

# BlurPoint: Efficient Motion Blur Aware Student-Teacher Local Feature Learning

Wenting Wang, Zhenjun Zhao, Jiabin Guo, Yun-Hui Liu, Charlie C.L. Wang, Yeung Yam



The Chinese University of Hong Kong  
Centre for Perceptual and Interactive Intelligence (CPII) Limited  
University of Zaragoza  
The University of Manchester

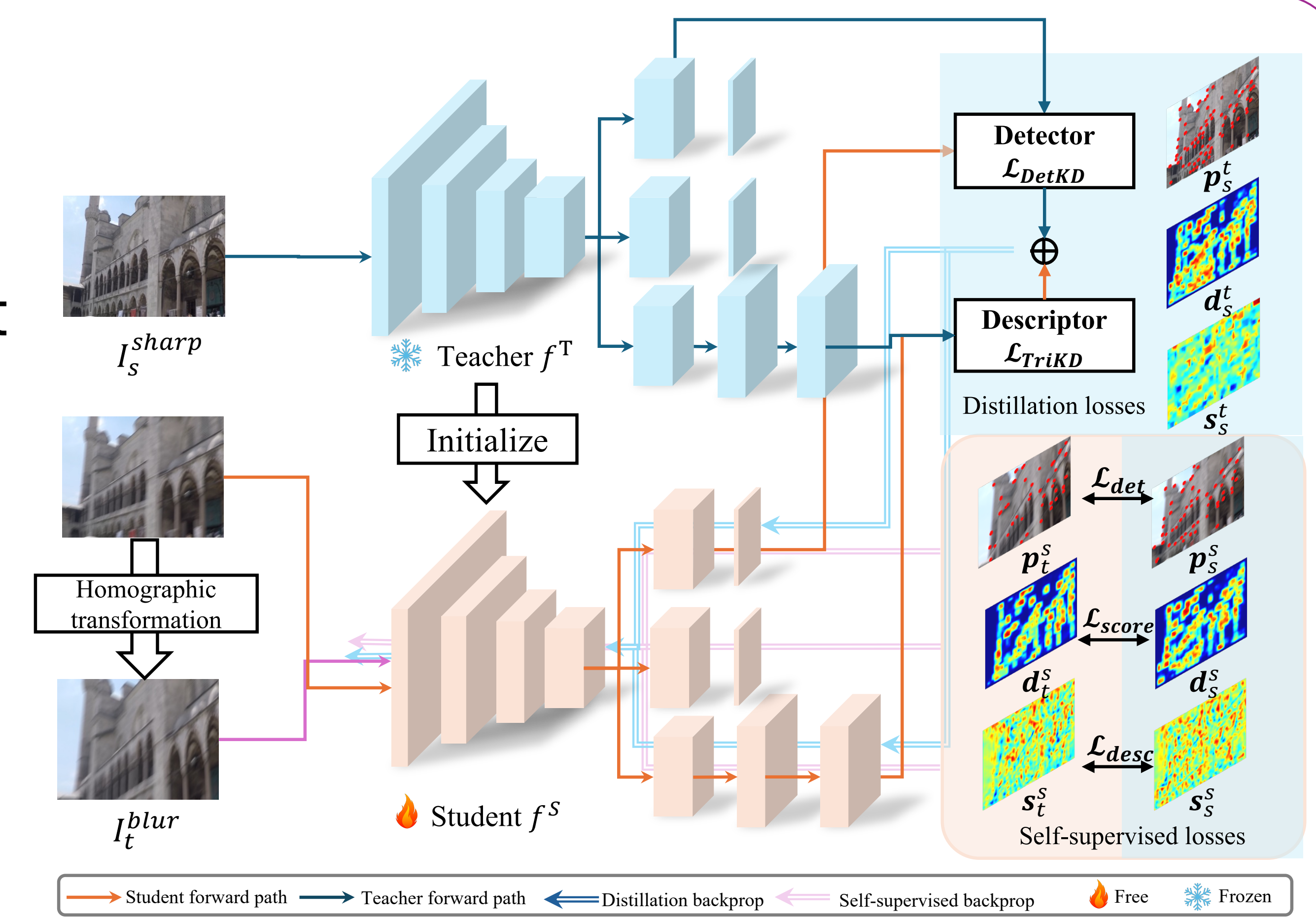


## Motivations

- Motion blur degrades local feature matching.
- Deblur-then-match introduces artifacts and latency.
- Blur-aware descriptors remain underexplored and robust matching needed for low-light robotics.
- Goal: motion blur aware joint detector and descriptor.

