Self-supervising Fine-grained Region Similarities for Large-scale Image Localization





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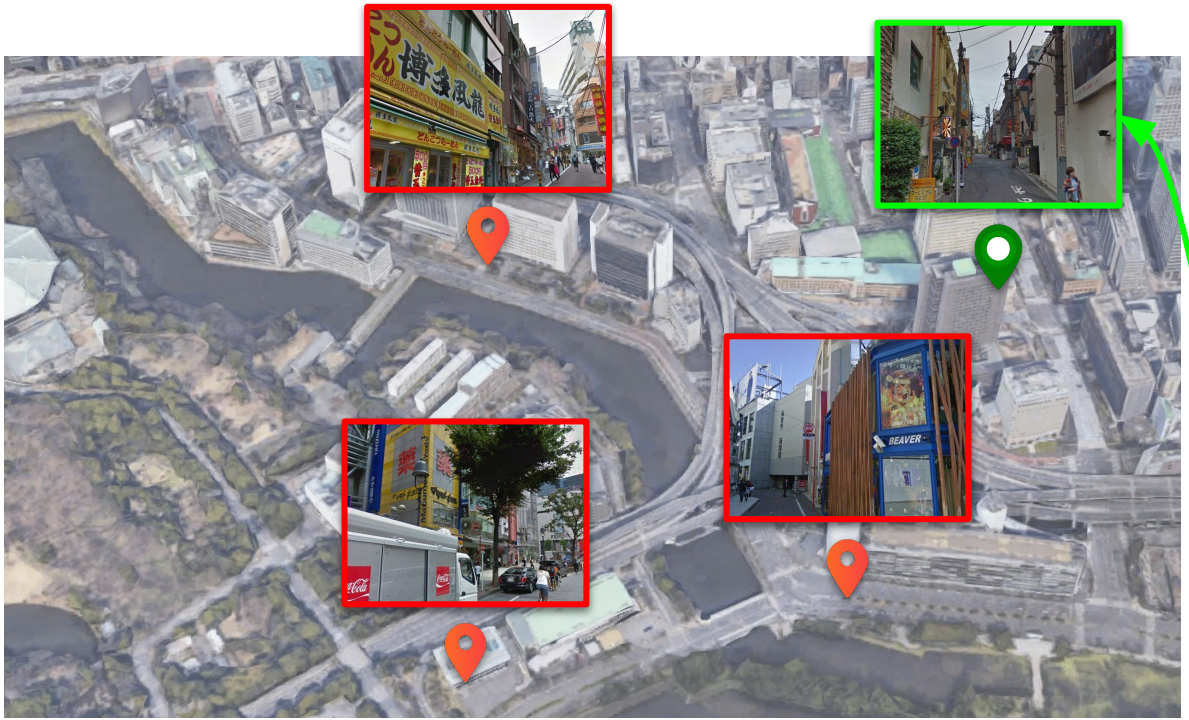
Image Localization via Image Retrieval



Query image

Nearest neighbor search

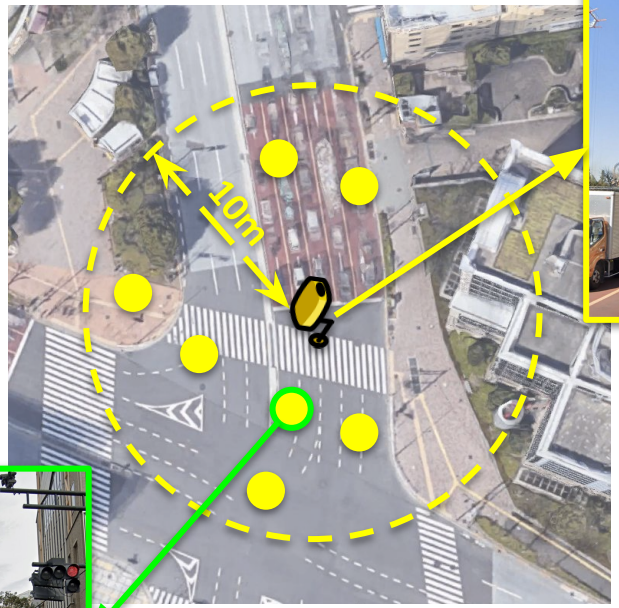
Top-ranking database images with GPS tags

Challenge #1: Noisy Positives by Weak GPS Labels

Geographically close-by images may not depict the same scene when facing different directions.

