

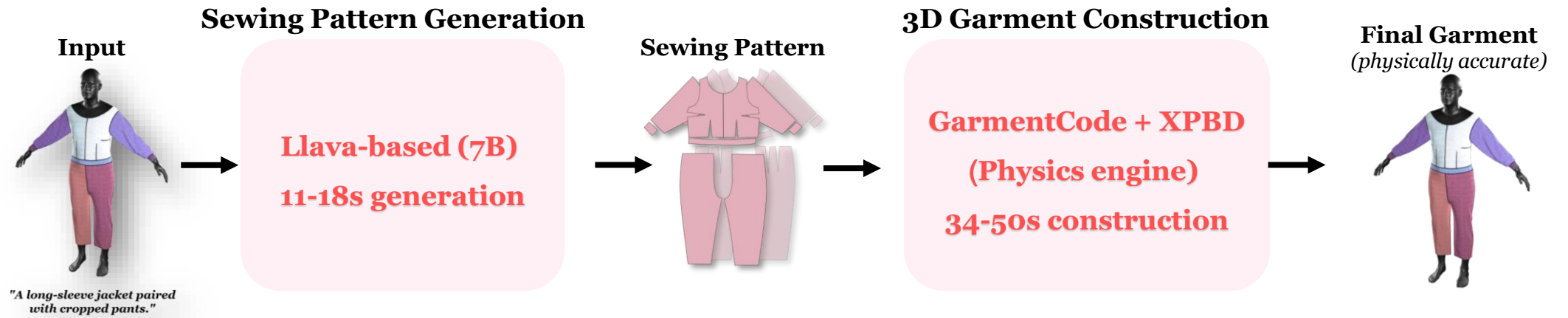
# SwiftTailor: Efficient 3D Garment Generation with Geometry Image Representation

Phuc Pham\*, Uy Dieu Tran\*, Binh-Son Hua, Phong Nguyen  
Qualcomm AI Research

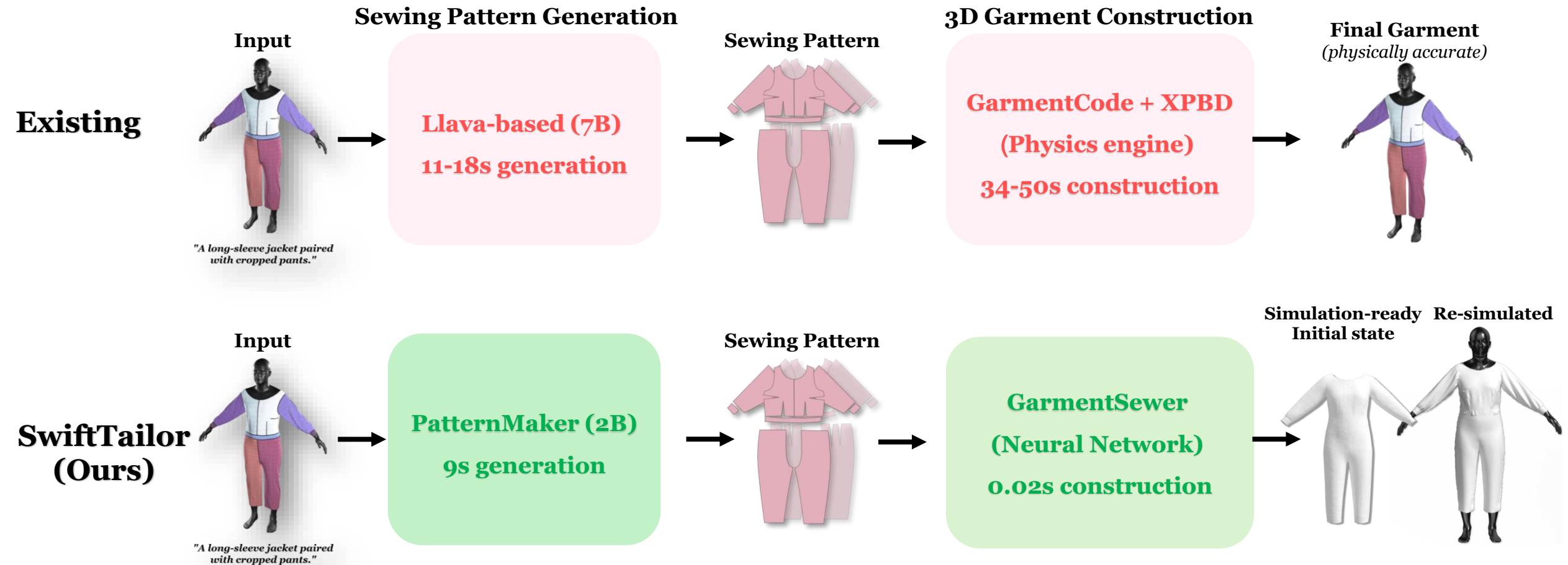


# Motivations

Existing



# Motivations



# Contributions - Overview

## Multimodal Input



"A long-sleeve jacket paired with cropped pants."

