

Reconstruction of Manipulated Garment with Guided Deformation Prior

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liren2515.github.io/page/folding/folding.html



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Problem Statement

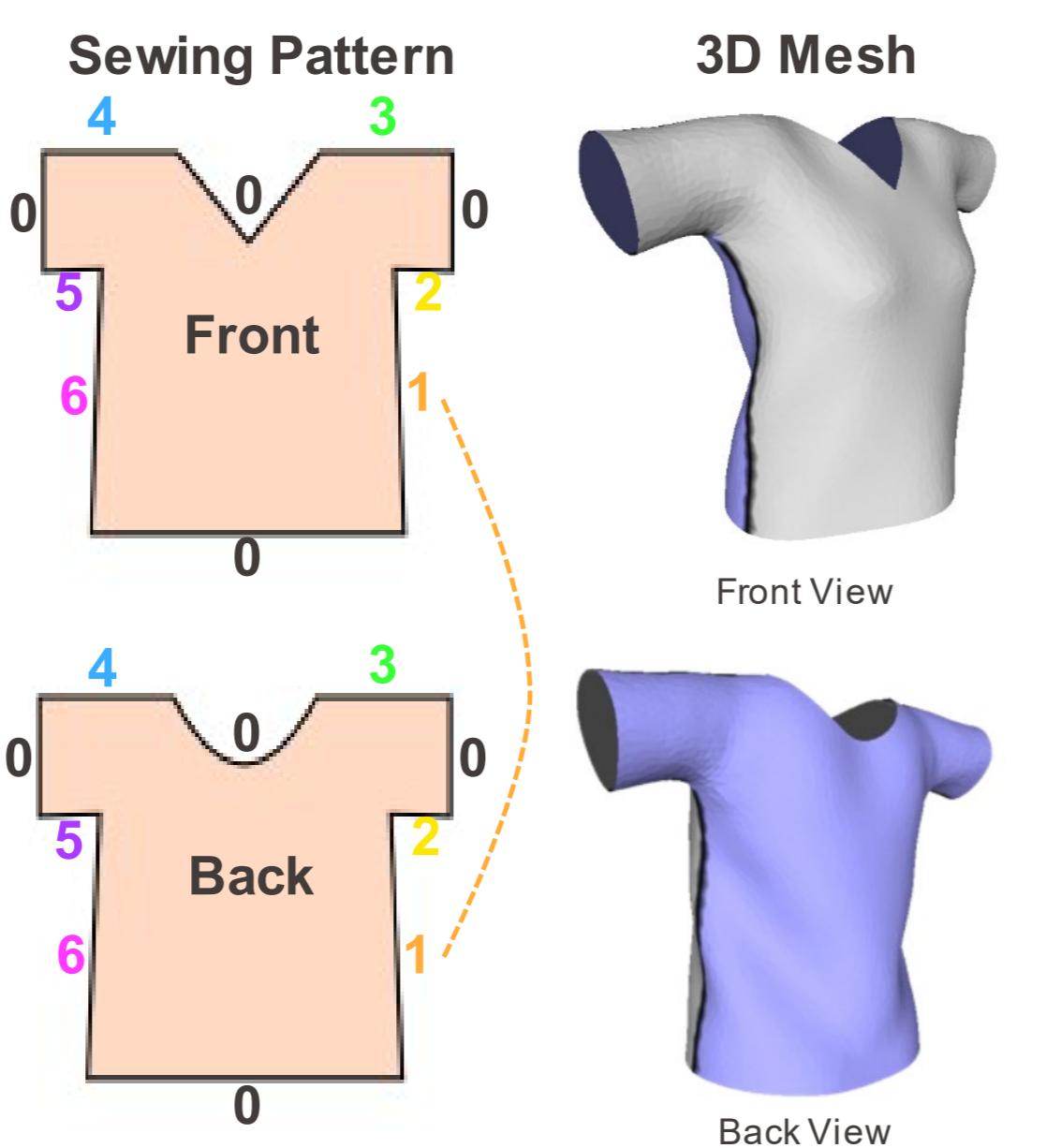
- Previous works in 3D garment reconstruction focus on the simple case where the garment is worn by a human, but garments being manipulated can have **a much wider range of shapes**
- From a **partial point cloud observation of a garment being folded or handled**, can we recover a **complete 3D mesh**?