Previous Solution: Train with Only the Easiest Positive

Potential positives filtered by GPS labels



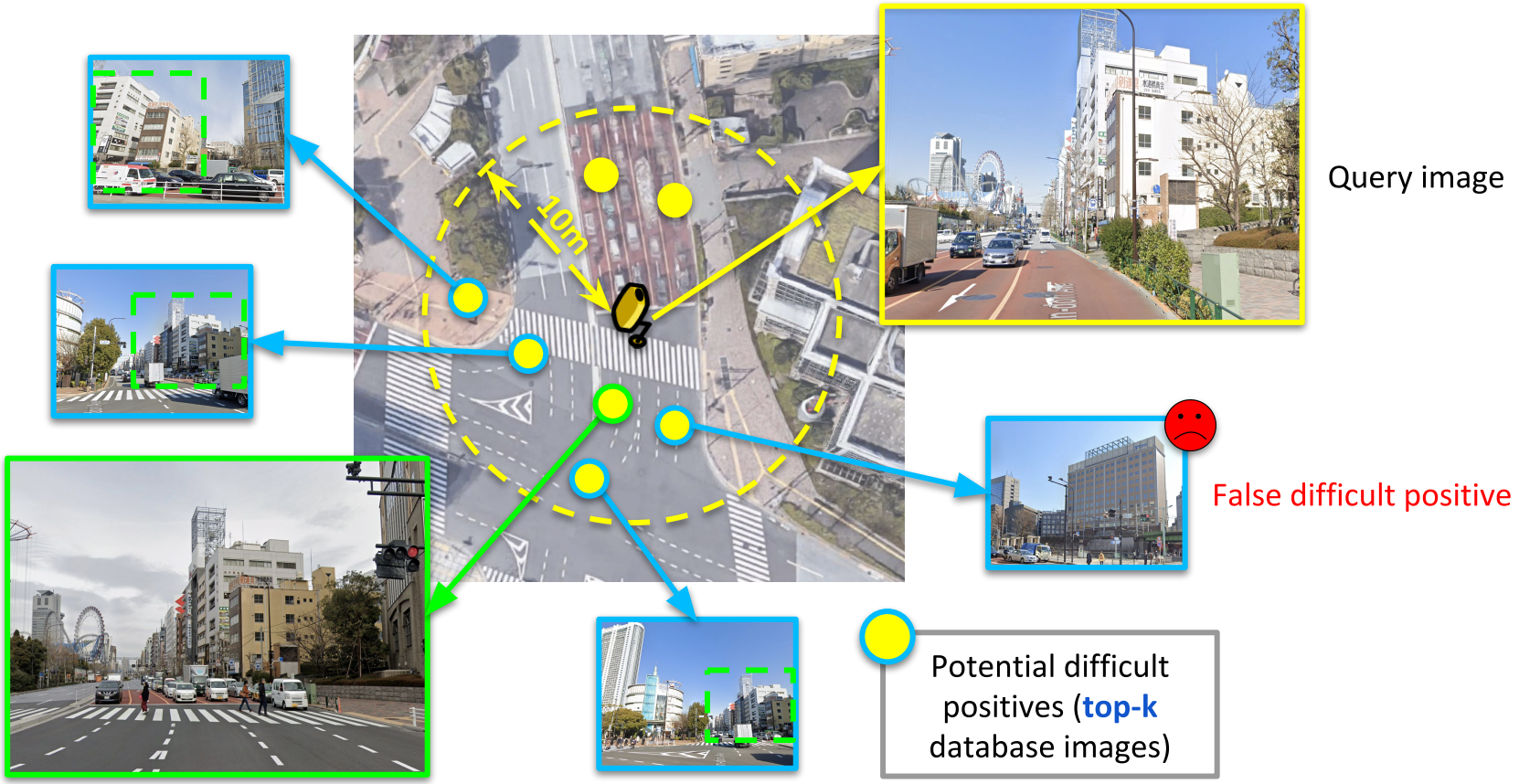
Query image

Top-1 database image

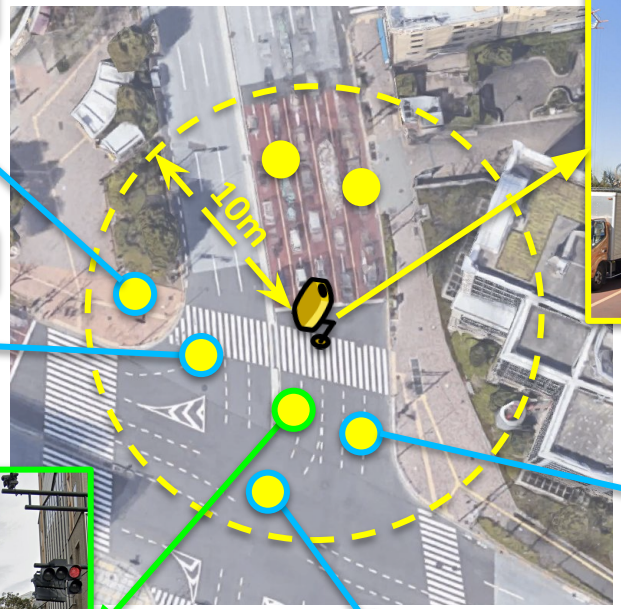
Forcing the queries to be closer to their already nearest neighbors results in a lack of robustness to varying conditions.

Difficult positives are needed!

Motivation: Use Noisy Difficult Positives Properly

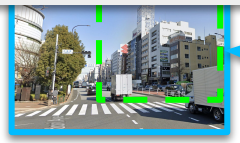


Our Solution: Image Similarities as Soft Supervisions



Similarity label = 0.6

Similarity label = 0.5



Query image

Similarity label = 1.0

Small similarity label
for ***false*** difficult positive

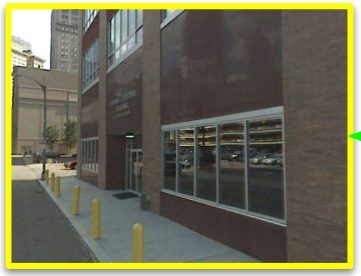
Similarity label = 0.1

Small similarity label for ***true*** difficult
positive with ***small overlapping regions***

