

Marilyn Keller¹, Vaibhav Arora², Abdelmoutaleb Dakri², Shivam Chandhok²,
Jürgen Machann³, Andreas Fritsche³, Michael J. Black¹, and Sergi Pujades²

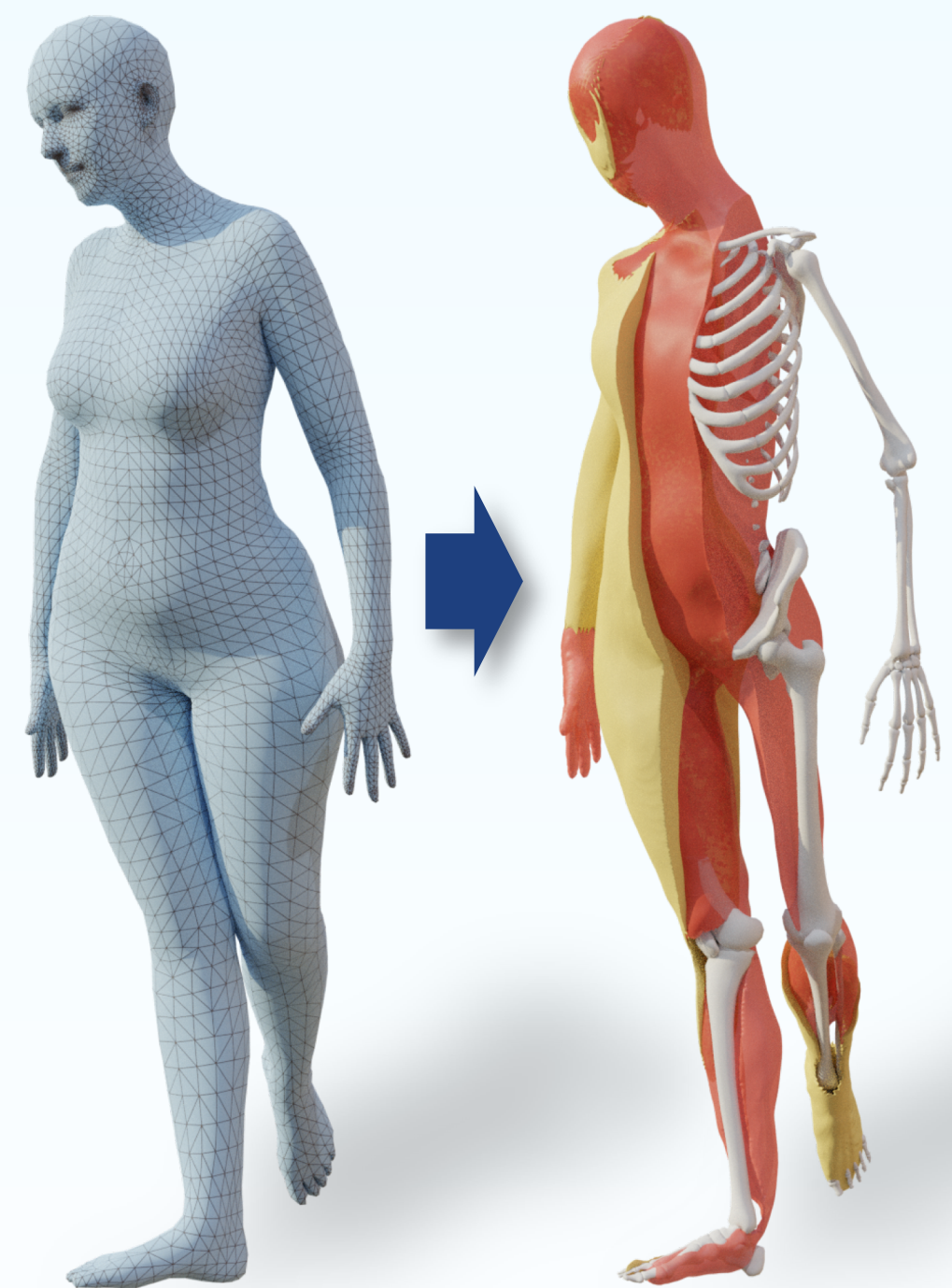


Goal

Infer the **internal tissues** from the **external body shape**

Motivations

- **Body composition screening** from cameras
- Early disease **diagnosis**
- Enhanced **soft tissue simulation realism**



