

# *Multi-view 3D Pose Estimation*

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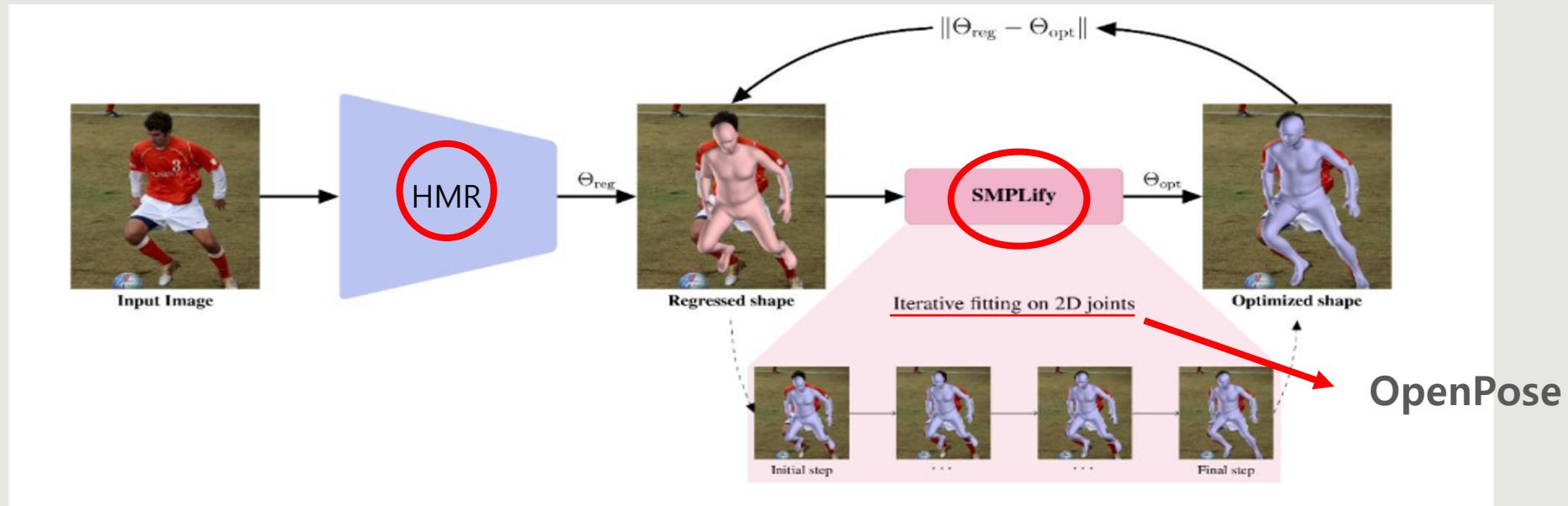
NCSOFT Vision AI Lab Human Pose Team Yeongeon Lee

## *Objective*

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**Improve 3D pose estimation accuracy  
using multi-view images**

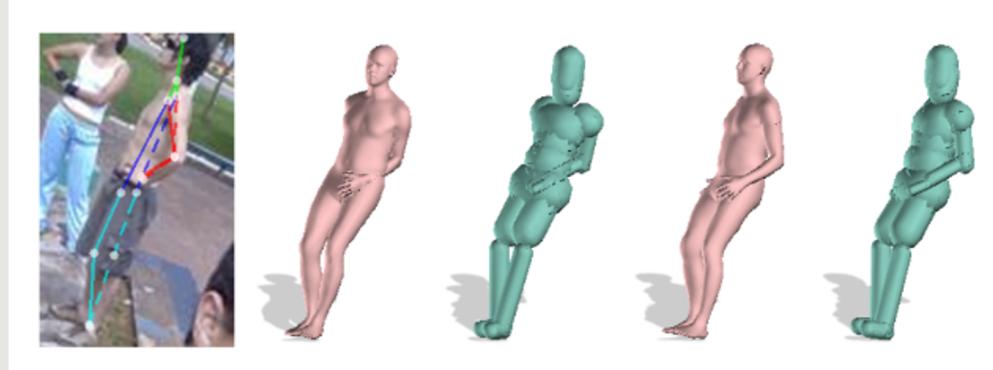
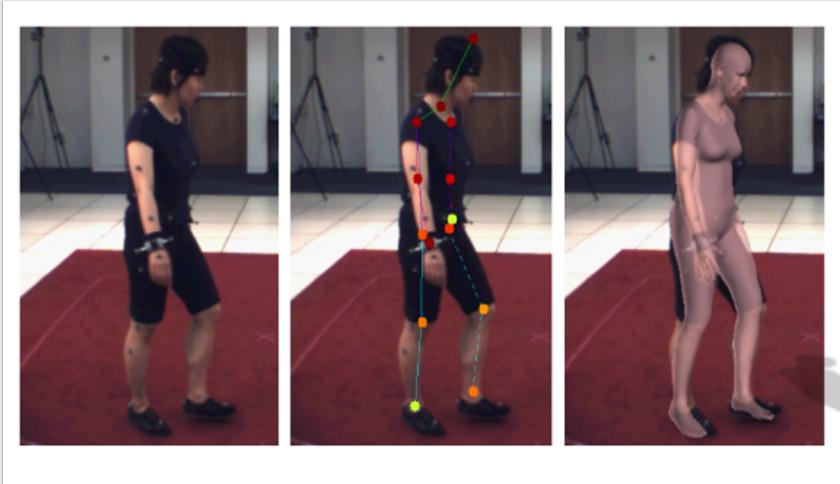
## *Related work – SPIN(Base Model)*