## SwiftTailor Pipeline

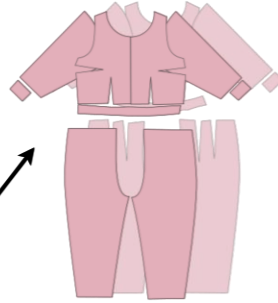
PatternMaker



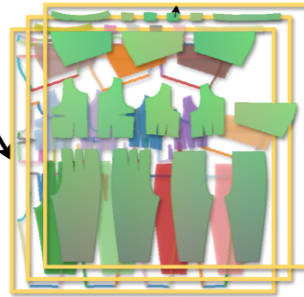
GarmentSewer



## Sewing Pattern

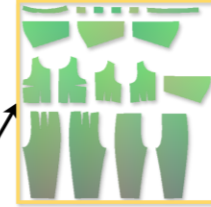


## Garment Geometry Image (GGI)



## Garment Geometry Image

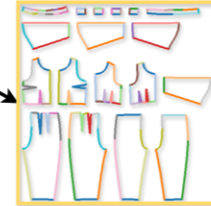
### Geometry Image



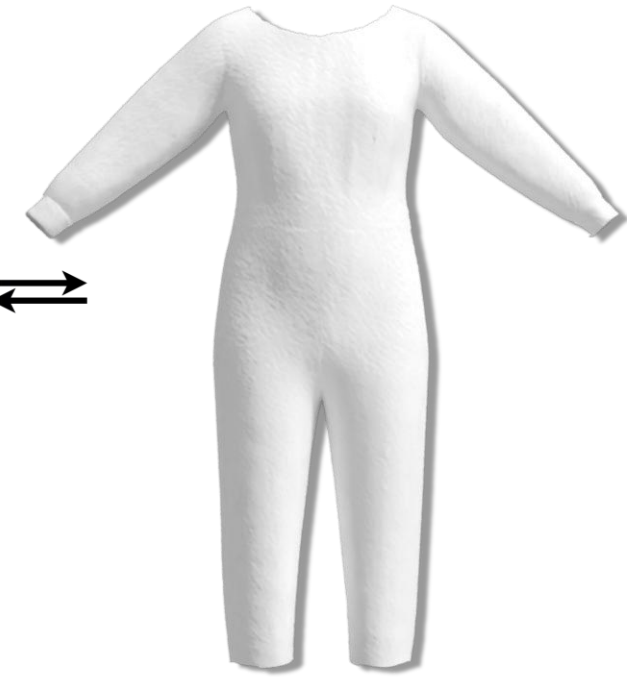
### Semantic Image



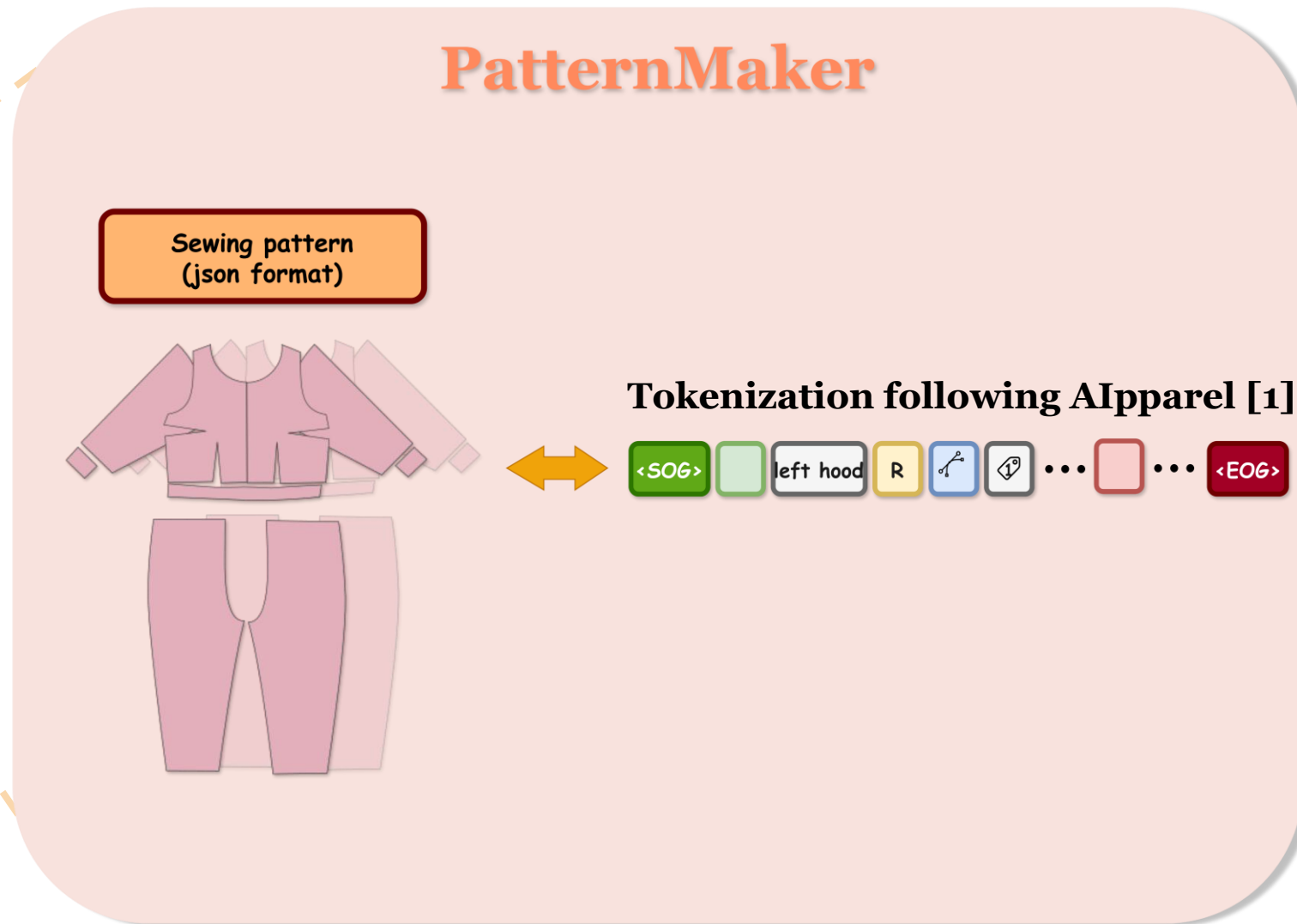
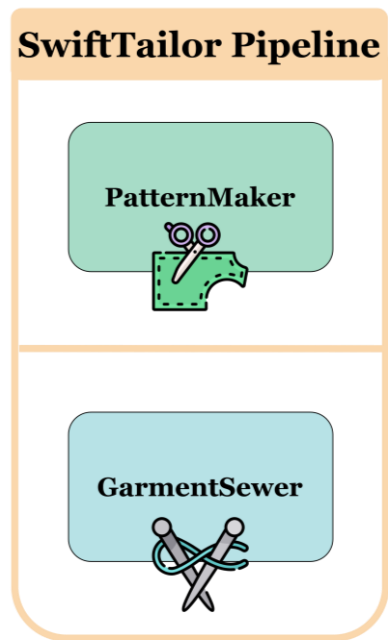
### Stitching Image