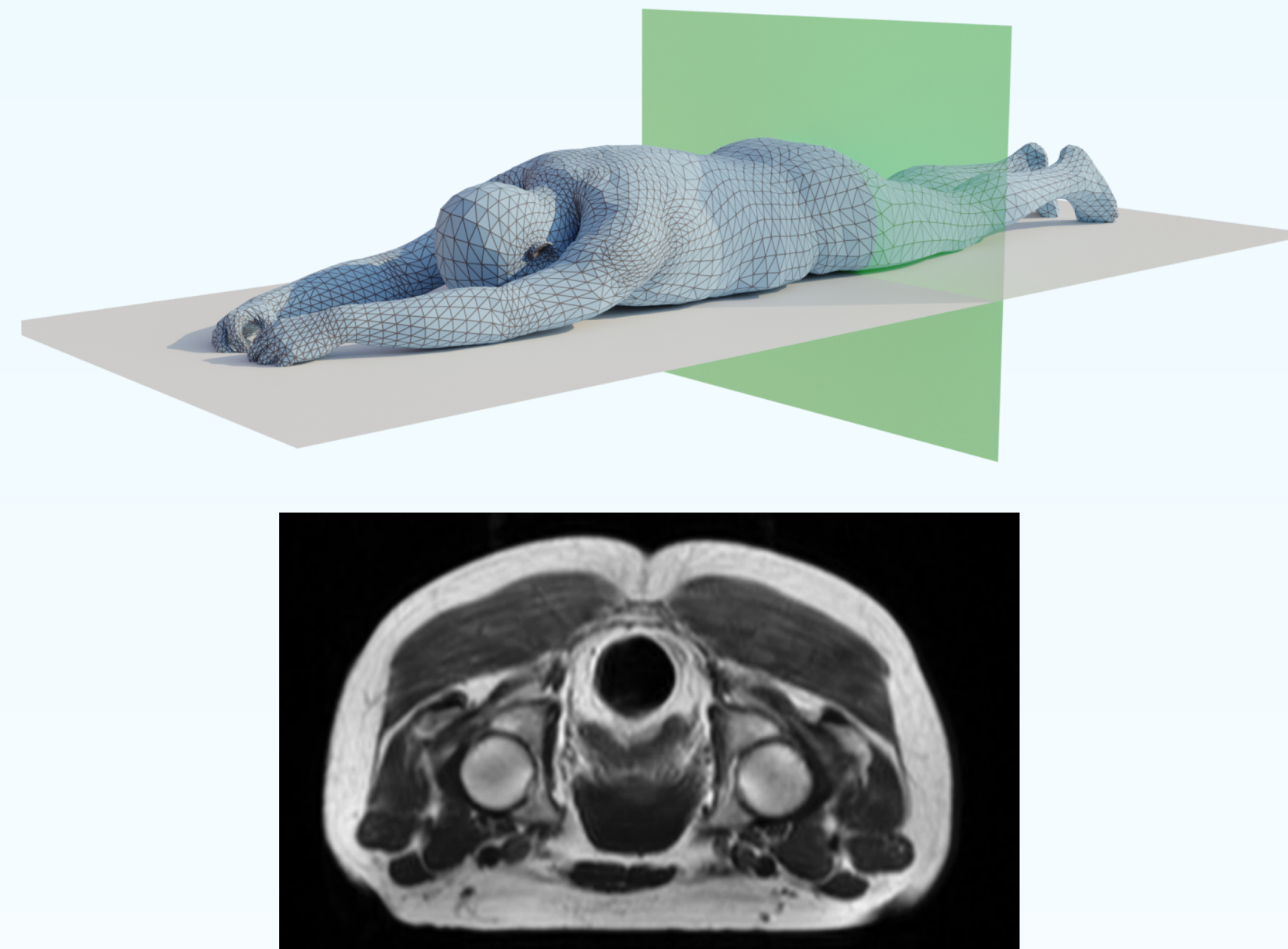
Project page
and code

hit.is.tue.mpg.de



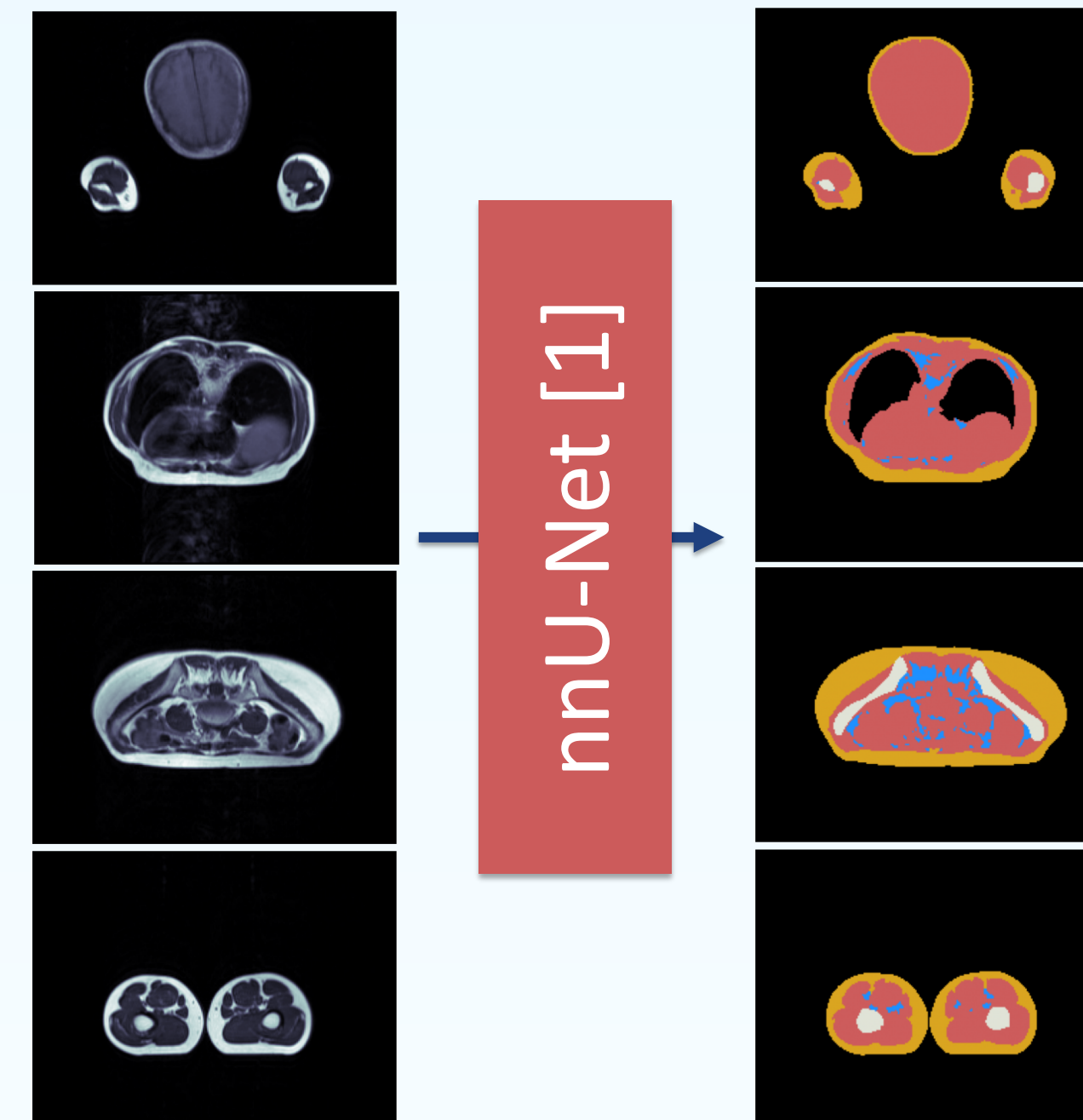
Challenges

- Building a paired dataset