Similarity label = 0.3

Challenge #2: Lack of Region-level Supervisions

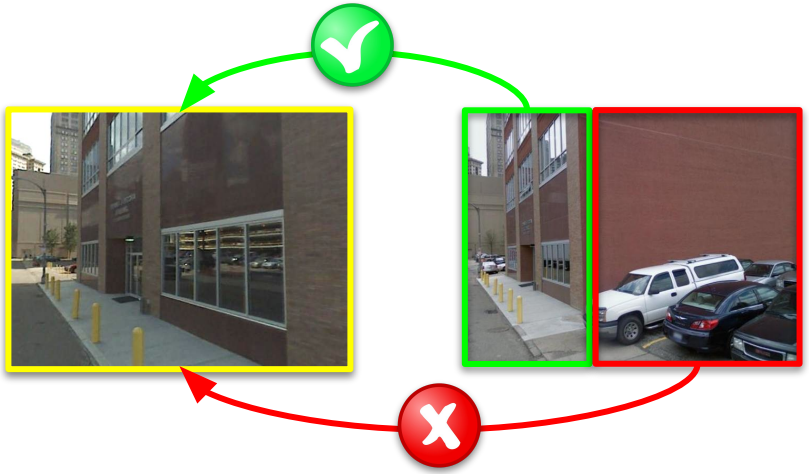
Only image-level labels



Query image

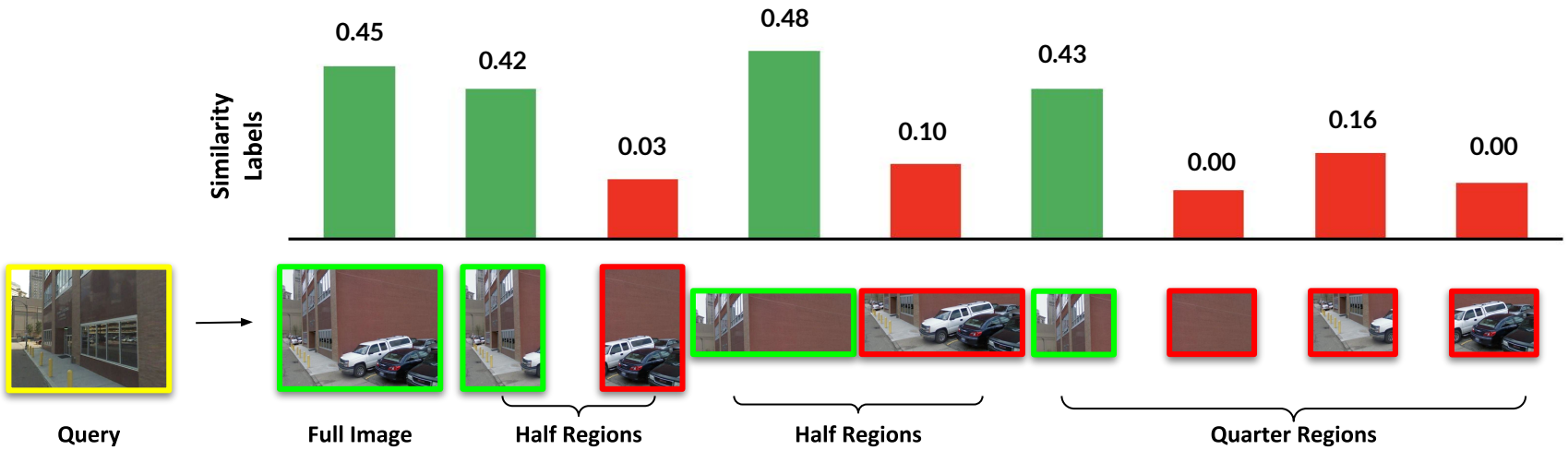
Positive sample

Ideal image-to-region labels



The correct image-level labels might not necessarily be the correct region-level labels.

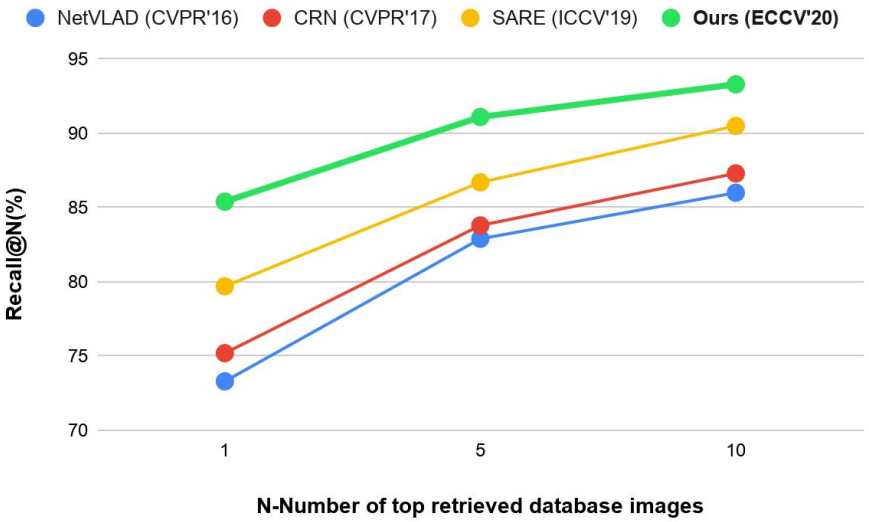
