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# HyNet: Local Descriptor with Hybrid Similarity Measure

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## 1 Image Matching Challenge 2020

We further evaluate HyNet on the newly proposed Image Matching Challenge<sup>1</sup> (IMC) dataset [1]. It consists of two tasks, namely wide-baseline stereo and multi-view reconstruction. Since the ground truth for the test set is not released, we report the performance on the validation set. For fair comparison, we use Key.Net [2] as the detector and compare HyNet with two other state-of-the-art descriptors, HardNet [3] and SOSNet [4]. The evaluation protocol is with a maximum of 2048 keypoints per image and standard descriptor size (512 bytes). We use DEGENSAC [5] for geometric verification, and nearest-neighbour matcher with first-to-second nearest-neighbour ratio test for filtering false-positive matches. Please refer to [1] for exact details of the challenge’s settings.

	mAA (%)		
	Stereo	Multi-View	Average
HardNet [3]	63.40	74.41	68.91
SOSNet [4]	63.41	74.51	68.96
HyNet	<b>64.07</b>	<b>74.84</b>	<b>69.46</b>

Table 1: Mean Average Accuracy (mAA) at 10° on IMC dataset [1].

As can be seen from Table 1, HyNet surpasses the previous state-of-the-art methods HardNet and SOSNet on both tasks, which further validates its effectiveness.

## 2 Integrating HyNet with SOSR

In this section, we test HyNet by combining it with the Second Order Similarity Regularisation (SOSR) proposed in [4], results are shown in Table 2 and Fig. 1. As shown, HyNet generalises well with the extra supervision signal from SOSR, indicating its potential of being further boosted by other third-party loss terms.

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<sup>1</sup><https://vision.uvic.ca/image-matching-challenge/benchmark/>

Train	ND	YOS	LIB	YOS	LIB	ND	Mean
Test	LIB		ND		YOS		
SIFT [6]	29.84		22.53		27.29		26.55
HardNet [3]	1.49	2.51	0.53	0.78	1.96	1.84	1.51
SOSNet [4]	1.08	2.12	0.35	0.67	1.03	0.95	1.03
HyNet	<b>0.89</b>	<b>1.37</b>	0.34	0.61	0.88	0.96	0.84
HyNet+SOSR [4]	0.91	1.62	<b>0.31</b>	<b>0.54</b>	<b>0.78</b>	<b>0.73</b>	<b>0.82</b>

Table 2: Patch verification performance on the UBC phototour dataset. Numbers denote false positive rates at 95% recall(FPR@95). ND: Notredame, LIB: Liberty, YOS: Yosemite.

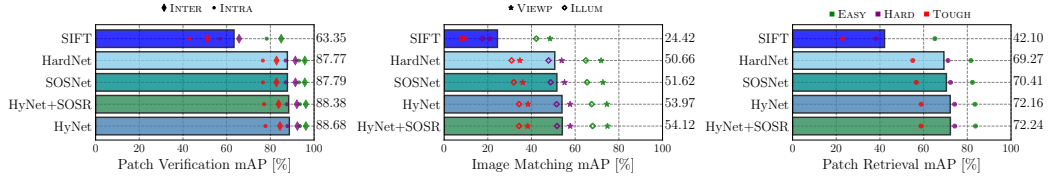


Figure 1: Results on test set ‘a’ of HPatches [7]. Colour of the marker indicates EASY, HARD, and TOUGH noise. The type of marker corresponds to the variants of the experimental settings.

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