- Stomach compression
- Multi-tissue prediction



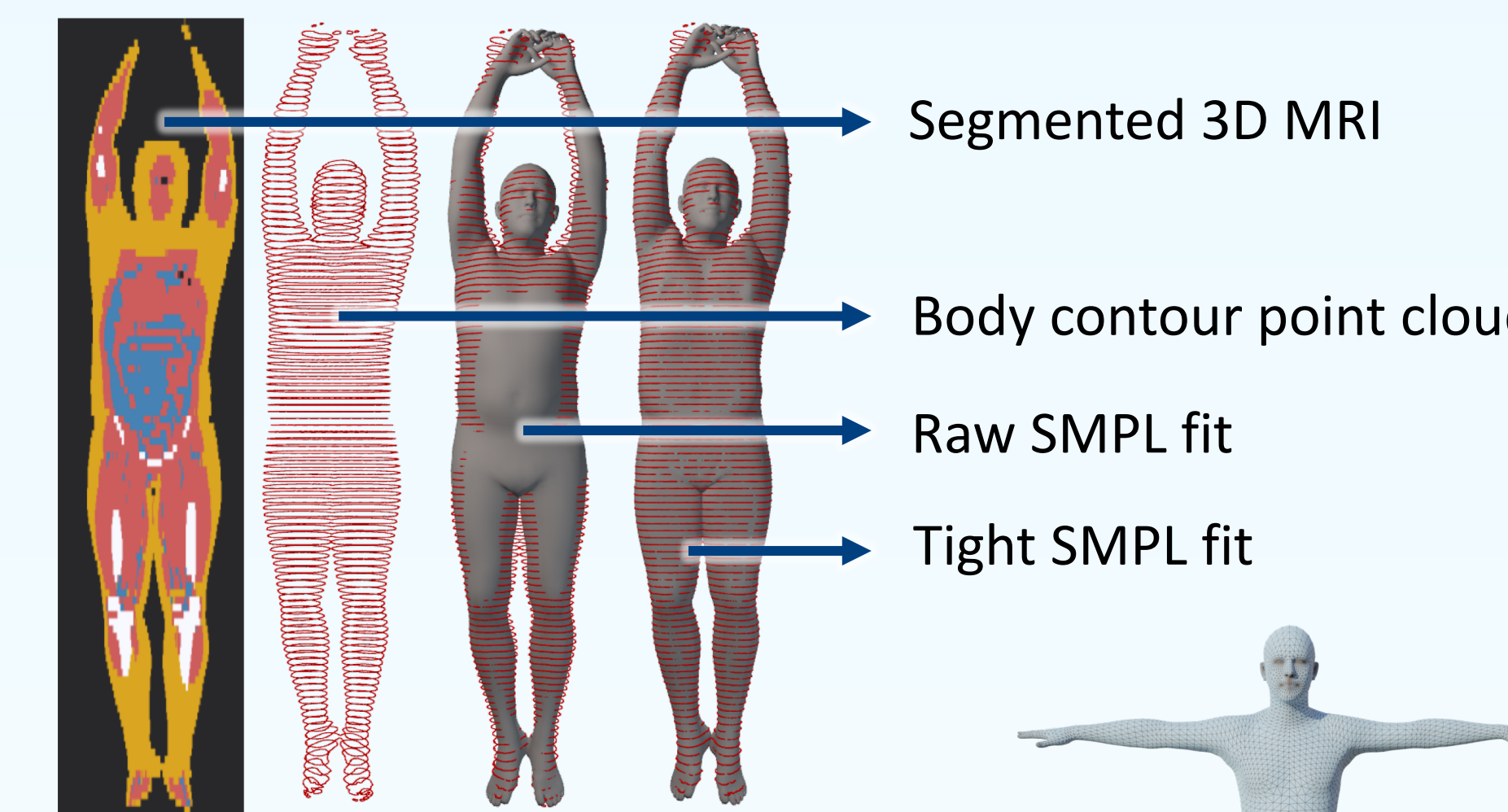
Dataset

Method



[1] Isensee 2021 [2] Loper 2015

Result