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Pattern Representation

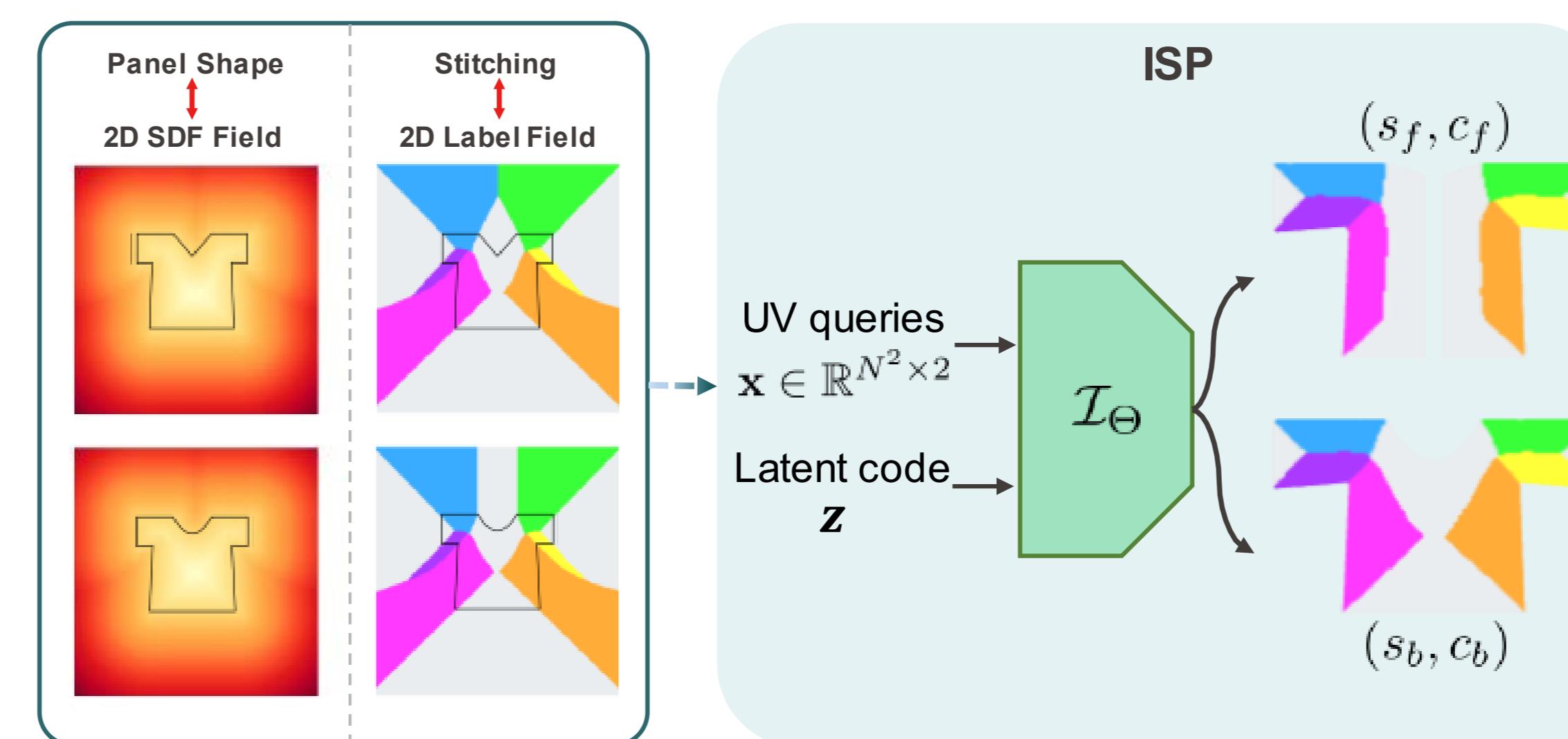
- Real garments are fabricated from 2D patterns
- Similarly, we use a compact 2D representation in our method



