Adaptive Reranking for Visual Place Recognition

1 Analysis of Adaptive Reranking

Table **??** presents the performance of our logistic-regression-based adaptive reranking module compared to the CosPlace baseline and the full reranking pipeline.

1.1 Accuracy Improvements

Adaptive reranking consistently improves over the CosPlace baseline across all datasets. The gains are substantial:

- SF-XS-test: +8.0%
- SVOX-test-sun: +14.0%
- SVOX-test-night: +23.0%
- Tokyo-test: +14.0%

These results demonstrate that even a lightweight learned reranker can correct many of the baseline retrieval errors, particularly under challenging conditions such as nighttime imagery.

1.2 Comparison to Full Reranking

Adaptive reranking recovers the majority of the performance of the full reranking pipeline. The remaining gap is small:

- SF-XS-test: 3.3% behind full reranking
- SVOX-test-sun: 3.1% behind
- SVOX-test-night: 1.5% behind
- Tokyo-test: 1.7% behind

This shows that the logistic regression model captures most of the geometric consistency signals used by the full reranking stage.

1.3 Computational Efficiency

Adaptive reranking is significantly faster than full reranking:

- SF-XS-test: 3.9× faster
- SVOX-test-sun: 3.5× faster
- SVOX-test-night: 1.8× faster
- Tokyo-test: 3.0× faster

This makes adaptive reranking suitable for real-time or large-scale VPR deployments where full reranking is computationally prohibitive.

Table 1: Comparison of CosPlace baseline, Adaptive Reranking (logistic-regression-based), and Full Reranking across four VPR benchmarks. We report Top-1 accuracy (%) and reranking time (minutes).

Dataset	**CosPlace**	**Adaptive Rerank**	**Full Rerank**	**Time (A / F)**
SF-XS-test	70.0	78.0	**81.3**	10 / 39
SVOX-test-sun	73.0	87.0	**90.1**	9 / 32
SVOX-test-night	49.0	72.0	**73.5**	17 / 31
Tokyo-test	70.0	84.0	**85.7**	4 / 12

1.4 Nighttime Robustness

The largest relative improvement occurs on SVOX-test-night (+23%), indicating that the logistic regression model is particularly effective under severe illumination changes. This suggests that the reranker learns discriminative geometric cues that remain stable even when appearance-based descriptors degrade.

2 Summary

Overall, adaptive reranking provides an excellent trade-off between accuracy and computational cost. It consistently boosts Top-1 accuracy over the CosPlace baseline while remaining significantly faster than full reranking. These results demonstrate that a simple learned reranker can approximate the performance of a full geometric verification pipeline at a fraction of the computational cost.