Deep Learning for 3D Mesh Registration

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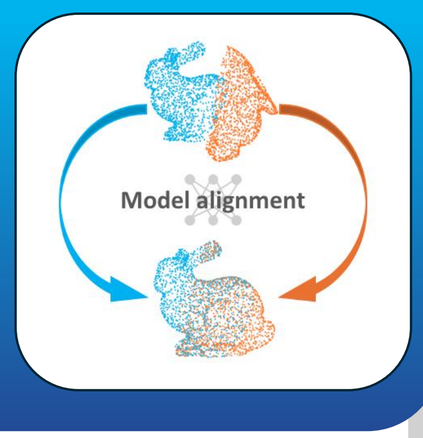
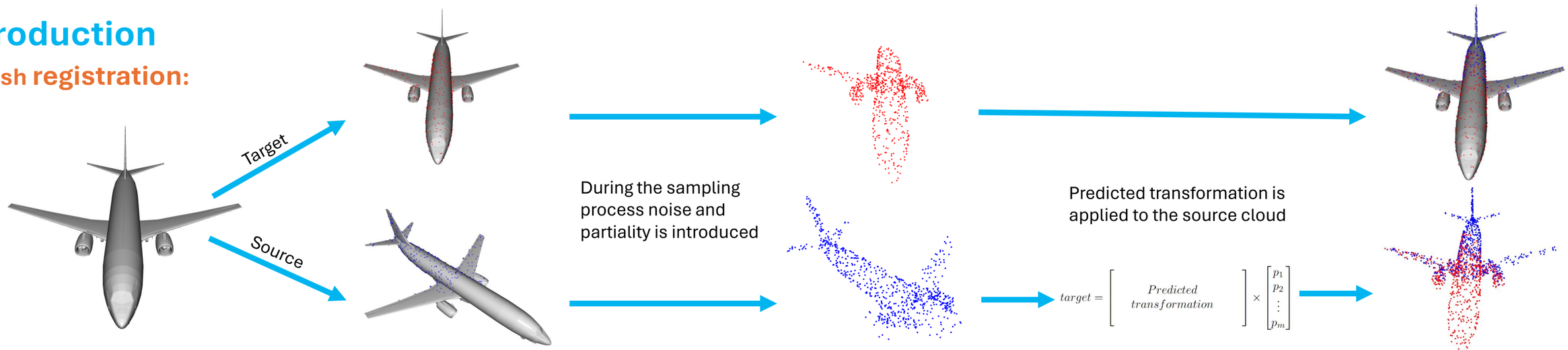


Introduction

Mesh registration:



Methods

Correspondence-based:

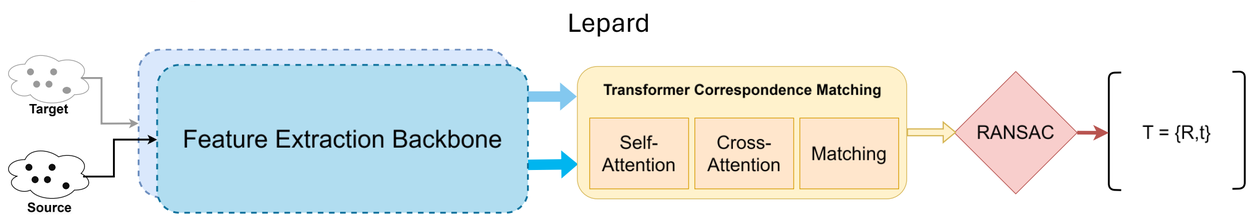


Figure 1

Correspondence-free:

