Rethinking Illumination for Person Re-Identification: A Unified View

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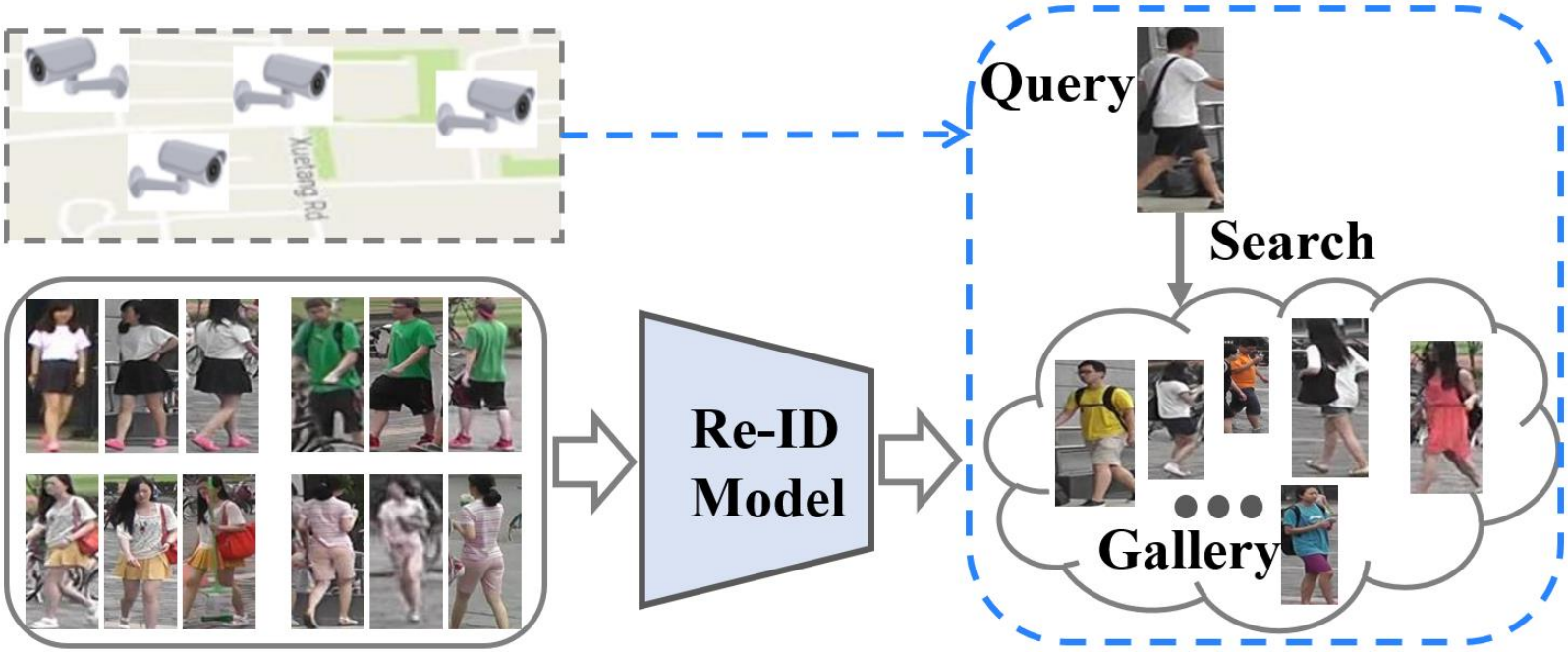
Introduction: Person Re-ID

- Retrieve a specific person in a large gallery

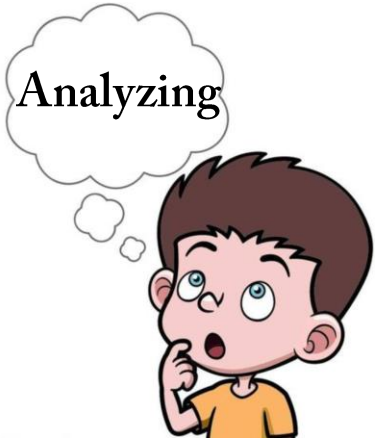


Dataset engine

Person identities

Weather/Illumination

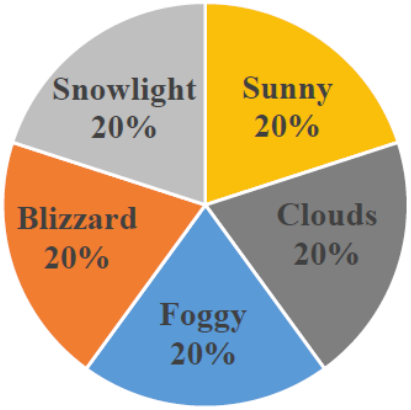
How visual factors affect re-ID system ?



