



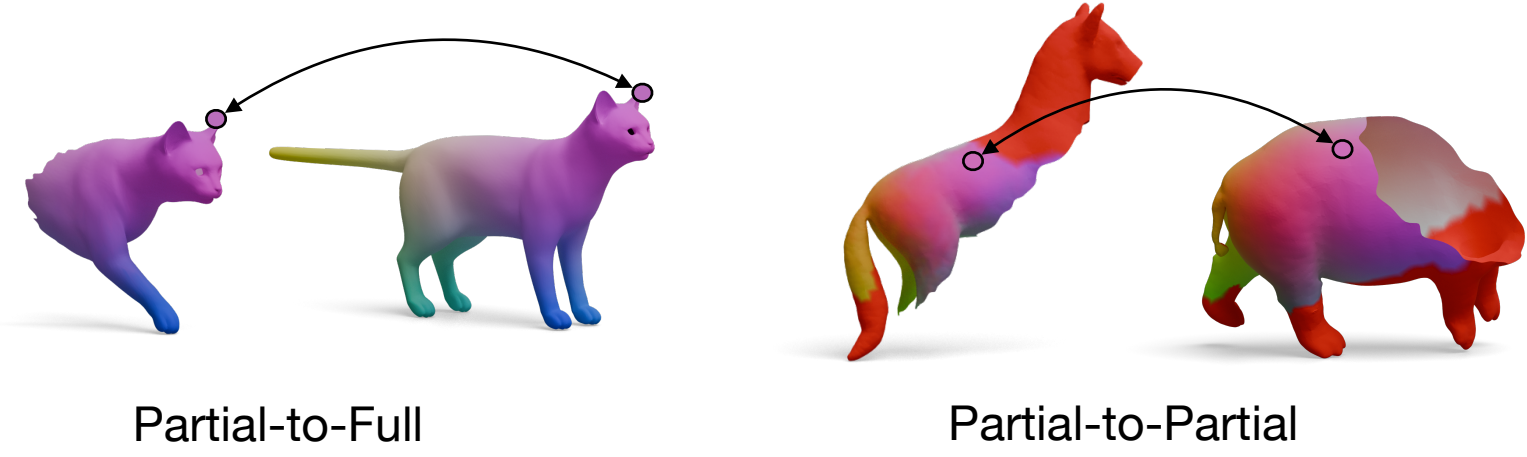
# Teaching DINOv3 About Partial 3D Geometry: A Self-Supervised Geometry-Aware Approach

Viktoria Ehm<sup>1,2</sup> Dongliang Cao<sup>3,4</sup> Riccardo Marin<sup>1,2</sup> Daniel Scholz<sup>1,2</sup> Weikang Wang<sup>3,4</sup> Florian Bernard<sup>3,4</sup> Daniel Cremers<sup>1,2</sup>

<sup>1</sup> Technical University of Munich <sup>2</sup> MCML <sup>3</sup> University of Bonn <sup>4</sup> Lamarr Institute