Garment Representation

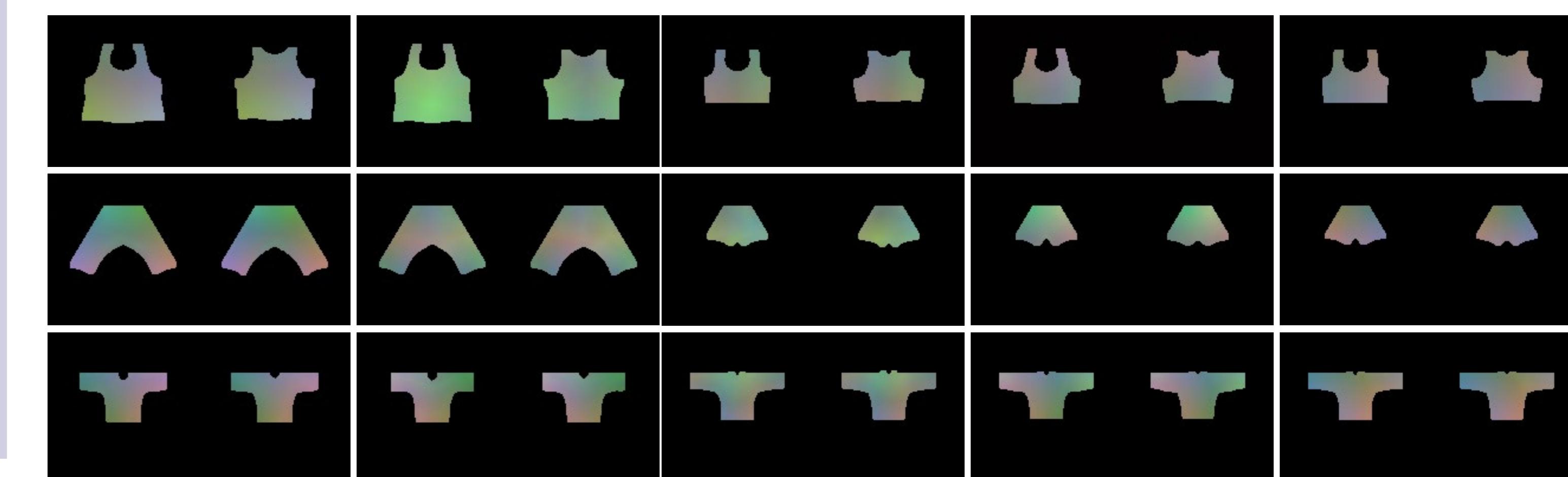
2D Pattern Shape Prior

- We use ISP [1] to learn a prior on the distribution of 2D sewing patterns of a given garment category
- From a latent code \mathbf{z} , ISP predicts patterns as an **SDF** and a **stitching label field**



3D Position Maps Prior

- We extend ISP by adding a **diffusion-based deformation prior** representing the 2D to 3D mapping for each pixel in the patterns
- It generates **UV position maps** to model the 3D shape of garments
- This provides ISP with the additional flexibility necessary to model manipulated garments

