

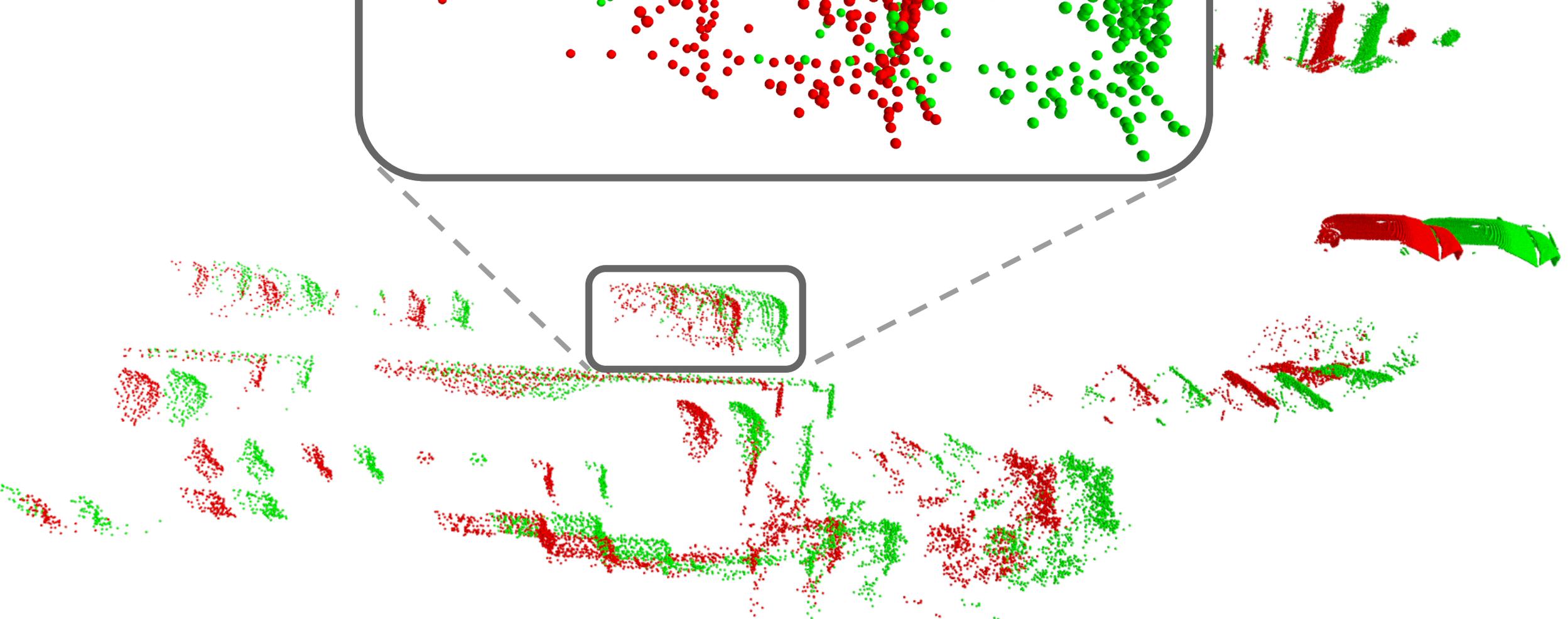
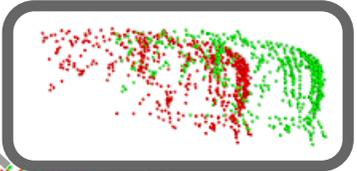
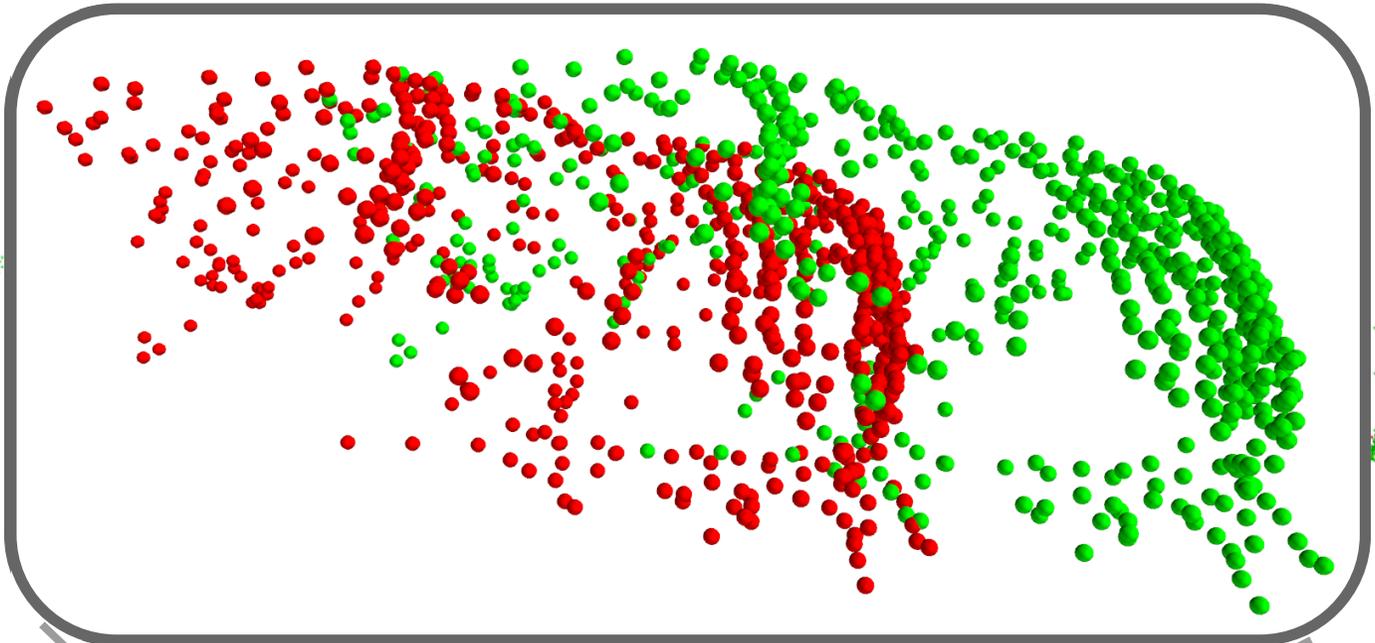
SCOOP: Self-Supervised Correspondence and Optimization-Based Scene Flow

Itai Lang^{1,2}, Dror Aiger², Forrester Cole², Shai Avidan¹, Michael Rubinstein²

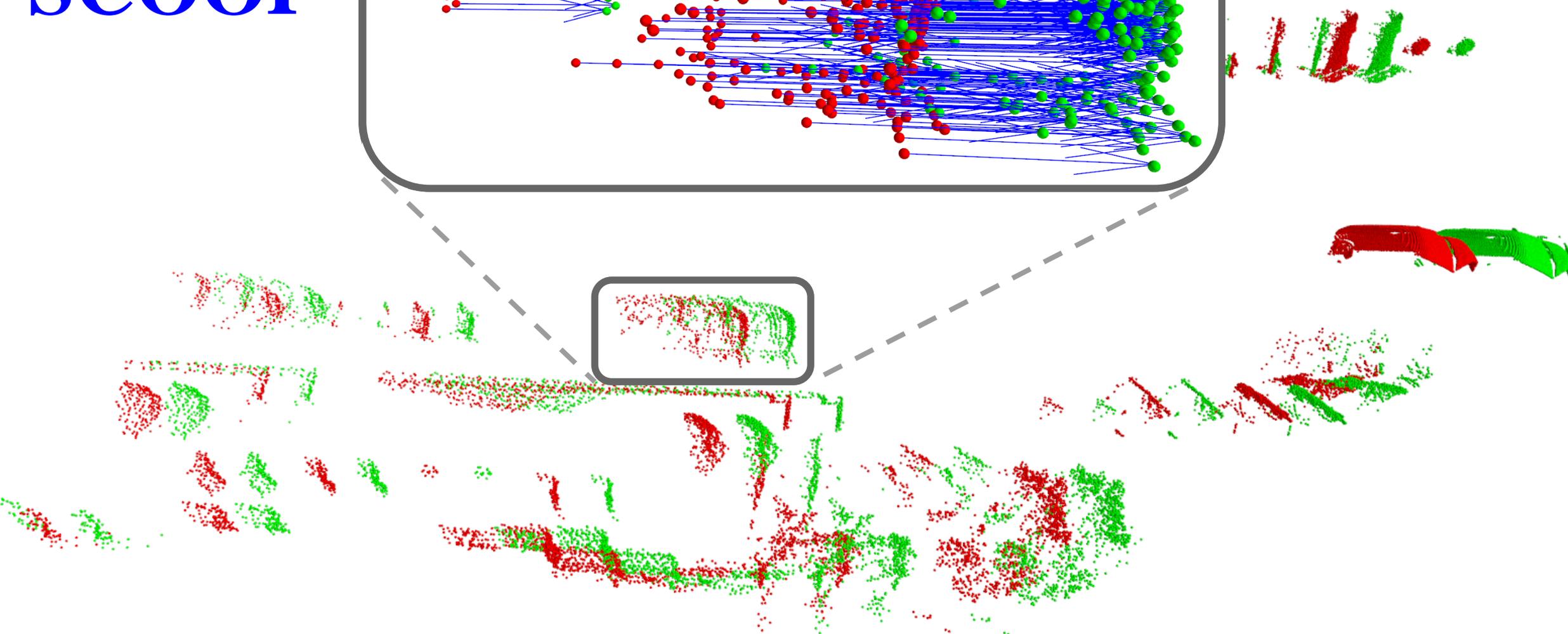
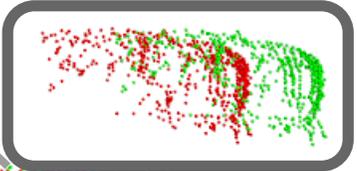
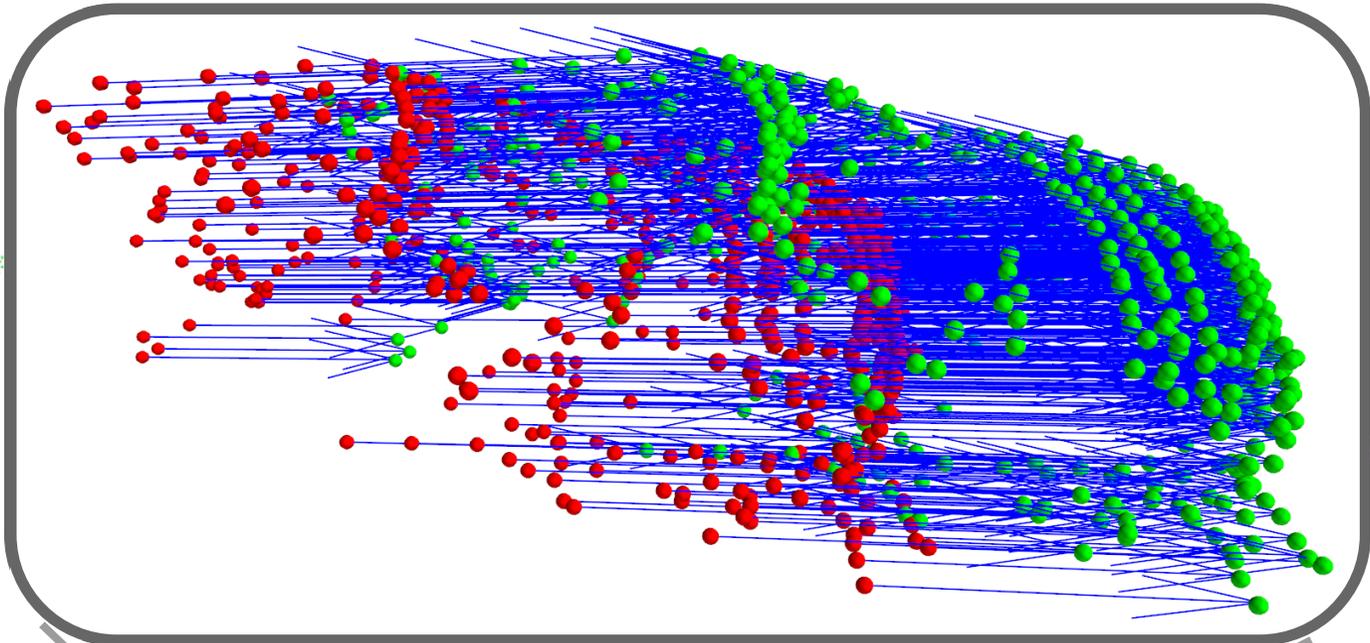
¹Tel Aviv University

²Google Research

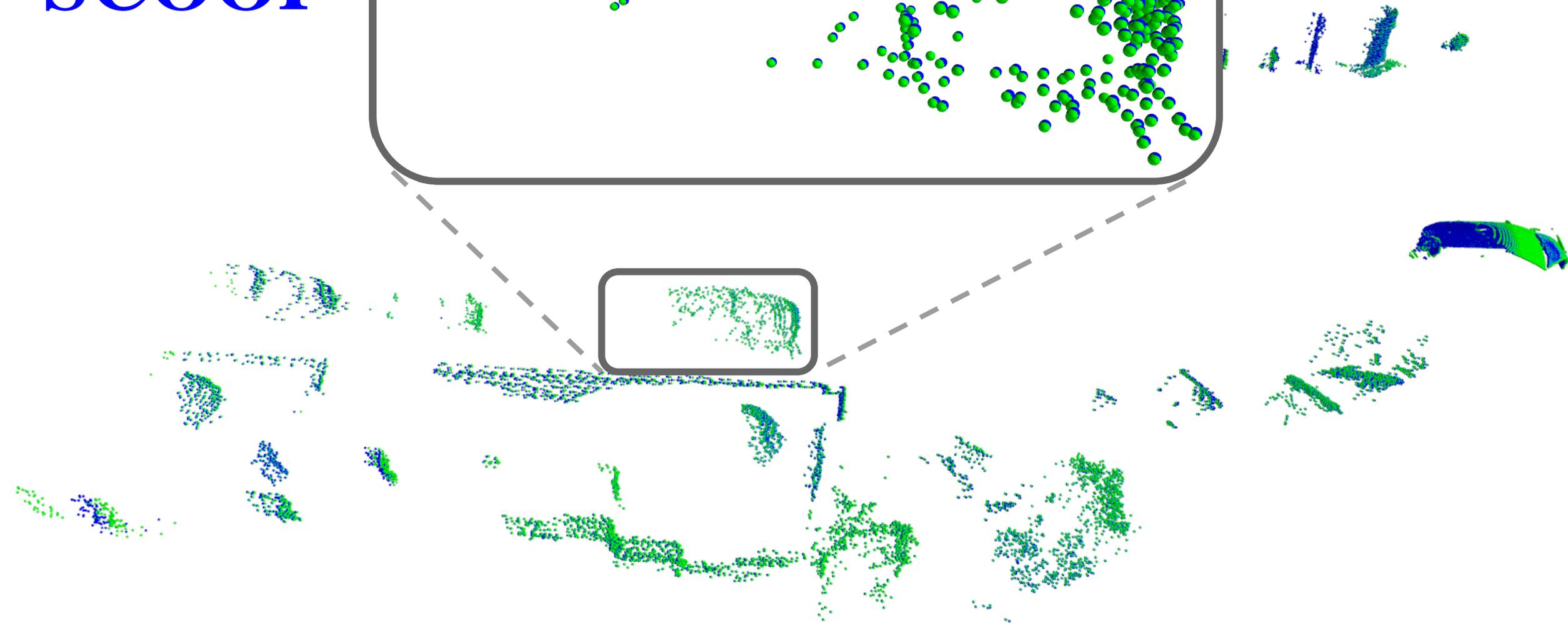
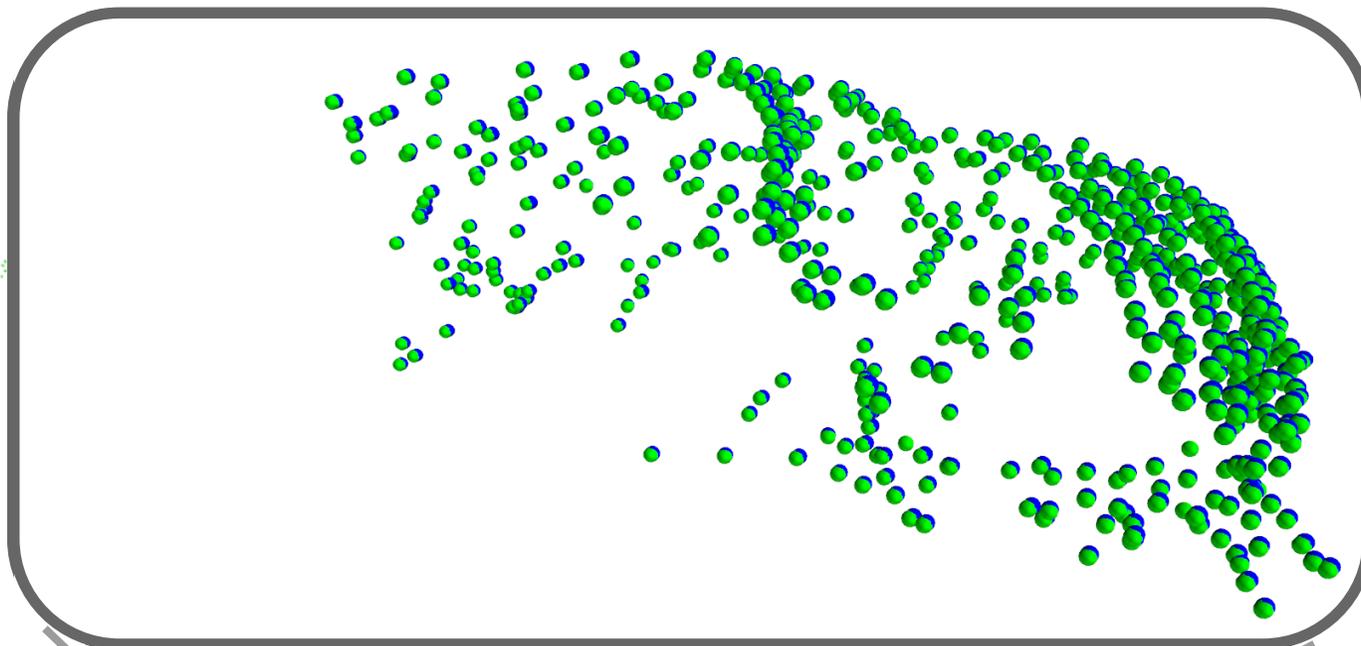