## Reconstructed Garment Mesh

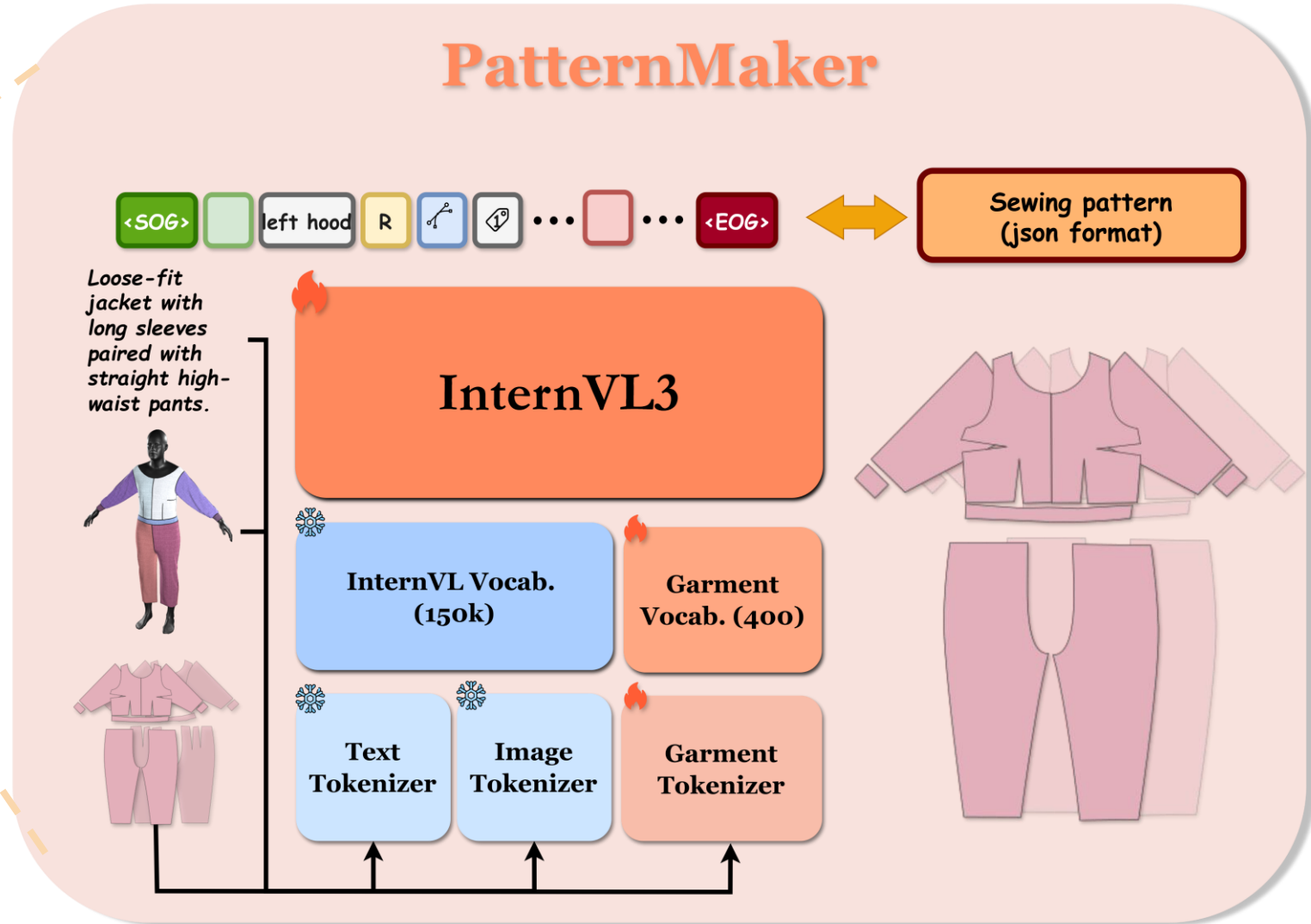


# Contributions – SwiftTailor