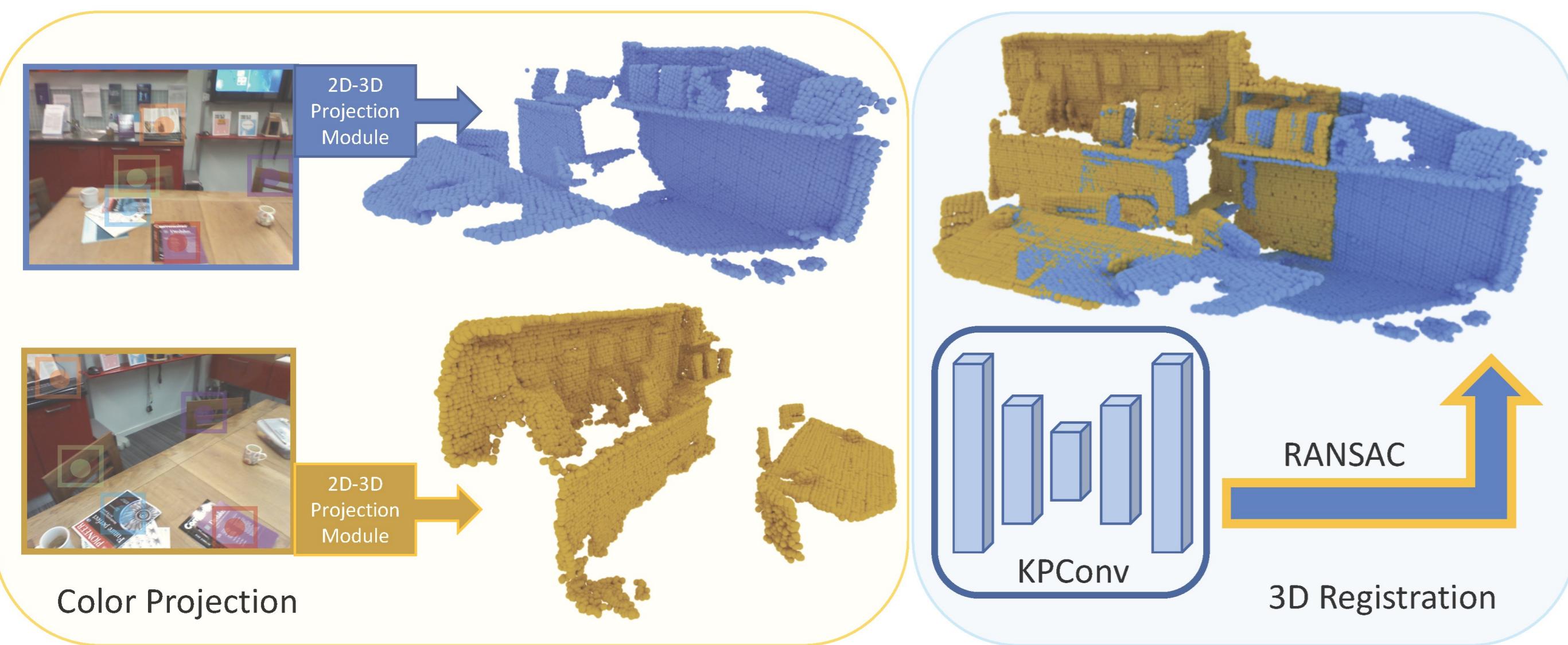




Code is available



Align Two Point Clouds in RGB-D Data

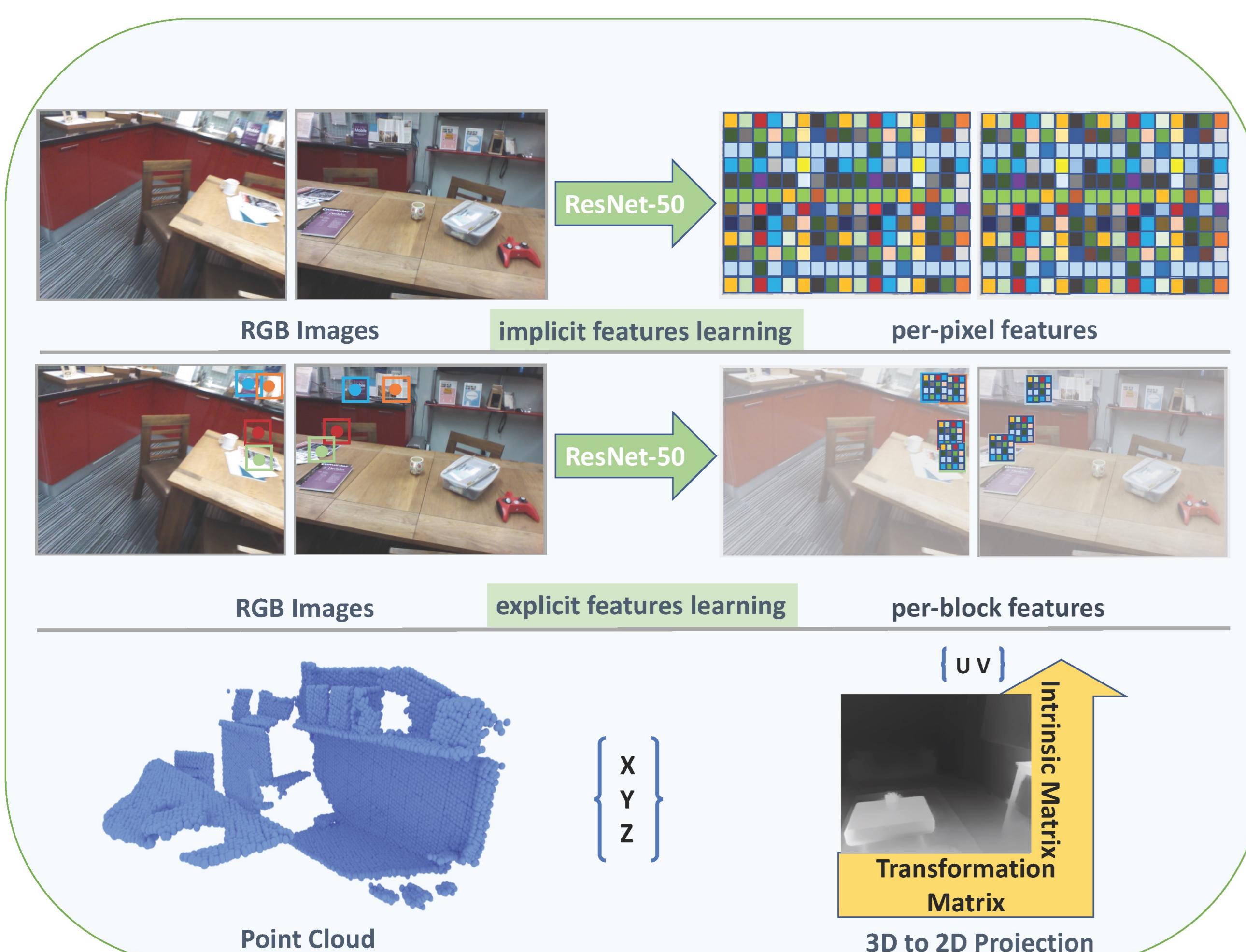


Our contributions:

- A novel 2D-3D projection module that explicitly embeds the 2D color into the point cloud for registration task.
- Empirical studies show the transfer ability of 2D pre-trained weights for 3D point cloud registration tasks.