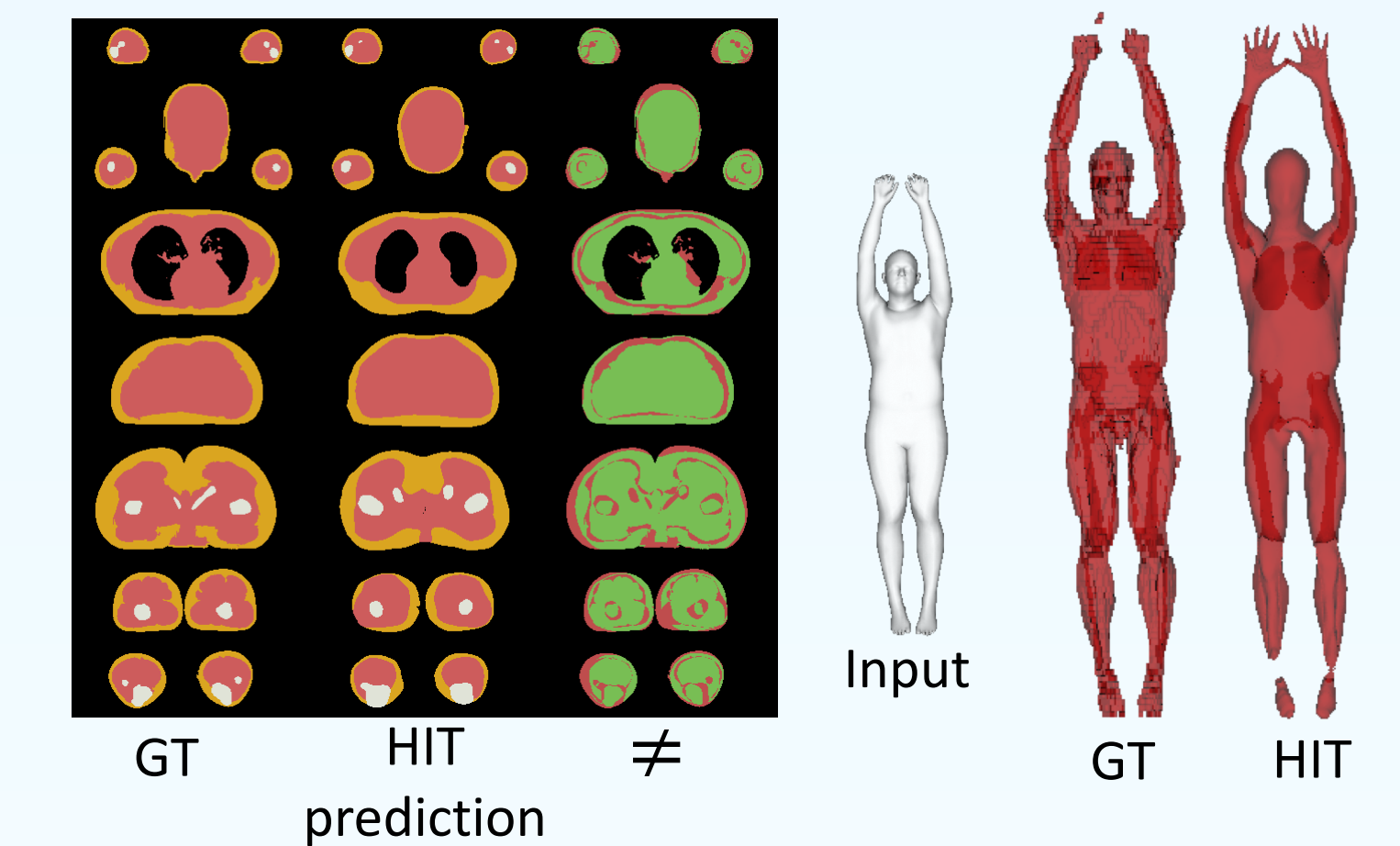
157 males
241 females

SAT Subcutaneous Adipose Tissue (fat)
LT Lean Tissue (muscles, organs)
BT Bone
IMVAT Other adipose tissue (visceral, intramuscular)
