

# Virtual Humans – Winter 23/24

Lecture 1\_3 – Introduction to Human Models - Overview

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Topics to be covered in a nutshell

# Image formation, rotations and surfaces

Robert Collins  
CSE486, Penn State

## Imaging Geometry

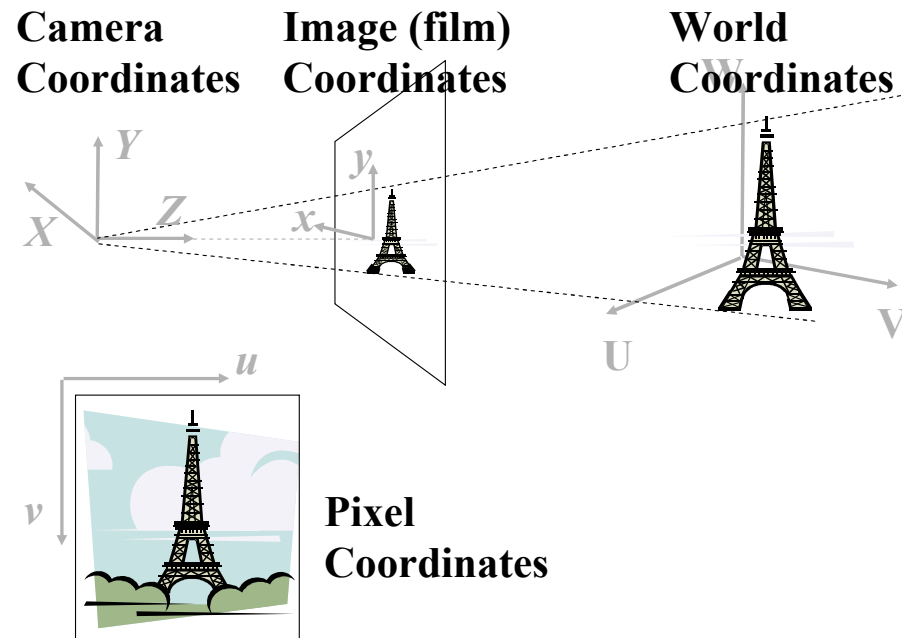
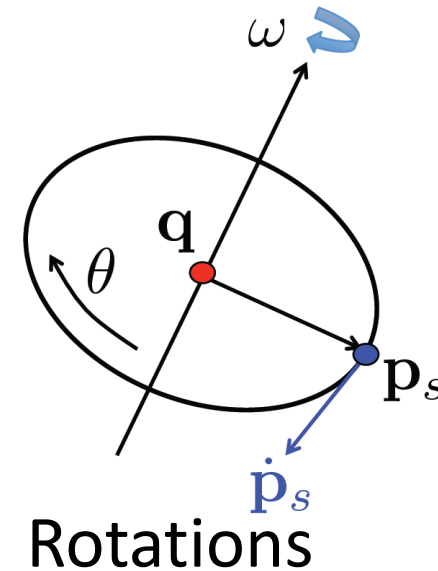
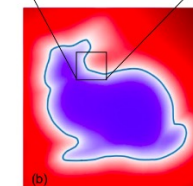
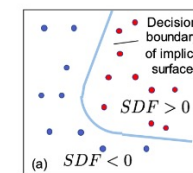


