Multimodal Data Augmentation for Visual-Infrared Person ReID with Corrupted Data (Supplementary)

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1. Thermal modality corruptions:

In practice, except for the brightness corruption, each and every other corruptions from the 20 corruptions [1] appeared to be meaningful for the thermal modality as well. Concerning the brightness changes, the thermal modality is not impacted by the current luminosity so this corruption is removed. Then, all others applicable, with eventually few slight adjustments that we describe here. Those corruptions are visible Fig. 1. The different forms of noises, like Gaussian, Shot, Impulse, Speckle are applied similarly, except that we turned the noise into greyscale values while combining it with the original IR images. Speckle and frost are two other corruptions which needed to be grayscaled before being applied on the thermal images. Indeed, they initially apply eventual color changes on the images, with blue colored water or brown colored dirt for spatter, and blue frozen masks for frost. As a last adjustment, the saturation is expressed differently for the IR modality, brightening eventually the object of interest if this one is too close to the camera. Regarding this expression of the thermal saturation, we applied in practice the brightness function as ease to mimic it. Then, every other corruptions are affecting similarly both modalities, so we applied them the exact same ways.

2. Additional experiments - Intuitive data augmentation

For additional interpretations, two common corruptions that are part of the corrupted test sets are used as a data augmentation strategy.

Approach. As the idea is to keep a degree of blindness with the test set encountered corruptions, those two data augmentation corruptions are applied at a fixed intensity. The first data augmentation is the Gaussian blur corruption, applied with a blur radius of 3 for both the RGB and the IR. The latter is the RGB's luminosity changes and the IR modality's image saturation. The luminosity changes are whether increasing RGB brightness by an enhancement factor 2 or decreasing it by a factor 0.5. The saturation for the IR is changed by increasing the enhancement factor to 1.5. Each of those augmentation occurs with equiprobability on the RGB and the IR modality, with a probability of $1/8$. As those corruptions are part of the corrupted test set, which biased the obtained performances, these results will only be used for comparison but are not proposed as a solution for better generalization.

Results. The obtained results are gathered table 1 Looking at the reached performances by blur data augmentation or luminosity and saturation ones, it appears that those strategies are significantly improving over Augmix on the -C* setting. From those results only, we cannot know how well it allows the model to generalize over other types of corruption. However, it is clear that it helps and probably comes from better handling the related corruptions in the test corrupted test set. Still, the Masking strategy compares well with those for both SYSU-MM01-C* and RegDB-C* while not introducing bias in the results, which is a great observation. Also, the MS-REA approach is much ahead of those results, showing that the strategy allows a great generalization power while not introducing such bias to the results.

References

[1] Minghui Chen, Zhiqiang Wang, and Feng Zheng. Benchmarks for corruption invariant person re-identification. *arXiv preprint arXiv:2111.00880*, 2021.

[2] Dan Hendrycks, Norman Mu, Ekin D Cubuk, Barret Zoph, Justin Gilmer, and Balaji Lakshminarayanan. Augmix: A simple data processing method to improve robustness and uncertainty. *arXiv preprint arXiv:1912.02781*, 2019.

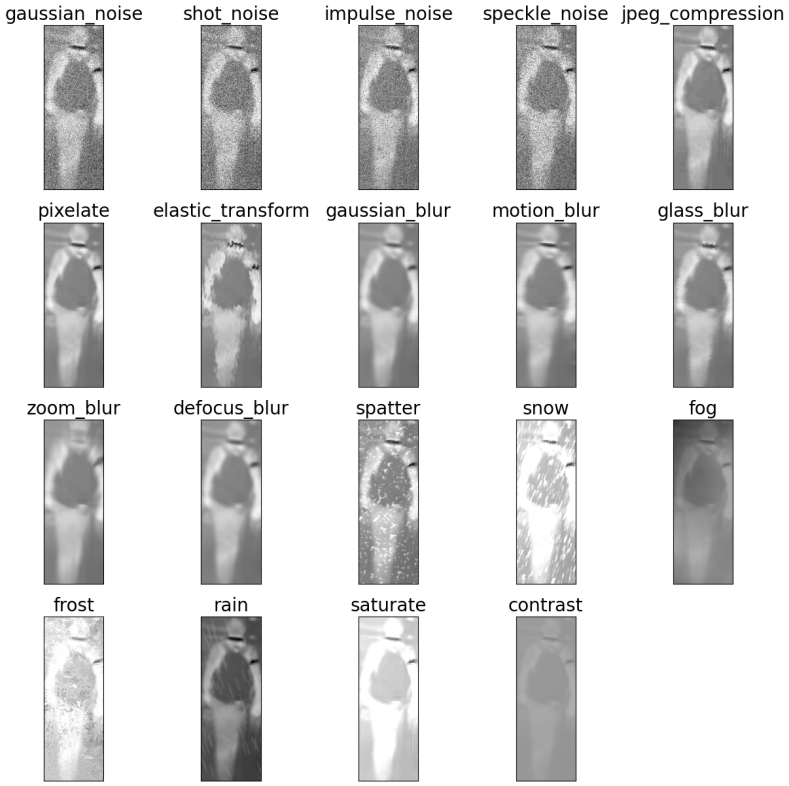

Figure 1. Taxonomy of our 19 used thermal corruptions, all applied on level 3.

Table 1. Comparison of the various data augmentation strategies, with standard being the multimodal concatenation model without specific augmentation, to standard Augmix [2] and Augmix with one or another data augmentation. This table gather random activation, Patch, Masking and intuitive corruptions related strategies.

	SYSU		**SYSU-C***		**RegDB**		**RegDB-C***		**Tworld**		**Tworld-C***	
	mAP	mINP	mAP	mINP	mAP	mINP	mAP	mINP	mAP	mINP	mAP	mINP
Standard	96.47	73.69	25.01	1.90	99.64	98.46	21.80	2.40	87.90	49.05	29.30	3.93
Augmix [2]	95.37	68.60	35.23	2.56	99.88	99.40	40.75	9.10	87.12	46.33	42.26	5.69
+ S-REA [1]	96.21	74.36	43.24	4.06	99.90	99.51	43.84	10.25	89.24	50.10	54.14	8.92
+ MS-REA	**96.81**	**77.02**	**61.44**	**8.34**	99.86	99.35	**57.84**	**19.38**	88.95	49.92	**58.10**	**9.89**
+ S-PATCH [1]	96.40	74.89	31.39	2.14	99.90	99.53	41.83	9.39	89.12	50.53	40.73	5.63
+ MS-PATCH	94.70	69.10	33.69	2.17	99.89	99.41	40.97	9.34	**89.26**	**51.26**	41.75	5.57
+ M-PATCH-SS	96.10	73.40	35.49	2.44	99.86	99.34	43.28	10.68	88.35	50.16	44.41	5.61
+ M-PATCH-SD	95.94	72.93	35.10	2.40	99.87	99.35	42.95	10.31	88.58	51.59	43.49	5.53
+ M-PATCH-DD	94.98	68.95	33.90	2.42	99.89	99.48	41.98	9.71	88.49	51.35	43.90	5.51
+ Masking	95.61	73.49	40.92	2.90	**99.90**	**99.52**	49.27	12.10	86.01	42.76	39.91	6.16
+ Blur	94.77	69.38	41.72	3.06	99.86	99.33	45.68	11.66	88.05	51.36	50.36	7.66
+ Lum - Sat	94.99	70.31	38.54	2.79	99.79	99.00	54.05	17.89	88.01	50.25	44.09	5.73