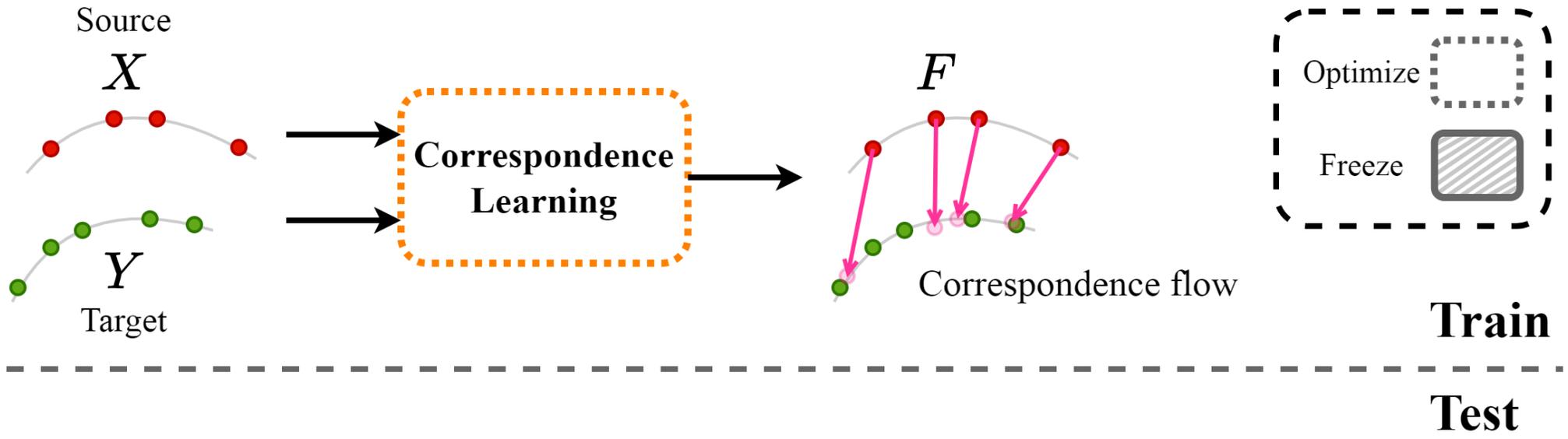
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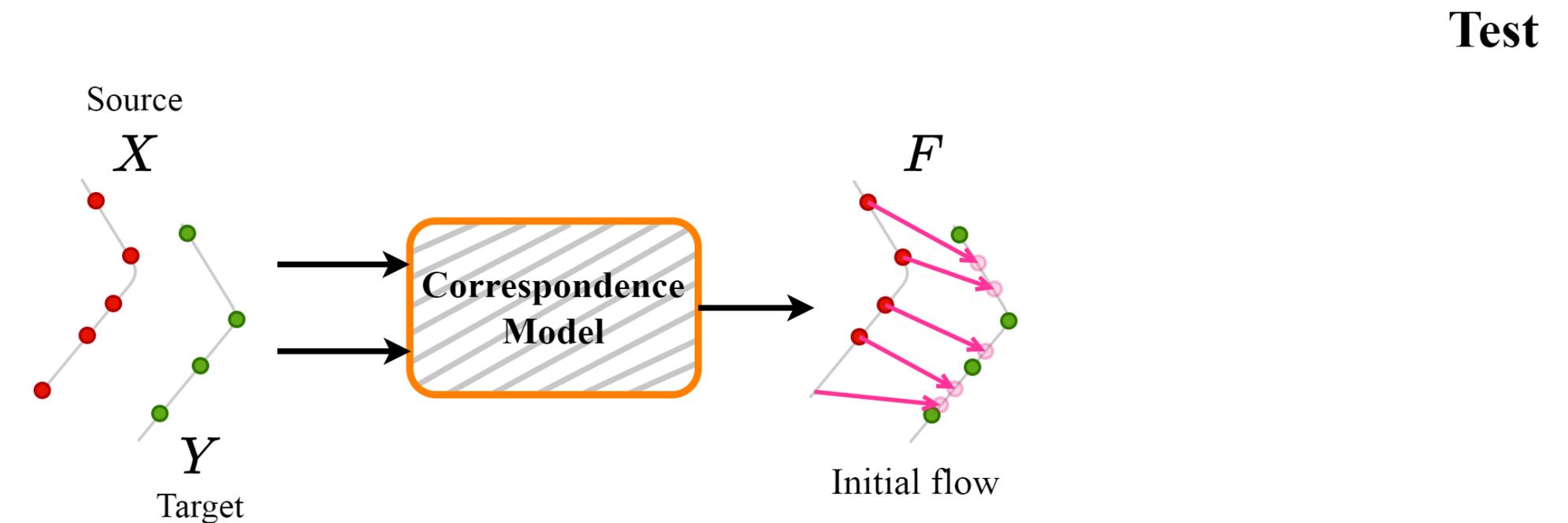
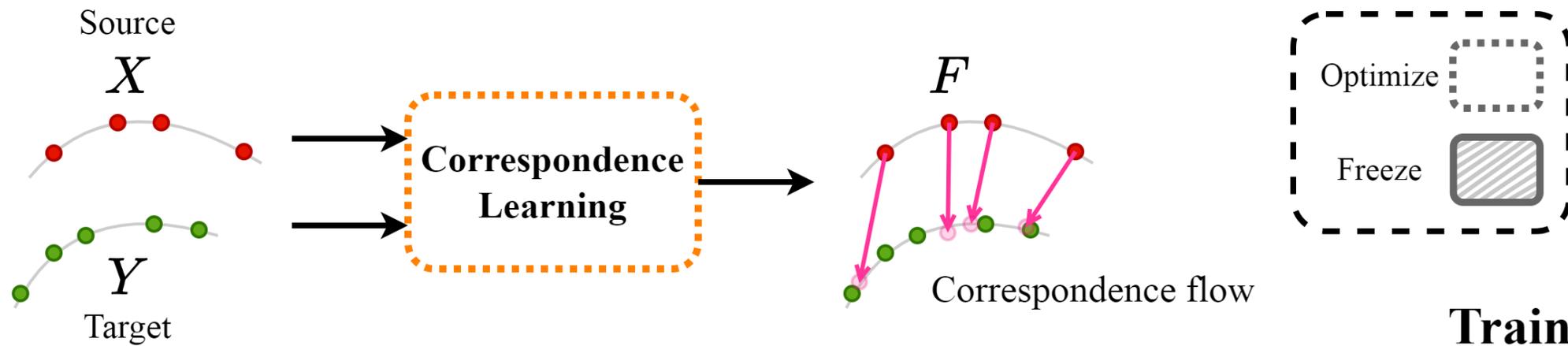
SCOOP



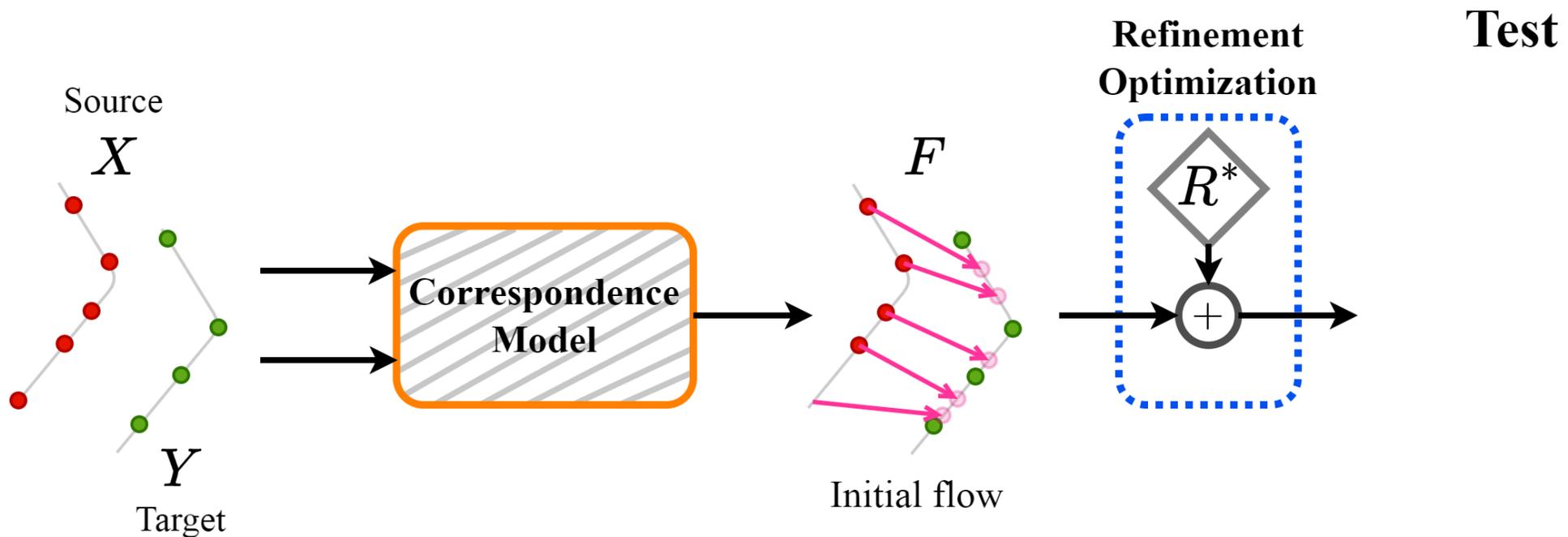
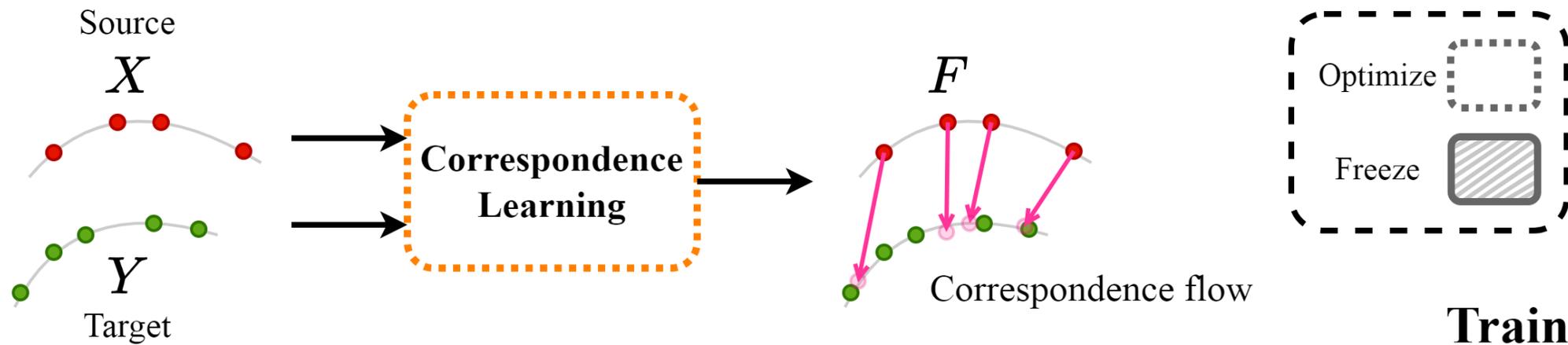
Our Method



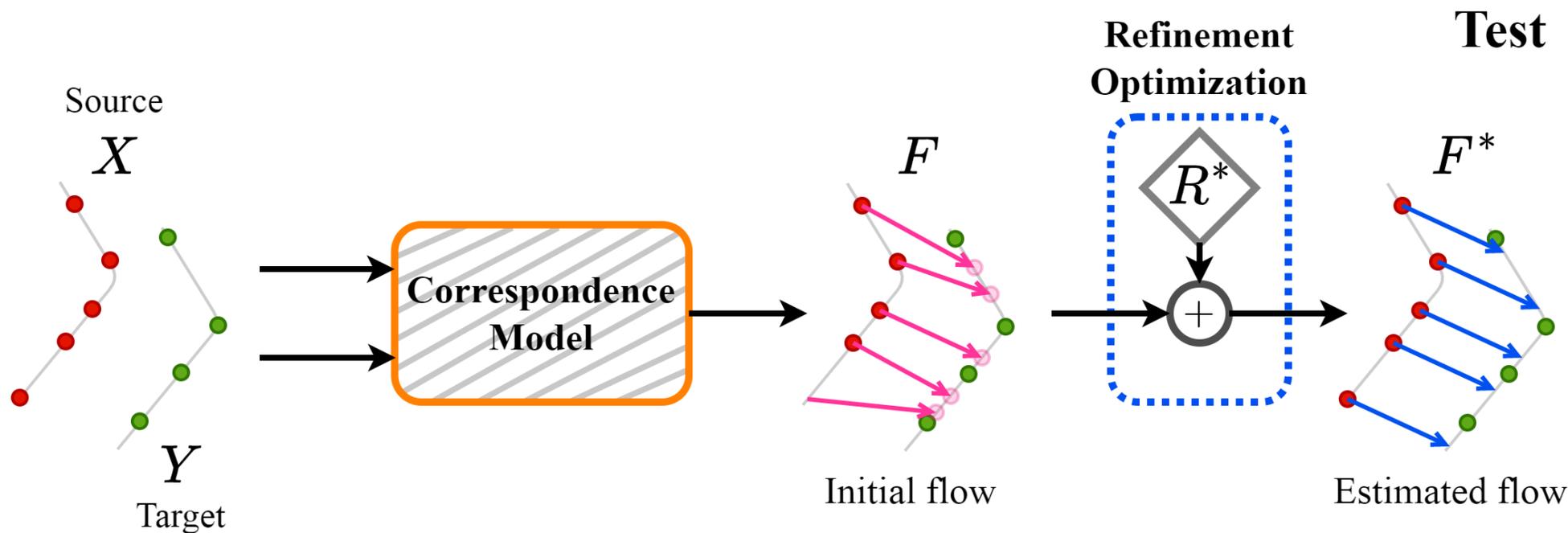
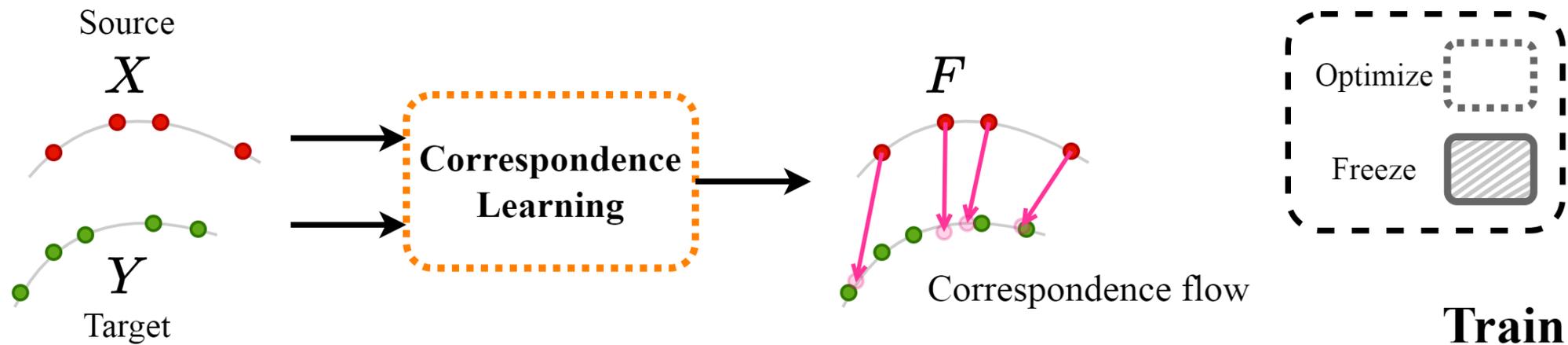
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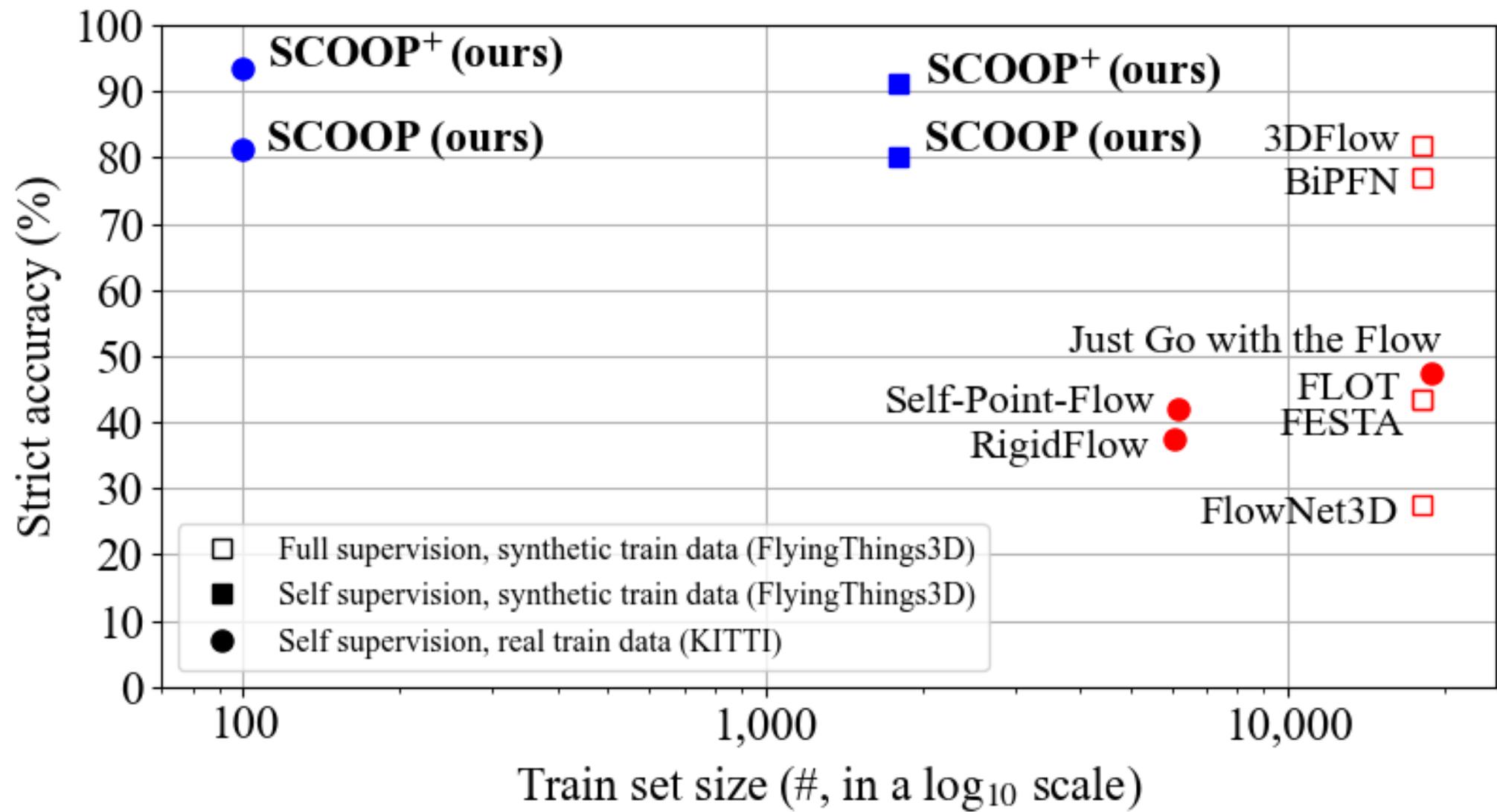
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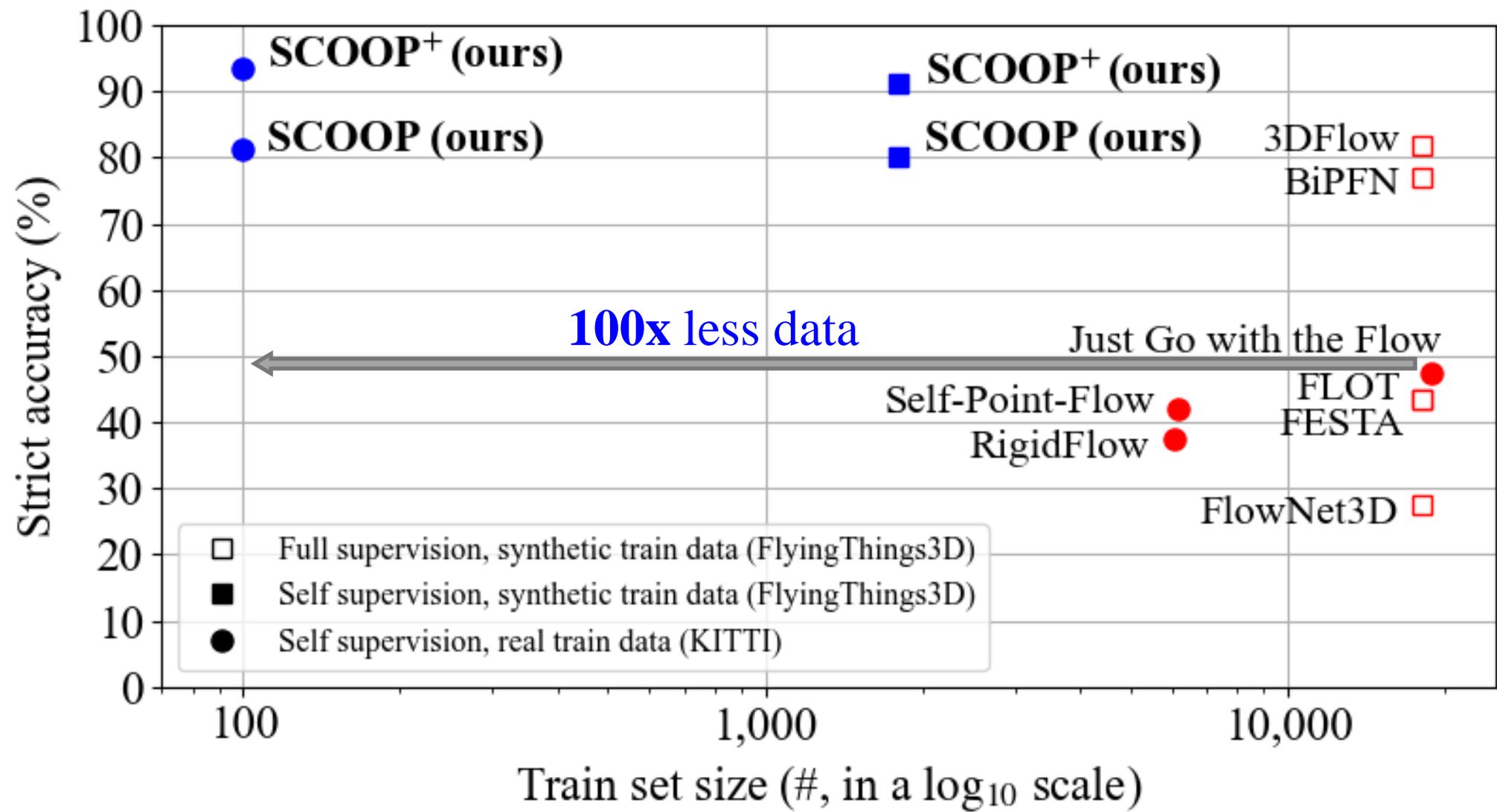
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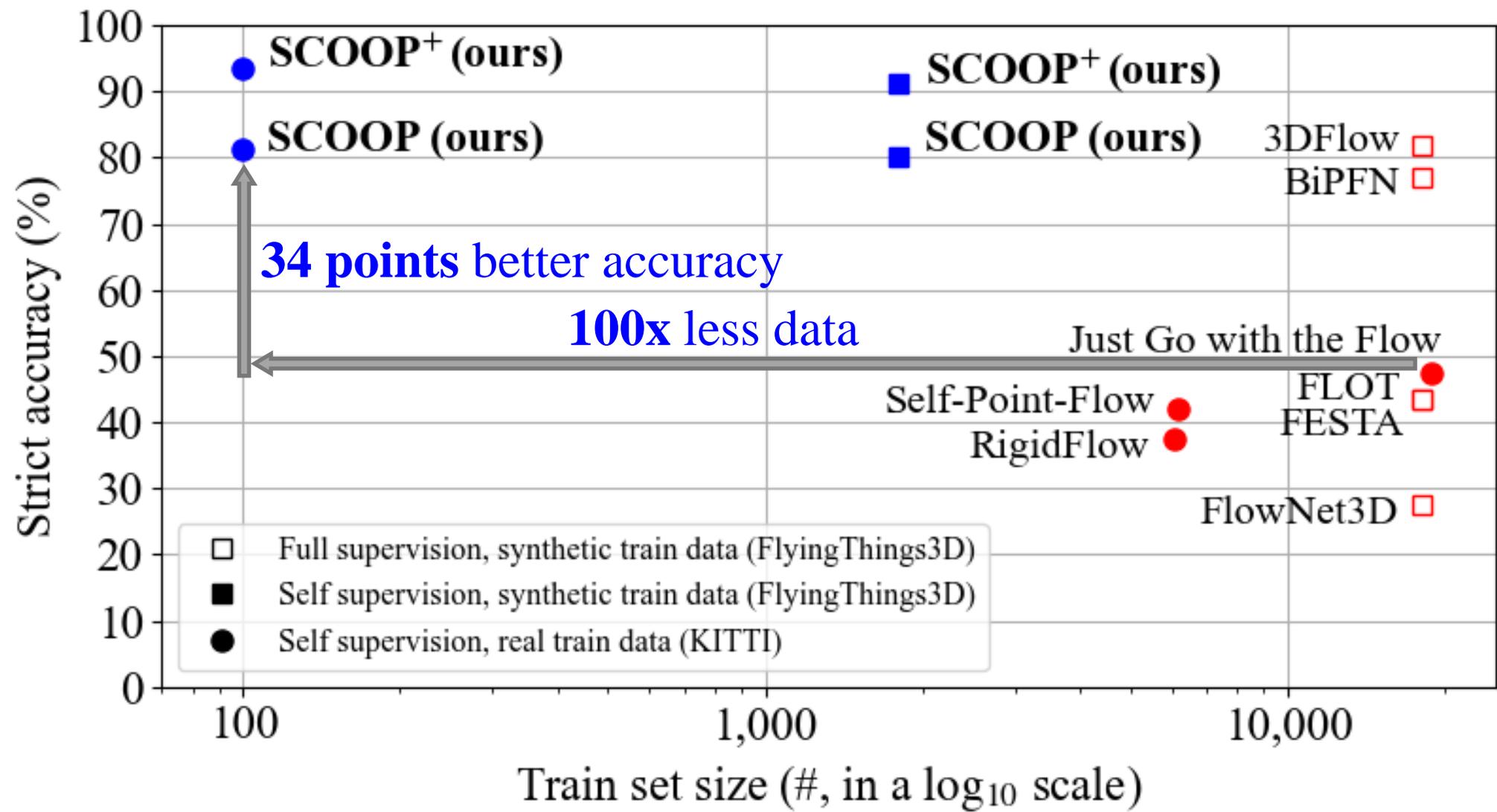
Flow Accuracy vs. Train Set Size