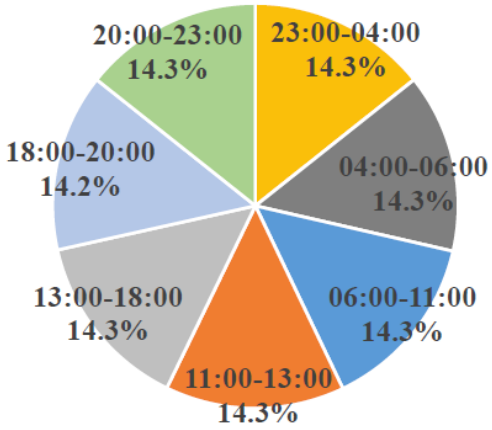
Our SynPerson dataset

https://github.com/JeremyXSC/SynPerson

Our SynPerson dataset

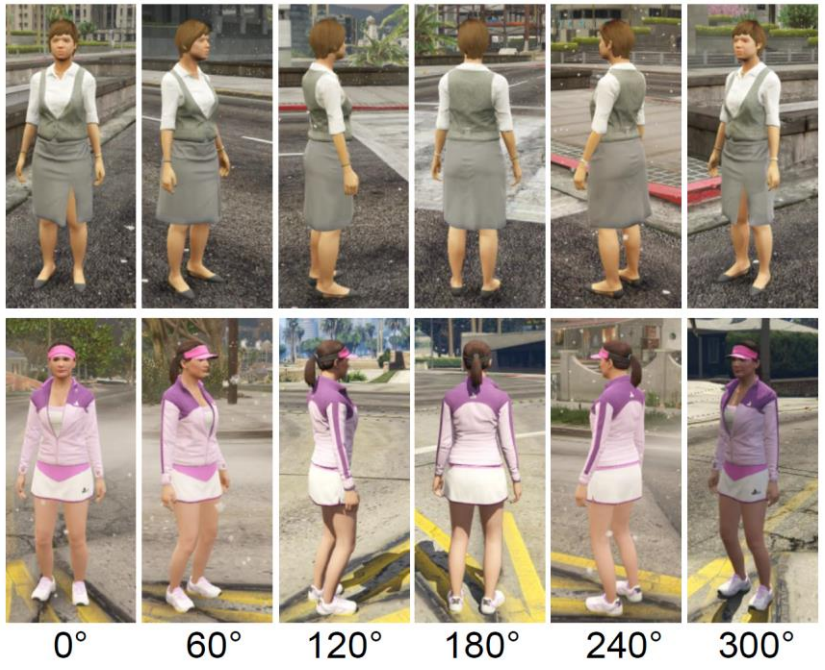


(1) weather



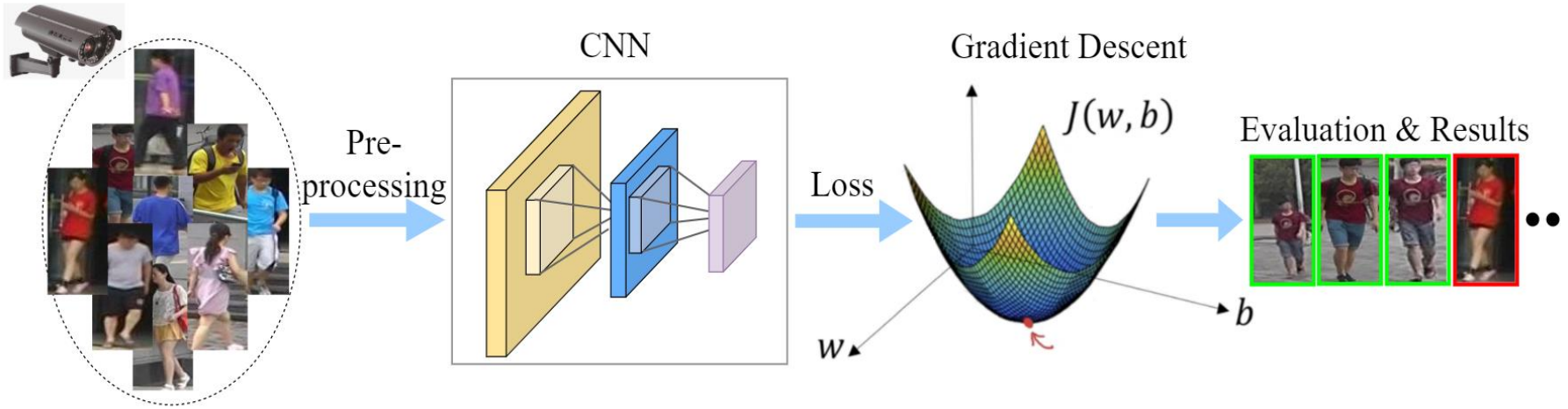
(2) illumination

