

Reconstruction of Manipulated Garment with Guided Deformation Prior

Ren Li, Corentin Dumery, Zhantao Deng, Pascal Fua

Computer Vision Lab, EPFL

Lausanne, Switzerland

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



1 Problem Statement

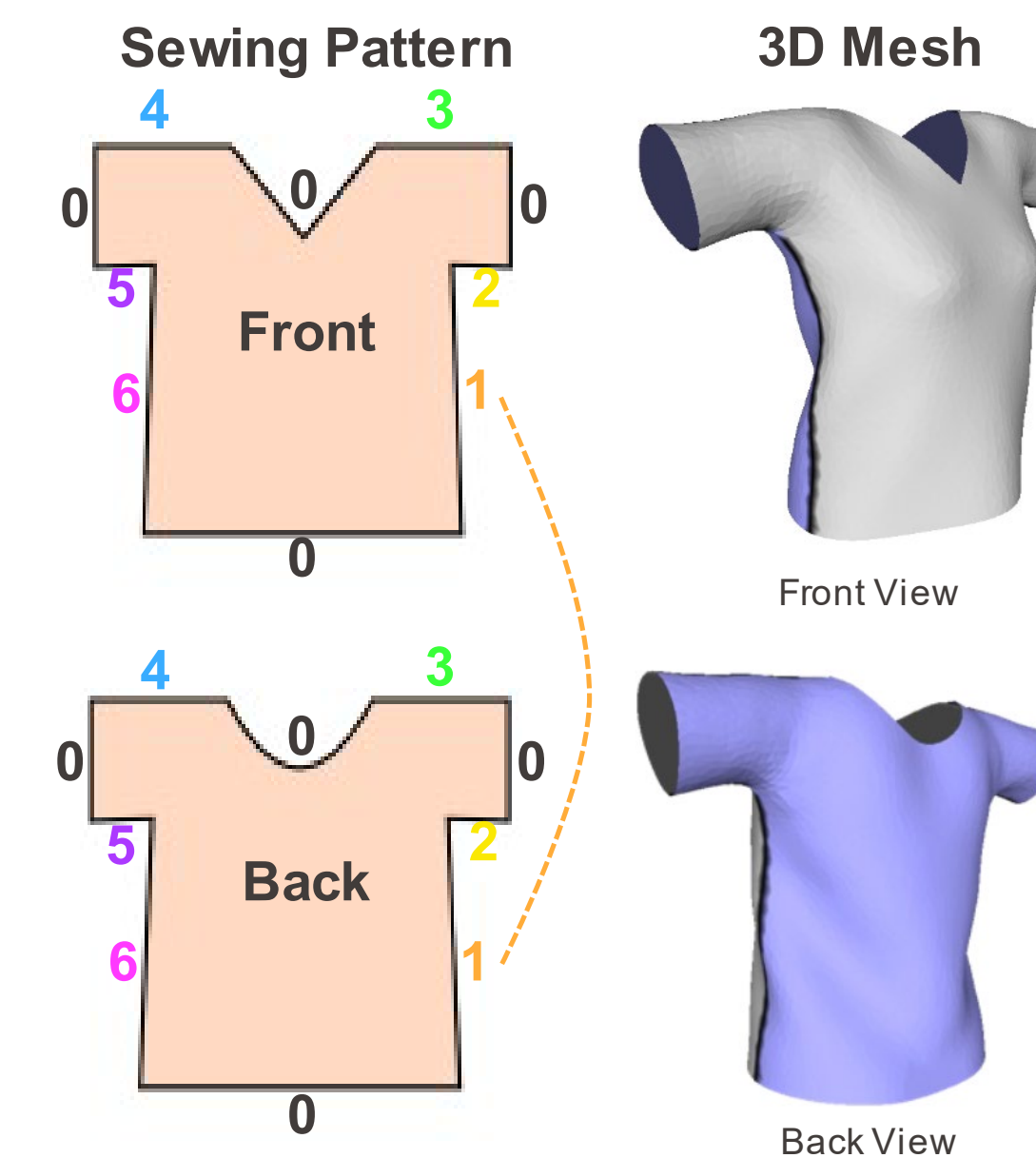
- Previous works in 3D garment reconstruction focus on the simple case where the garment is worn by a human, but garments being manipulated can have a **much wider range of shapes**
- From a **partial** point cloud observation of a **garment being folded or handled**, can we recover a **complete 3D mesh**?