## *Related work - SMPLify*

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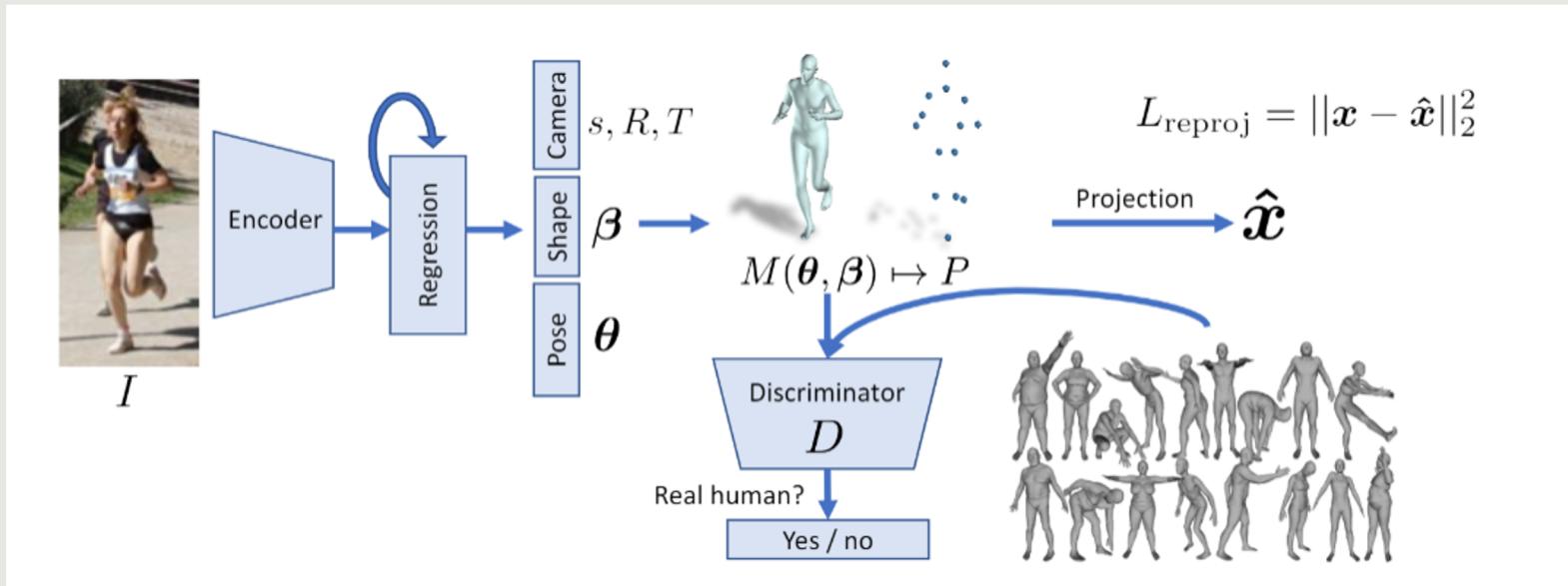
Image -> 2D annotation -> 3D annotation -> **OPTIMIZATION**



# Related work - HMR

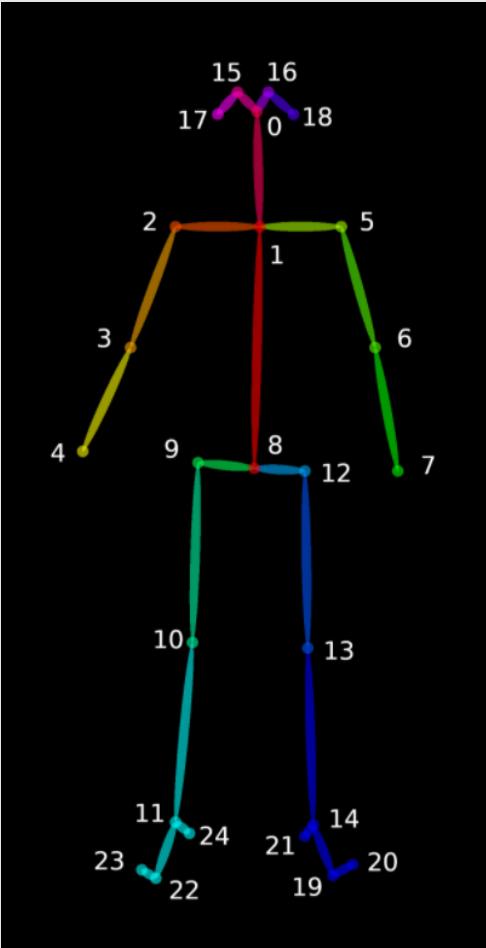
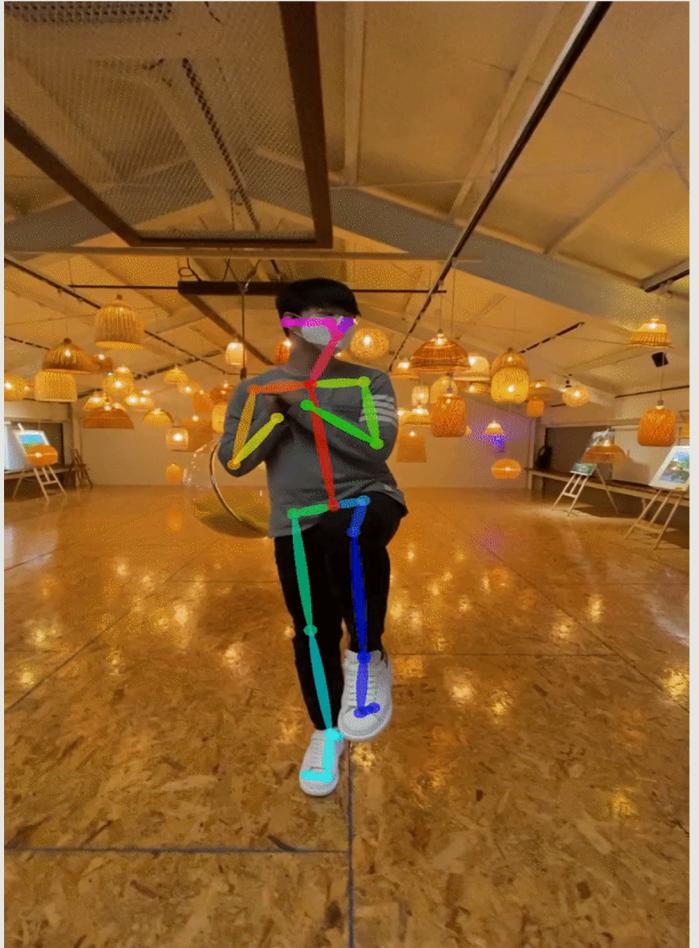
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Image -> 3D annotation(using Discriminator)