Flow Accuracy vs. Train Set Size



Flow Accuracy vs. Train Set Size





SCOOP: Self-Supervised Correspondence and Optimization-Based Scene Flow

CVPR 2023



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Dror Aiger²



Forrester Cole²



Shai Avidan¹



Michael Rubinstein²

¹Tel Aviv University ²Google Research

*The work was done during an internship at Google Research.

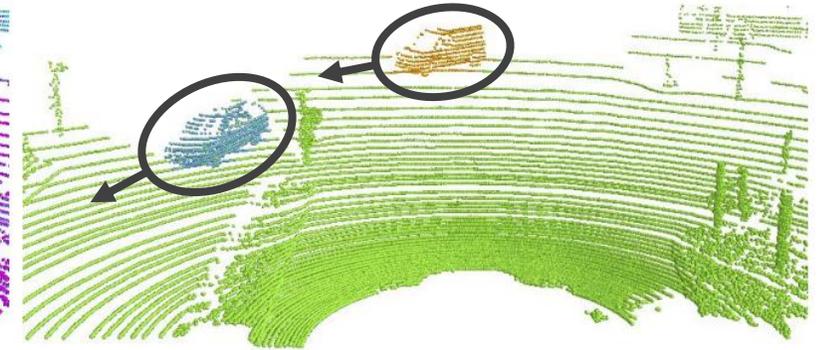
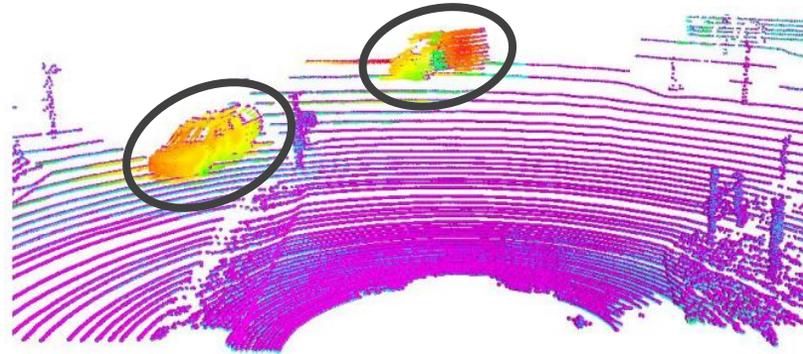
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 arXiv

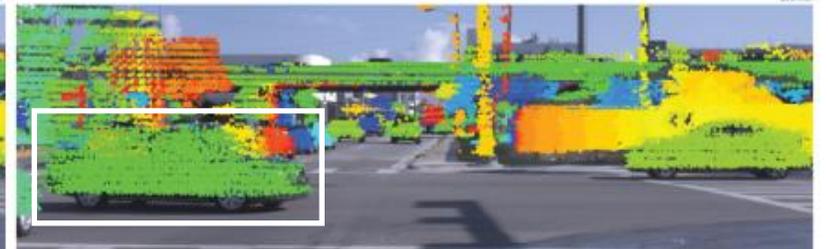
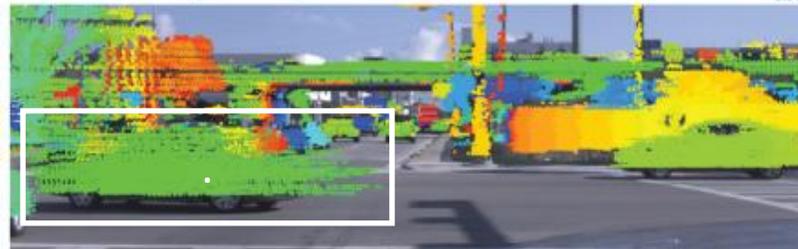
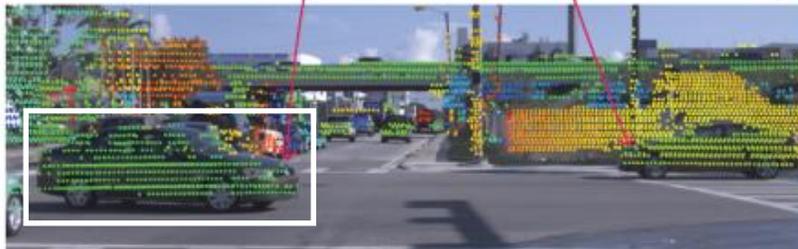
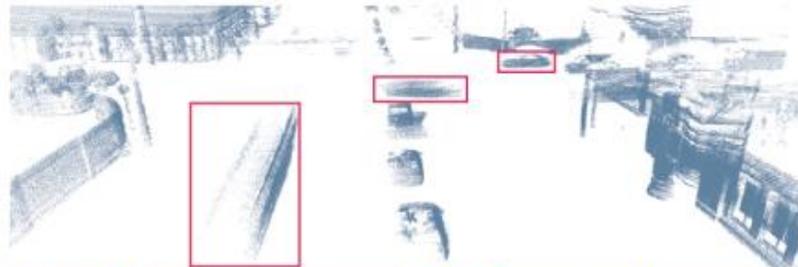
 Video

 Code

Motivation for Scene Flow

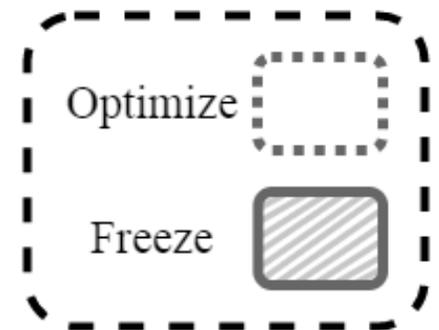
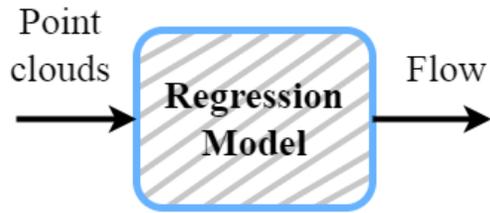
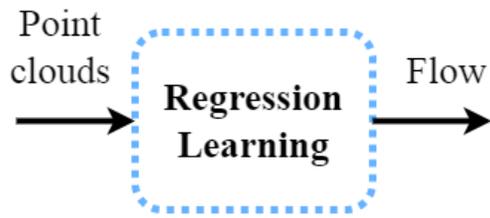


FlowNet3D, Liu *et al.*, 2019

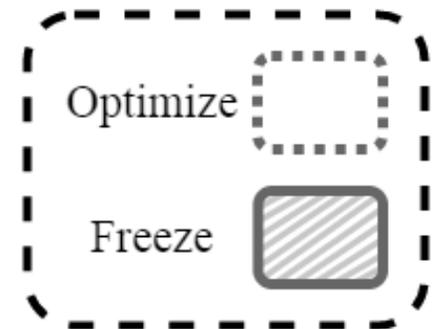
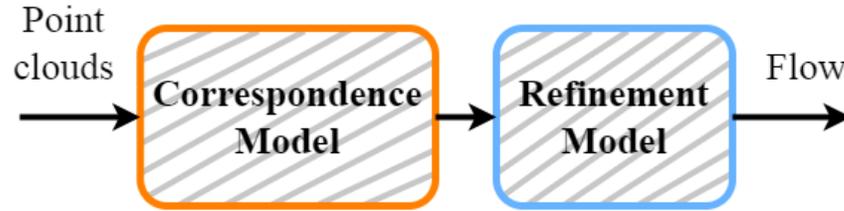
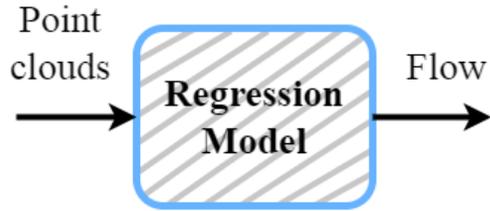
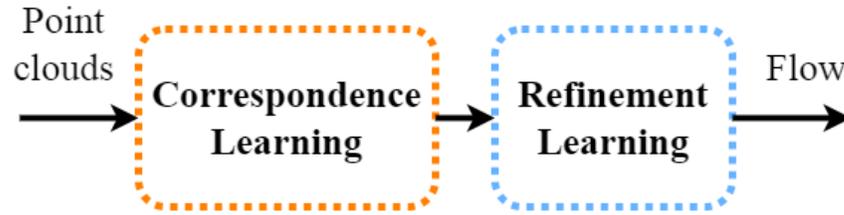


Graph Prior, Pontes *et al.*, 2020

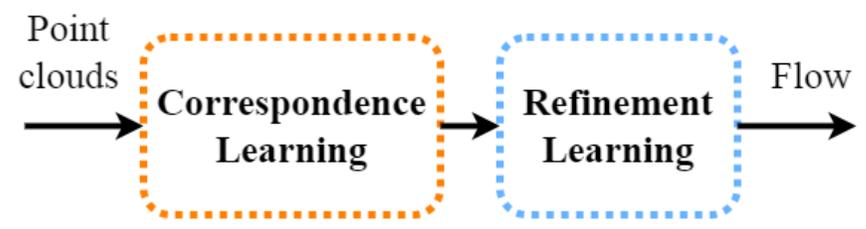
Previous Approaches vs. Ours



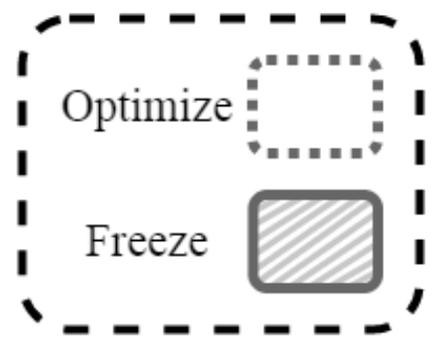
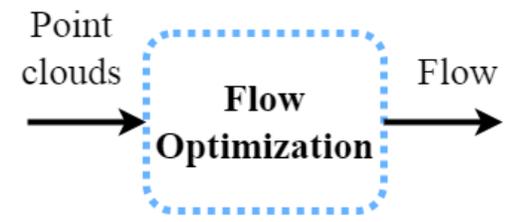
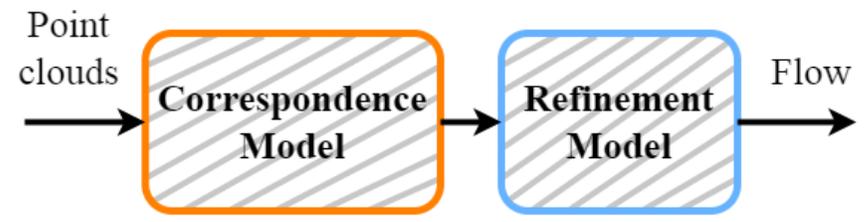
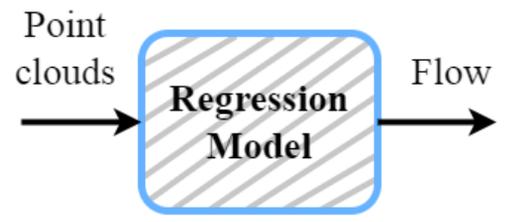
Previous Approaches vs. Ours