## Partial Shape Matching

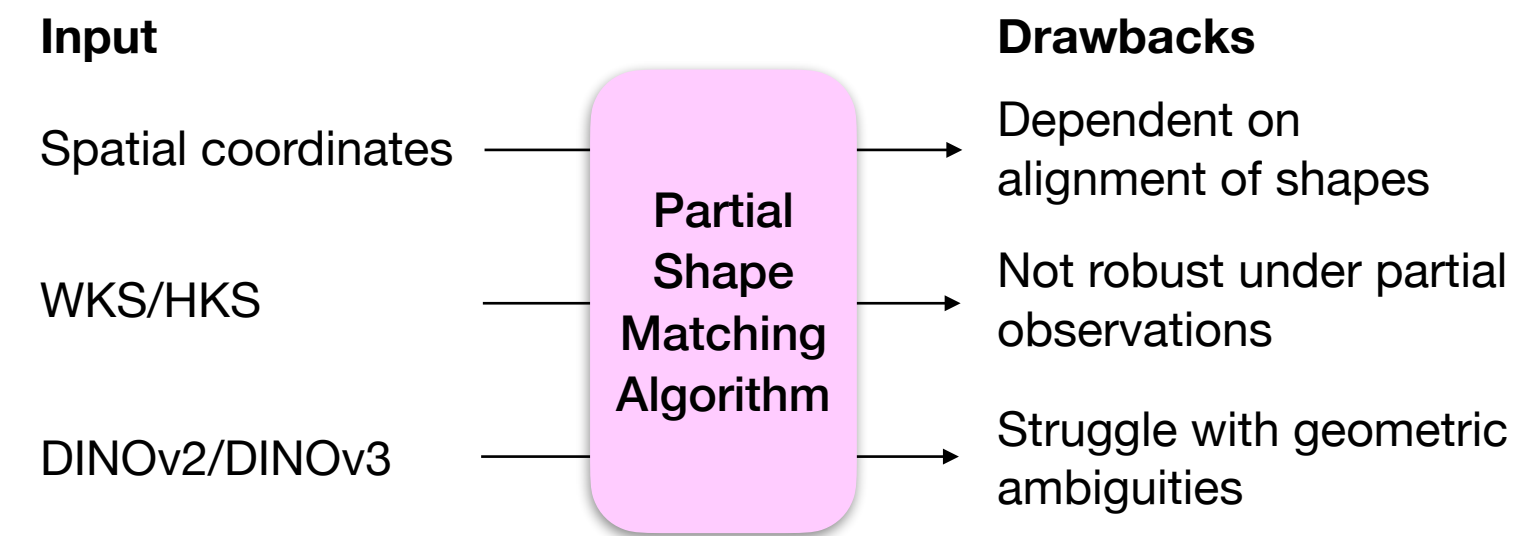


**Goal:** Find correspondences between two (partial) shapes

## Contribution

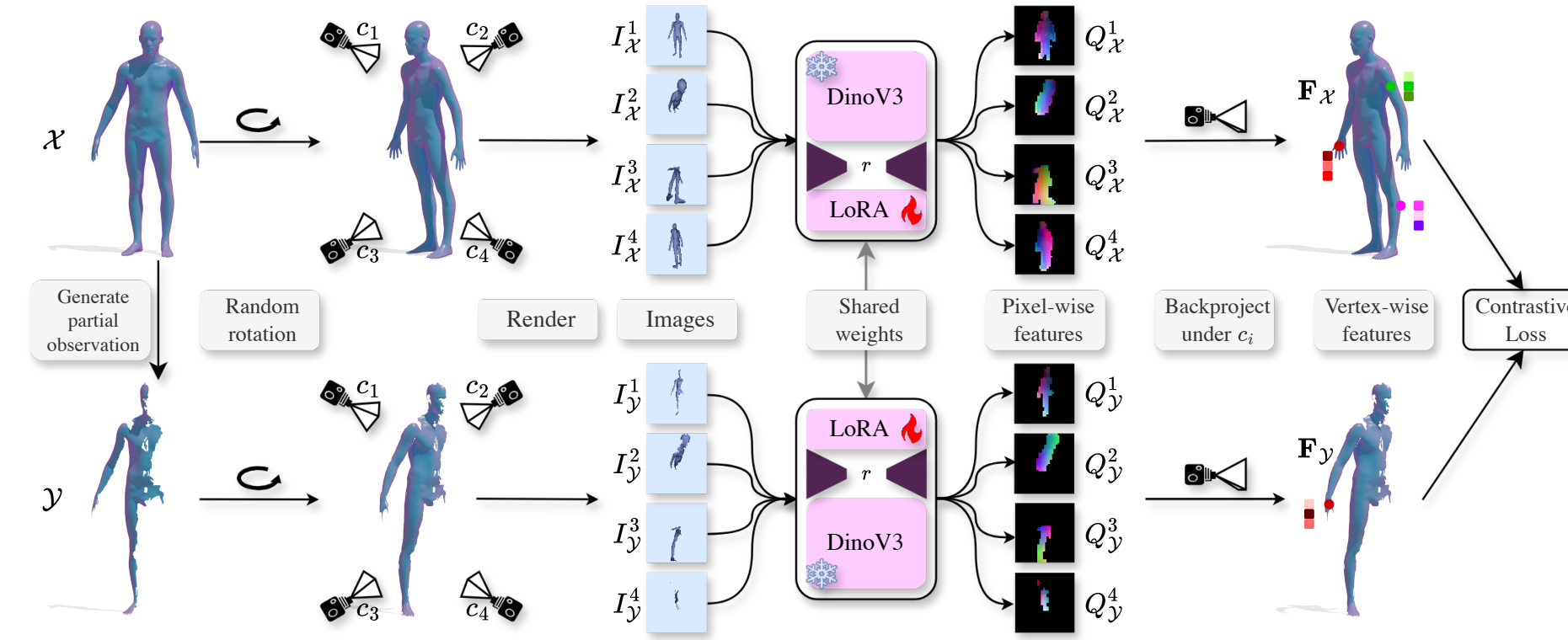
- **GeoLoRA** injects 3D geometric information into 2D foundation features from partial 3D observations
- **State-of-the-art feature quality** for partial 3D shapes across multiple benchmark datasets
- **Better downstream performance** in partial-to-full and partial-to-partial shape matching and improved robustness to geometric ambiguities such as left-right disambiguation