# *Related work – OpenPose*

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Detect 2d human body parts

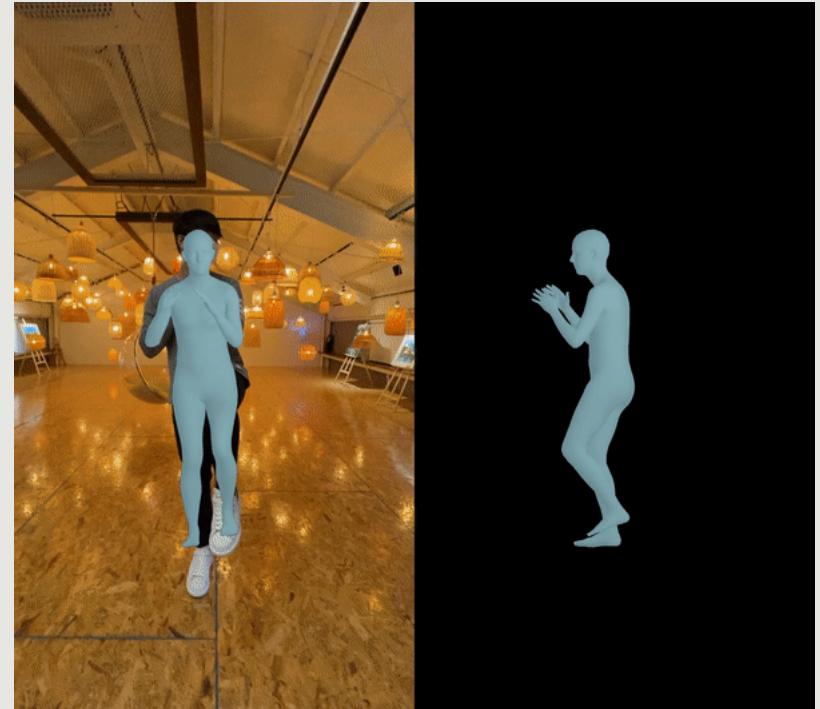
25 joints X 3 (x, y, confidence)

# *Problem Statement*

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Low accuracy for unusual pose

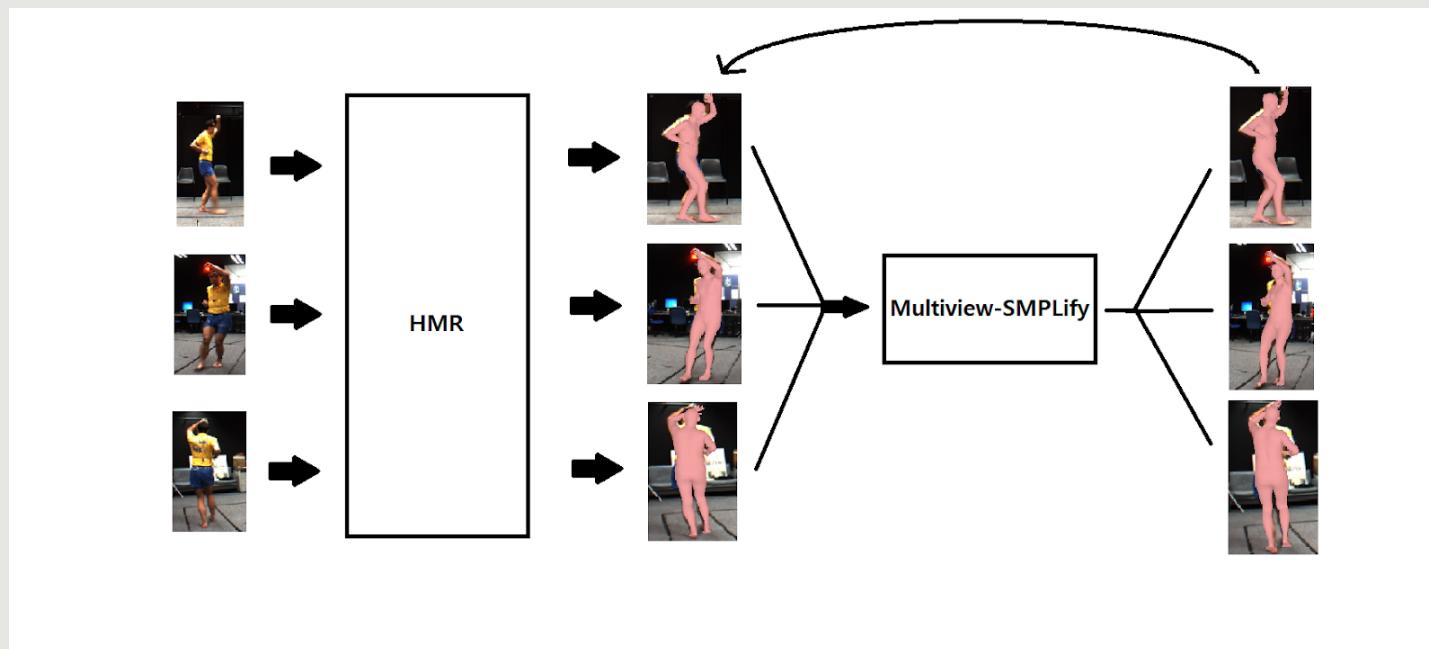
Not enough multi-view datasets with Ground Truth