## Methodology

- Student-teacher framework transfers sharp knowledge to blurred feature learning.
- Self-supervised homography consistency without requiring ground-truth labels.
- Feature divergence loss aligns detector feature distributions across domains.
- Triplet distillation improves descriptor consistency under motion blur.
- End-to-end motion blur-aware feature extraction without explicit deblurring.



## Experiment Result

- Evaluated on HPatches, Blur-HPatches and Deblur-HPatches benchmarks.
- Achieves superior matching accuracy under severe motion blur on both synthetic and real-world data.
- Significantly improves the accuracy of two downstream tasks, indoor relative pose estimation and visual localization.
- Outperforms deblur-then-match pipelines in robustness and efficiency and maintains competitive performance on sharp image matching tasks.

TABLE I  
QUANTITATIVE RESULTS ON THE HPATCHES [42] AND BLUR-HPATCHES [25] DATASETS. THE PROPOSED METHOD ACHIEVES THE BEST PERFORMANCE ON BOTH SHARP-TO-BLUR AND BLUR-TO-BLUR CONFIGURATIONS. THE 1ST, 2ND, AND 3RD -BEST METHODS ARE HIGHLIGHTED.

| Methods                          | Reference: Sharp<br>Target: Sharp |              |              |              | Reference: Sharp<br>Target: Blur |              |              |              | Reference: Blur<br>Target: Blur |              |              |              |
|----------------------------------|-----------------------------------|--------------|--------------|--------------|----------------------------------|--------------|--------------|--------------|---------------------------------|--------------|--------------|--------------|
|                                  | Repeat. ↑                         | Cor-1 ↑      | Cor-3 ↑      | Cor-5 ↑      | Repeat. ↑                        | Cor-1 ↑      | Cor-3 ↑      | Cor-5 ↑      | Repeat. ↑                       | Cor-1 ↑      | Cor-3 ↑      | Cor-5 ↑      |
| <b>Sparse</b>                    |                                   |              |              |              |                                  |              |              |              |                                 |              |              |              |
| SIFT [16]                        | 0.404                             | 0.483        | 0.759        | 0.855        | 0.222                            | 0.128        | 0.410        | 0.545        | 0.323                           | 0.121        | 0.412        | 0.536        |
| SuperPoint [18] + NN             | 0.503                             | 0.202        | 0.428        | 0.478        | 0.351                            | 0.024        | 0.181        | 0.333        | 0.335                           | 0.019        | 0.150        | 0.297        |
| SuperPoint [18] + LightGlue [40] | 0.593                             | 0.409        | 0.821        | 0.909        | 0.443                            | 0.059        | 0.367        | 0.621        | 0.405                           | 0.041        | 0.319        | 0.564        |
| KP2D [24]                        | 0.644                             | 0.455        | 0.791        | 0.893        | 0.533                            | 0.126        | 0.347        | 0.462        | 0.536                           | 0.166        | 0.395        | 0.514        |
| LANet [26]                       | 0.666                             | 0.500        | 0.686        | 0.762        | 0.523                            | 0.209        | 0.543        | 0.597        | 0.549                           | 0.244        | 0.545        | 0.619        |
| BALF [25] + HardNet [41] + NN    | 0.488                             | 0.255        | 0.667        | 0.822        | 0.323                            | 0.026        | 0.322        | 0.584        | 0.346                           | 0.055        | 0.331        | 0.548        |
| <b>Semi-Dense</b>                |                                   |              |              |              |                                  |              |              |              |                                 |              |              |              |
| LoFTR [23]                       | 0.935                             | 0.597        | 0.852        | 0.914        | 0.548                            | 0.240        | 0.566        | 0.659        | 0.552                           | 0.241        | 0.581        | 0.686        |
| AspanFormer [38]                 | 0.589                             | 0.379        | 0.479        | 0.484        | 0.552                            | 0.176        | 0.417        | 0.450        | 0.557                           | 0.172        | 0.409        | 0.445        |
| MatchFormer [39]                 | 0.476                             | 0.398        | 0.466        | 0.481        | 0.430                            | 0.216        | 0.452        | 0.467        | 0.444                           | 0.226        | 0.453        | 0.472        |
| <b>BlurPoint (Ours)</b>          | <b>0.675</b>                      | <b>0.490</b> | <b>0.847</b> | <b>0.910</b> | <b>0.573</b>                     | <b>0.212</b> | <b>0.652</b> | <b>0.809</b> | <b>0.592</b>                    | <b>0.252</b> | <b>0.669</b> | <b>0.798</b> |