## Related Work



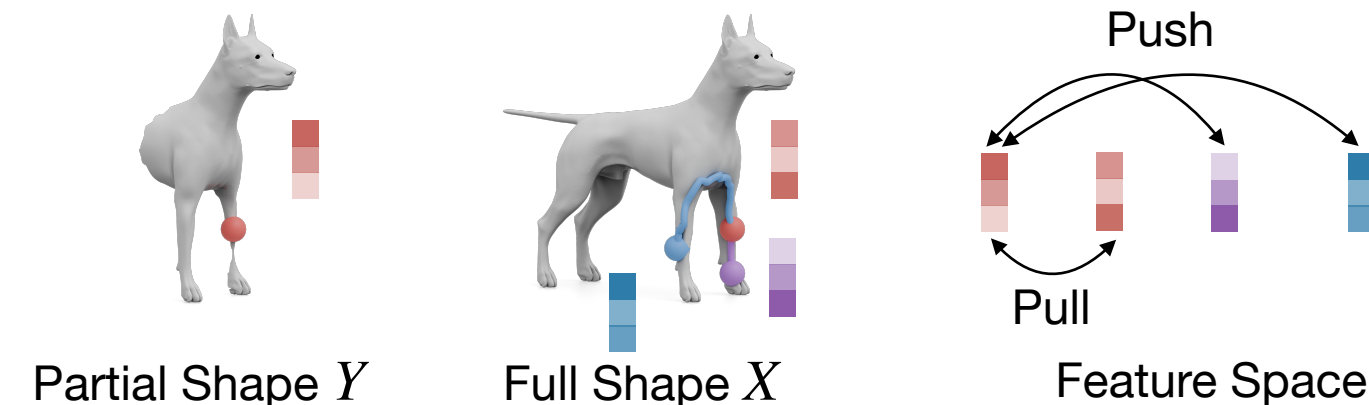
## Method

### Pipeline



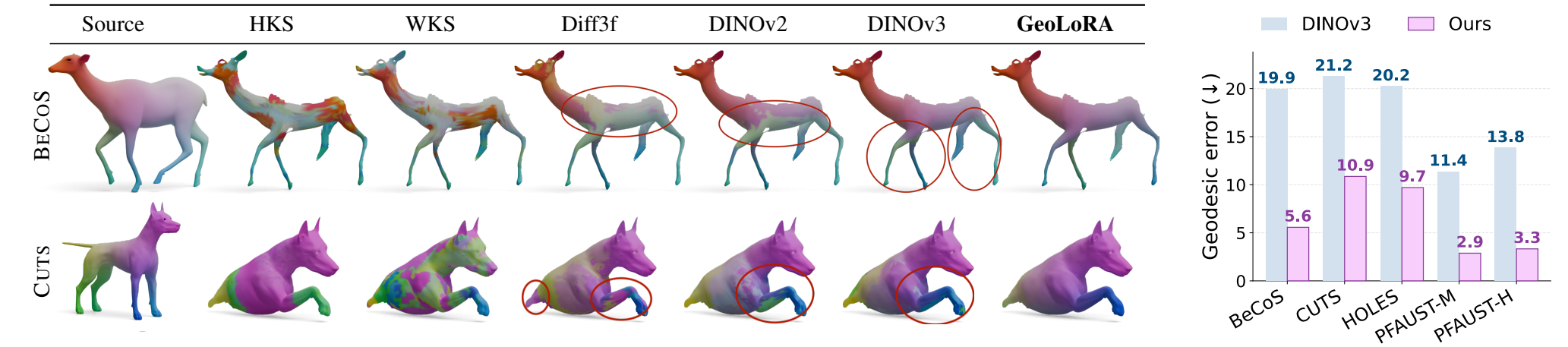
1. Generate a **partial observation**  $Y$  from a full 3D shape  $X$
2. **Render** both full and partial shapes from multiple viewpoints
3. Process rendered images using a **DINOv3 feature extractor with LoRA module** to obtain dense pixel-wise features
4. **Backproject** them into 3D to produce vertex-wise features
5. Train with a **contrastive objective**:
  - Pull corresponding vertex features together
  - Push non-corresponding vertex features apart