Our Solution: Image-to-region Similarities as Soft Supervisions



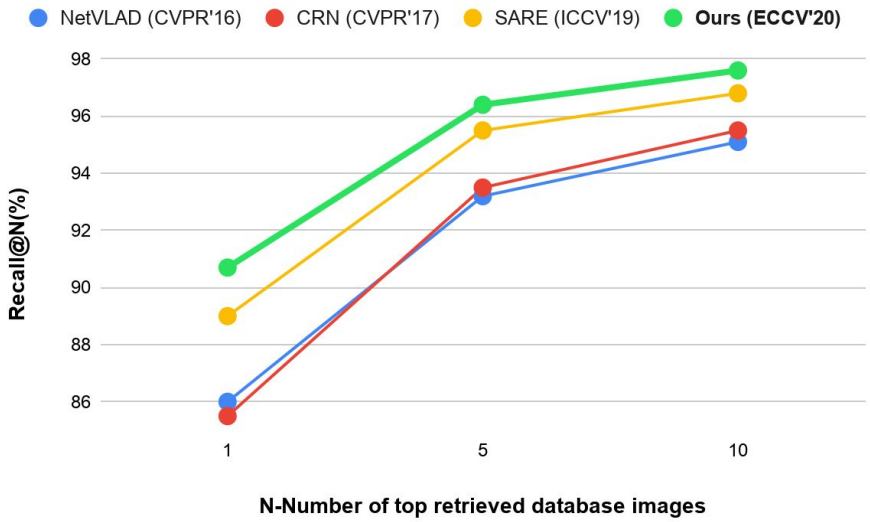
Provide fine-grained image-to-region similarities to enhance the learning of local features.

Performances on Image Localization Benchmarks

Tokyo 24/7



Pitts250k-test



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Code available at

https://github.com/yxgeee/SFRS