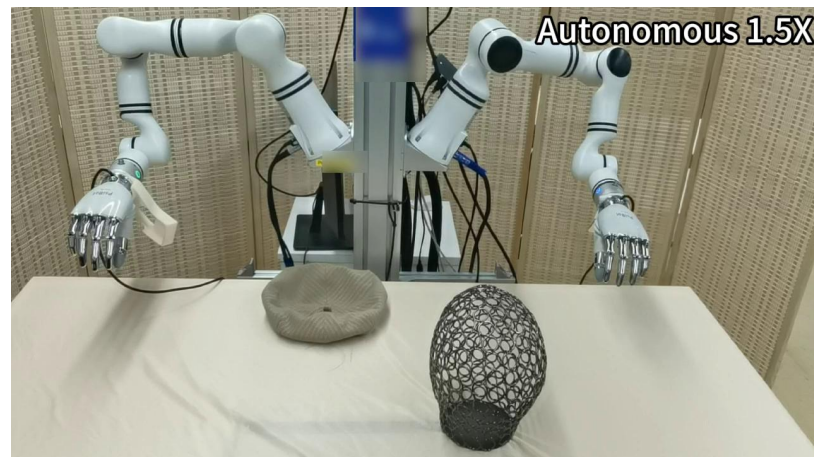
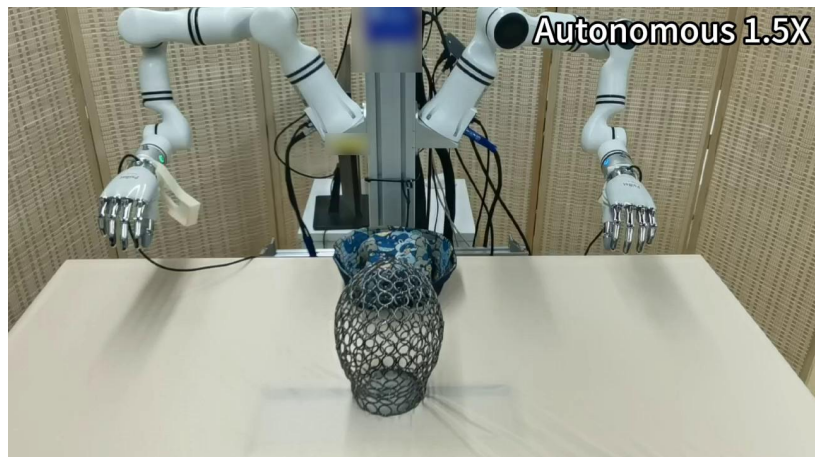
## Hang Tops Real-World Videos



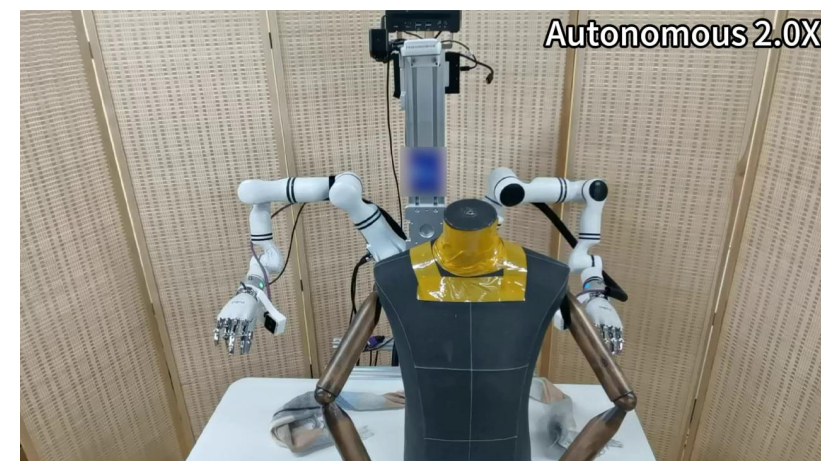
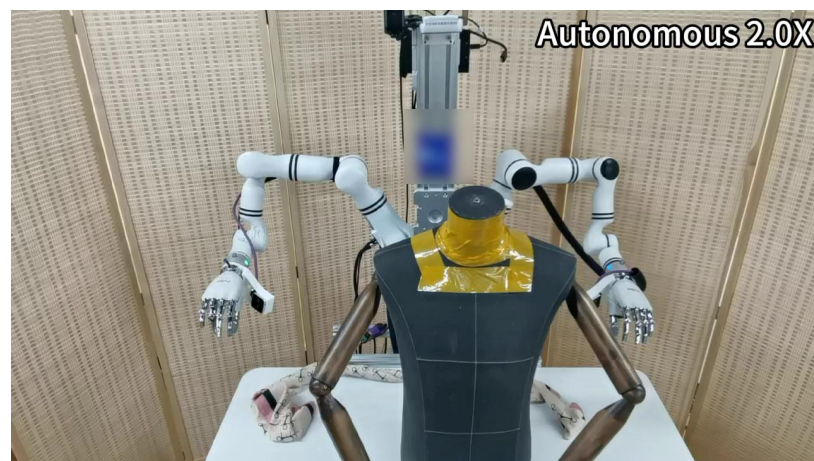


# RealWorld Experiment

## Wear Bowl Hat Real-World Videos



## Wear Scarf Real-World Videos





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## Dexterous Garment Manipulation Environment with Generalizable Policy



**Fling Tops**



**Store Tops**



**Fling Trousers**



**Fold Trousers**



**Hang Trousers**



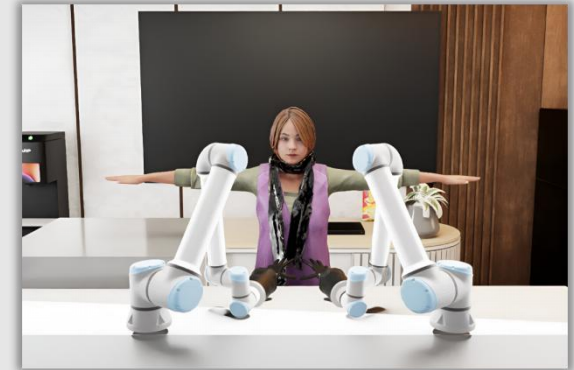
**Fold Dress**



**Wear Bowl Hat**



**Wear Glove**



**Wear Scarf**



**Fold Tops**



**Fling Dress**



**Hang Tops**



**Wear Baseball Cap**



**Hang Coat**



**Hang Dress**