2 Garment Representation

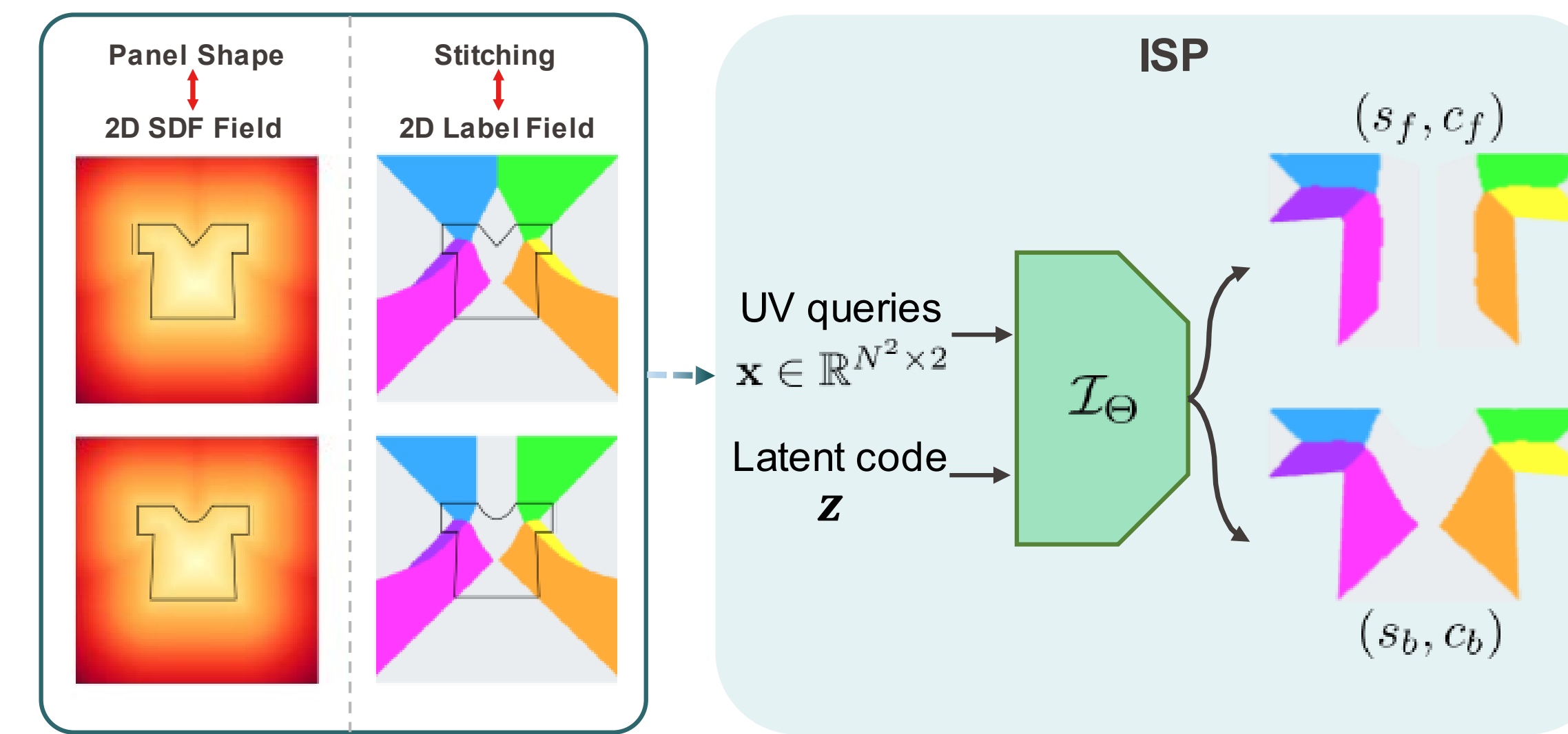
Pattern Representation

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



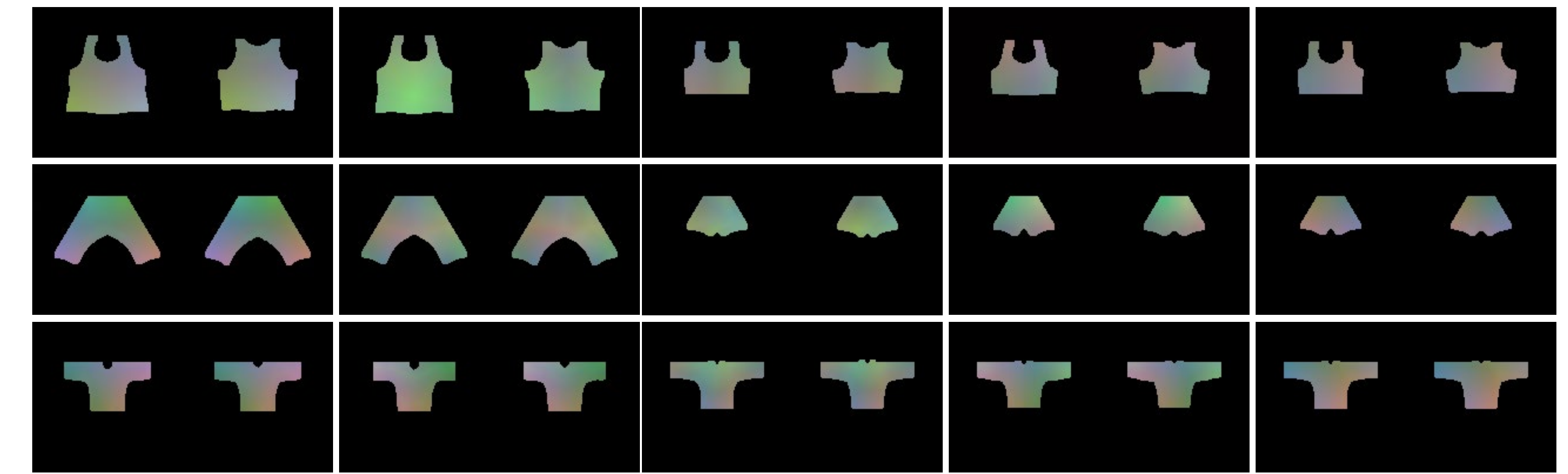
2D Pattern Shape Prior