Pipeline

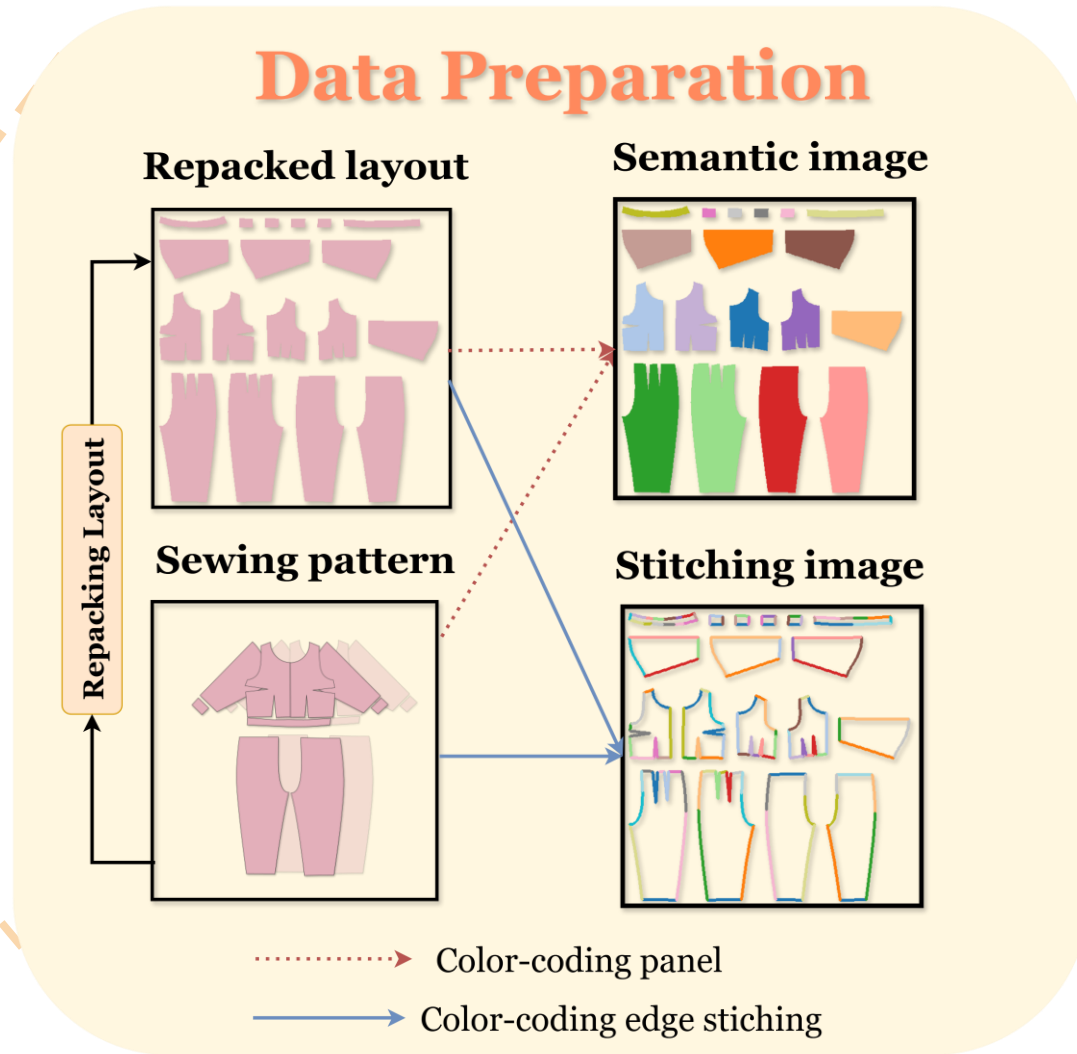
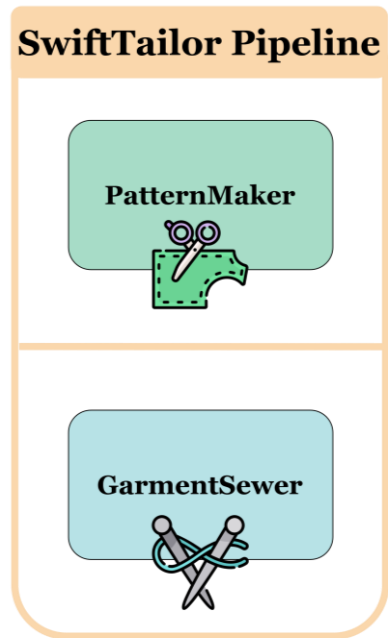


