Asymmetric Image Matching

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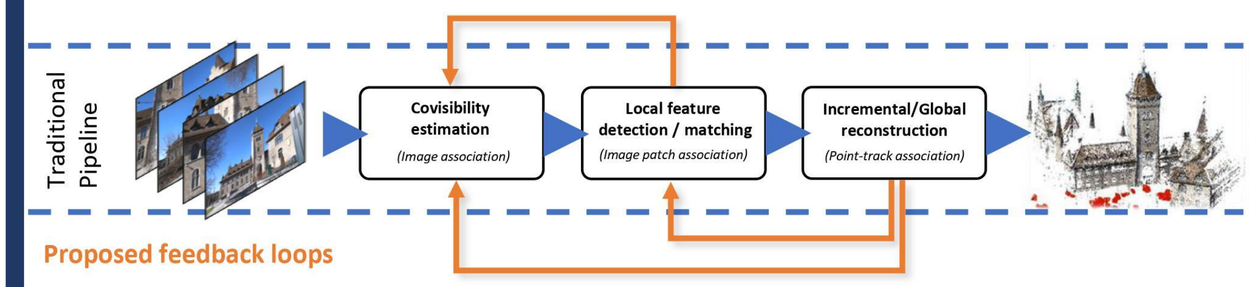
Project Overview

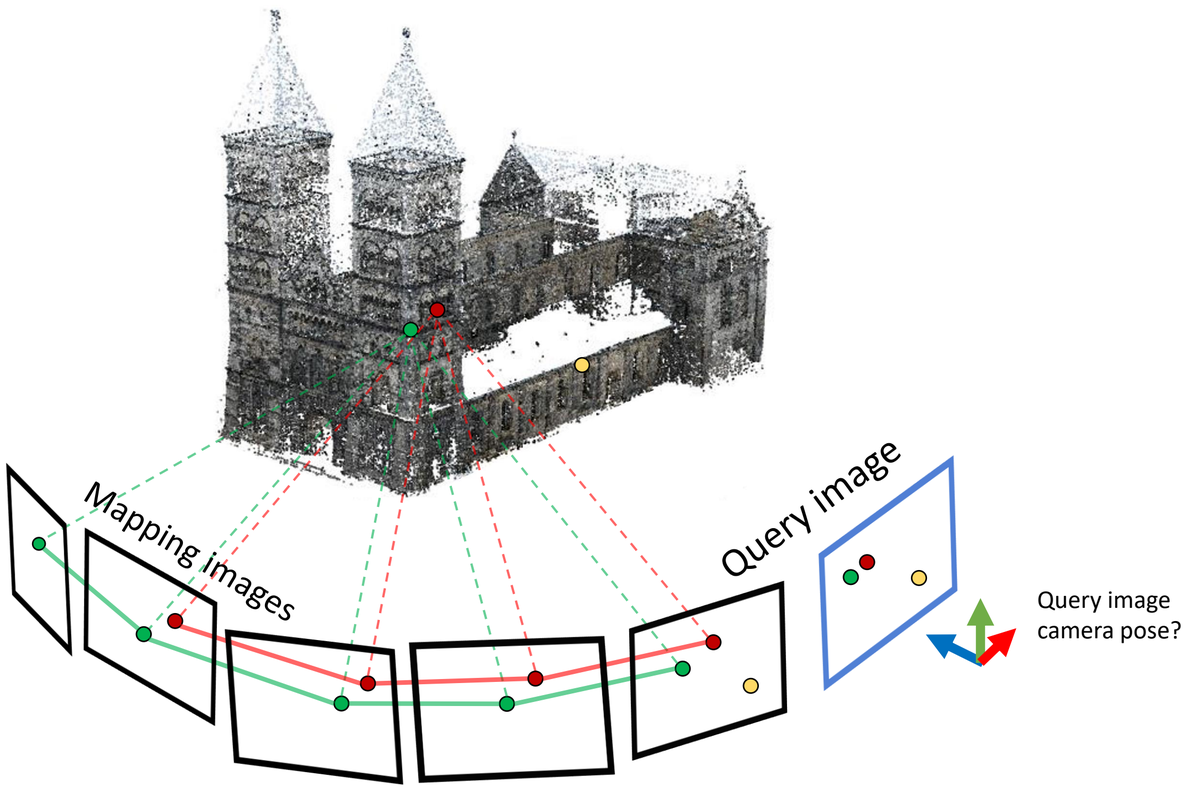
Data-associations in **modern reconstruction pipelines**:



Because of the sequential pipeline, recovering from early mistakes can be difficult. In this project, we replace the traditional pipeline with an **iterative** approach.