- 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

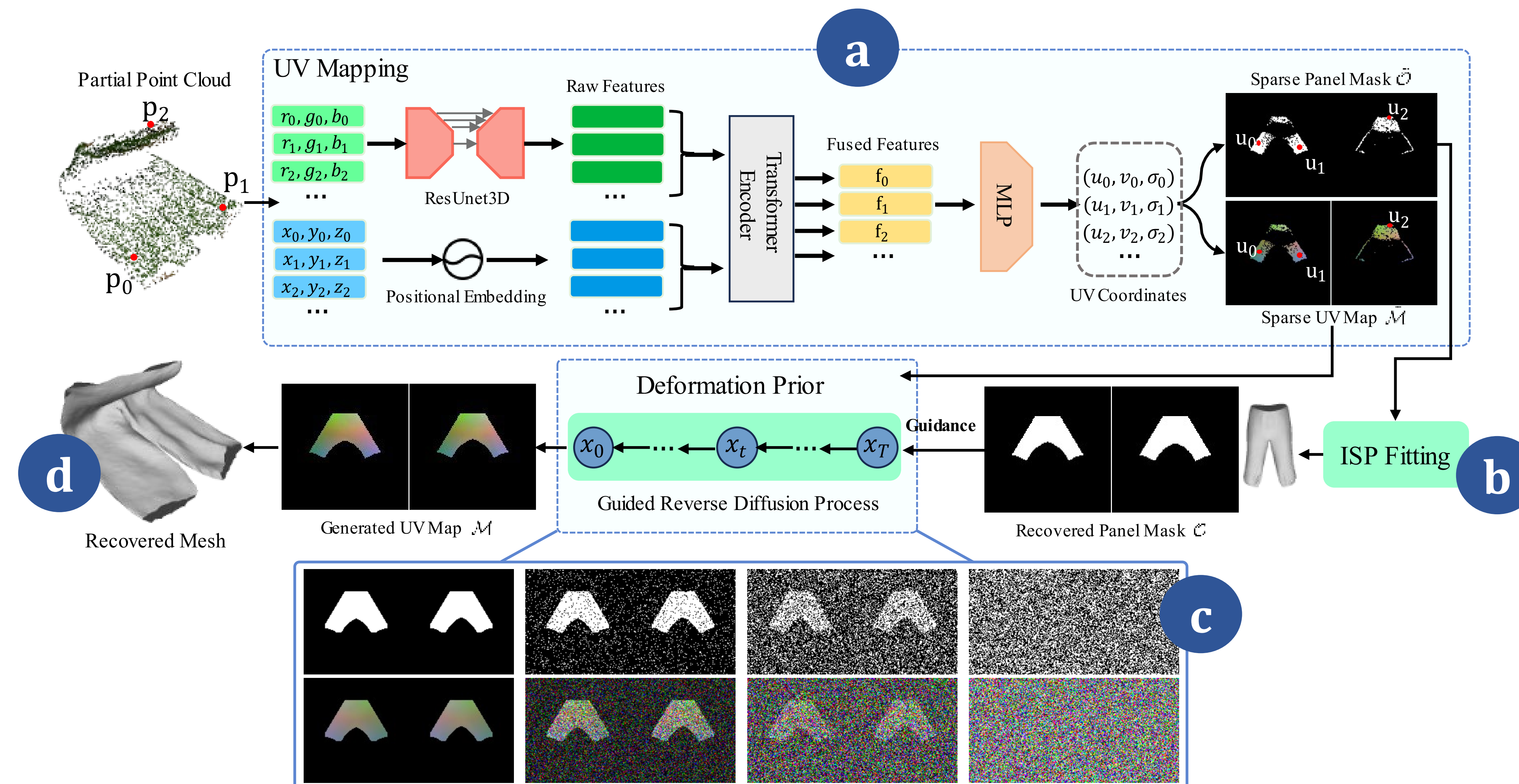


3 Garment Reconstruction

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→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



4 Results

Results

