

# Consensus Learning with Deep Sets for Essential Matrix Estimation - Rebuttal

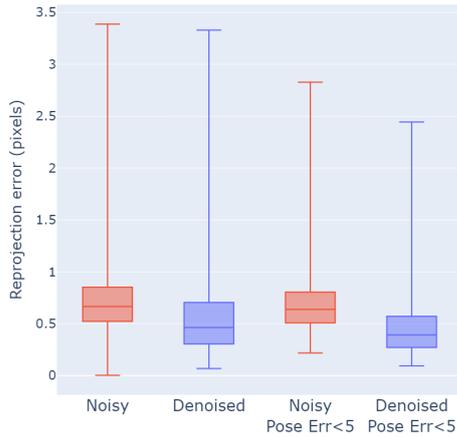


Figure R.1: **Denoising evaluation.** Reprojection error of inlier key-points before and after applying our denoising scheme, computed using the ground truth pose. The box plots show the 0.25, 0.5, and 0.75 quantiles. The two left bar plots represent the evaluation over all the image pairs in the YFCC dataset. The right two bar plots focus on image pairs whose pose prediction was accurate (i.e., pose error below  $5^\circ$ , where the pose error is defined as the maximum of the translation and rotation angular errors.) Evaluation was conducted on the YFCC dataset using SIFT descriptors.

| Methods   | #Params (M) | Max GPU Mem (MB) | Runtime Avg.(ms) |
|-----------|-------------|------------------|------------------|
| GC-RANSAC | -           | -                | 217.3            |
| MAGASAC++ | -           | -                | 295.29           |
| NCMNet    | <b>4.77</b> | 174.52           | 67.43            |
| BCLNet    | 4.87        | 140.91           | 46.94            |
| Ours      | 22.14       | <b>130.75</b>    | <b>11.12</b>     |

Table R.1: **Resource Usage**, tested on YFCC with SIFT descriptors. We used for GPU an NVIDIA GeForce RTX 2080Ti and for CPU an Intel(R) Xeon(R) Gold 6248 CPU @ 2.50GHz.

| Methods | mAP(%)       |             |              |              |
|---------|--------------|-------------|--------------|--------------|
|         | $5^\circ$    | $10^\circ$  | $20^\circ$   | $30^\circ$   |
| NCMNet  | 8.6          | 15.16       | 25.65        | 33.56        |
| Ours    | <b>10.33</b> | <b>17.9</b> | <b>28.55</b> | <b>36.08</b> |

Table R.2: **ScanNet.** Evaluation of camera pose on the ScanNet dataset with models trained on SUN3D and SIFT descriptors. SuperGlue test split was used.

| Methods                | In-scene    |             |             | Cross-scene |             |             |
|------------------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                        | P(%)        | R(%)        | F1(%)       | P(%)        | R(%)        | F1(%)       |
| RANSAC                 | 47.4        | 52.6        | 49.9        | 43.5        | 50.6        | 46.8        |
| PointNet++             | 49.8        | 86.4        | 63.2        | 46.6        | 84.1        | 59.9        |
| LFGC                   | 56.6        | 86.3        | 68.3        | 54.6        | 84.7        | 66.4        |
| OANet++                | 60.0        | 89.3        | 71.8        | 55.7        | 85.9        | 67.6        |
| MSA-Net                | 61.9        | 90.5        | 73.5        | 58.7        | 87.9        | 70.4        |
| CLNet                  | 76.0        | 79.2        | 77.6        | 75.0        | 76.4        | 75.7        |
| MS <sup>2</sup> DG-Net | 63.1        | 90.9        | 74.5        | 59.1        | 88.4        | 70.8        |
| ConvMatch              | 63.0        | <b>91.5</b> | 74.6        | 58.7        | <b>89.3</b> | 70.9        |
| NCMNet                 | 78.4        | 81.7        | 79.6        | 77.0        | 78.2        | 77.4        |
| BCLNet                 | 78.4        | 82.5        | 80.1        | 77.3        | 79.7        | 78.3        |
| Ours                   | <b>84.6</b> | 82.9        | <b>83.2</b> | <b>82.2</b> | 79.1        | <b>80.2</b> |

Table R.3: **Classification Evaluation.** Inlier/outlier classification results on the YFCC dataset and SIFT descriptors. Precision(P), Recall(R), and F1 score are reported.

| Category      | Range            | SIFT              |        | SuperPoint        |        |
|---------------|------------------|-------------------|--------|-------------------|--------|
|               |                  | mAP $5^\circ$ (%) | #Pairs | mAP $5^\circ$ (%) | #Pairs |
| Base          |                  | 66.14             | 4000   | 59.10             | 4000   |
| Outlier ratio | [0, 0.7]         | 69.99             | 30     | 74.77             | 1098   |
|               | (0.7, 0.8]       | 82.22             | 225    | 70.67             | 914    |
|               | (0.8, 0.9]       | 80.30             | 1381   | 54.61             | 1278   |
|               | (0.9, 1]         | 56.30             | 2364   | 28.02             | 710    |
| # inliers     | [0, 100]         | 32.90             | 702    | 20.21             | 282    |
|               | (100, 200]       | 66.39             | 1693   | 36.20             | 674    |
|               | (200, $\infty$ ) | 80.43             | 1605   | 67.77             | 3044   |

Table R.4: **Evaluation with data partition.** Essential matrix estimation accuracies on the YFCC dataset with different ratios (top rows) and numbers (bottom rows) of inliers/outliers.

| Exp.          | In-scene     | Cross-scene  |
|---------------|--------------|--------------|
| Base          | <b>60.10</b> | <b>66.14</b> |
| 2NAC blocks   | 53.52        | 59.75        |
| Enc. Dim. 256 | 54.86        | 63.47        |

Table R.5: **Hyperparameters ablation studies.** Evaluation of our model with 2NAC blocks, encoder dimension of 256 and no classification head. Tested on YFCC using SIFT descriptors.