Robust scene coordinate regression for large-scale visual localization

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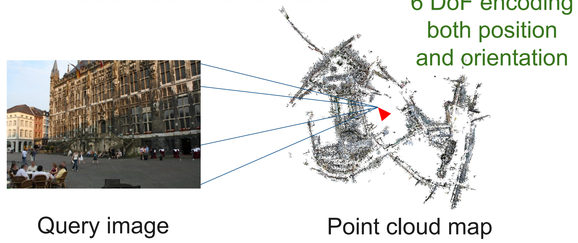
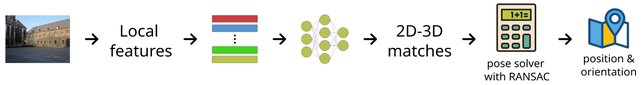
Abstract

The visual localization task



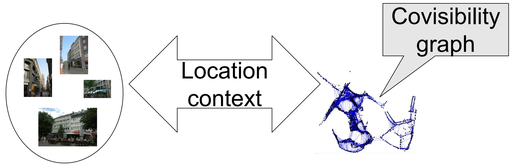
Scene coordinate regression (SCR) models



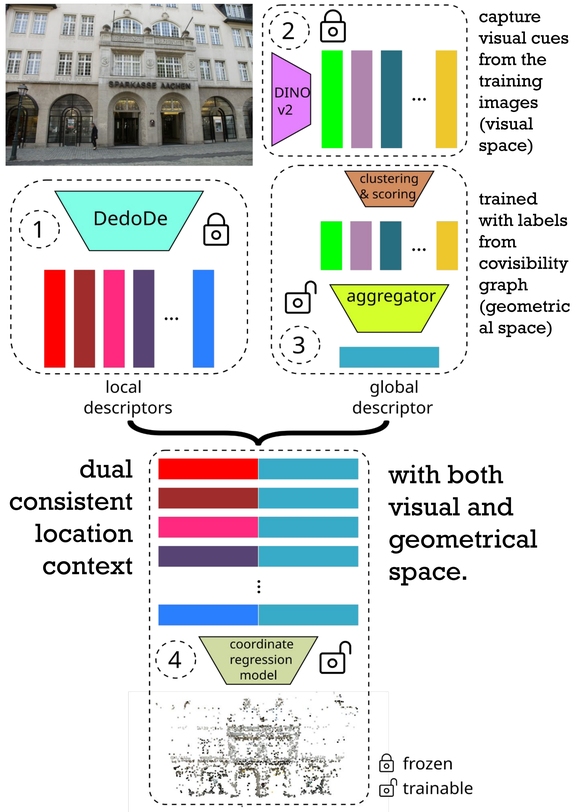
Literature gap

Location context for SCR models:

- Pretrained global descriptors such as GLACE [1] are not smooth enough for larger maps.
- Covisibility graph embeddings as in R-Score [2] skip visual cues and lead to noisy graph connections
- This work offer slocation context that is **consistent with both image space and covisibility graph**.

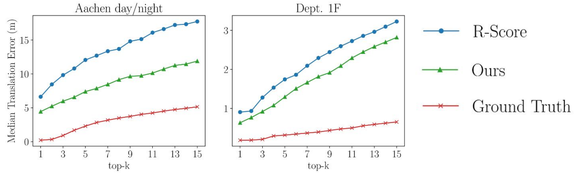


System overview



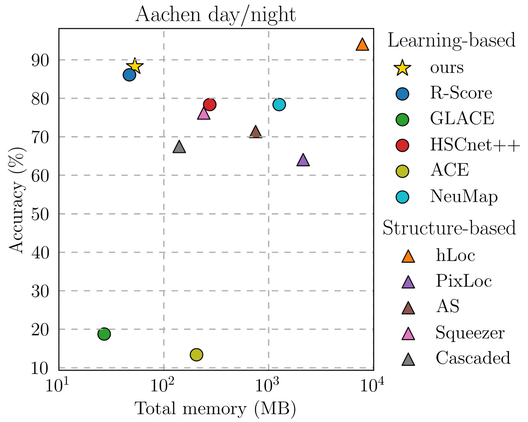
Results

Location context quality



- Similar places (by translation difference) should have similar location context in the global descriptor space.
- Better retrieval performance compared to raw covisibility graph embeddings (lower translation differences for top-k retrievals).

Quantitative results



- 2.5% higher accuracy on average on Aachen day/night dataset, with only 7 MB additional storage.

Ablation studies

	Average accuracy
NetVLAD + GCL [5]	81.2%
FocusTune [3] + NetVLAD + GCL [5]	86.3%
FocusTune [3] + SALAD [4] + GCL [5]	87.3%
FocusTune [3] + SALAD [4] + mGCL	**88.3%**

- Buffer sampling matters: FocusTune [3] improves the accuracy by 5.5%.
- Accuracy improvement by using better global descriptors at query time: SALAD [4] improves the accuracy by 1%.
- Using our proposed mGCL loss with smoother distance function is better than GCL [5].

SCAN QR FOR THE CODE!

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References

[1] GLACE: Global Local Accelerated Coordinate Encoding, Wang et al., CVPR 2024.
[2] R-SCoRe: Revisiting Scene Coordinate Regression for Robust Large-Scale Visual Localization, Jiang et al., CVPR 2025.
[3] FocusTune: Tuning Visual Localization through Focus-Guided Sampling, Nguyen et al., WACV 2024.
[4] Optimal Transport Aggregation for Visual Place Recognition, Izquierdo and Civera, CVPR 2024.
[5] Data-efficient Large Scale Place Recognition with Graded Similarity Supervision, Leyva-Vallina et al., CVPR 2023.

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