Image formation

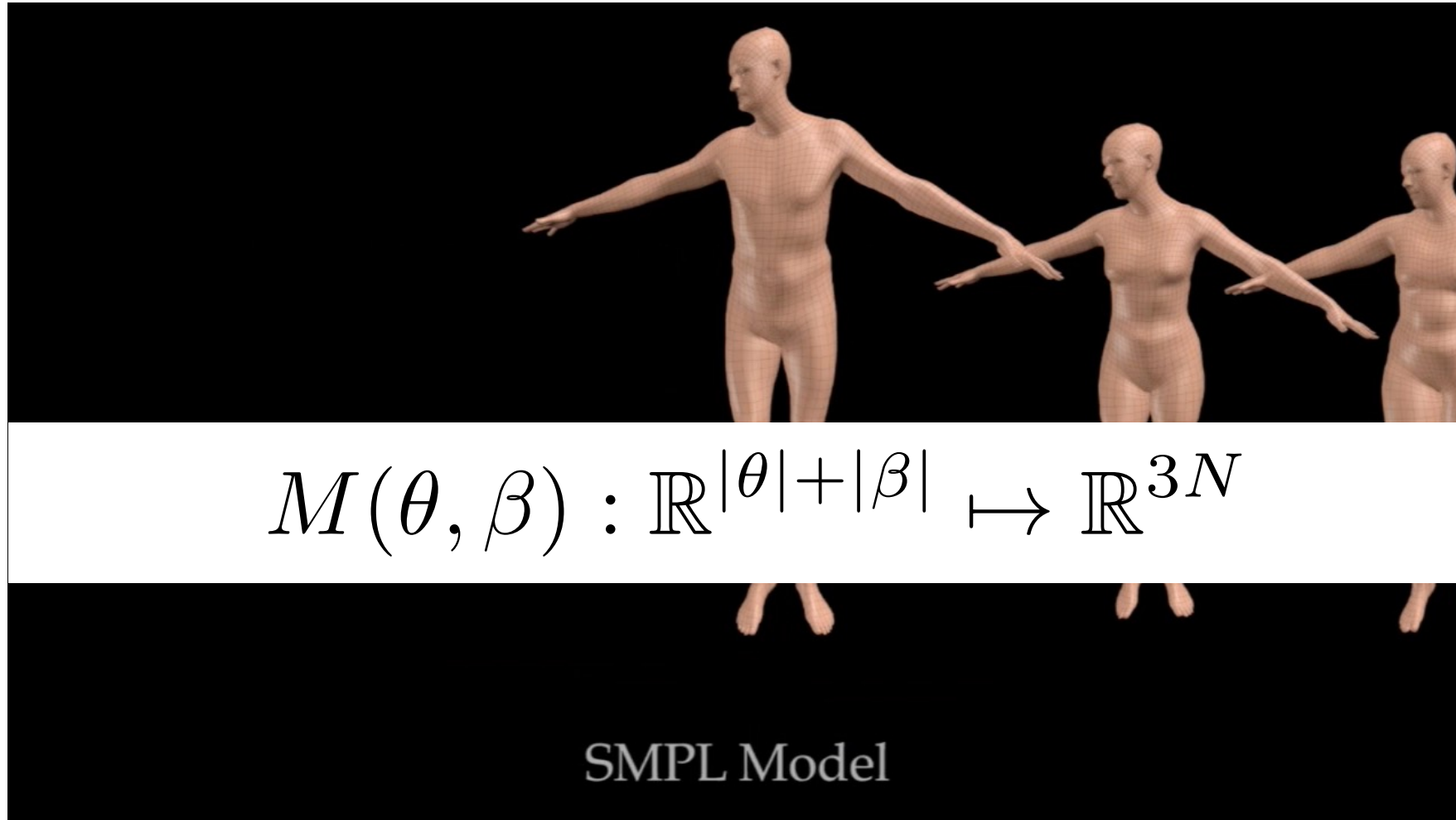


Rotations

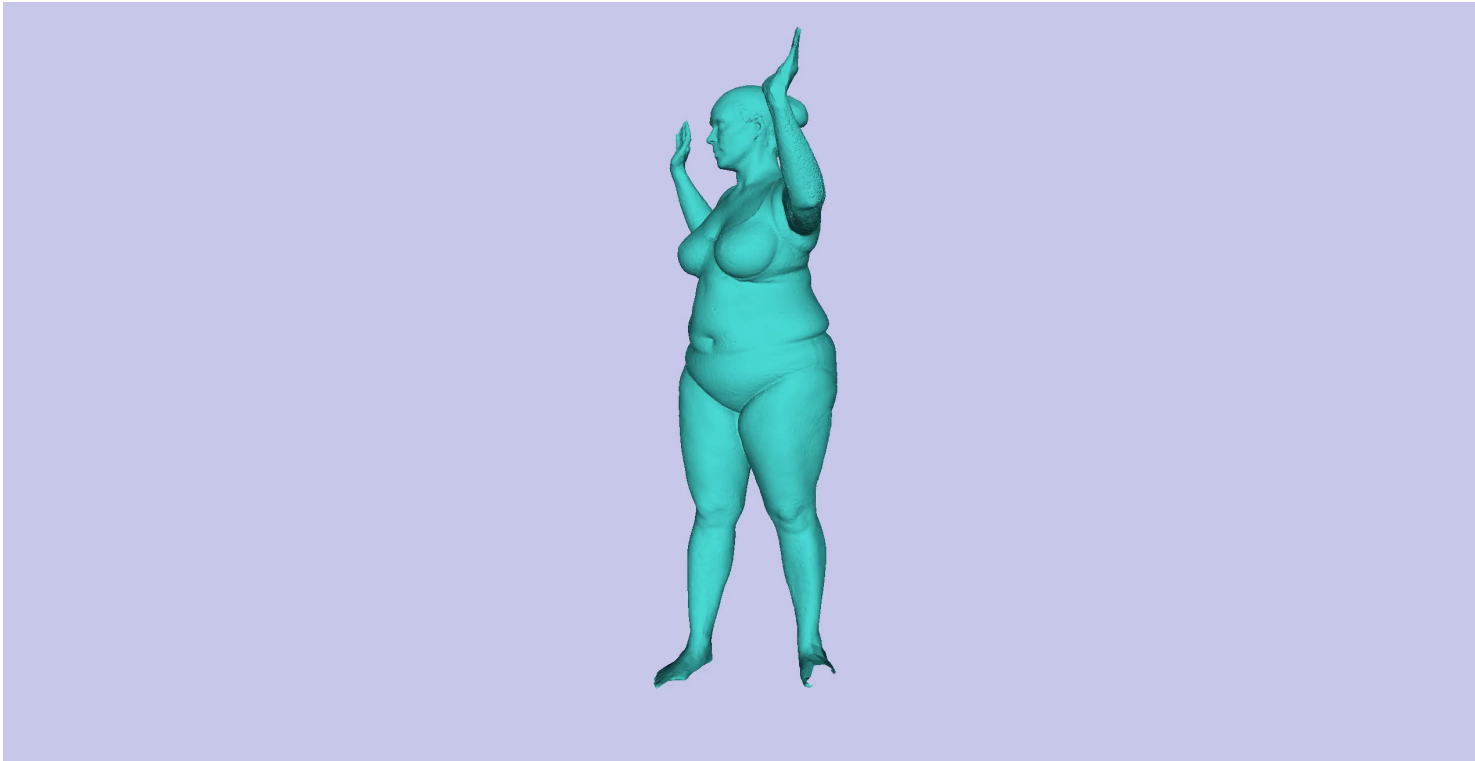