E Empty

$SMPL(\beta, \theta)$ [2]

Evaluation

Prediction vs Ground Truth (GT)



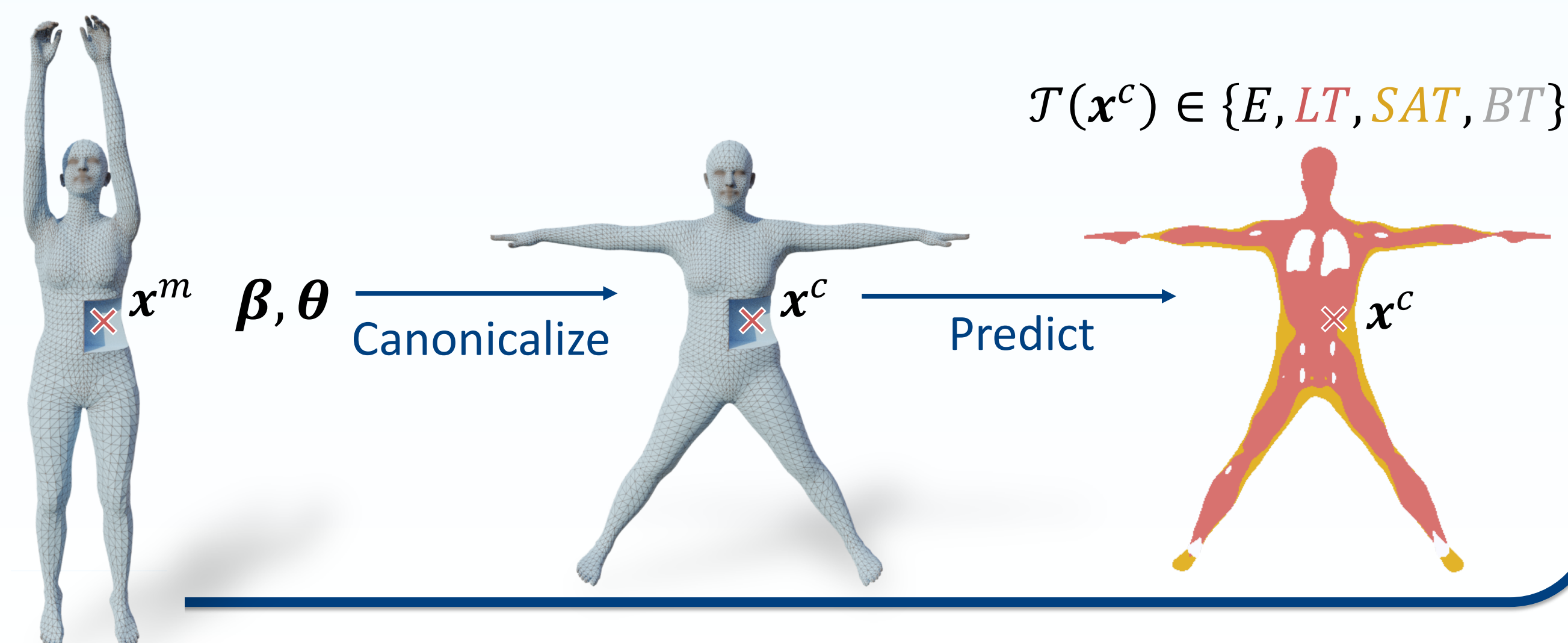
Prediction metrics (female)