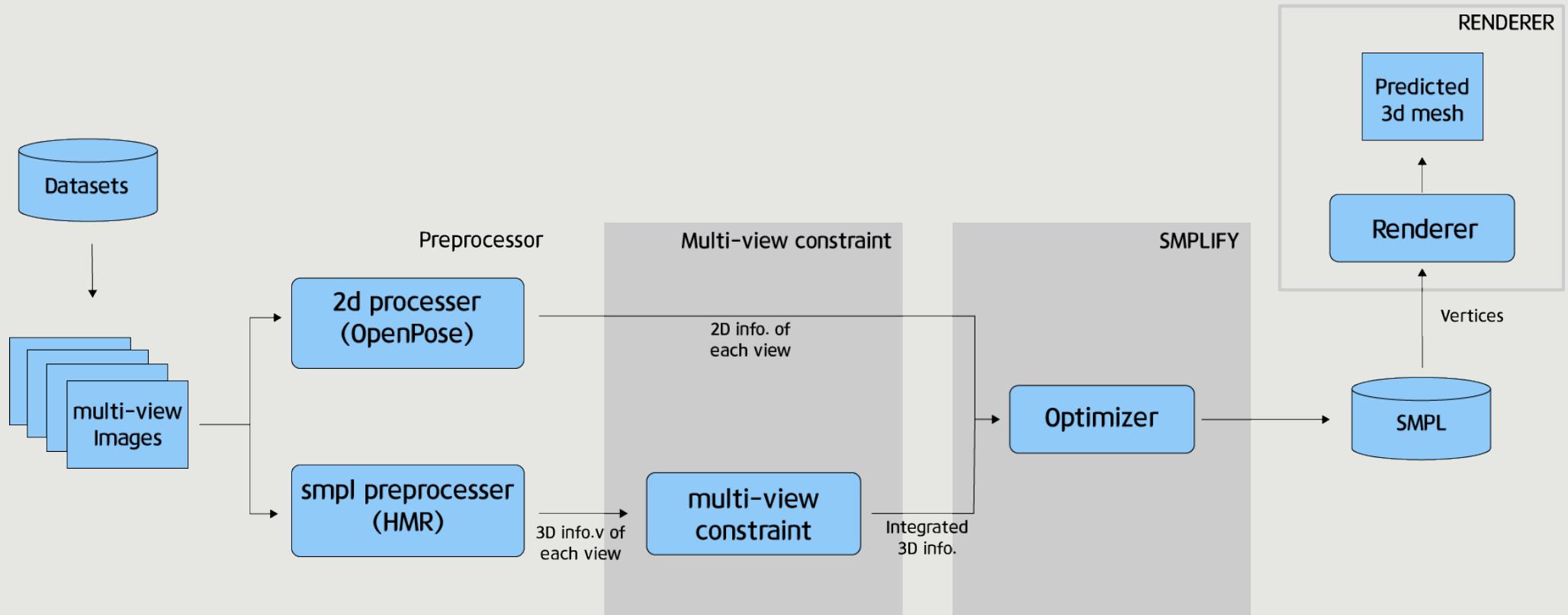
# *Solution*

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Generate more pseudo-datasets by using  
SPIN model and our constraints