Viewpoint



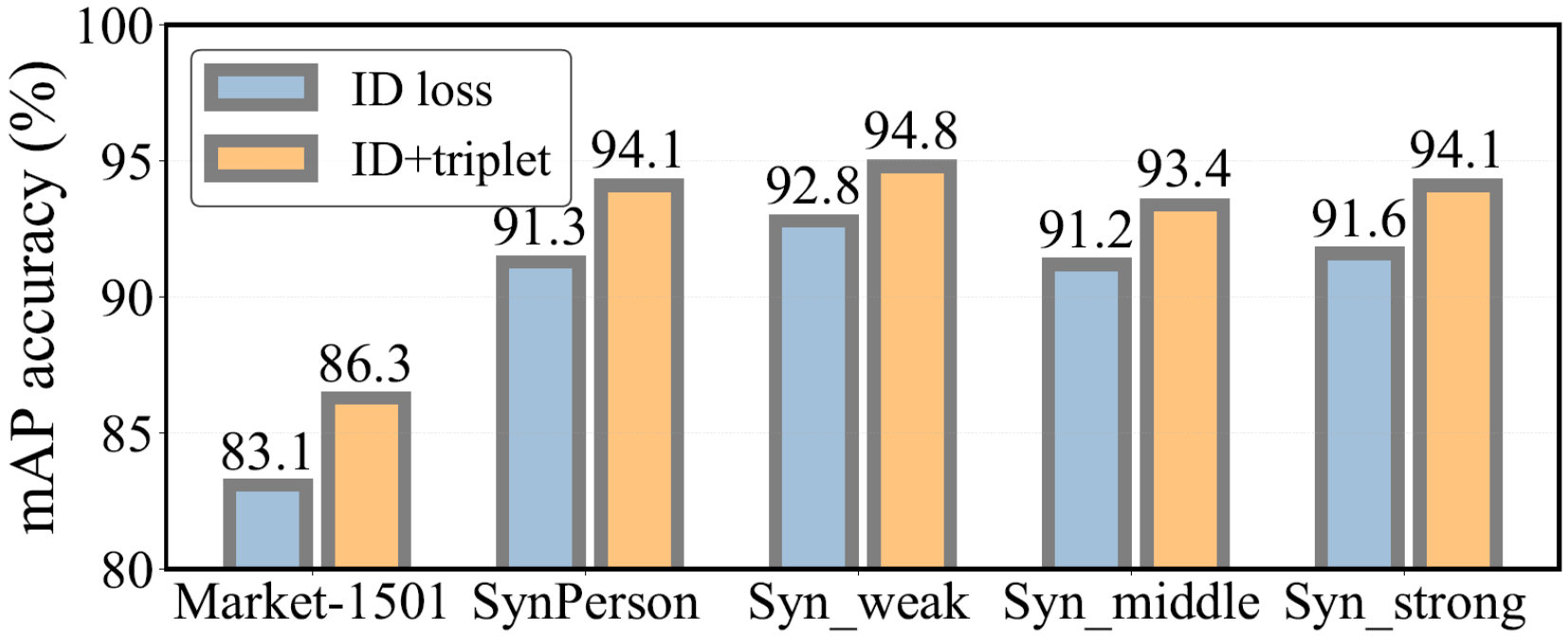
Background

Backbone



https://github.com/Cysu/open-reid

Benchmarking Validation



Performance of re-ID system on real-world datasets and SynPerson dataset with different loss functions