	LT		SAT		BT	
	D.S. ↑	Δ% ↓	D.S. ↑	Δ% ↓	D.S. ↑	Δ% ↓
Chance	51.4	4.9	40.2	6.7	3.9	0.7
HIT	77.8	4.0	57.7	9.4	45.5	0.6

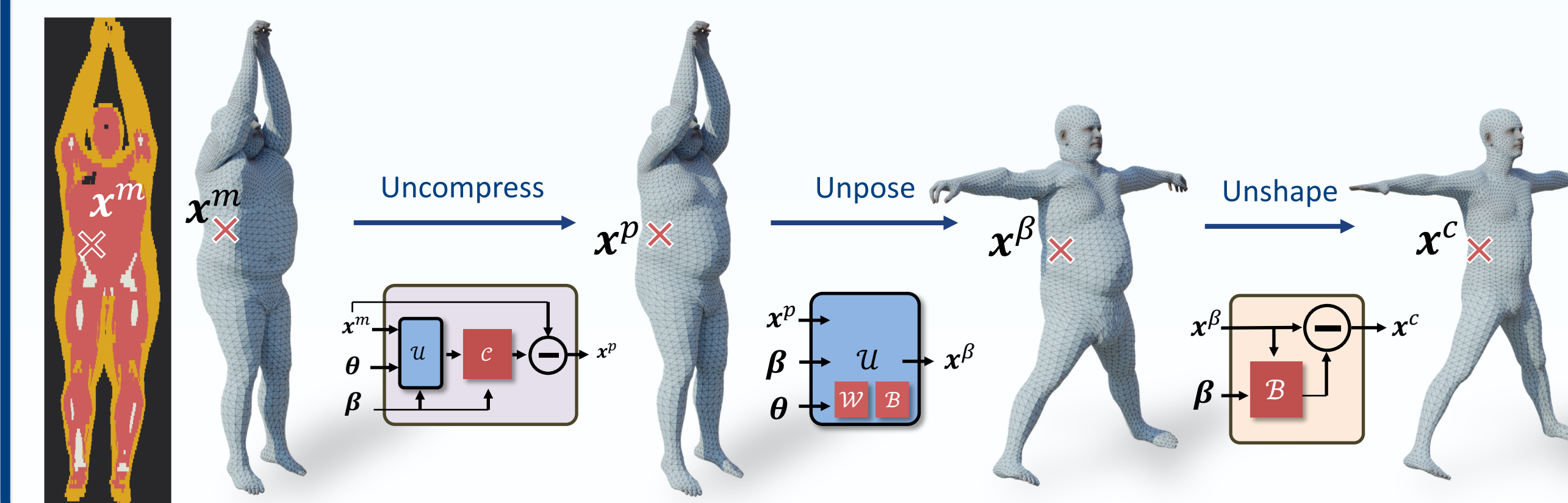
D.S.: Dice score
Δ%: Tissue percentage prediction error

Key idea

Learn to **map** a 3D point inside **any body** to the corresponding 3D point in a **template**



Canonicalization



Prediction for an unseen body shape and pose