# Contributions – SwiftTailor Pipeline

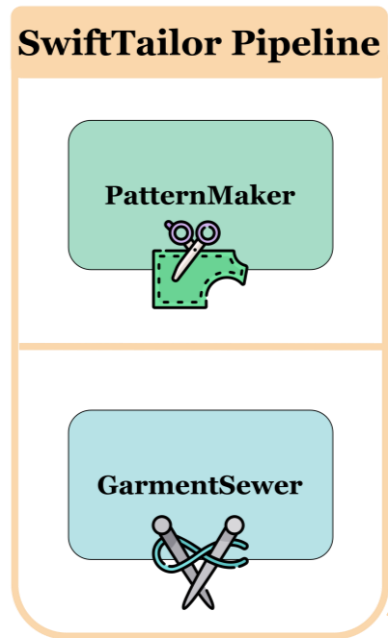
## SwiftTailor Pipeline



# Contributions – SwiftTailor Pipeline



# Contributions – SwiftTailor Pipeline



**Semantic image**



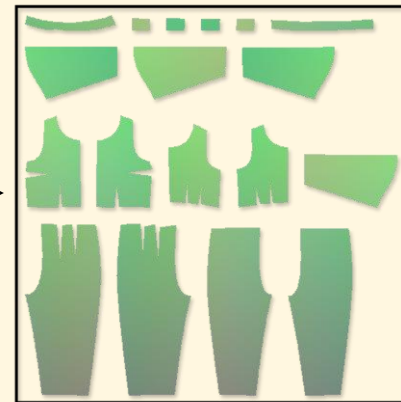
**Stitching image**



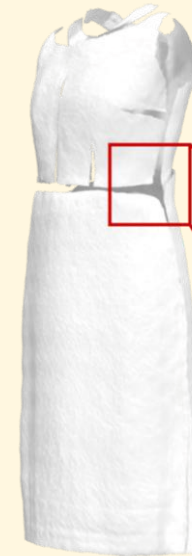
**GarmentSewer**



**Geometry Image**



Only using Semantic & Geometry as paired data training



Training & Inference Input Trainable

# Contributions – SwiftTailor Pipeline

## SwiftTailor Pipeline

PatternMaker



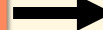
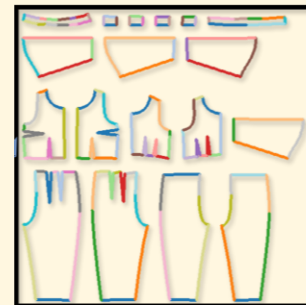
GarmentSewer



Semantic image

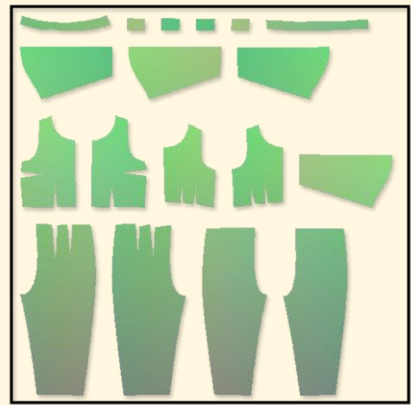


Stitching image



## GarmentSewer

Geometry Image

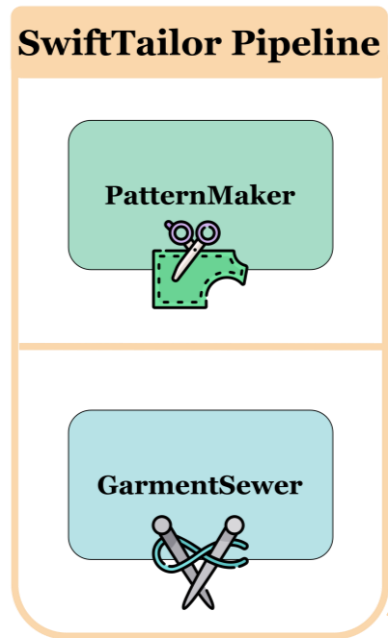


Providing stitching on boundary as learning signal with custom loss for boundary-sensitivity



- Training & Inference Input
- Training Input only
- Trainable
- Only Algorithmic

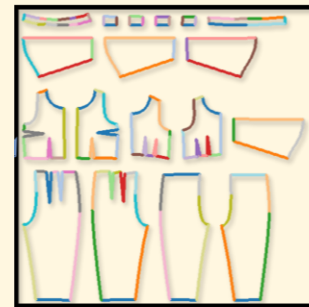
# Contributions – SwiftTailor Pipeline



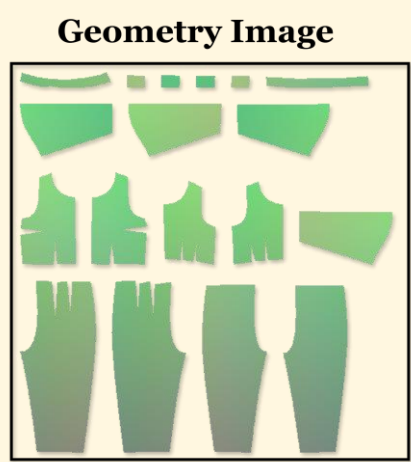
**Semantic image**



**Stitching image**



## GarmentSewer



- Training & Inference Input
- Training Input only
- Trainable
- Only Algorithmic