Implicit vs. Explicit Features Learning

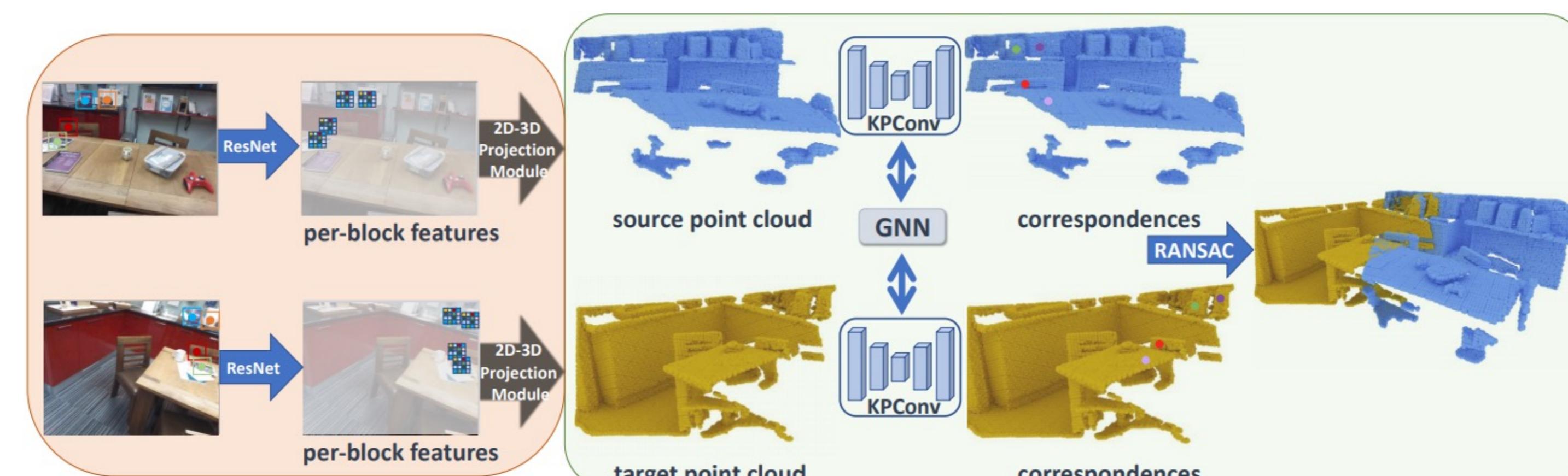
Implicit projection lifts the features of every pixel, while the other projects features of some certain pixels in an explicit manner.



Our Approach

The pipeline is composed of a 3D network, a 2D network and a 2D-3D projection module:

- The 2D network takes RGB images as input and extracts per-region features.
- A 2D-3D Projection Module is used to lift 2D pixel features into 3D point cloud explicitly.
- The concatenated features are fed into 3D network for finding correspondences.



Quantitative Results

# Sampled Points	3DMatch					3DLoMatch				
	5000	2500	1000	500	250	5000	2500	1000	500	250
Feature Matching Recall(%) ↑										
3DSN [16]	95.0	94.3	92.9	90.1	82.9	63.6	61.7	53.6	45.2	34.2
FCGF [10]	97.4	97.3	97.0	96.7	96.6	76.6	75.4	74.2	71.7	67.3
D3Feat [6]	95.6	95.4	94.5	94.1	93.1	67.3	66.7	67.0	66.7	66.5
SpinNet [1]	97.4	97.0	96.4	96.7	94.8	75.5	75.1	74.2	69.0	62.7
Predator [23]	96.6	96.6	96.5	96.3	96.5	78.6	77.4	76.3	75.7	75.3
CoFiNet [46]	98.1	98.3	98.1	98.2	98.3	83.1	83.5	83.3	83.1	82.6
Ours – PCR-CG	97.4	97.5	97.7	97.3	97.6	80.4	82.2	82.6	83.2	82.8
Registration Recall(%) ↑										
3DSN [16]	78.4	76.2	71.4	67.6	50.8	33.0	29.0	23.3	17.0	11.0
FCGF [10]	85.1	84.7	83.3	81.6	71.4	40.1	41.7	38.2	35.4	26.8
D3Feat [6]	81.6	84.5	83.4	82.4	77.9	37.2	42.7	46.9	43.8	39.1
SpinNet [1]	88.8	88.0	84.5	79.0	69.2	58.2	56.7	49.8	41.0	26.7
Predator [23]	89.0	89.9	90.6	88.5	86.6	59.8	61.2	62.4	60.8	58.1
CoFiNet [46]	89.3	88.9	88.4	87.4	87.0	67.5	66.2	64.2	63.1	61.0
Ours – PCR-CG	89.4	90.7	90.0	88.7	86.8	66.3	67.2	69.0	68.5	65.0
3DMatch										
		RRE (°)	RTE (m)			RRE (°)	RTE (m)			
3DSN [16]		2.199	0.071			3.528	0.103			
FCGF [10]		1.949	0.066			3.146	0.100			
D3Feat [6]		2.161	0.067			3.361	0.103			
Predator [23]		2.029	0.064			3.048	0.093			
CoFiNet [46]		2.002	0.064			3.271	0.090			
Ours – PCR-CG		1.993	0.061			3.002	0.087			

Qualitative Results