# Architecture

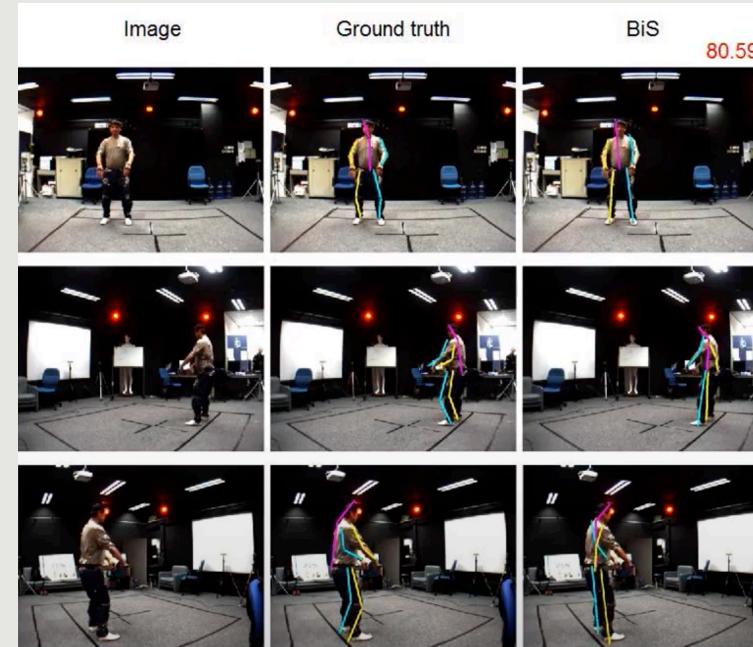


# Datasets

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```
▽ dataset_extras
  ≡ 3dpw_test.npz
  ≡ coco_2014_train.npz
  ≡ h36m_valid_protocol1.npz
  ≡ h36m_valid_protocol2.npz
  ≡ hr-lspet_train.npz
  ≡ lsp_dataset_original_train.npz
  ≡ lsp_dataset_test.npz
  ≡ mpi_inf_3dhp_train.npz
  ≡ mpi_inf_3dhp_valid.npz
  ≡ mpii_train.npz
```

Used in paper



Ours : filtered 3990 multi-view images

# *Generate Pseudo-GT*

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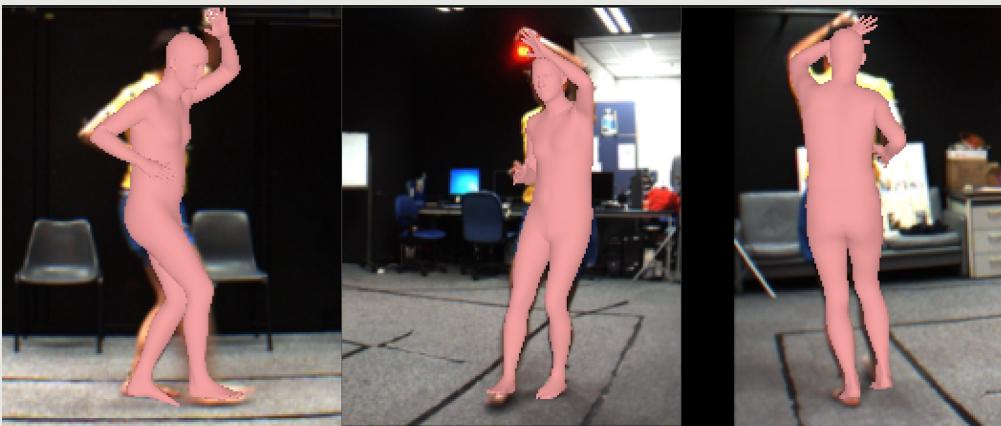
↓ OpenPose



→ HMR



↑ Optimize



# *Training*

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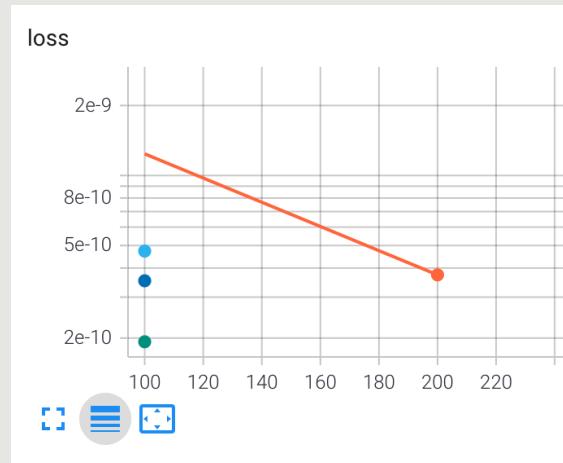
## 1. Datasets

```
root@c3054aa5c962:/opt/SPIN/npz# ls  
filtered_hiphop2.npz hiphop1.npz hiphop2.npz hiphop3.npz hiphop4.npz  
hiphop5.npz hiphop6.npz jazz1.npz jazz3.npz jazz4.npz jazz5.npz  
jazz6.npz kata_f2.npz kata_f3.npz kata_f4.npz
```

## 2. Training