# Contributions – SwiftTailor Pipeline

## SwiftTailor Pipeline

PatternMaker



GarmentSewer



GGI-to-Mesh

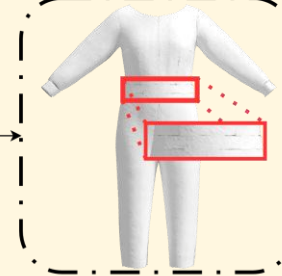


Lifted pointcloud

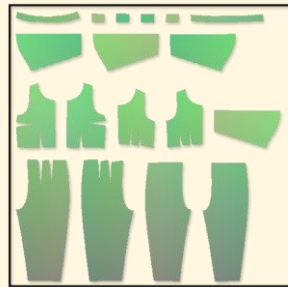


Remeshing

Pre-stitching mesh



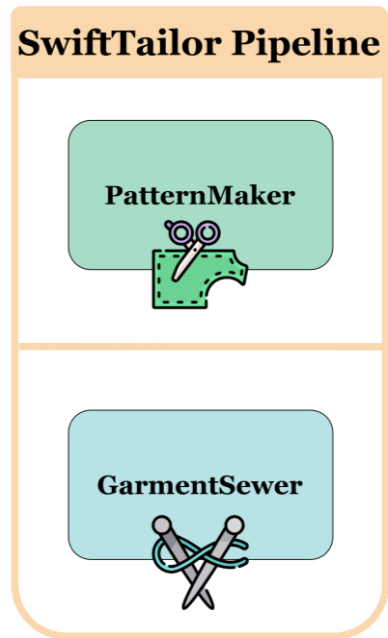
3D  
Pointcloud Lifting



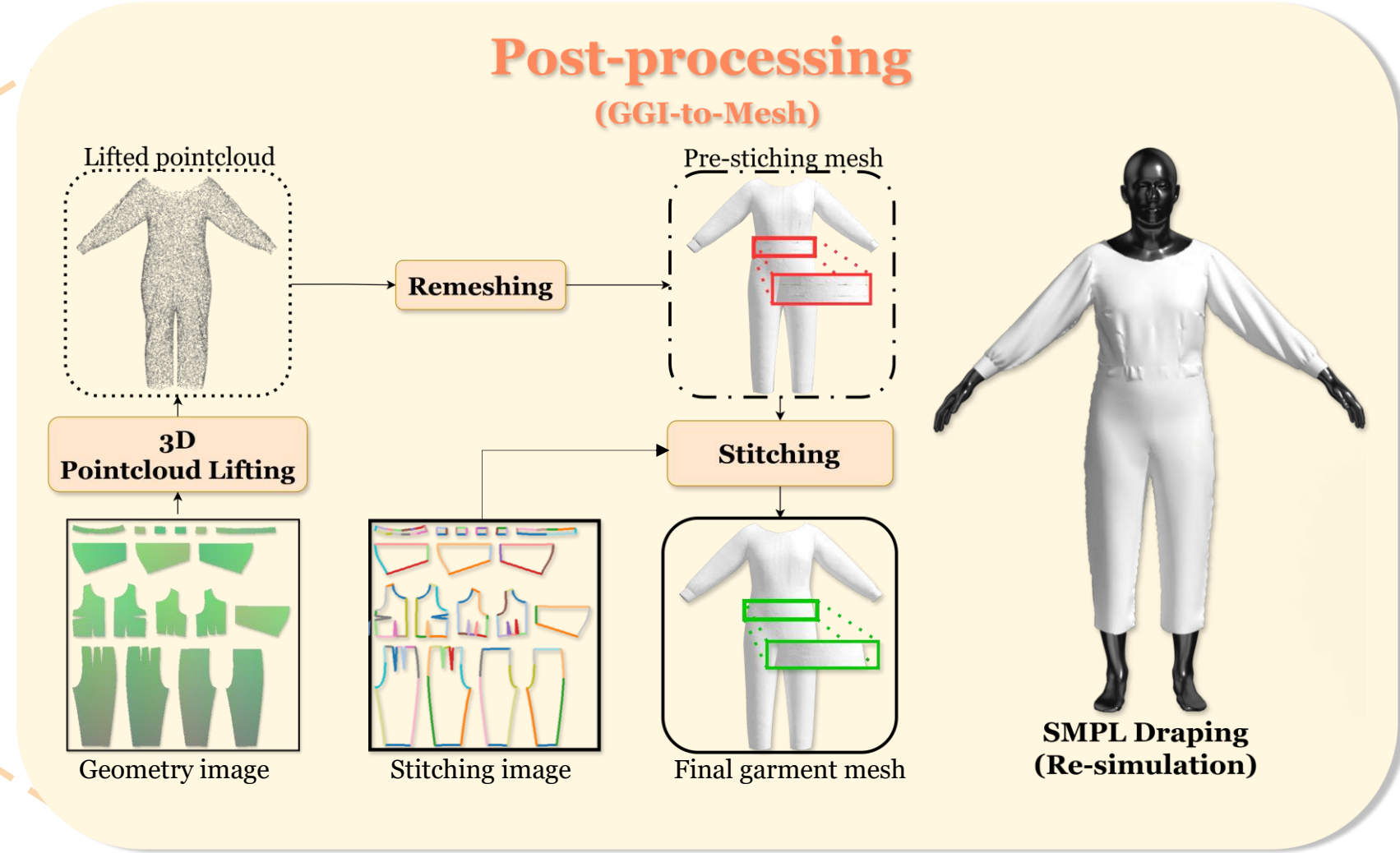
Geometry image

## Post-processing (GGI-to-Mesh)

# Contributions – SwiftTailor Pipeline



**GGI-to-Mesh**



# Quantitative Results

Table 1. Quantitative results on sewing-pattern generation (left) and editing (right). Best results are shown in **bold**.