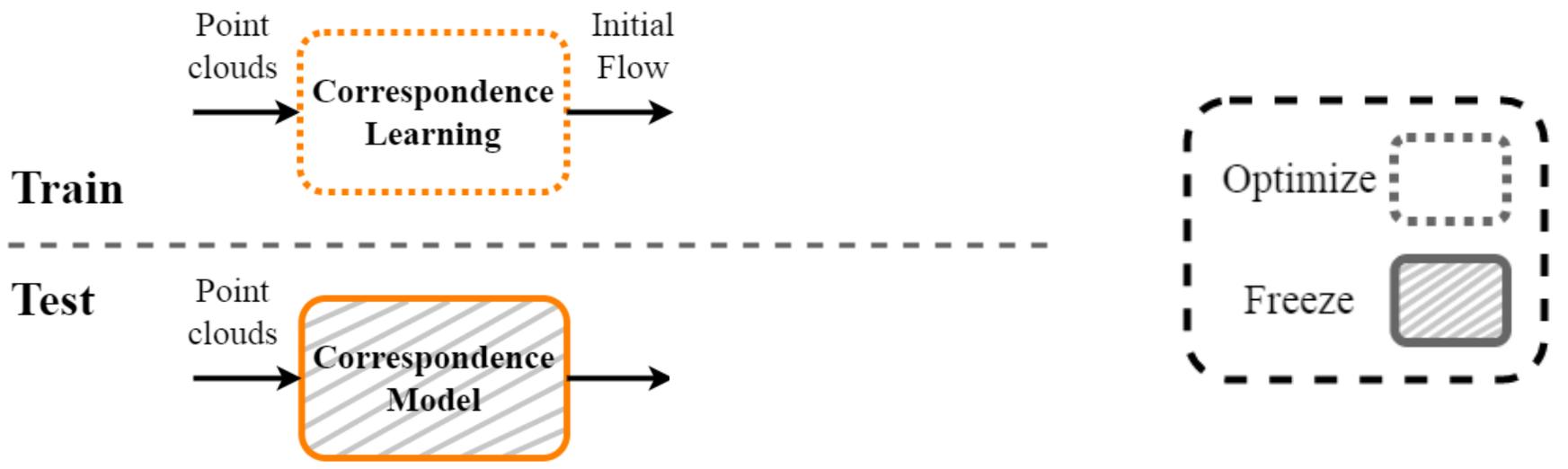
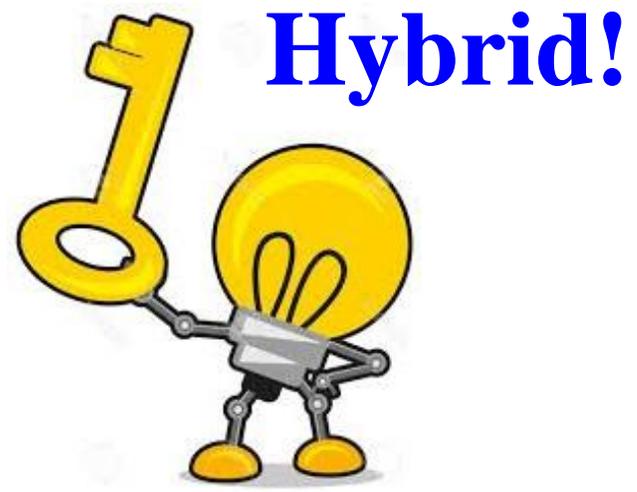
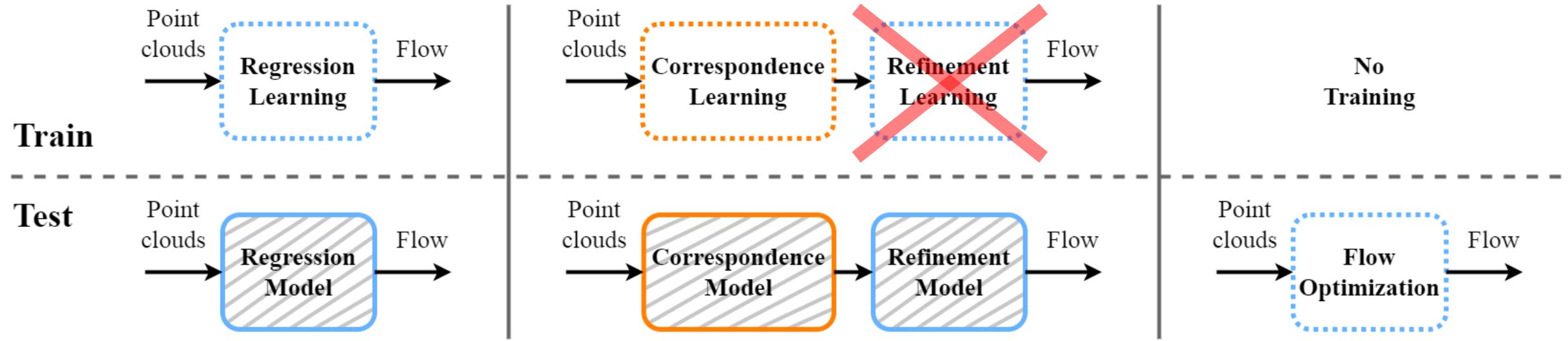
Previous Approaches vs. Ours



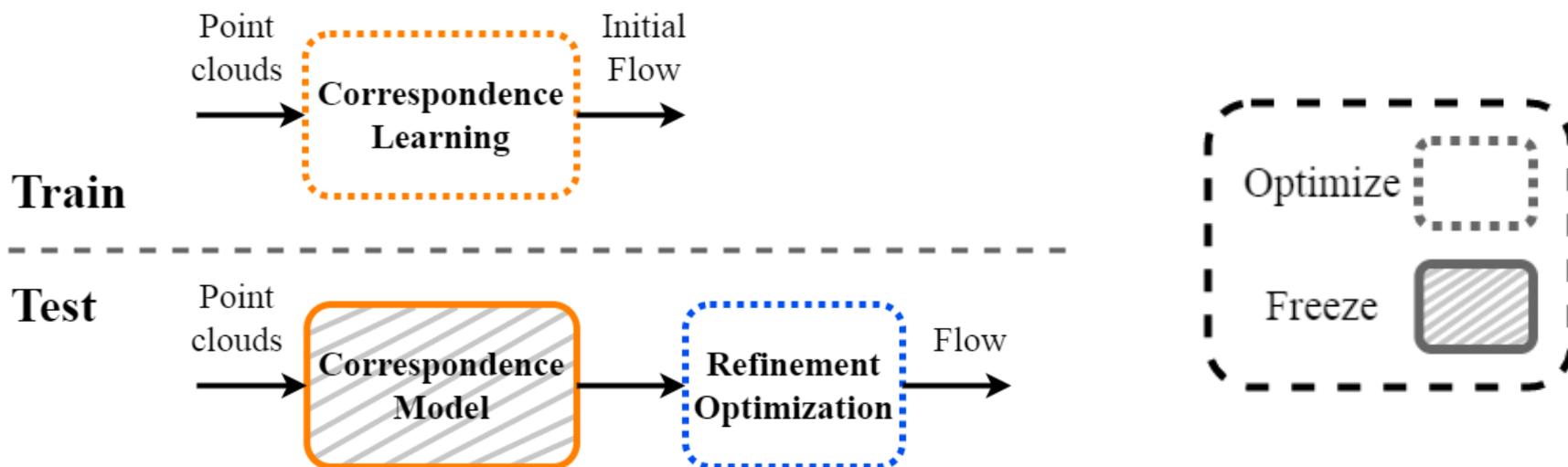
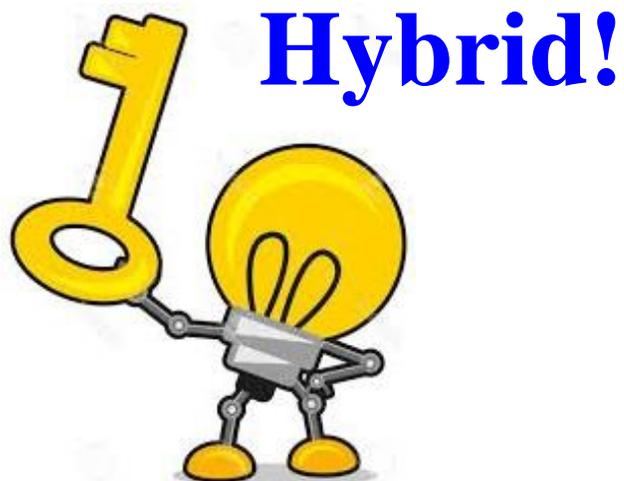
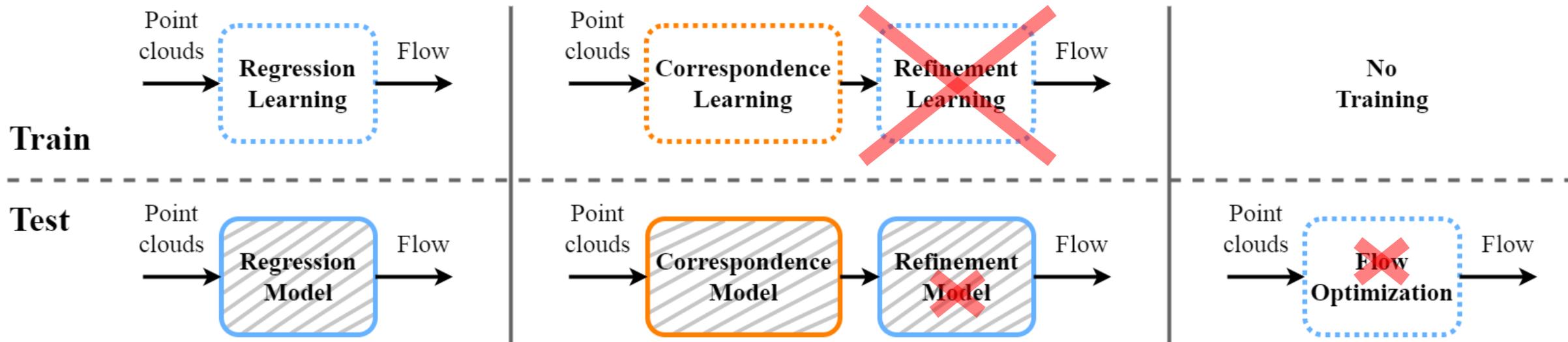
No Training