Surface representations

# Vertex based human models: SMPL



# Fitting human models to scans



# Inferring 3D human models from images

Predict full 3D human body mesh from a single 2D image



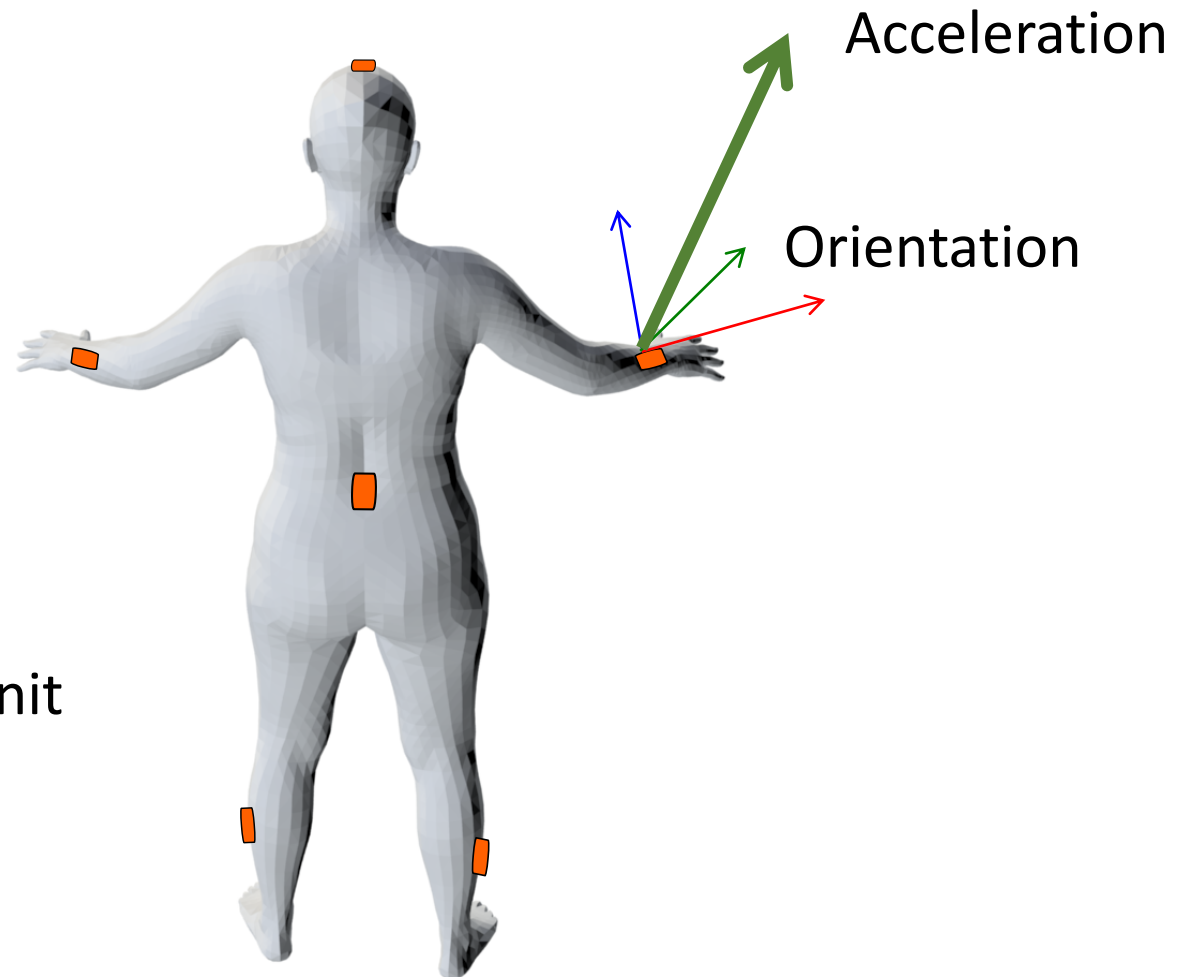
Input (2D)