Method	Vertex L2 (↓)	#Panel Acc (↑)	#Edge Acc (↑)	Rot L2 (↓)	Transl L2 (↓)	Stitch Acc (↑)
AIpparel [32]	4.8 / 2.5	93.7 / 82.9	79.0 / 88.2	0.007 / 0.002	2.5 / 1.7	73.0 / 86.3
ChatGarment [1]	14.9 / 13.5	16.4 / 19.6	49.7 / 60.3	0.038 / 0.036	15.4 / 10.1	38.2 / 55.2
SewingLDM [27]	15.6	18.0	49.0	0.052	16.6	30.6
<b>PatternMaker (Ours)</b>	<b>3.5 / 1.5</b>	<b>94.8 / 85.0</b>	<b>92.3 / 98.0</b>	<b>0.006 / 0.002</b>	<b>1.9 / 1.3</b>	<b>85.1 / 97.8</b>

Table 2. Quantitative results on mesh generation using multi-modal inputs (image and text). Best results are shown in **bold**.

Method	MMD↓	COV↑	#Sampling↓
AIpparel [32] + GC [17]	6.94	0.52	4.27
ChatGarment [1] + GC [17]	12.27	0.22	<b>1.20</b>
SewingLDM [27] + GC [17]	11.33	0.34	5.87
<b>PatternMaker + GC [17]</b>	6.82	0.54	2.98
<b>SwiftTailor (Ours)</b>	<b>5.31</b>	<b>0.68</b>	2.98

Table 3. Running time comparison to obtain the final mesh (in seconds) between other baselines and our SwiftTailor. Stage 1 is generating patterns, while Stage 2 is constructing mesh from them.

Method	Stage 1	Stage 2	Post-proc.	Total
AIpparel [32] + GC [17]	10.20	49.55	3.99	63.74
ChatGarment [1] + GC [17]	18.85	33.92	5.76	58.53
SewingLDM [27] + GC [17]	<b>5.44</b>	46.87	<b>2.16</b>	54.47
<b>PatternMaker + GC [17]</b>	9.93	37.45	2.18	49.56
<b>SwiftTailor (Ours)</b>	9.93	<b>0.02</b>	4.83	<b>14.78</b>

# Qualitative Results – Generation

Input



AApparel



Chatgarment



SewingLDM



Ours



The maxi dress features a turtleneck and short sleeves



The dress features an asymmetric design with a defined waist and back-slit skirt.



# Qualitative Results – GarmentCode vs GarmentSewer

Predicted Sewing Pattern



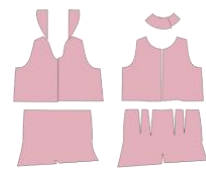
GarmentCode



GarmentSewer



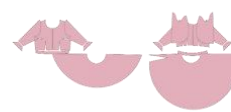
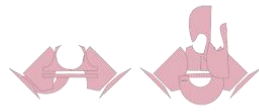
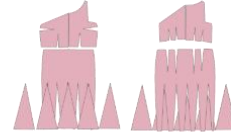
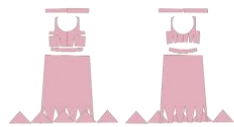
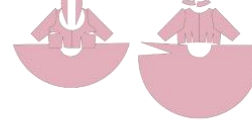
Predicted Sewing Pattern



GarmentCode



GarmentSewer



# Conclusions

- We proposed **SwiftTailor**, a **two-stage pipeline** for 3D simulation-ready Garment Generation:
  - + **PatternMaker**, a lightweight multimodal VLM generating sewing pattern.
  - + **GarmentSewer**, a DPT-based model, leveraging **Garment Geometry Image representation** to directly and efficiently construct a simulation-ready 3D garment.
    - Improve both construction quality and computational efficiency.
- For future work, we plan to:
  - + Explore **efficient pattern-generation** strategies for near real-time inference.
  - + Investigate **texture generation** for garment.
  - + **Reconstruct wrinkles** without relying on physical simulation.

# Thank you

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