Evaluation of Illumination

- How Do Illumination Distributions in the Training Set Affect Model Learning?
- How Does Query Illumination Affect Retrieval?
- How Do True Match Illuminations in the Gallery Affect Retrieval ?

Results

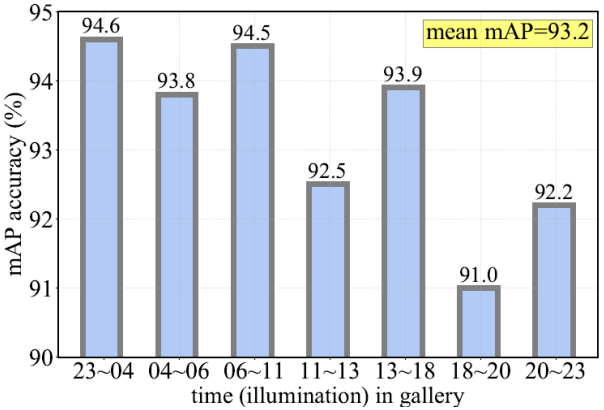
How Do Illumination Distributions in the Training Set Affect Model Learning?

Experiment	Bboxes	Components			SynPerson		
		W	M	S	mAP	rank-1	rank-5
Group 1	43,930	✓			63.2	93.2	98.6
Group 2	43,930		✓		78.0	96.1	99.3
Group 3	43,930			✓	60.9	95.0	98.9
Group 4	43,930	✓	✓		90.3	97.4	99.5
Group 5	43,930	✓	✓	✓	93.8	98.5	99.8

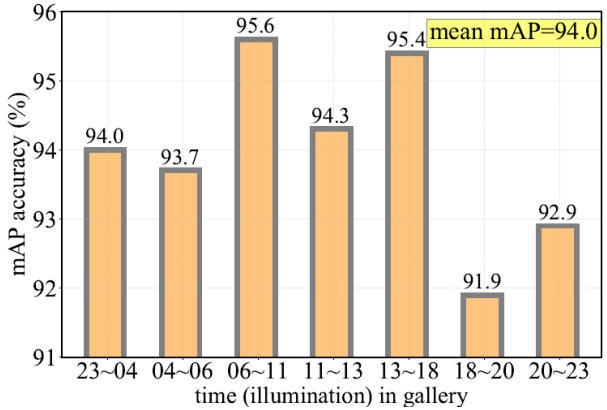
- Person with a Weak or Strong illumination may deteriorate the model performance in some degree.
- Using more illumination categories is always beneficial to the re-ID system.

Results

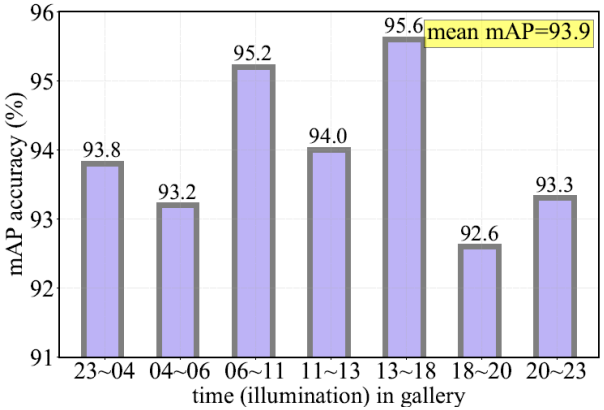
How Does Query Illumination Affect Retrieval?