```
Saving checkpoint file [/opt/SPIN/logs/jazz5/checkpoints/2020_12_06-12_02_31.pt]#####  
2020-12-06 12:04:32.836582 Epoch: 20 Iteration: 0#####  
Saving checkpoint file [/opt/SPIN/logs/jazz5/checkpoints/2020_12_06-12_04_32.pt]#####  
2020-12-06 12:06:37.035671 Epoch: 30 Iteration: 0#####  
Saving checkpoint file [/opt/SPIN/logs/jazz5/checkpoints/2020_12_06-12_06_37.pt]#####  
2020-12-06 12:08:56.956613 Epoch: 40 Iteration: 0#####  
Saving checkpoint file [/opt/SPIN/logs/jazz5/checkpoints/2020_12_06-12_08_56.pt]#####  
2020-12-06 12:11:00.227692 Epoch: 50 Iteration: 0#####  
Saving checkpoint file [/opt/SPIN/logs/jazz5/checkpoints/2020_12_06-12_11_00.pt]#####  
100%#####
```

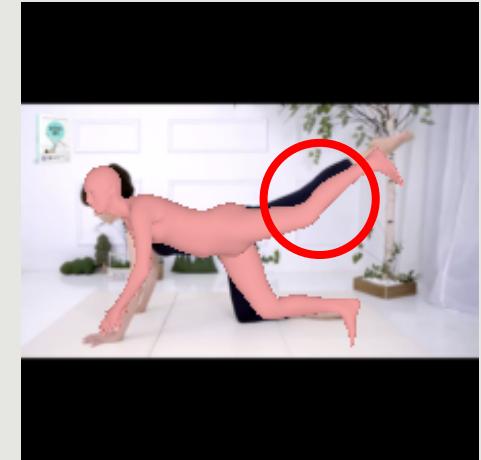
## 3. Tensorboard



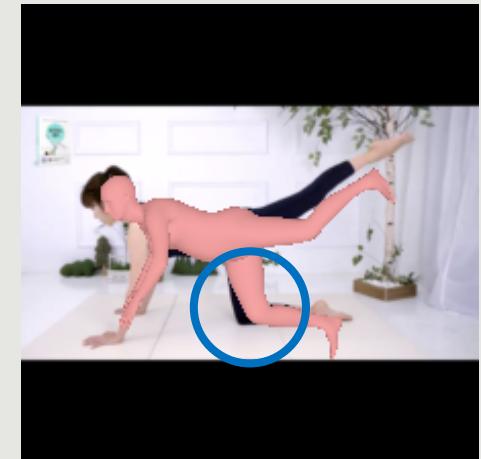
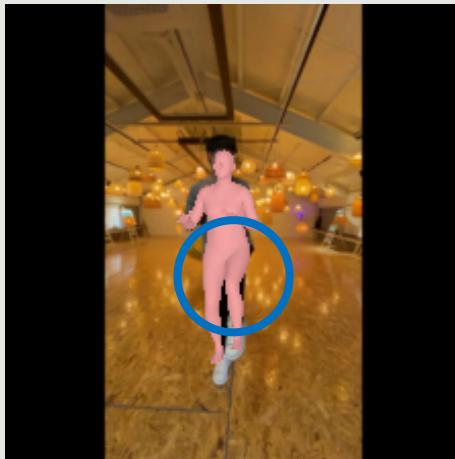
# *Result*

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**SPIN**



**Ours**



# ***Requirement Analysis***

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## **Functional Requirement**

- (Mid-Presentation) Design multi-view constraint and get better result
  - Integrate multi-view data
  - Optimize HMR result
- (Current) Design multi-view constraint and get better result