Previous Approaches vs. Ours

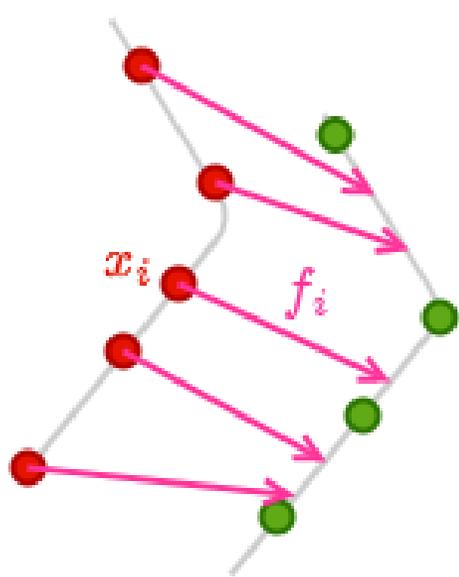


Previous Approaches vs. Ours



Self-Supervised Losses

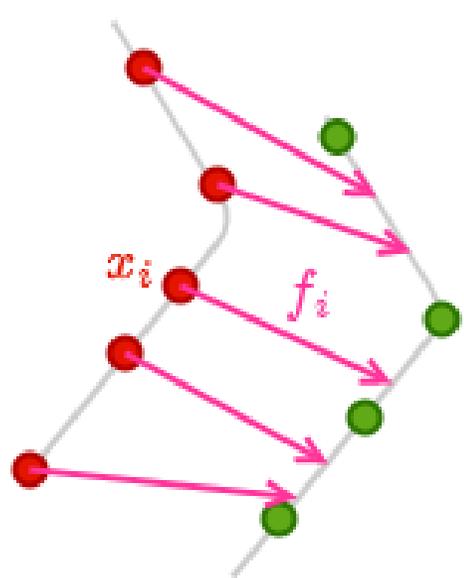
● Source ● Target



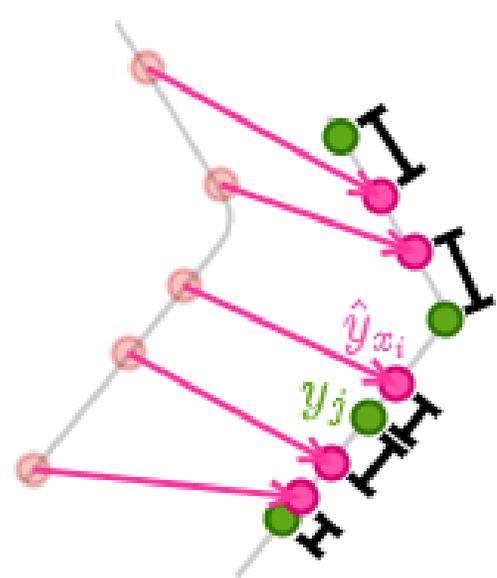
Flow before refinement

Self-Supervised Losses

● Source ● Target ● Soft correspondence



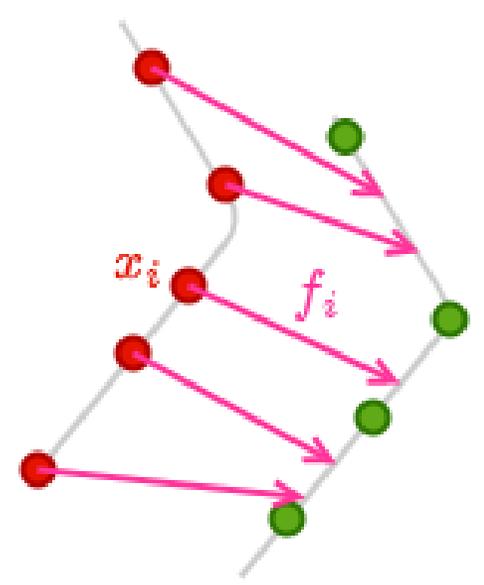
Flow before refinement



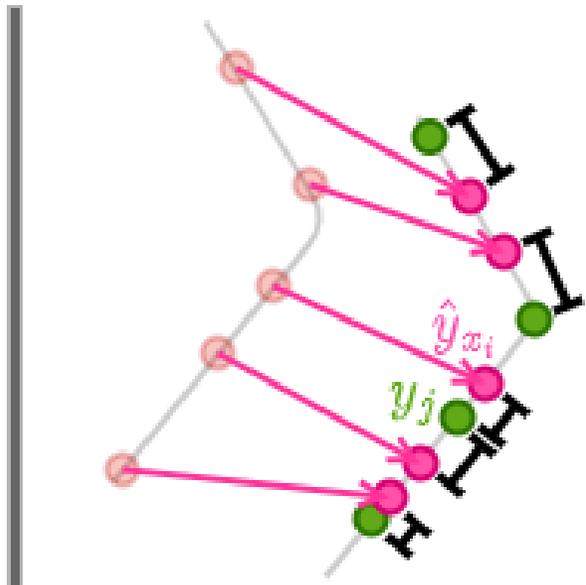
Distance loss

Self-Supervised Losses

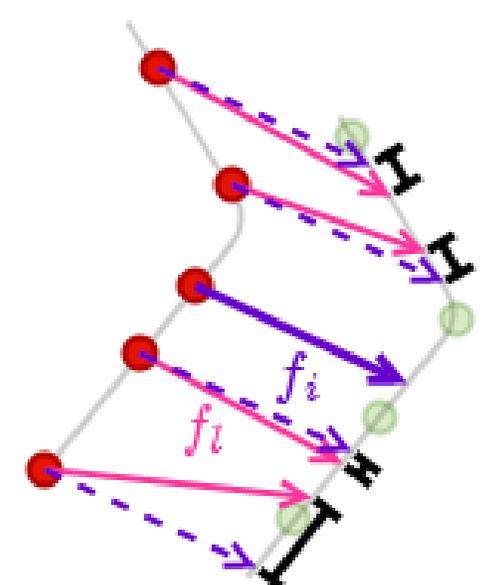
● Source ● Target ● Soft correspondence



Flow before refinement



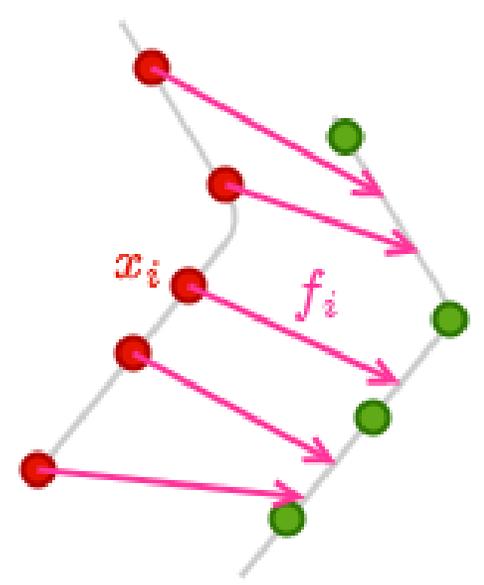
Distance loss



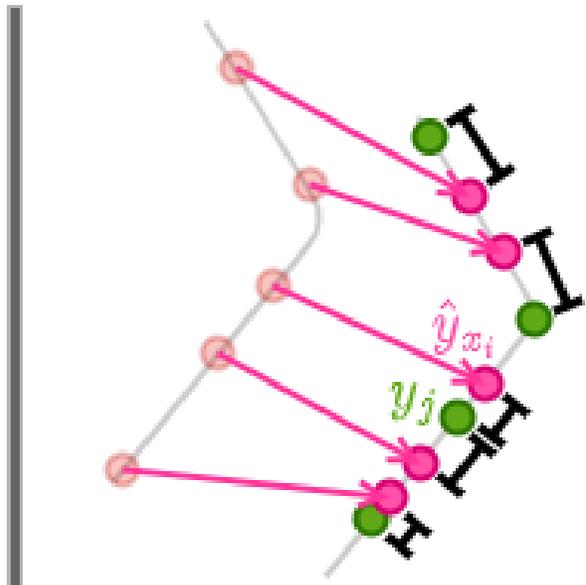
Smoothness loss

Self-Supervised Losses

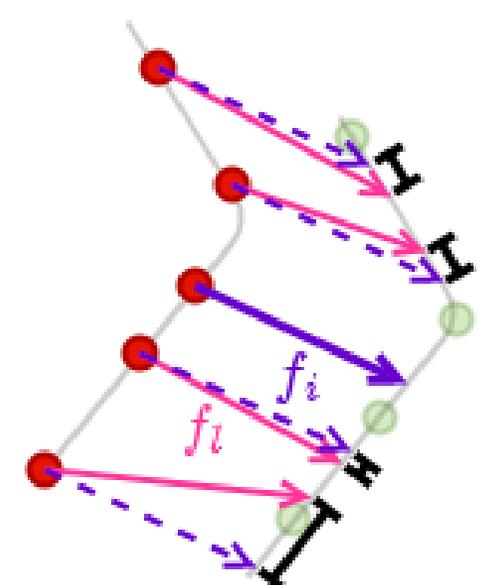
● Source ● Target ● Soft correspondence



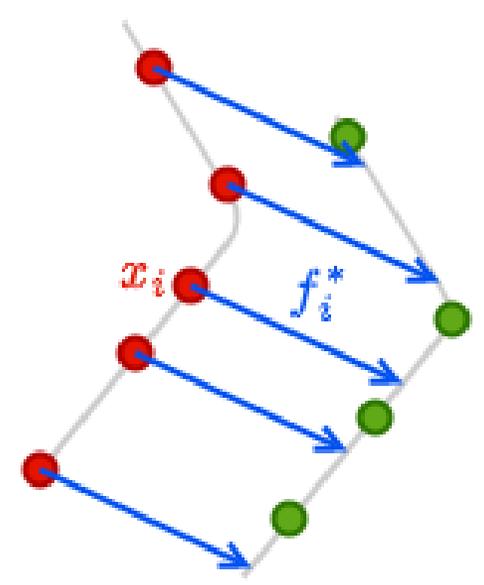
Flow before refinement



Distance loss

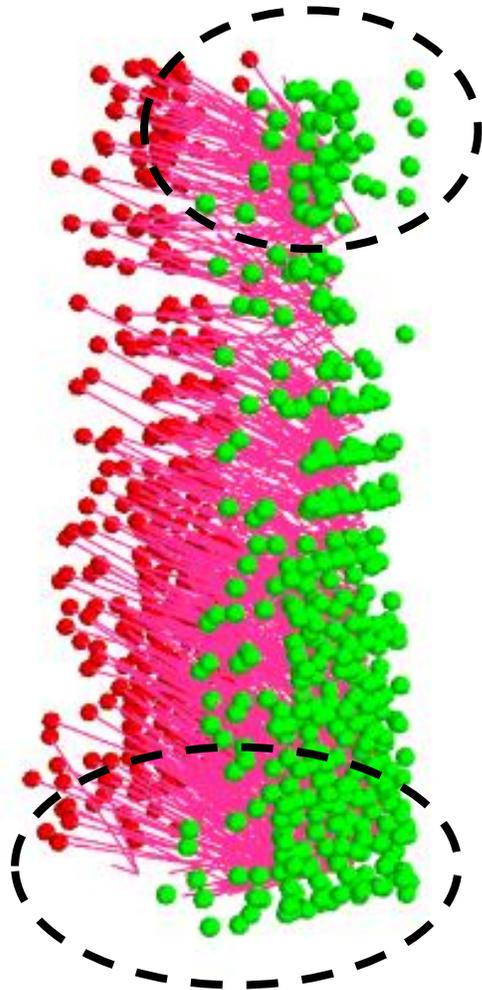


Smoothness loss

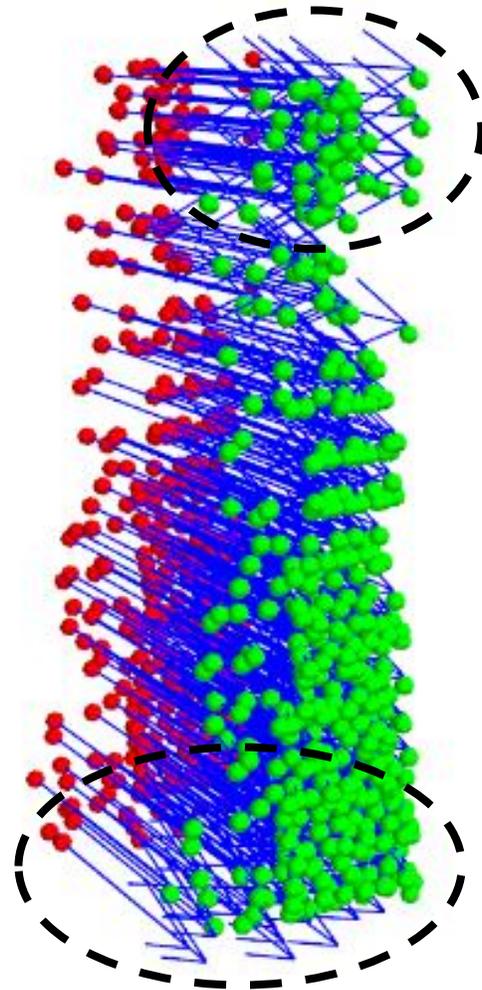