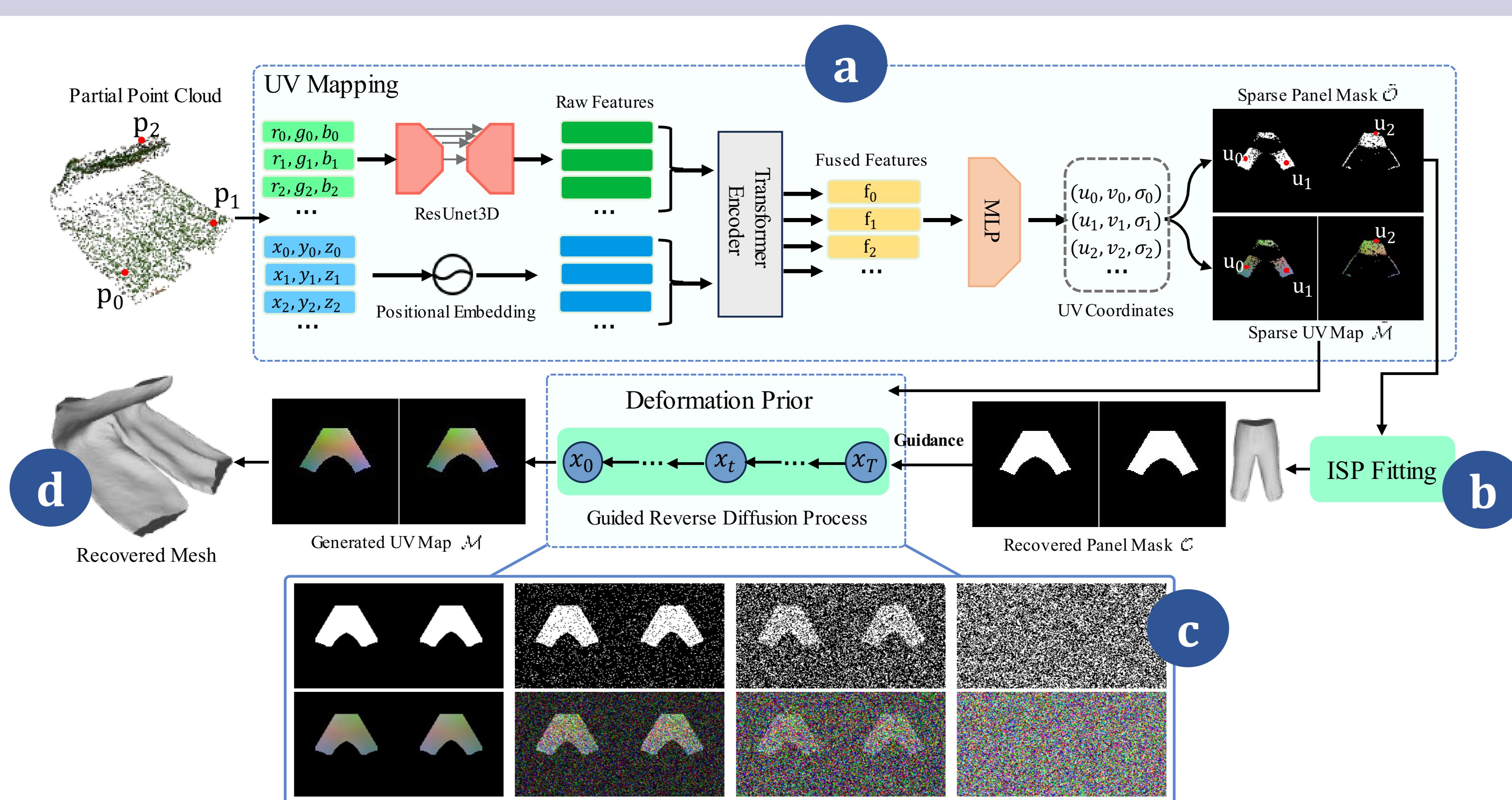


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Garment Reconstruction

Given a partial point cloud as input, we:

- Map every visible point to UV space**
 - This produces sparse UV maps and panel masks
 - Self-attention captures correlation between points
- Recover complete panel mask by fitting ISP**
 - Find the latent code \mathbf{z} that best explains the partial UV
 - The resulting patterns are still missing 3D positions
- Recover complete UV \rightarrow 3D maps**
 - We use our guided diffusion prior to infer the 3D positions of unseen points
 - It is conditioned on panel masks to produce garment specific mappings
- Recover a complete garment mesh**
 - We mesh the 2D grid uniformly and transfer it to 3D
 - Stitch the different panels together in 3D



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Results