Output (3D)

# Motion capture from sparse IMUs



IMU = Inertial Measurement Unit  
(Xsens)

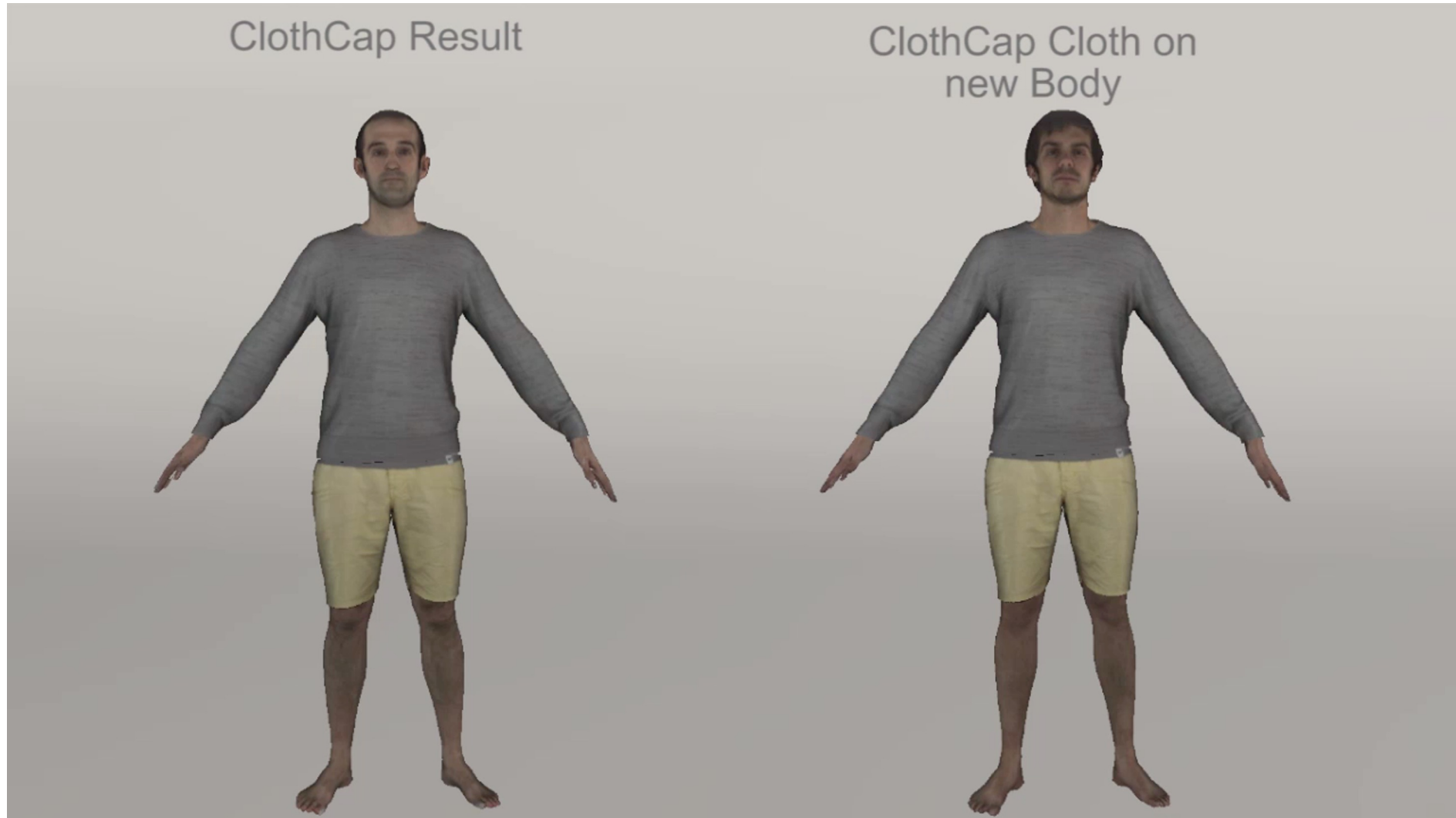


# Climbing





# Clothing based on vertex displacements

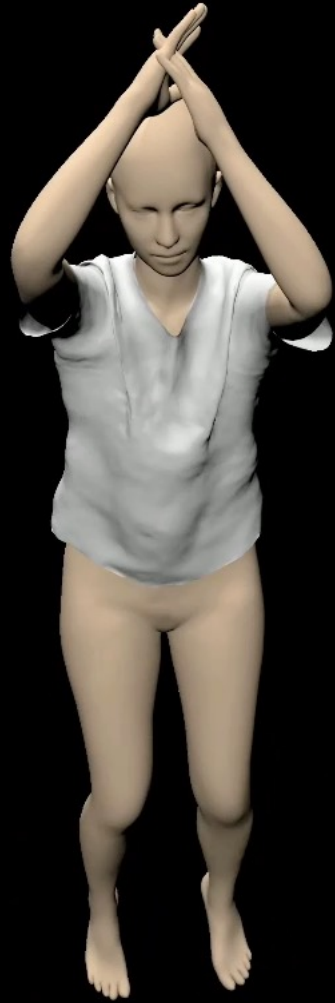


# Clothing based on vertex displacements

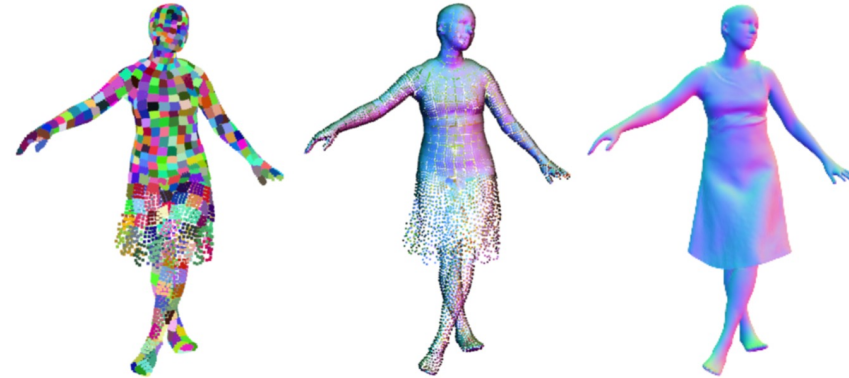
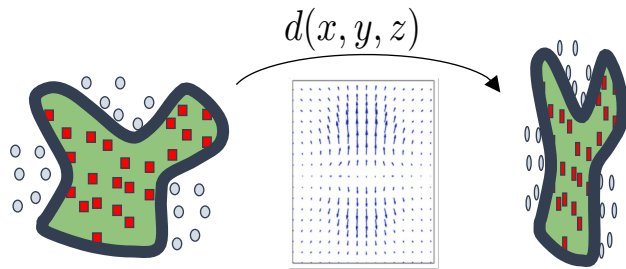
## The Virtual Tailor: Predicting Clothing in 3D as a Function of Human Pose, Shape and Garment Style