Flow after refinement

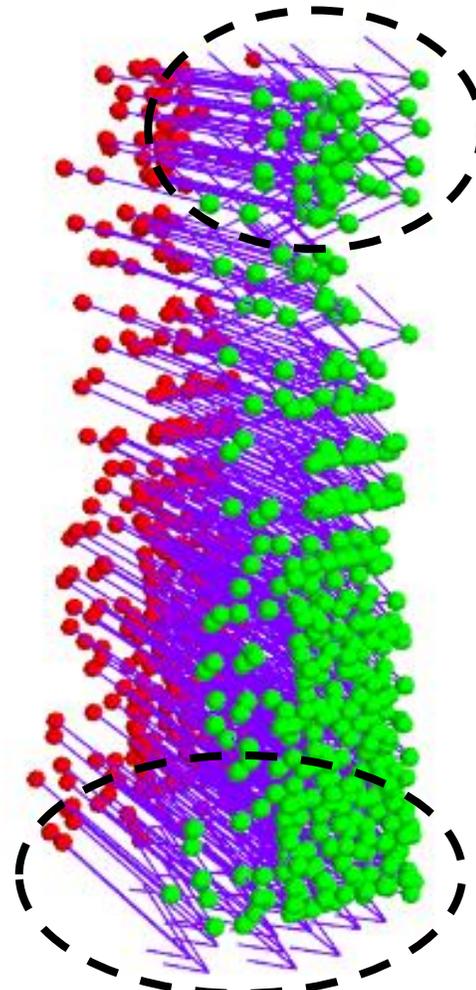
The Flow Refinement Effect



Before refinement

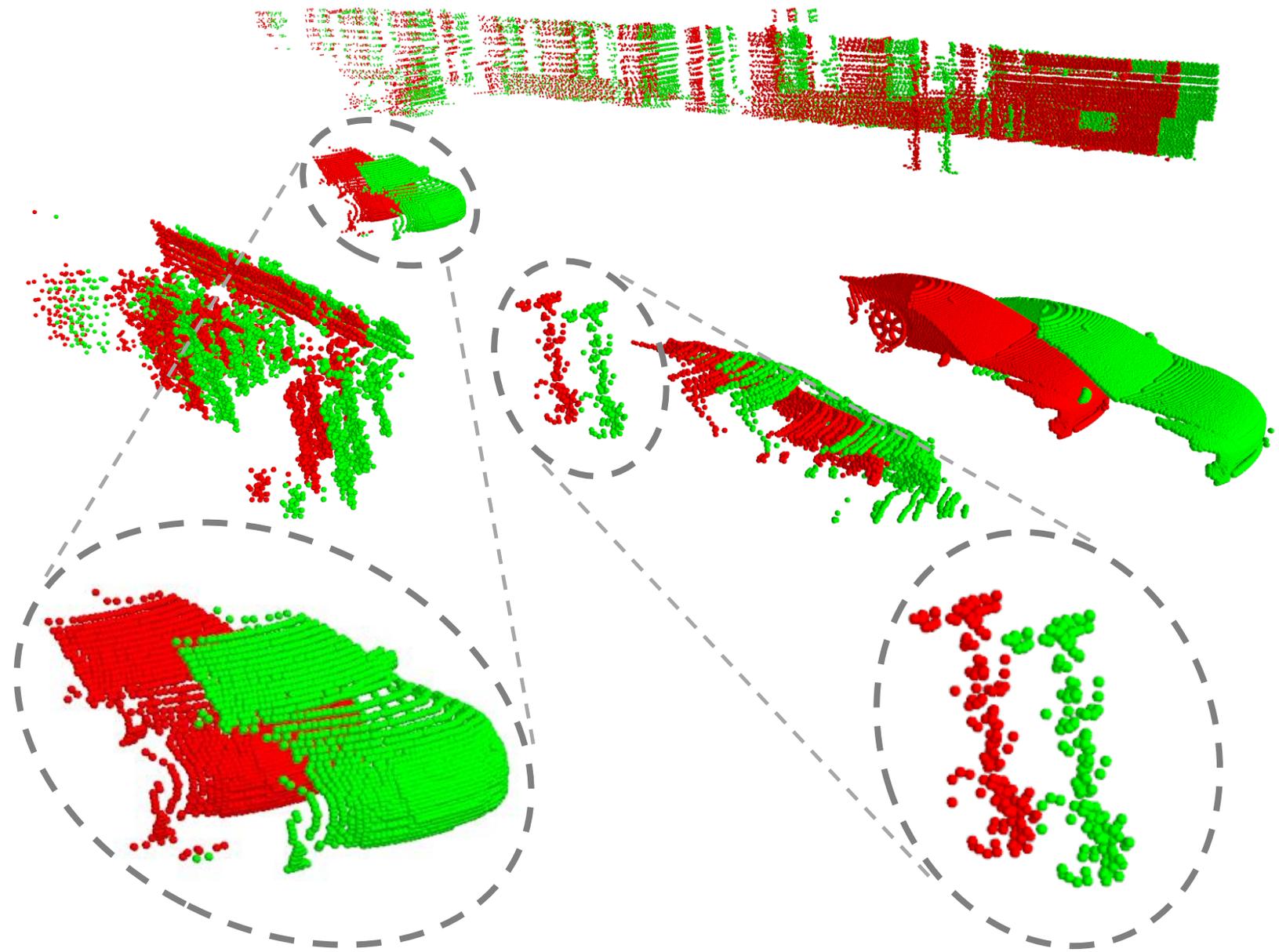


After refinement



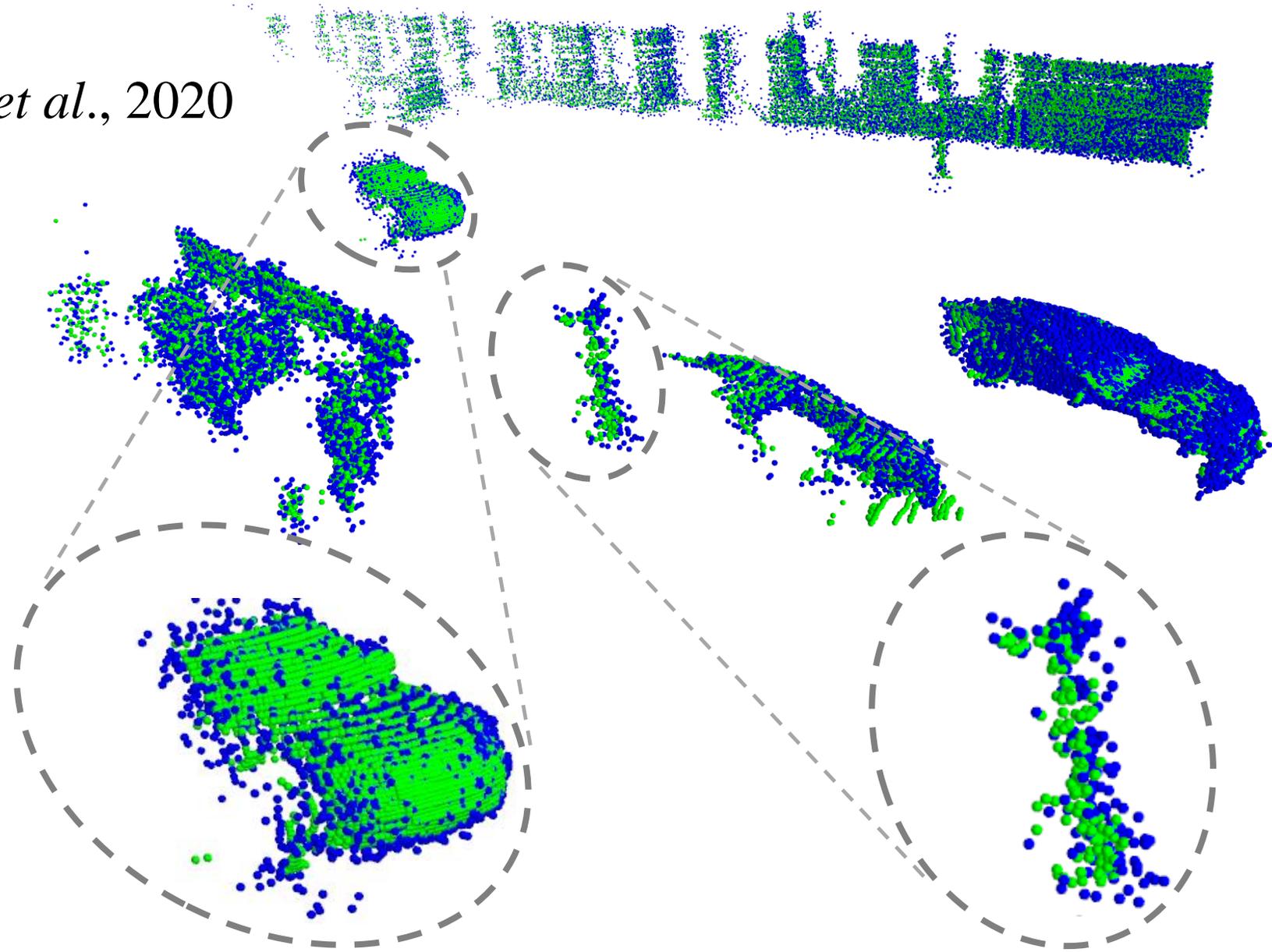
Ground-truth flow

Visual Comparison



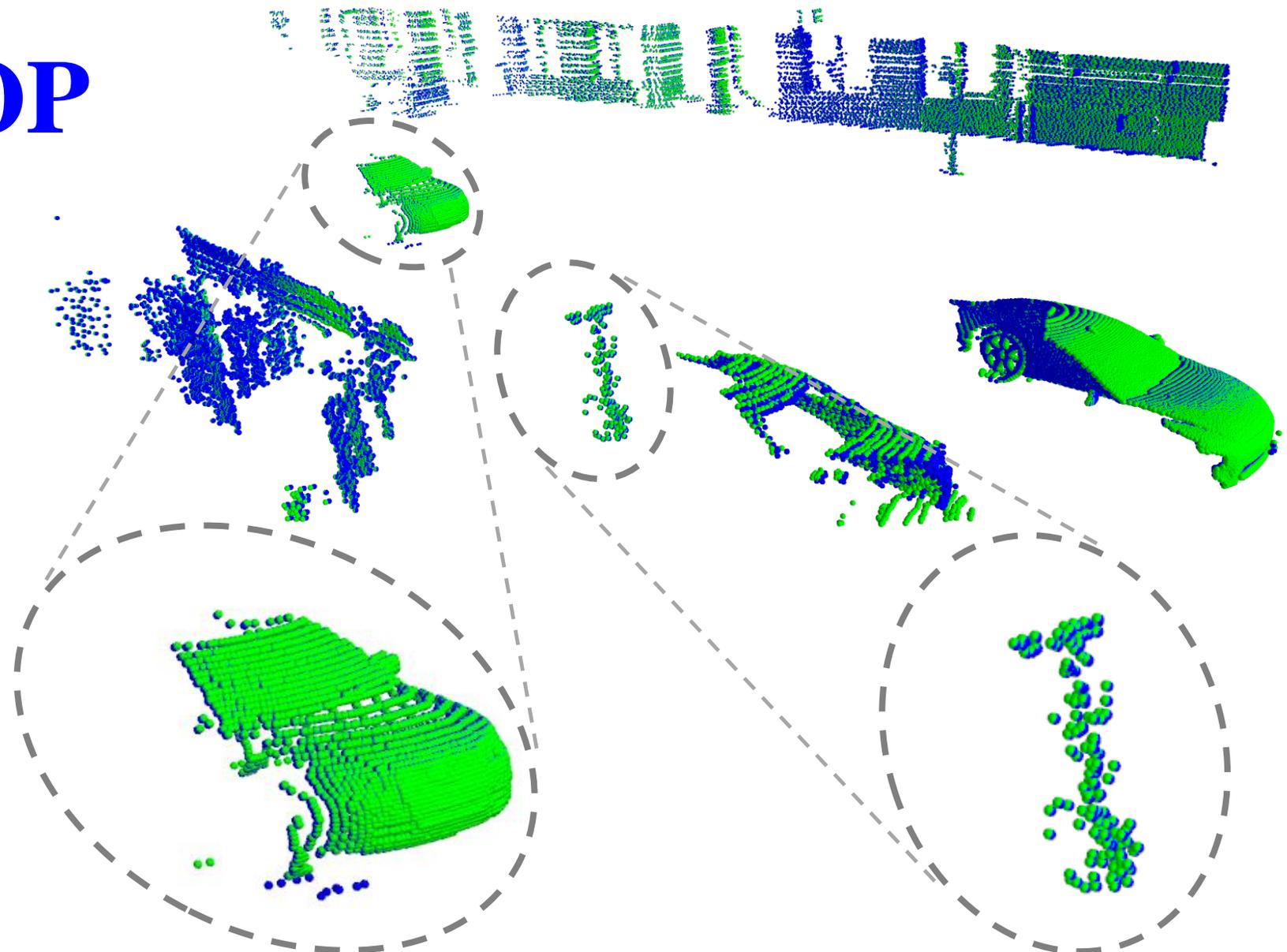
Visual Comparison

FLOT, Puy *et al.*, 2020

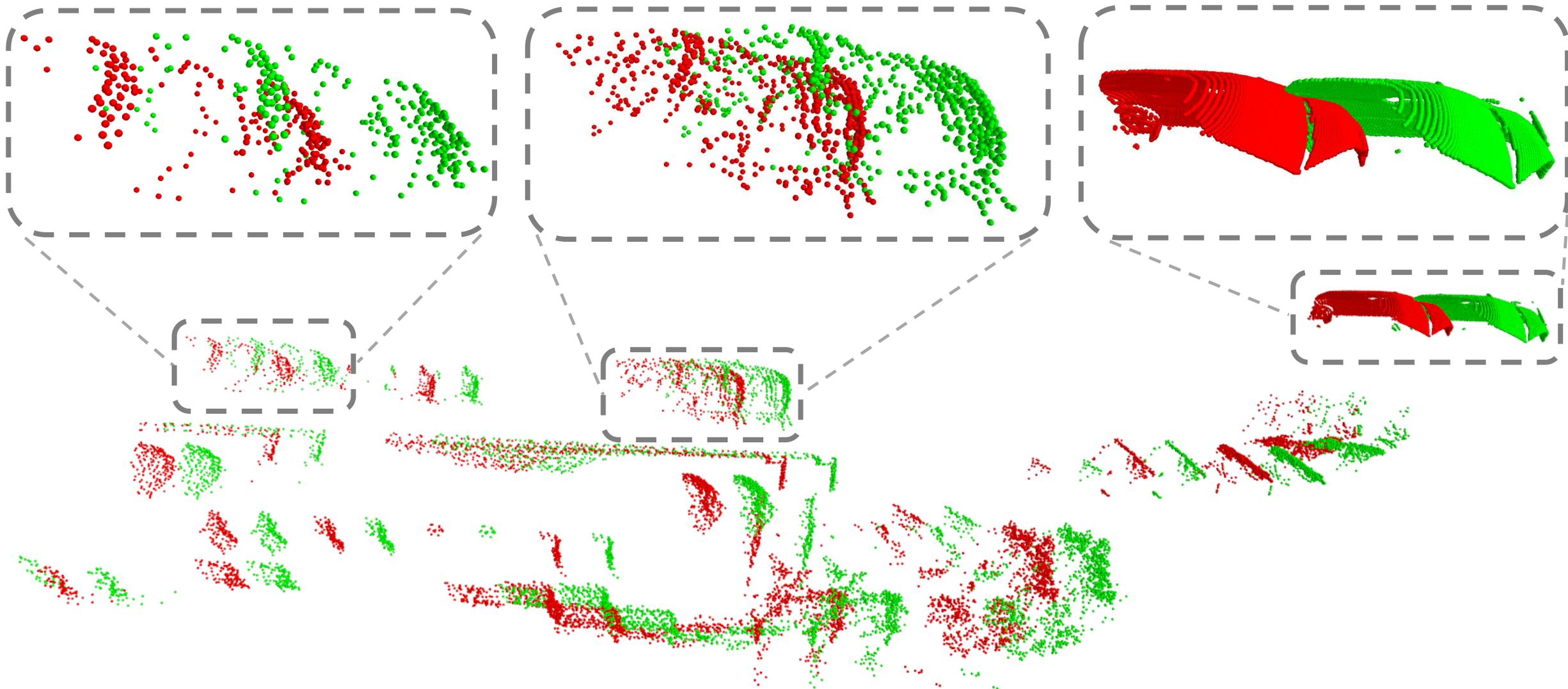


Visual Comparison

SCOOP

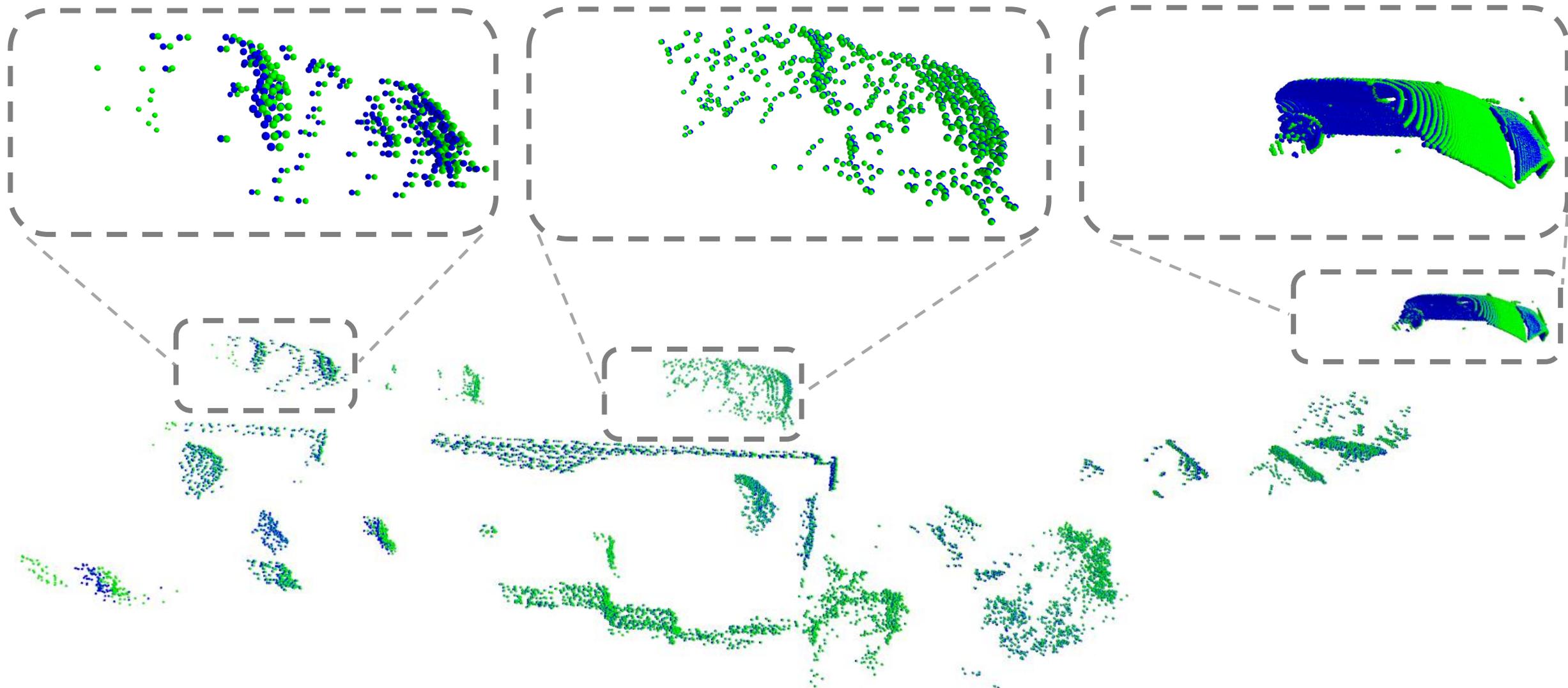


Varying Point Density



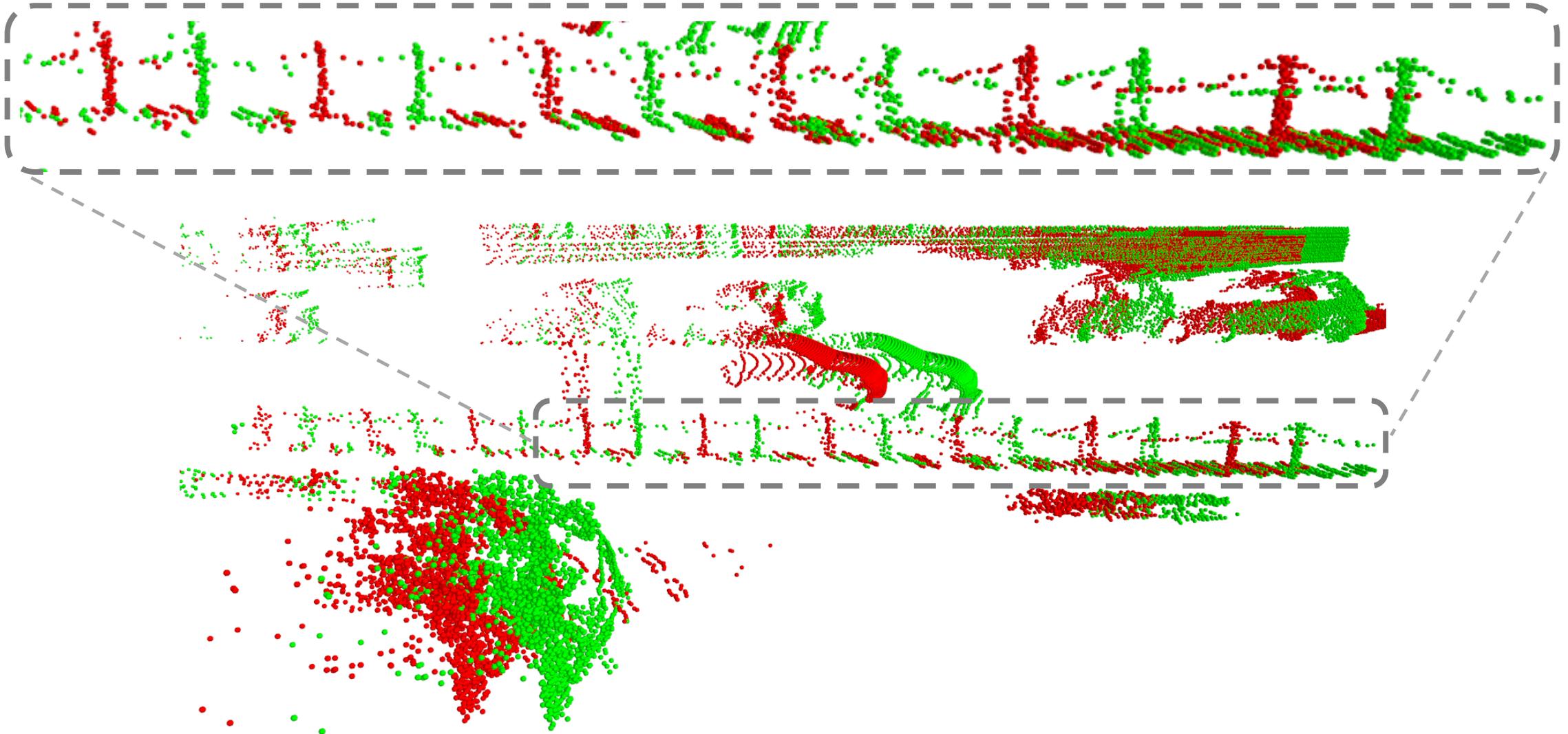
Input **source** and **target** point clouds

Varying Point Density



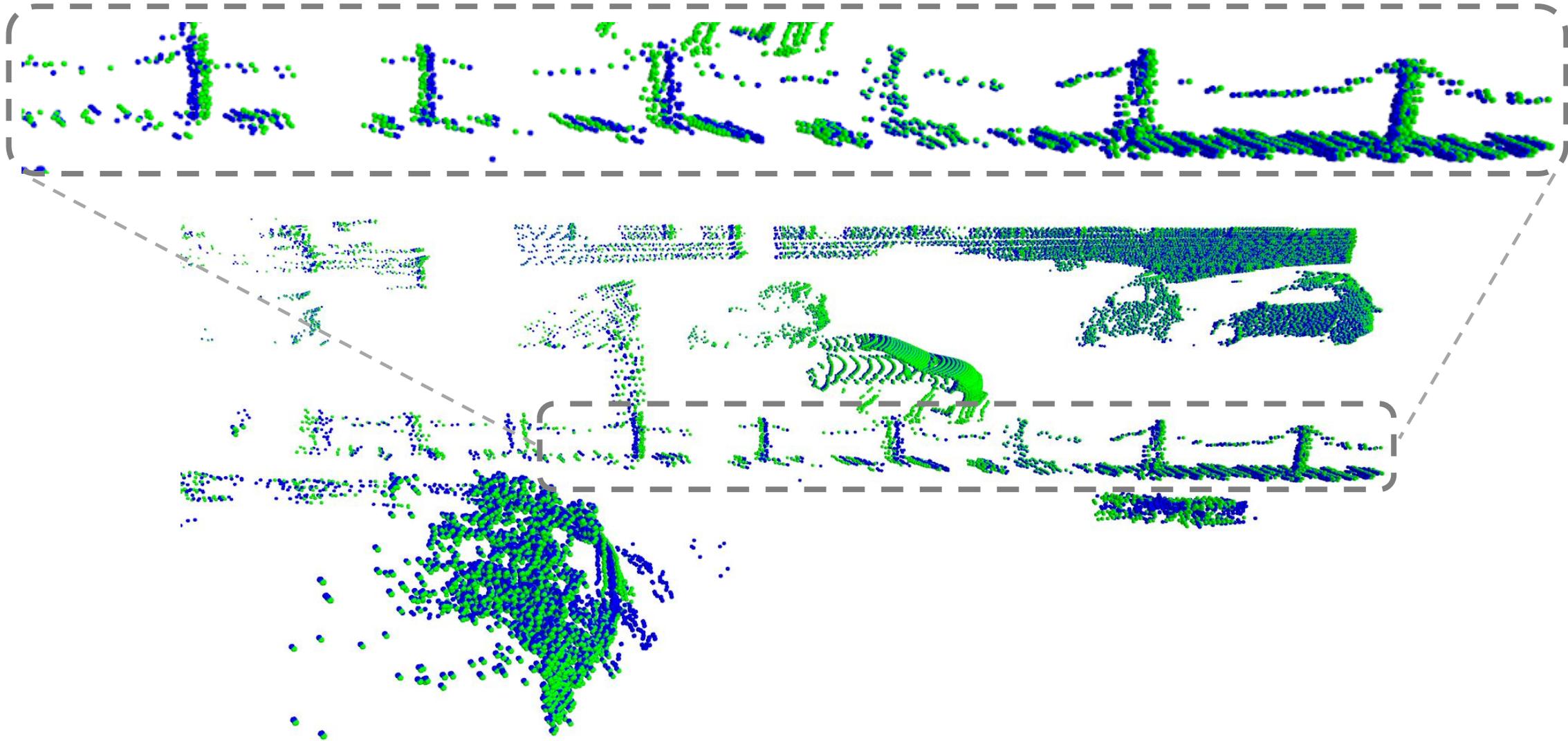
SCOOP's result

Repetitive Structures



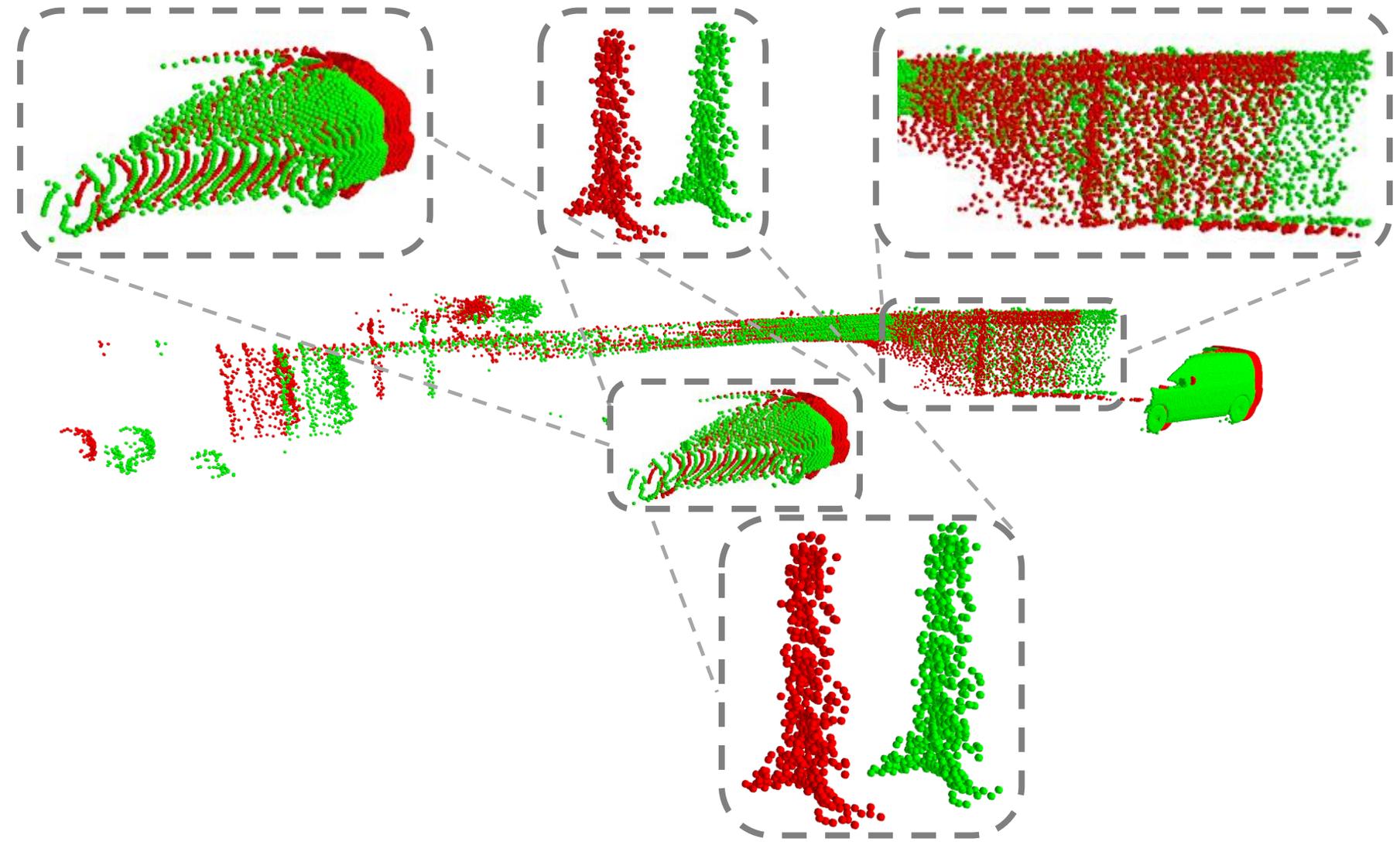
Input **source** and **target** point clouds

Repetitive Structures



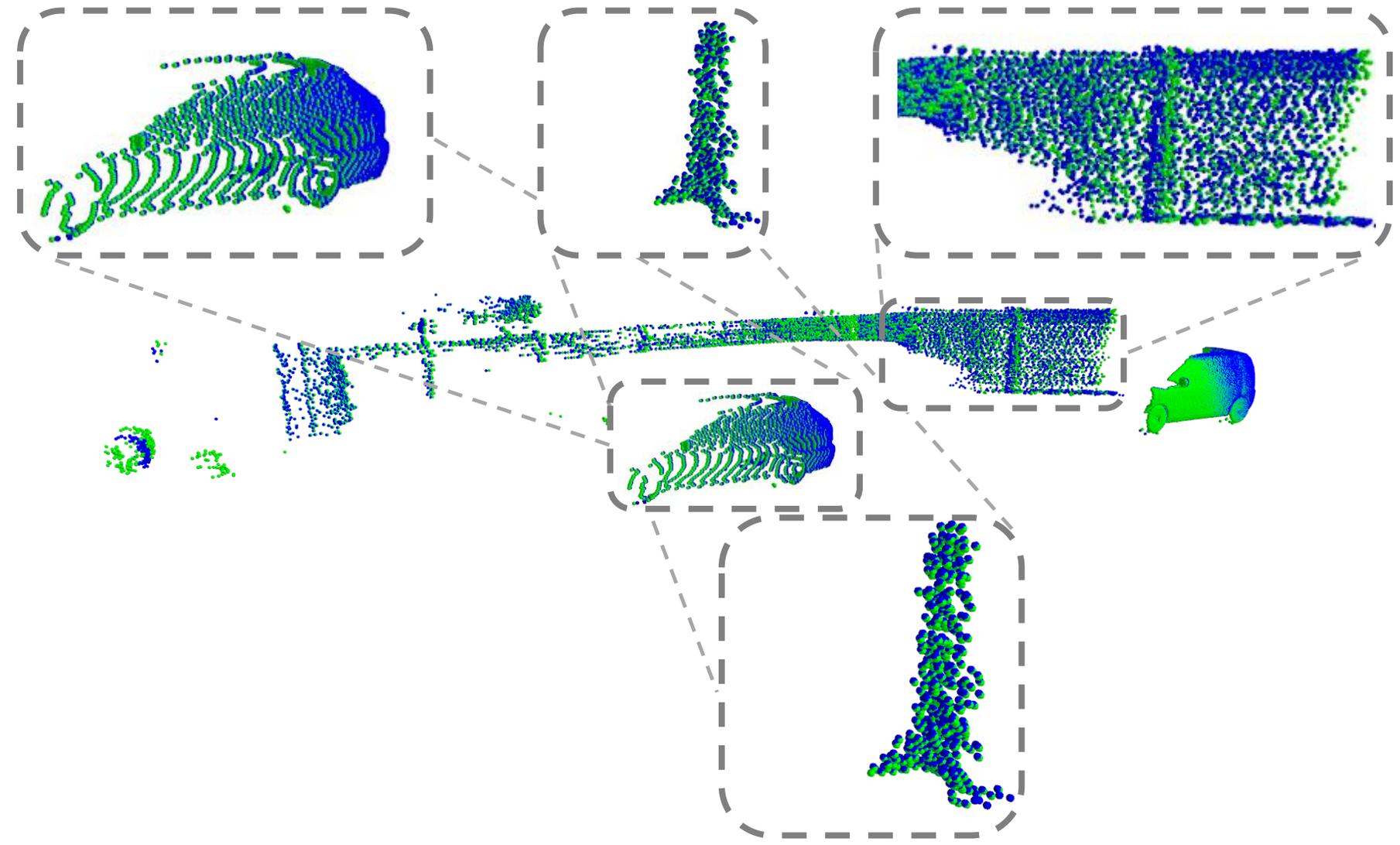
SCOOP's result

Different motion and Geometry



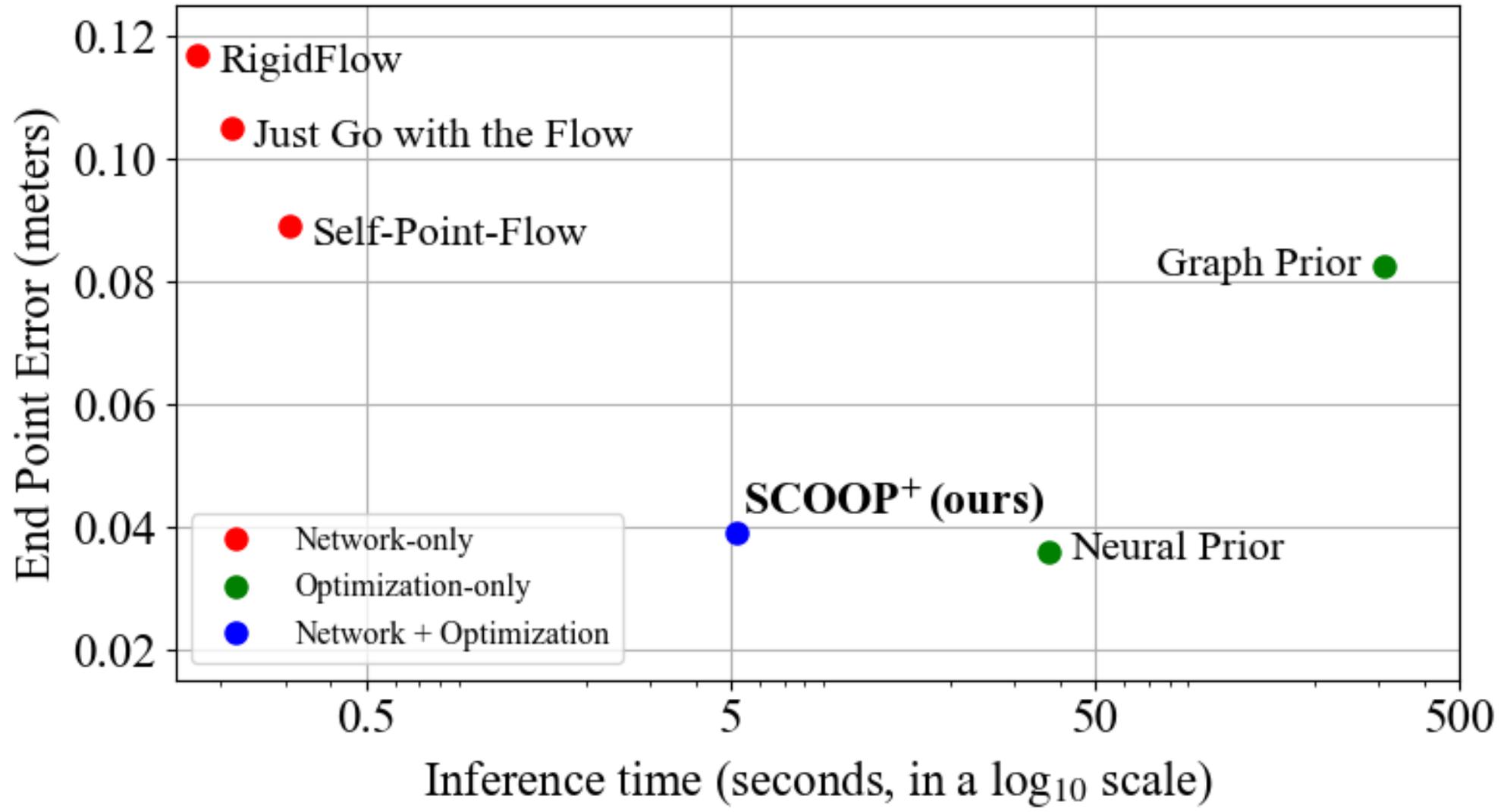
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Different motion and Geometry

