

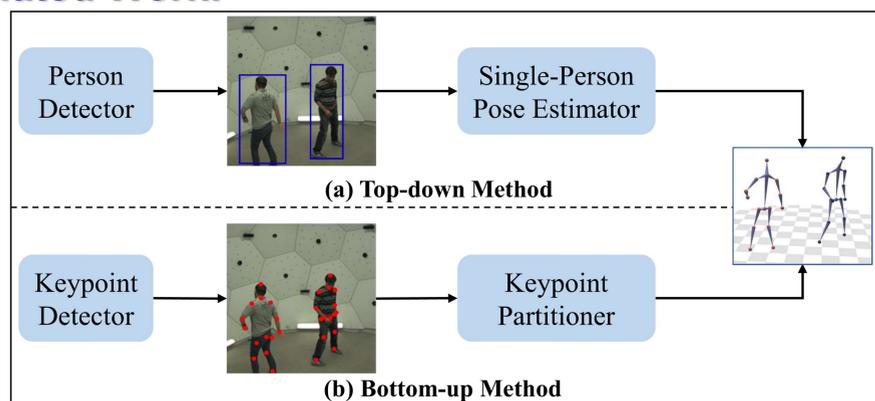
## Motivation:

- Two-stage paradigm, i.e., top-down or bottom-up, leading to redundant pipelines with high computation cost.
- Recent works have manifested the popularity and promising performance of the single-stage methods for 2D pose estimation. The single-stage pipeline for multi-person 3D pose estimation is barely explored.

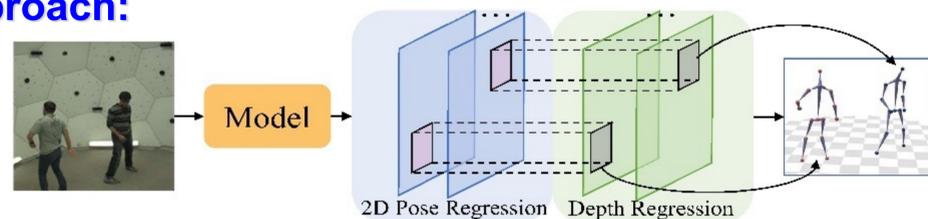
## Contributions:

- A single-stage solution Decoupled Regression Model (DRM) to decompose the multi-person absolute 3D pose estimation into 2D pose regression and depth regression via decoupled representation.
- A plug-in 2D Pose-guided Depth Query Module (PDQM) to adaptively perceive the scale information of instances and a Decoupled Absolute Pose Loss (DAPL) to focus on the absolute depth prediction are introduced.
- The best speed-accuracy trade-offs in current bottom-up and top-down methods.

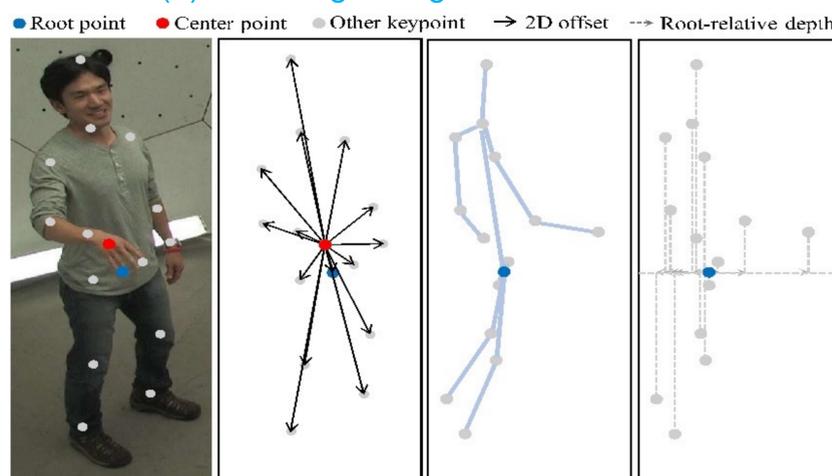
## Related Work:



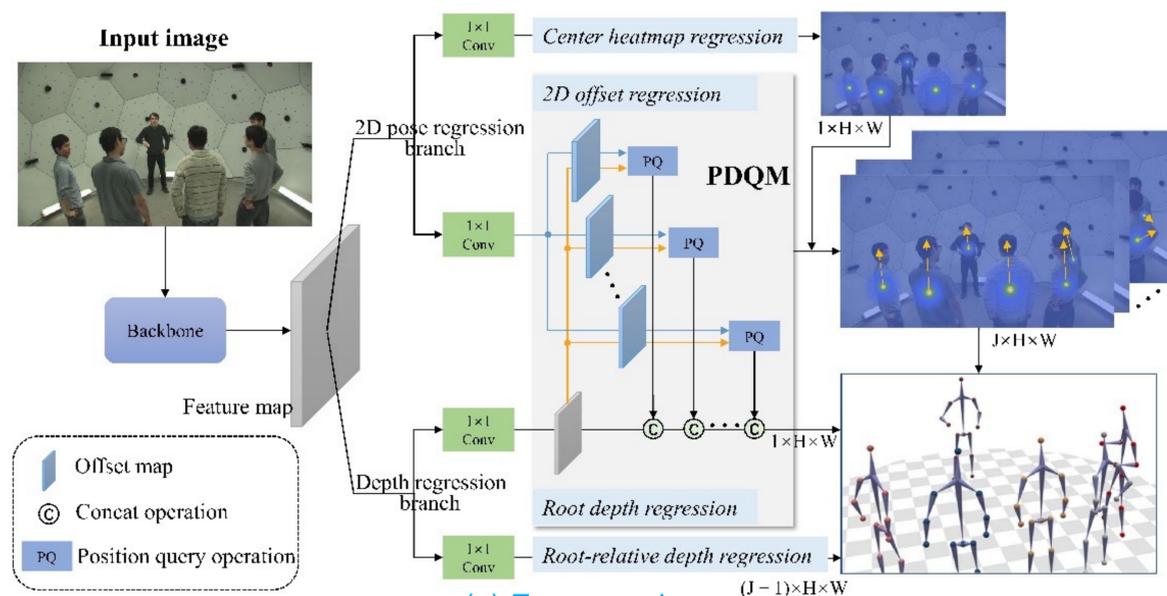
## Approach:



(a) Our Single-stage Solution



(b) Explanation of the Pose Representation



(c) Framework

## Experimental Results:

(a) Comparisons with Previous State-of-the-art Methods on MuPoTS-3D dataset.

	Methods	Matched people				All people	
		PCK <sub>rel</sub> ↑	PCK <sub>abs</sub> ↑	PCK <sub>root</sub> ↑	AUC <sub>rel</sub> ↑	PCK <sub>rel</sub> ↑	PCK <sub>abs</sub> ↑
Top down	CDMP (ResNet-50) [20]	82.5	31.8	<b>31.0</b>	<b>40.9</b>	81.8	31.5
	HDnet (FPN) [13]	83.7	35.2	-	-	-	-
	HMOR (FPN) [30]	-	-	-	-	<b>82.0</b>	<b>43.8</b>
	Pandanet (FPN) [1]	-	-	-	-	72.0	-
	3Dpose (HRNet-w32) [2]	<b>89.6</b>	<b>48.0</b>	-	-	-	-
Bottom up	Xnet [19]	75.8	-	-	-	70.4	-
	SMAP (Hourglass) [39]	<b>80.5</b>	<b>38.7</b>	<b>45.5</b>	<b>42.7</b>	<b>73.5</b>	<b>35.4</b>
Single-stage	<b>DRM (Ours, HRNet-w32)</b>	<b>85.1</b>	<b>41.0</b>	<b>45.6</b>	<b>45.4</b>	<b>80.9</b>	<b>39.3</b>

(b) Ablation Study of the Proposed components

<i>PDQM</i>	<i>DAPL</i>	PCK <sub>abs</sub> ↑	PCK <sub>root</sub> ↑	PCK <sub>rel</sub> ↑
		32.1	32.3	81.3
✓		35.5	40.8	81.4
	✓	39.8	44.1	83.7
✓	✓	<b>41.0</b>	<b>45.6</b>	<b>85.1</b>

(c) Qualitative Results