  - Get pseudo-GT datasets by using constraint
    - Preprocessing the 2D keypoints and images.
    - Generating the pseudo-GT using SPIN with Multiview-constraint
  - Inference Learning by using additional datasets
    - Modify SPIN's trainer and add train with generated datasets

# *Requirement Analysis*

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## Non-functional Requirement

- Reconstruction error of multi-view 3D pose estimation should be better than (existing models) **SPIN** for (human 3.6m) **MPI-INF-3DHP** datasets
- PCK, AUC, **MPJPE** loss value should be lower than existing models for **MPI-INF-3DHP** dataset

Metric	SPIN	Ours
Recon. error	103.74	101.47
MPJPE	67.88	64.71

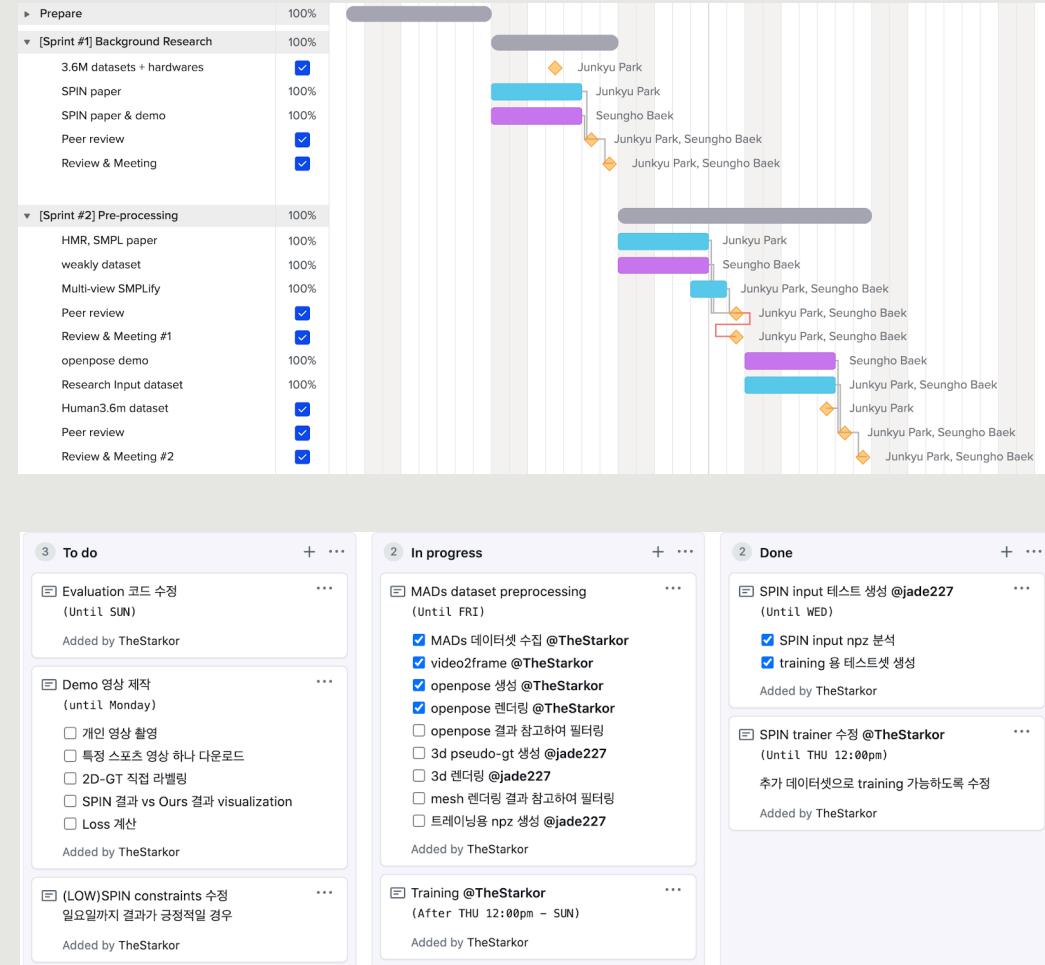
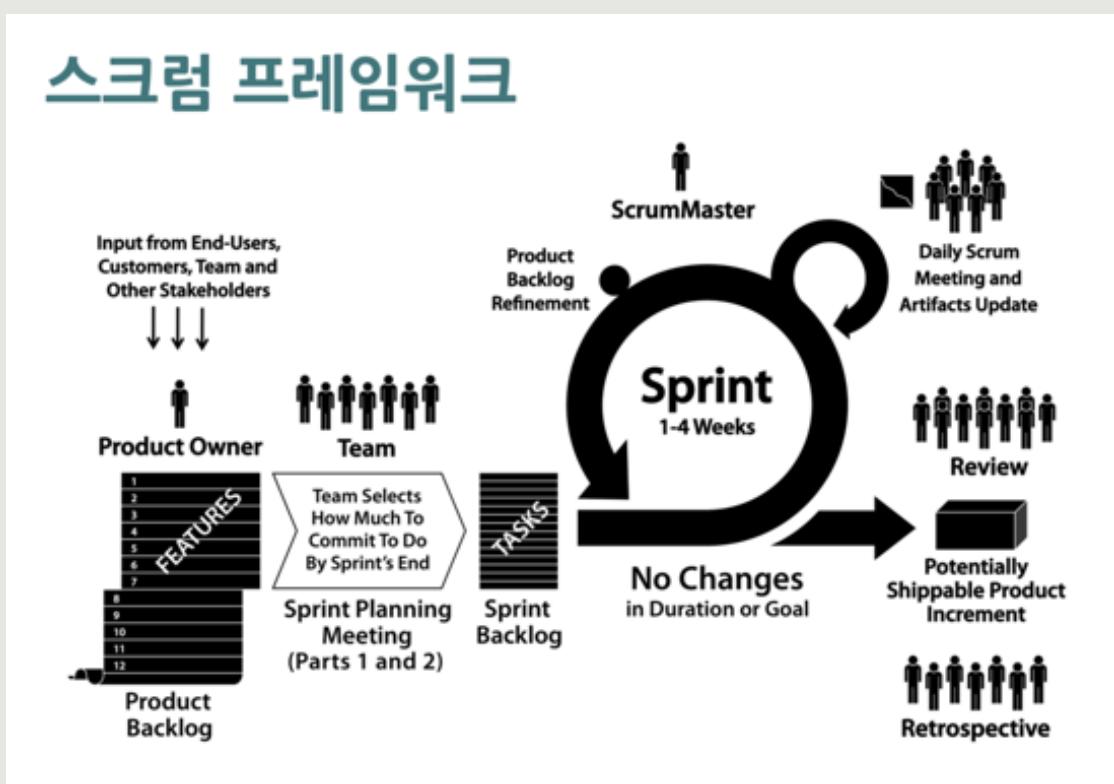
**MPJPE: 101.47103164462915**  
**Reconstruction Error: 64.71486536408716**

**Ours**

**MPJPE: 103.7407789841045**  
**Reconstruction Error: 67.88348467221192**

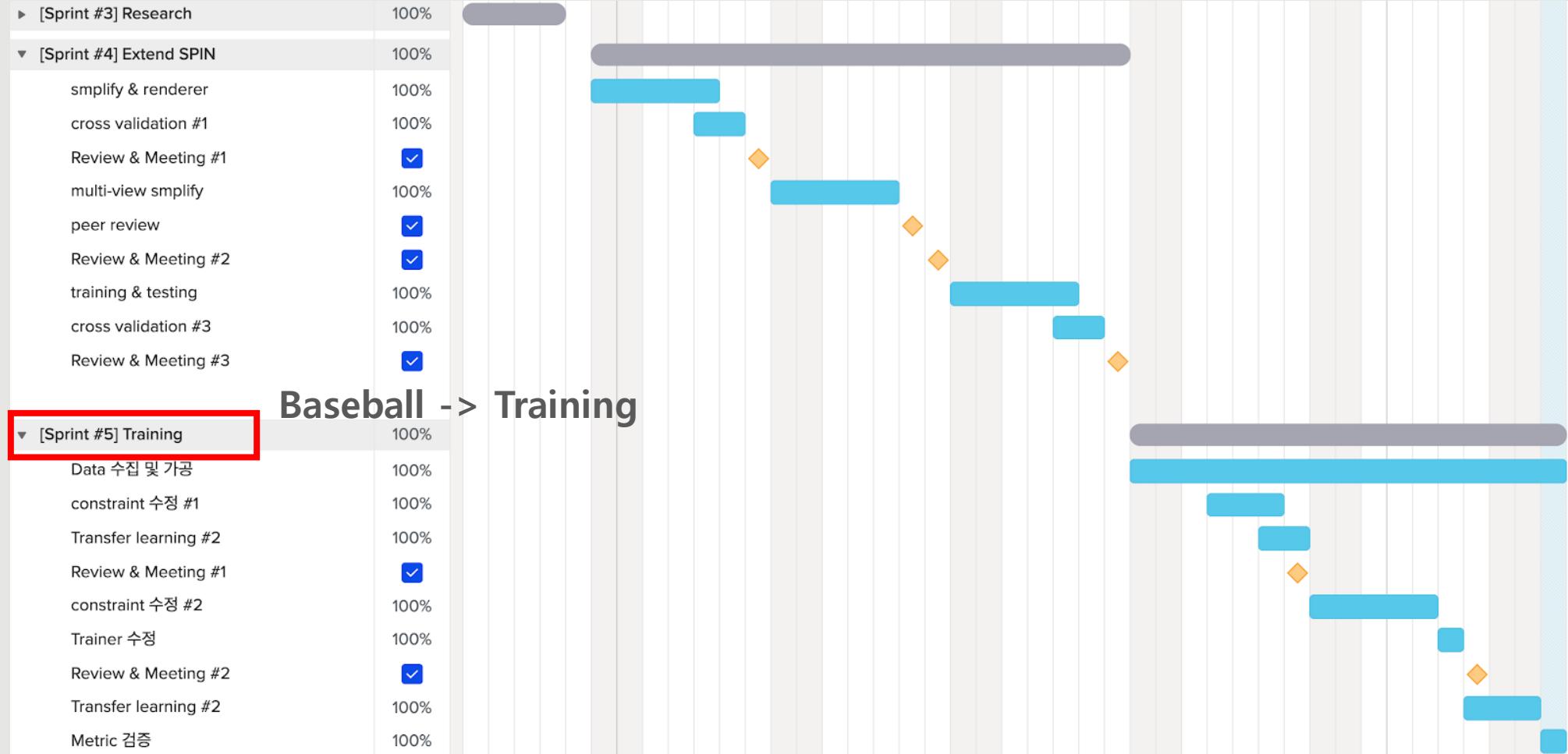
**SPIN**

# Project Management: Sprint Planning



# Schedule

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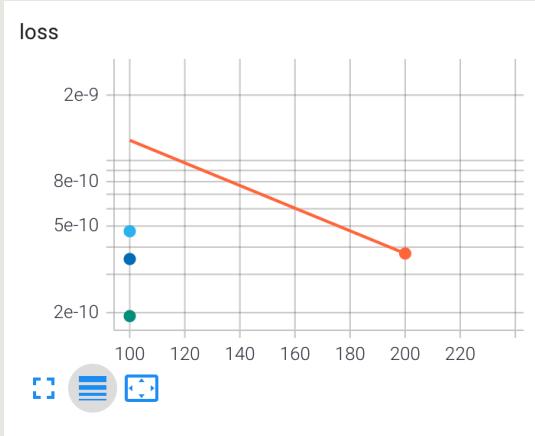
# Risk

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Risk	Description	Strategy