### Geodesic-Aware Contrastive Loss

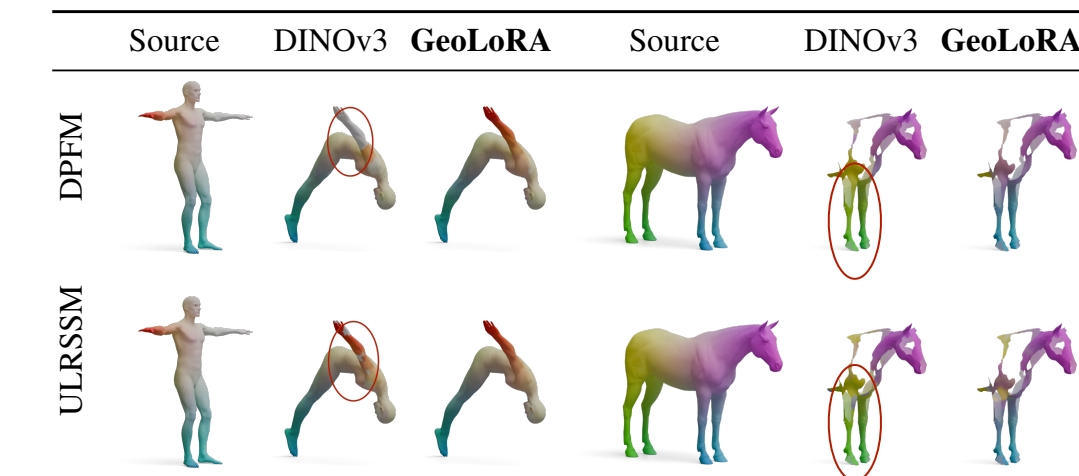


## Results

### Feature Quality



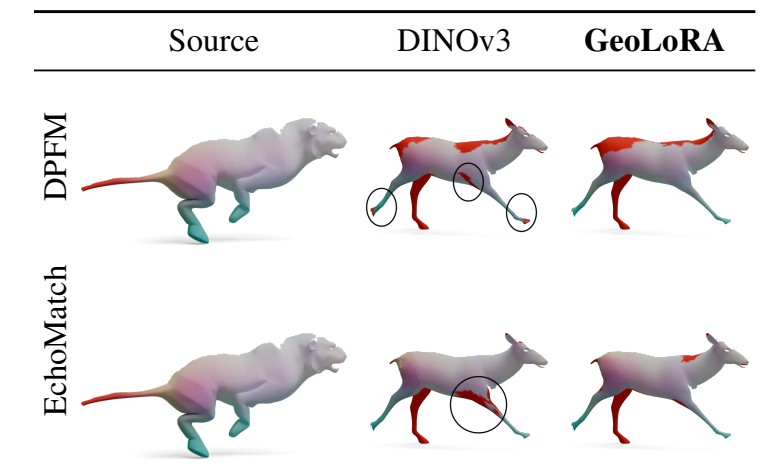
### Partial-to-Full



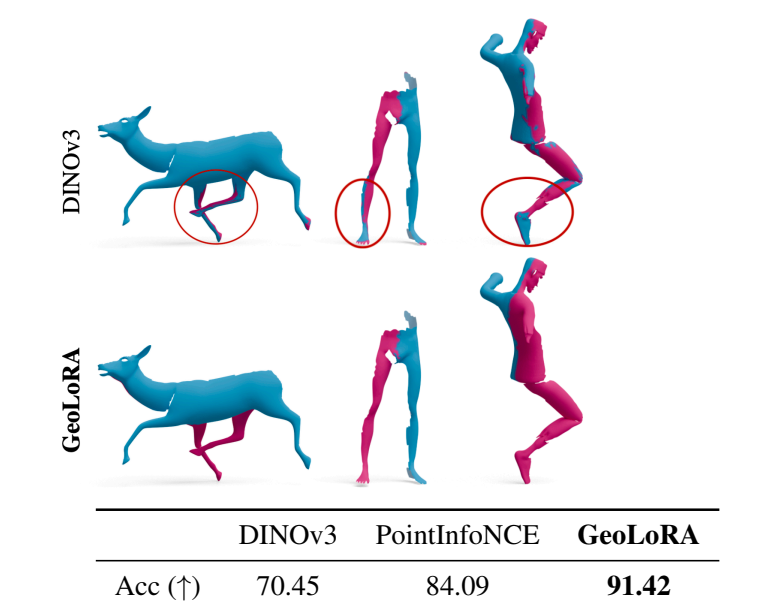
### Real-World Scenarios



### Partial-to-Partial



### Left-Right-Prediction



**References:**  
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