(a) Weak light in query set



(b) Middle light in query set

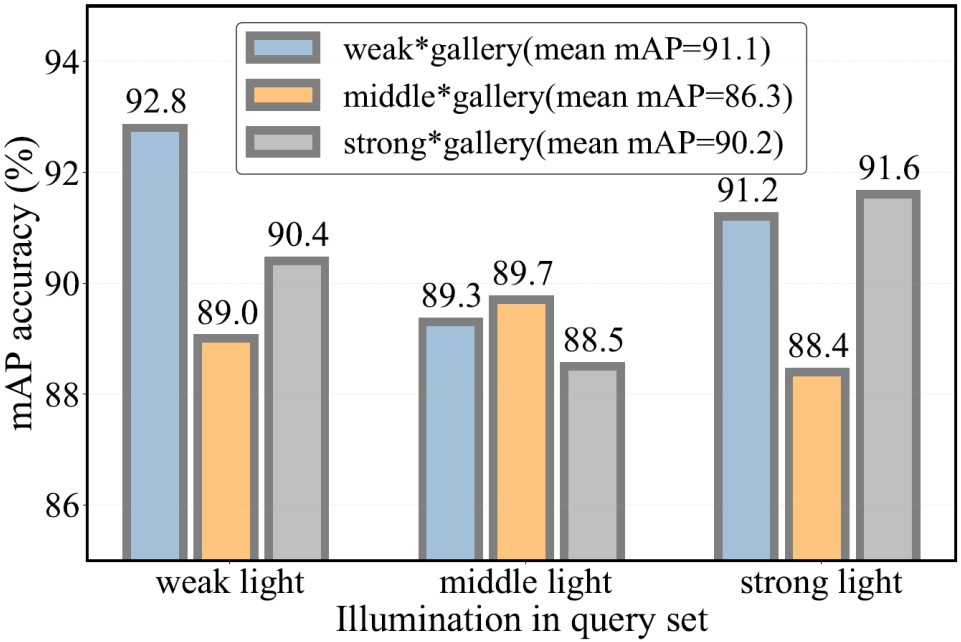


(c) Strong light in query set

- Highest re-ID accuracy can be achieved when the illumination of the true match is similar to the query.
- Queries of the due Middle Light and due Strong Light lead to a higher mAP accuracy than queries of the due Weak Light.

Results

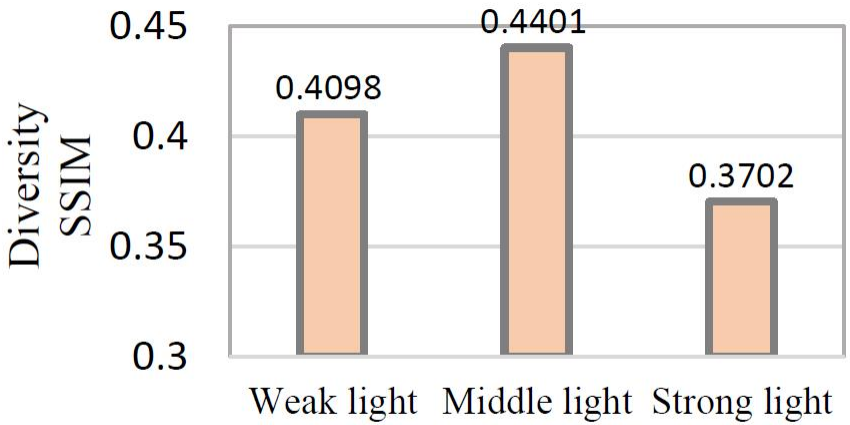
How Does Query Illumination Affect Retrieval?



- There will be a nontrivial performance drop if true matches with same illumination are not in the gallery set, .
- The accuracy decrease caused by illumination disparity between a query and its true match in gallery becomes more obvious especially when the illumination variation becomes more challenging

Discussion

(a)



(b)

- ✓ There exists a large illumination variation among subset of Middle Light due to its discontinuous time period
- ✓ The discriminability of re-ID model will be negatively affected in a scenario with a larger illumination variation

Future Work

- ✓ How to eliminate the negative impacts of large illumination of train-set on the discriminability of Re-ID model.
- ✓ Further exploring the influences of these visual factors on other human-related tasks, such as pose estimation and human part segmentation.

Thank you!