Fail to get dataset	<ul style="list-style-type: none"><li>- Human3.6m dataset is only supplied for research purpose</li><li>- Mannequin challenge video in youtube are not appropriate</li></ul>	<ul style="list-style-type: none"><li>- NCsoft supply Human3.6m dataset</li><li>- Mentor suggested MADS dataset for multiview video</li></ul>
Working environment	<ul style="list-style-type: none"><li>- Make environment for running SPIN model and Openpose</li><li>- 2-person team</li></ul>	<ul style="list-style-type: none"><li>- Use colab and docker to make same working environment</li><li>- Each teammate need to do more effort</li></ul>

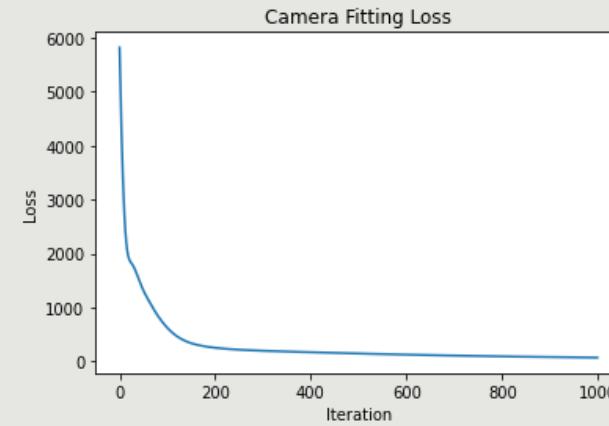
# *Quality Metric*

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## Training

Checking loss changes



## Optimizing

Checking Loss/Iteration

# *Role and Responsibility*

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## **Seungho Baek (Team Leader)**

- Setup environment
- Preprocess datasets for training
- Implement multi-view constraints

## **Junkyu Park**

- HMR, SMPLify, SPIN paper review
- Get Human3.6m dataset
- Implement multi-view constraints

## **Yeongeon Lee (Mentor, NCSOFT)**

- Feedback and advice for project proceeding
- Supply Human3.6m dataset.