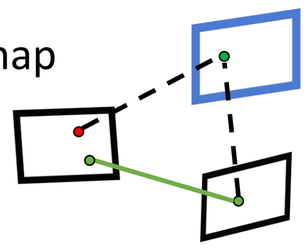
Problem Setup

How to match a query image (blue) to a set of reference images with established tracks?



Standard approach (independent pairwise matching)

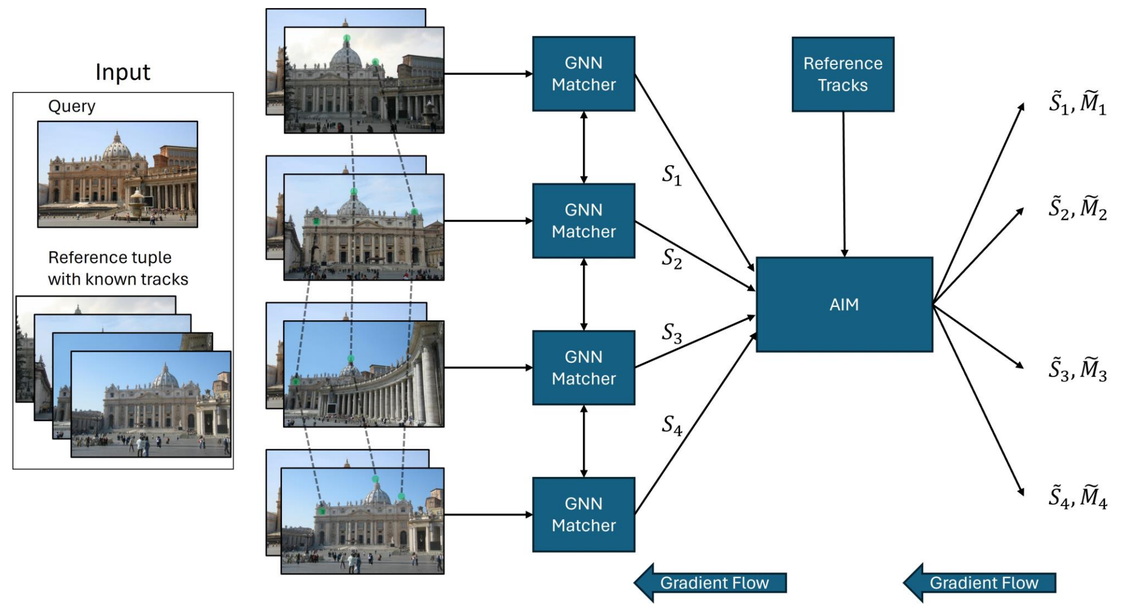
- Ignores track information present in map
- Might lead to inconsistent matches



Idea: Leverage known geometry of mapping images to guide matching.

AIM: Asymmetric Image Matching

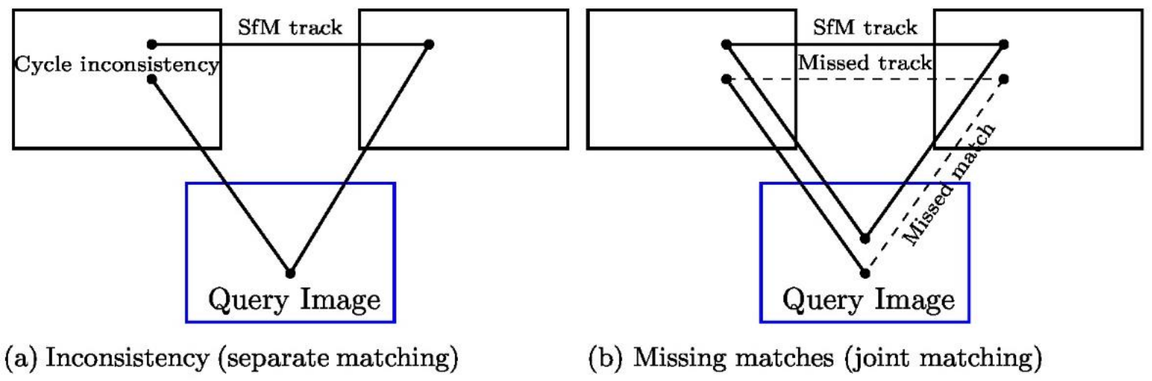
Goal: Train a graph neural network to perform joint matching between query and reference images.