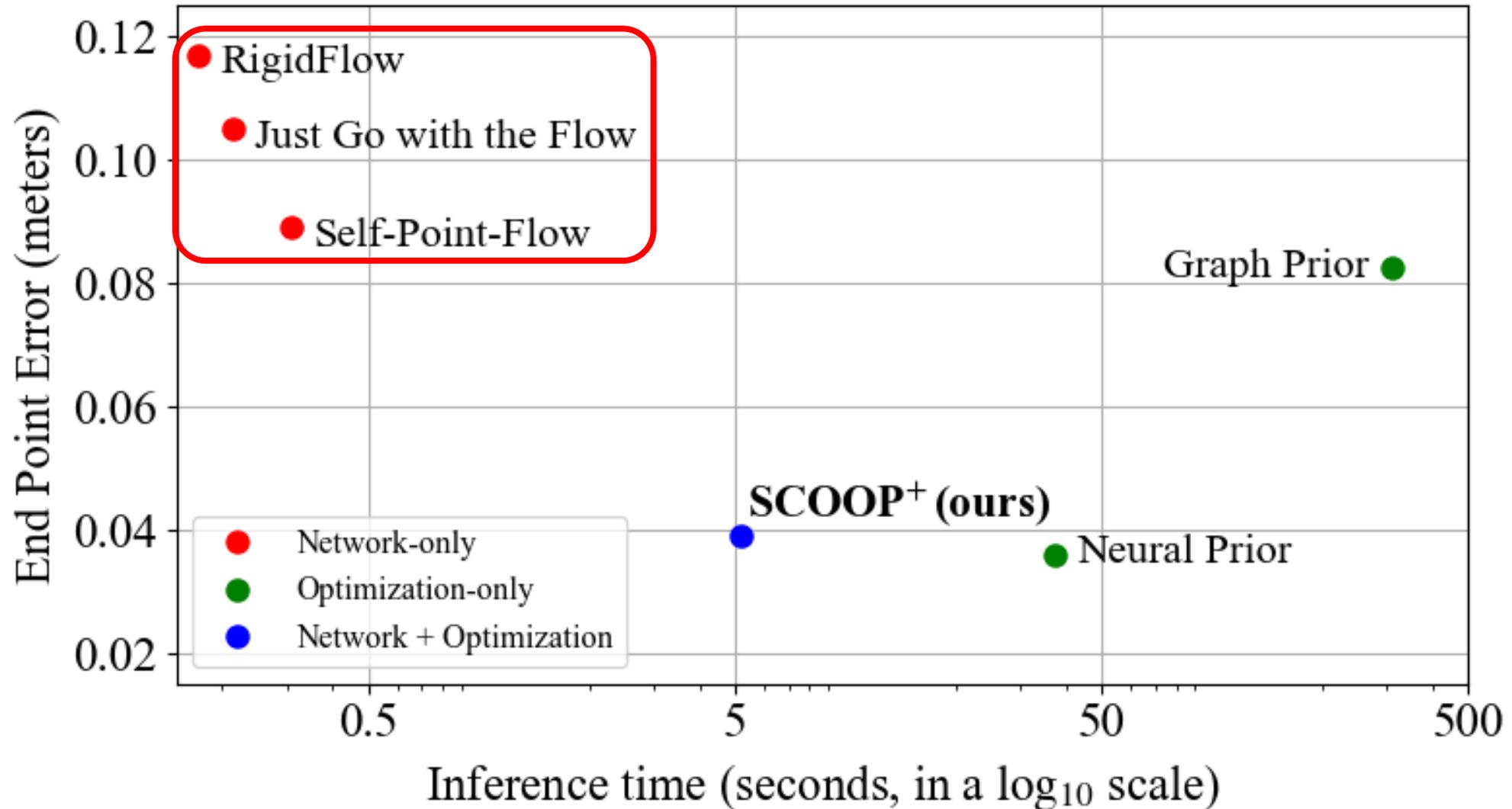


SCOOP's result

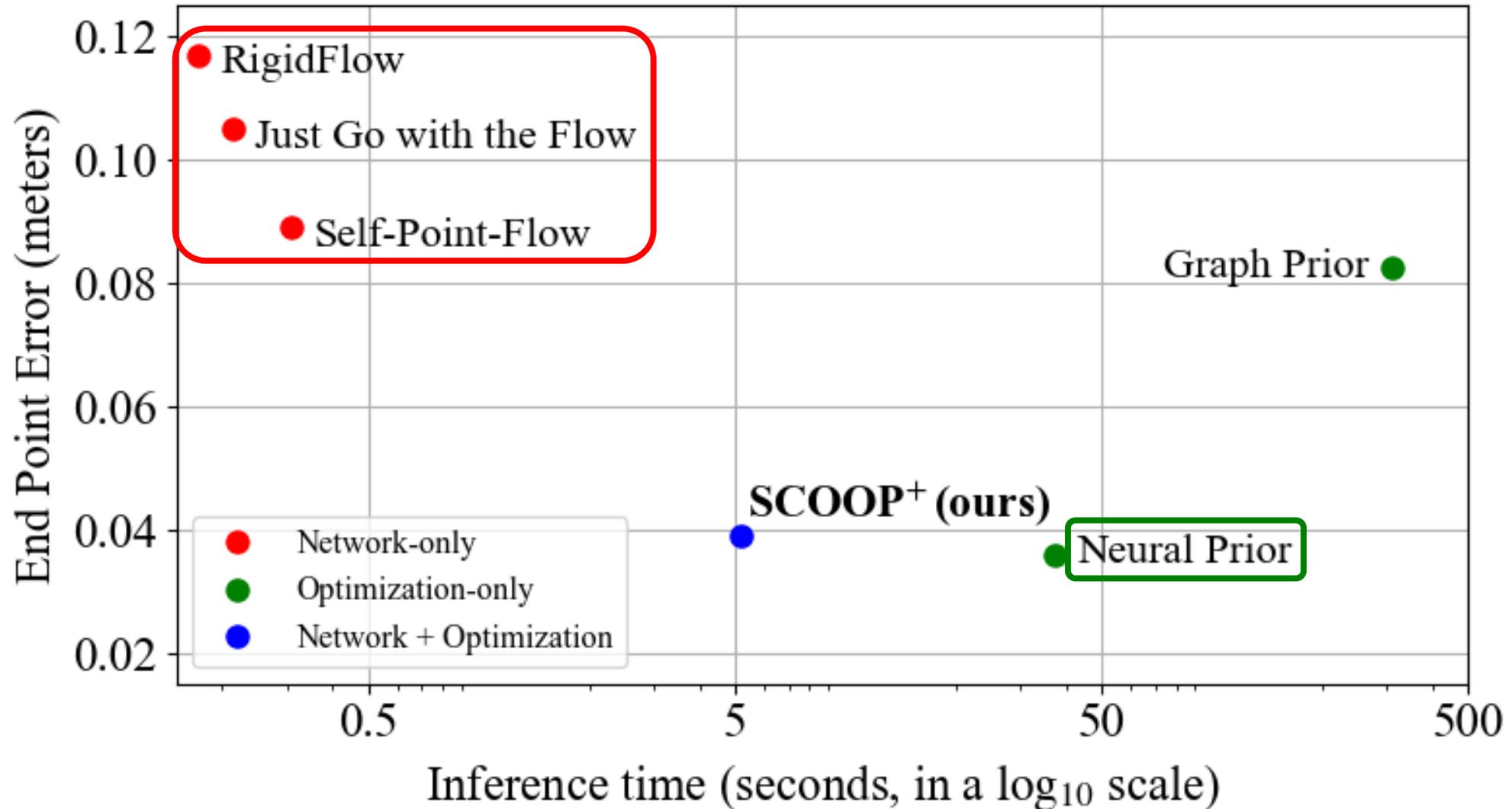
Flow Error vs. Inference Time



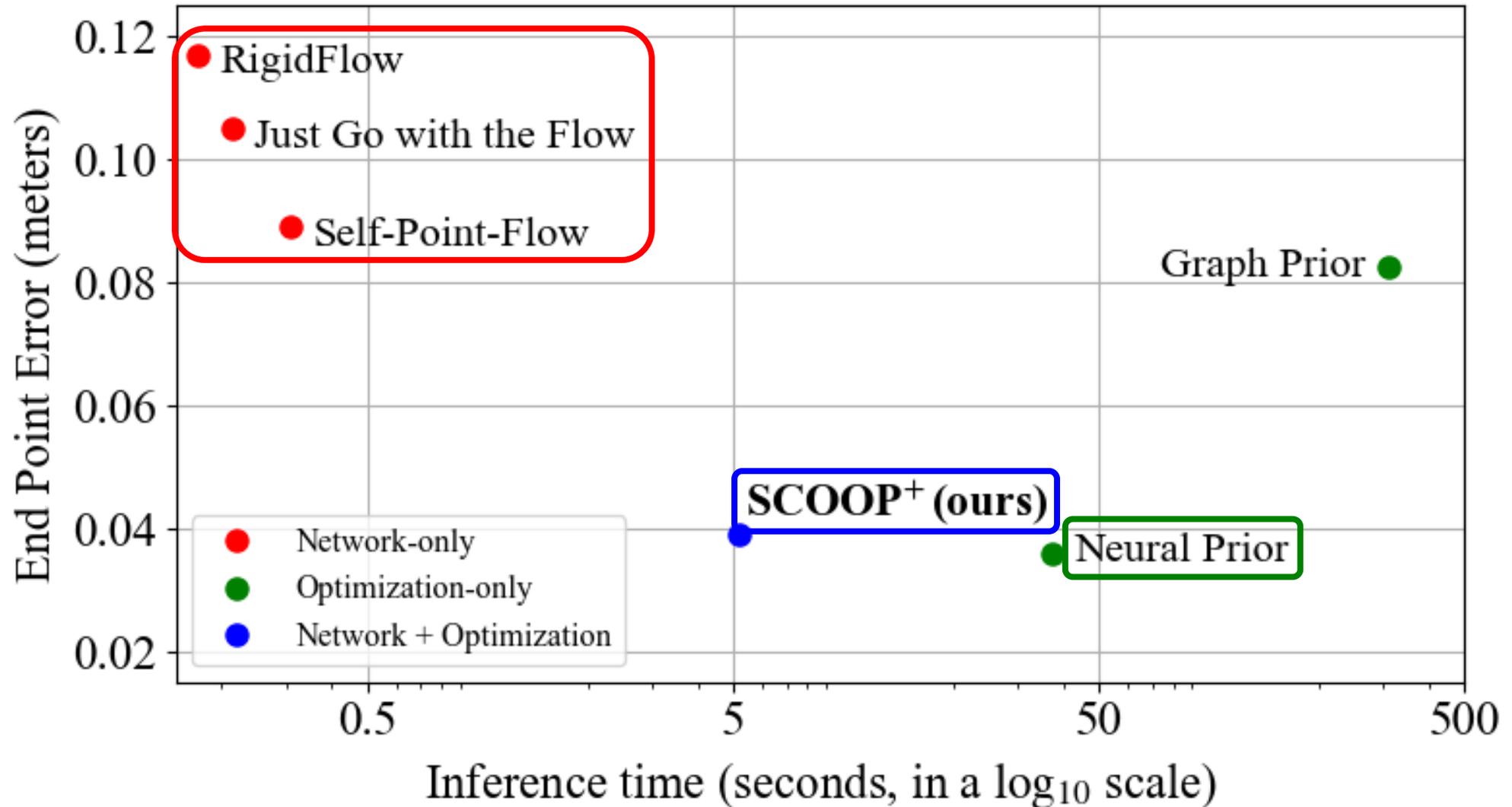
Flow Error vs. Inference Time



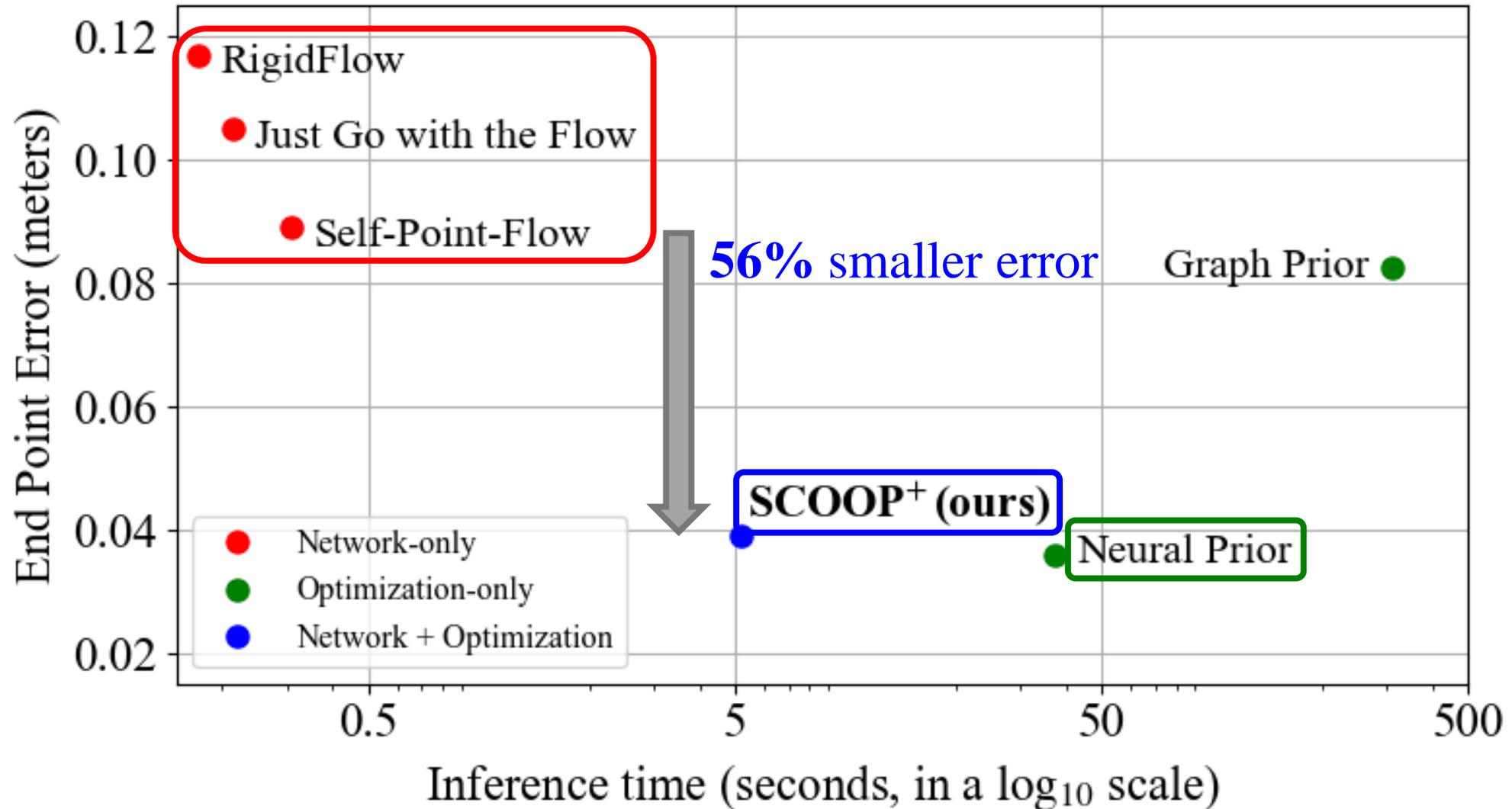
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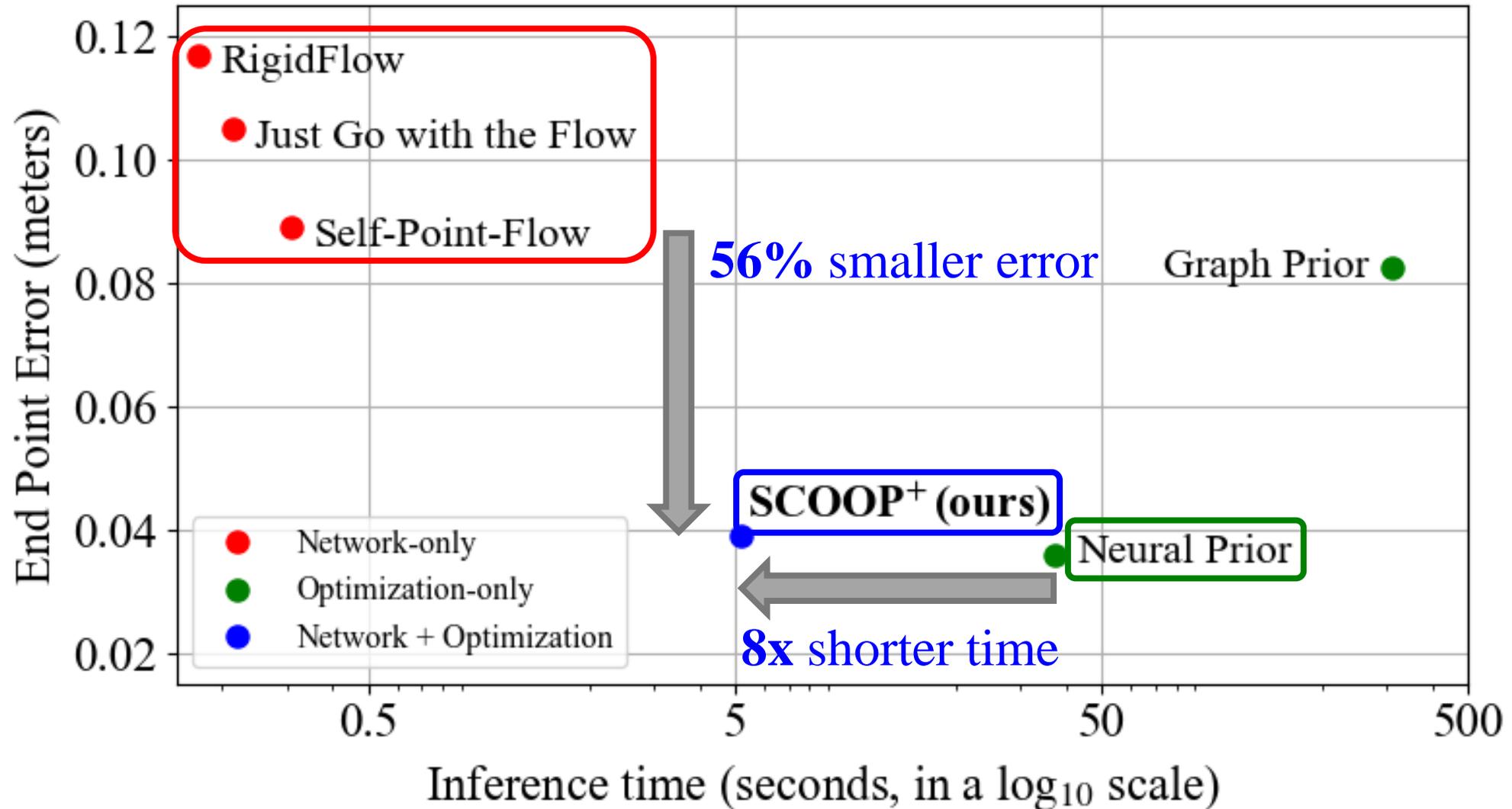
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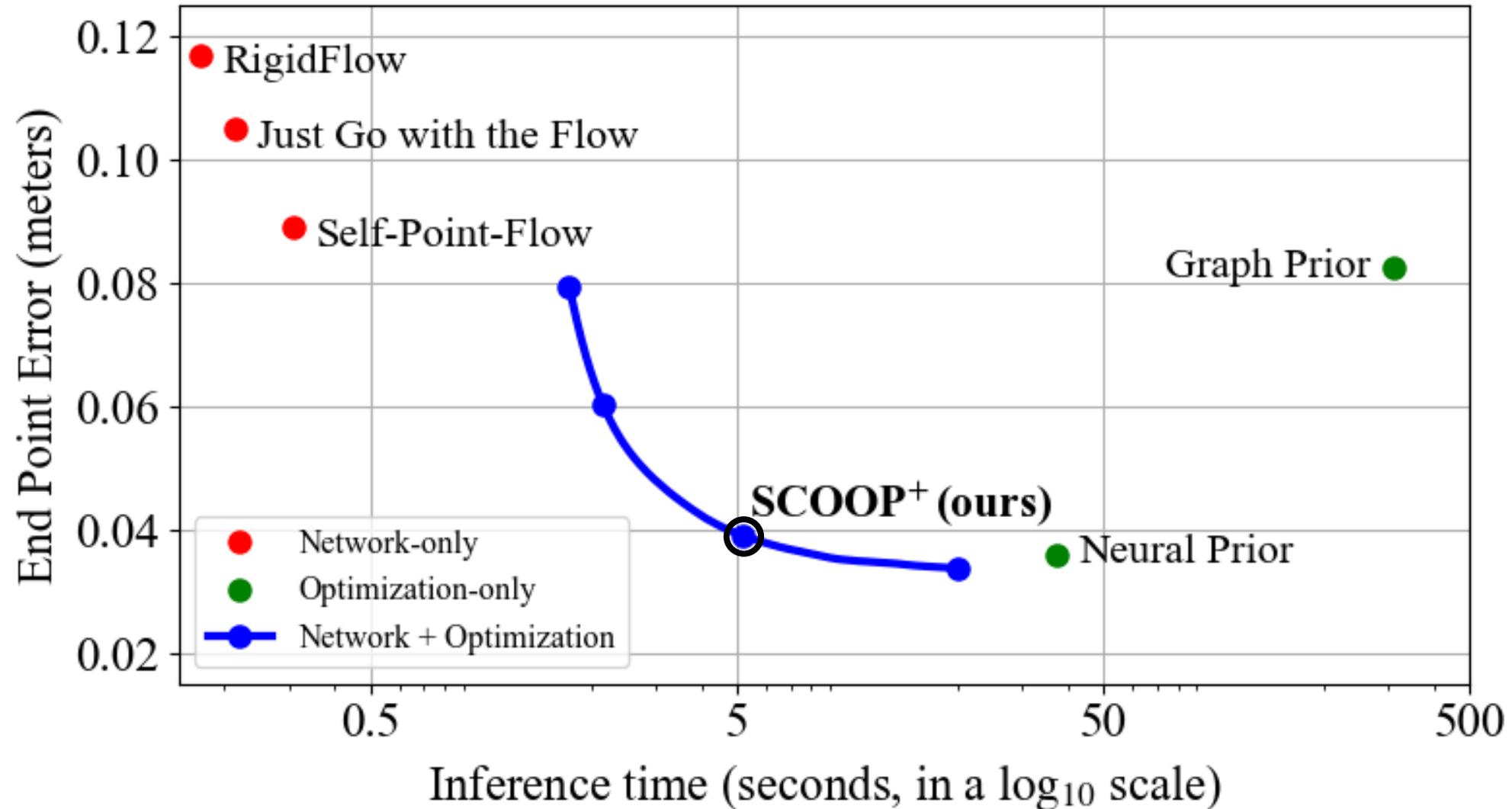
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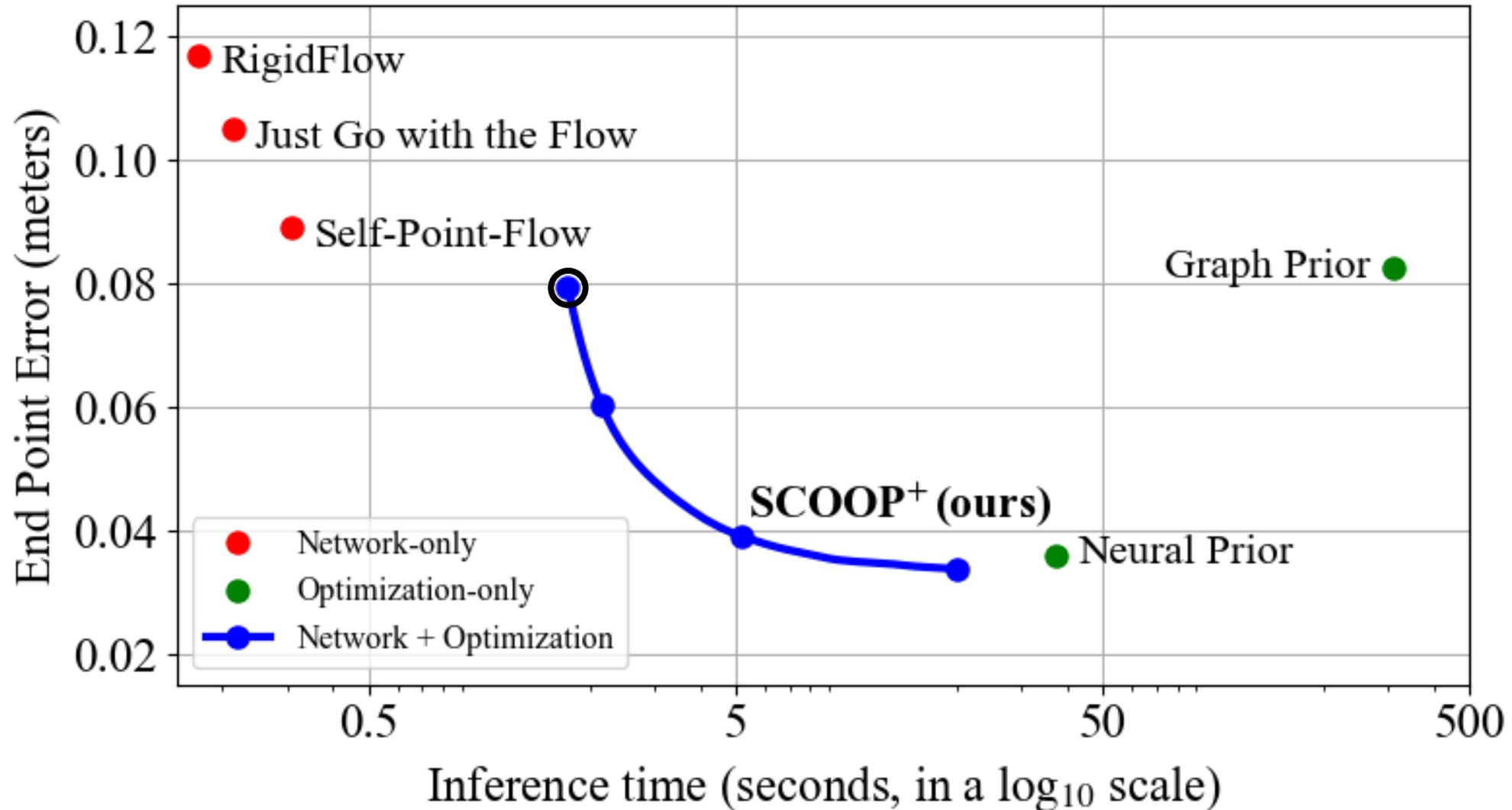
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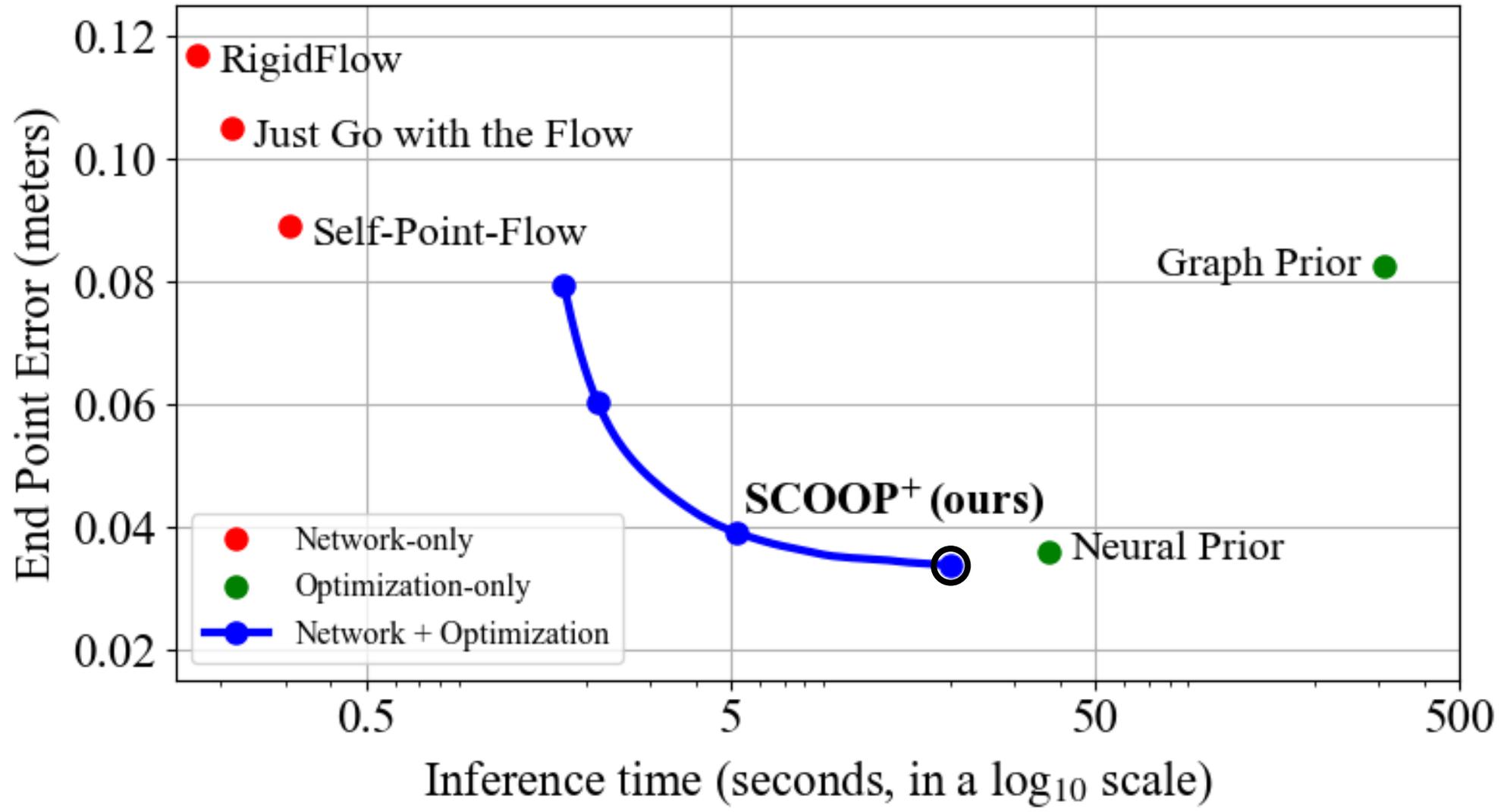
Flow Error vs. Inference Time



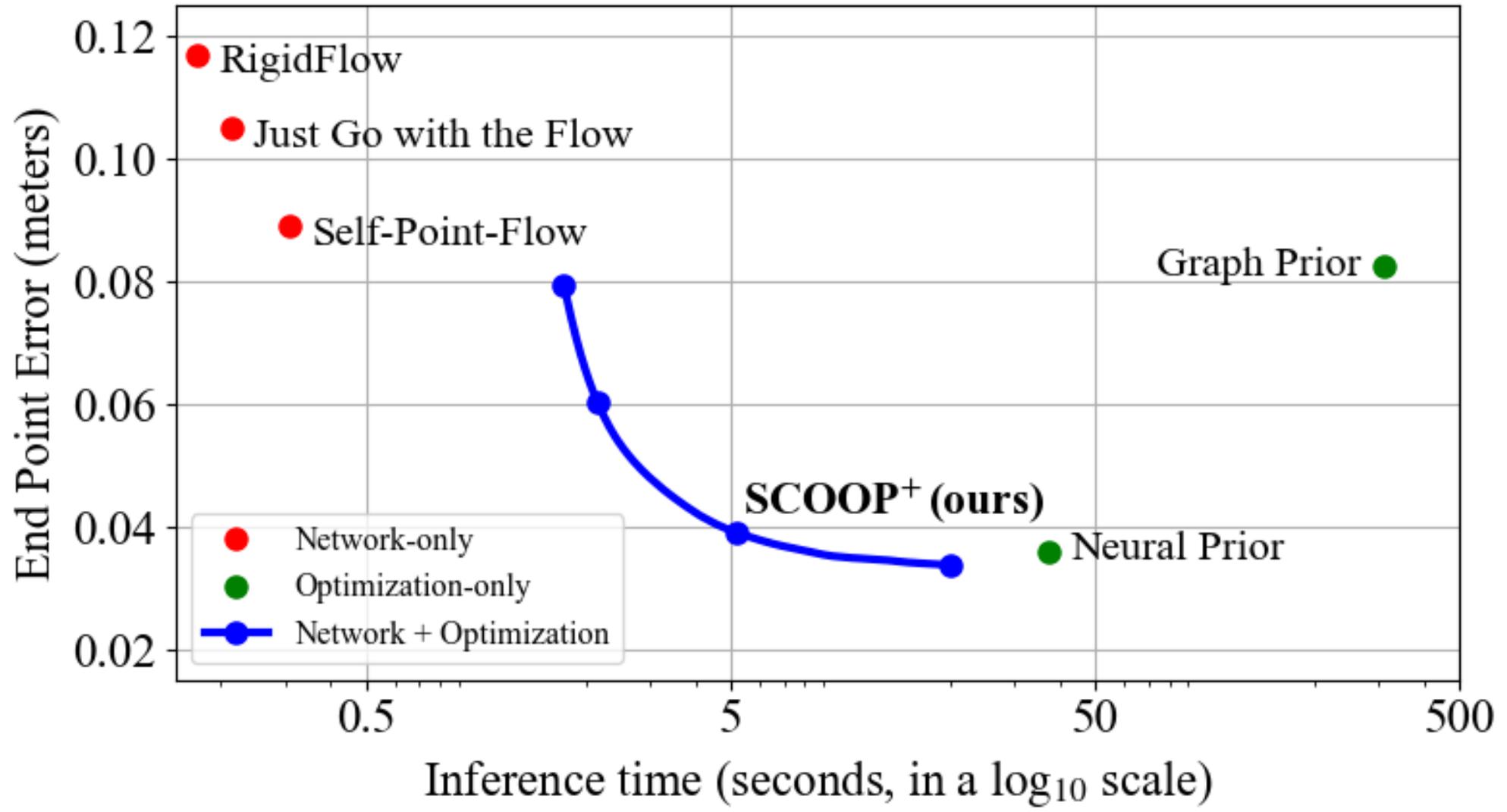
Flow Error vs. Inference Time