Paper ID 6098

# Keep style – Change shape



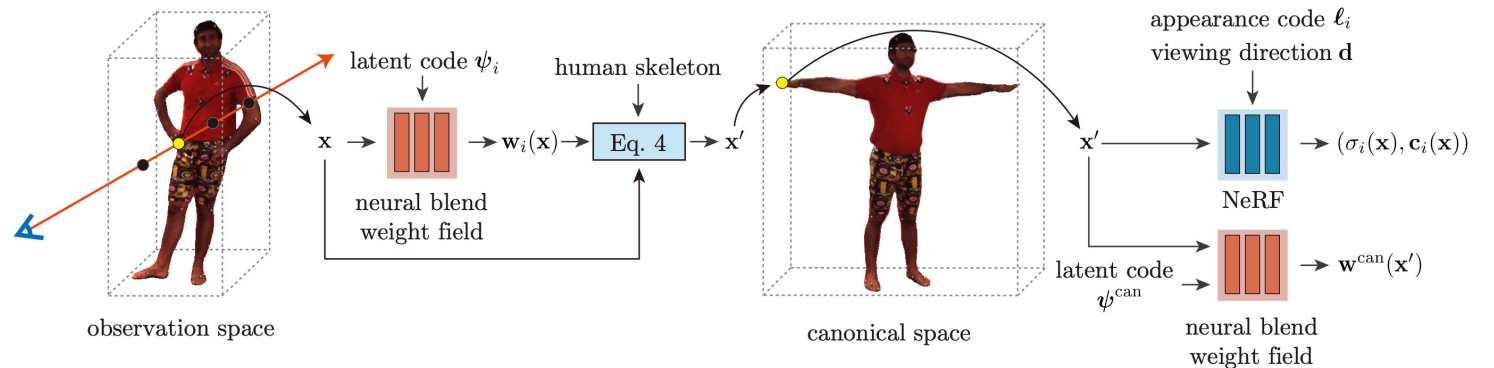
# Clothing based on neural implicits, points and NERF



Ma et al. CVPR'21 (Points/patches)

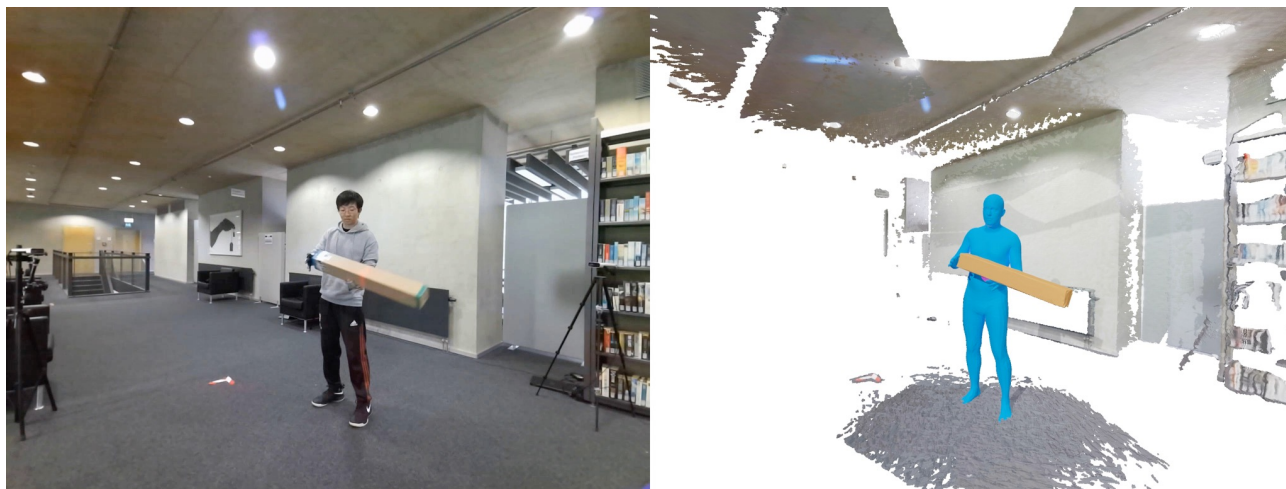


Tiwari et al. ICCV'21 (Implicits)



Peng et al. ICCV'21 (NERF)

# Human Behavior Capture/Synthesis



BEHAVE CVPR'22

Capture human-object  
interaction



PLACE 3DV'21

Learn to “place” people in 3D  
scenes

# Human Behavior Synthesis



# Slide credits and resources

- Michael Black, Siyu Tang, Javier Romero, Naureen Mahmood
- Resources:
  - <https://virtualhumans.mpi-inf.mpg.de/talks.html>
  - SMPL made simple tutorial: <https://smpl-made-simple.is.tue.mpg.de>
  - Siggraph course: <https://bodymodelling.is.tuebingen.mpg.de>