Make use of multi-view information to resolve ambiguities.

GMR: Geometric Match Recovery

When doing multi-view matching we have to select between doing separate and joint matching.



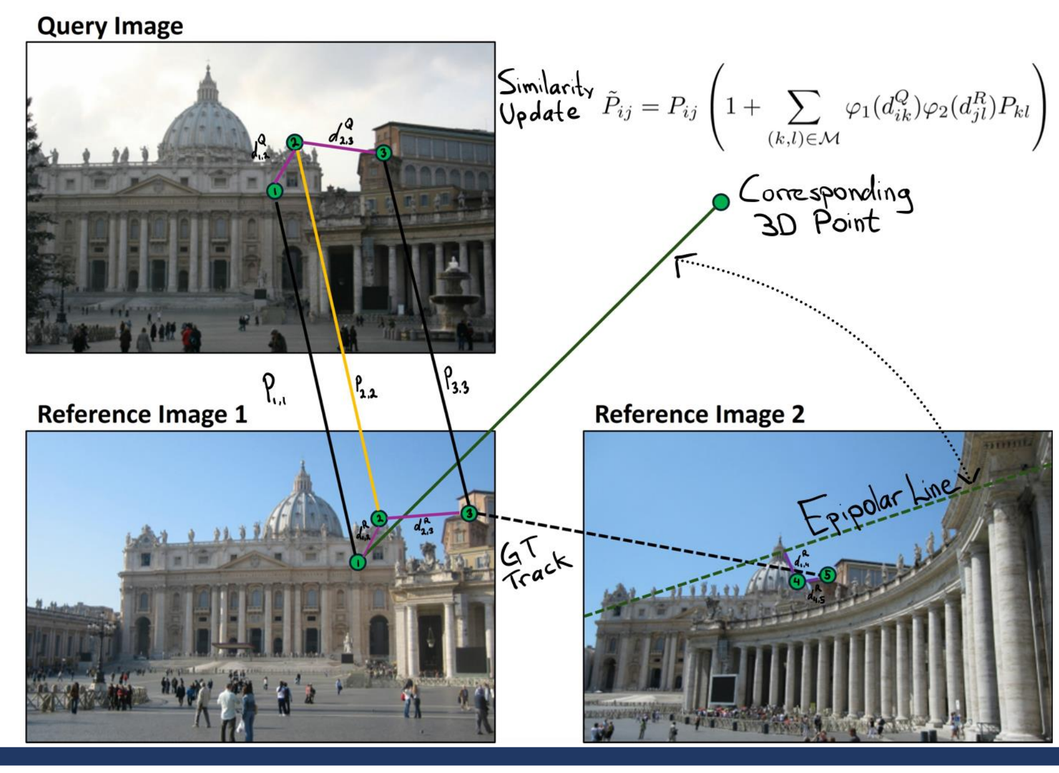
(a) Inconsistency (separate matching) (b) Missing matches (joint matching)

This can be solved by doing joint matching followed by **GMR** that **combines visual similarity** and **geometric consistency**. An additional reference keypoint is added to a matched track if the keypoint has

- high similarity with the corresponding query keypoint
- low **Sampson error** with the track keypoints

SGA: Spatially Guided Assignments

Idea: Guide matching with spatial information of confident correspondences and geometry of mapping images.



References

1. Zhengqi Li and Noah Snavely. Megadepth: Learning single-view depth prediction from internet photos. CVPR, 2018.
2. Philipp Lindenberger, Paul-Edouard Sarlin, and Marc Pollefeys. LightGlue: Local Feature Matching at Light Speed. ICCV, 2023.

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