Flow Error vs. Inference Time

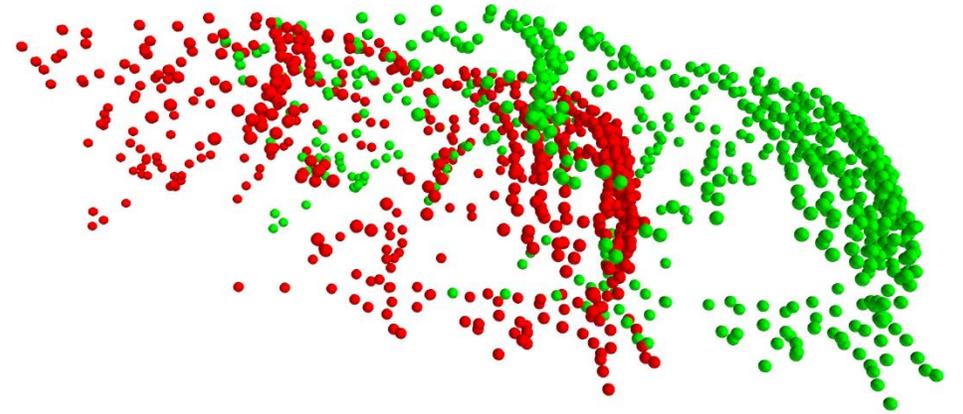


Flow Error vs. Inference Time



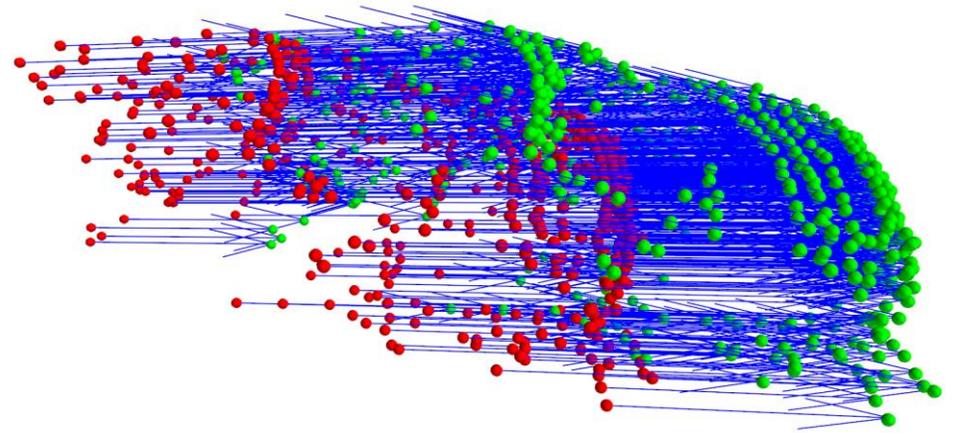
- A new method for scene flow estimation
Pure correspondence learning and
direct refinement optimization

SCOOP



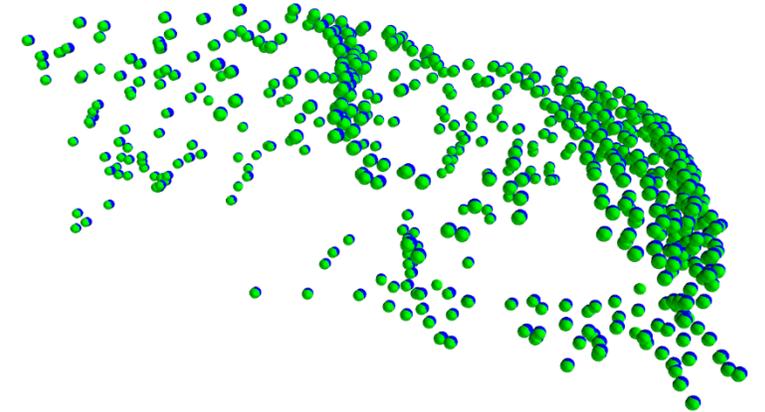
- A new method for scene flow estimation
Pure correspondence learning and
direct refinement optimization
- Achieves state-of-the-art results
Using a fraction of the training data

SCOOP



- A new method for scene flow estimation
Pure correspondence learning and
direct refinement optimization
- Achieves state-of-the-art results
Using a fraction of the training data
- Our code is publicly available
<https://github.com/itailang/SCOOP>

SCOOP



THANK YOU!