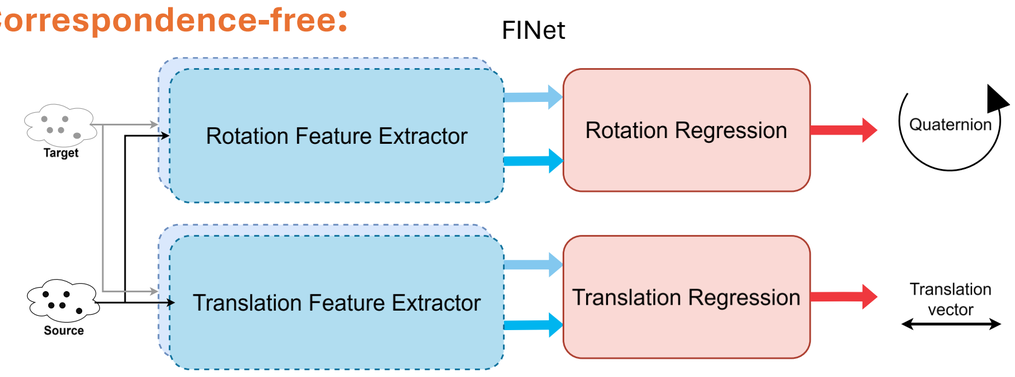
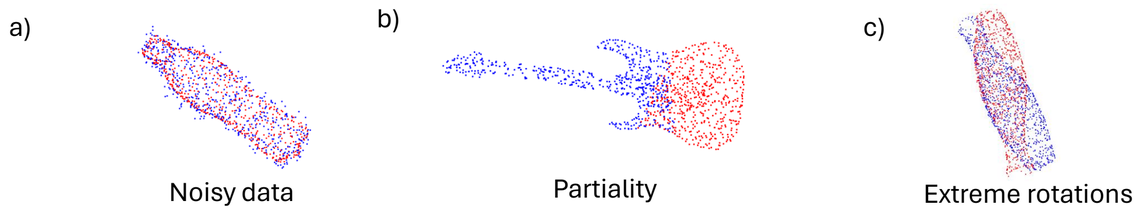


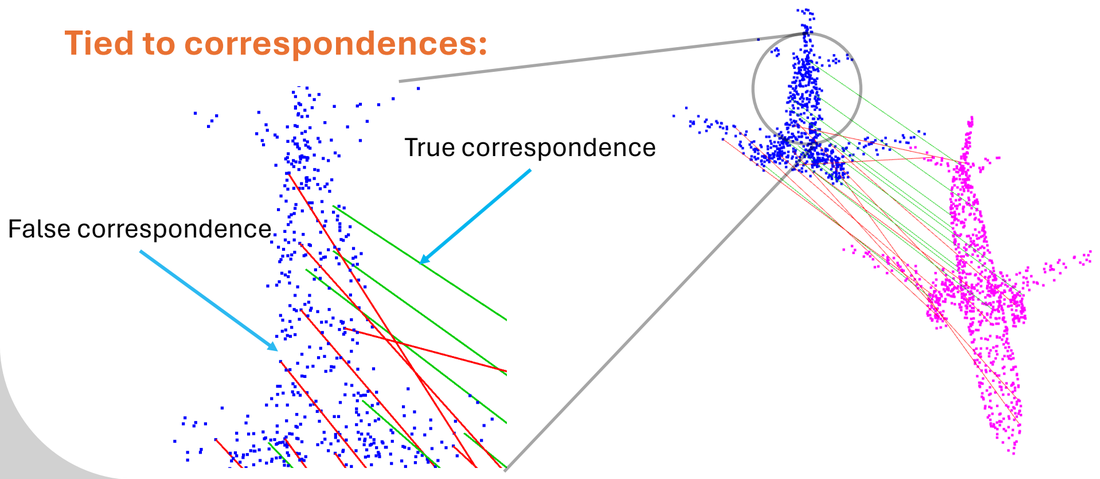
Figure 2

Challenges

Present in both methods:



Tied to correspondences:



Results

Experiment 1: The influence of correspondences, tested on 1024 points.

Dataset	Subset	FINet			Lepard		
		Error(**t**)	Error(**R**)	Ch. dist.	Error(**t**)	Error(**R**)	Ch. dist.
OS/w	train	0.0178	0.738	0.0005	0.0110	0.962	0.0003
	val	0.0170	0.707	0.0004	0.0103	0.875	0.0002
	test	0.0371	2.182	0.0012	0.0097	0.847	0.0004
OS	train	0.0300	1.157	0.0009	0.0126	1.064	0.0003
	val	0.0341	1.408	0.0010	0.0124	1.090	0.0003
	test	0.0527	2.820	0.0019	0.0160	1.740	0.0016
TS	train	0.0339	0.878	0.0013	0.0179	1.433	0.0014
	val	0.0380	1.162	0.0013	0.0189	1.620	0.0015
	test	0.0571	2.856	0.0023	0.0209	1.924	0.0020

OS/w one-to-one corr. | **OS** some points one-to-one corr. | **TS** no one-to-one corr.

Table 1

Experiment 2: Gaussian noise with std = 1%, rotation up to 45°, translation [-0.5 ; 0.5].

Method	Subset	≈ 72% overlap			≈ 53% overlap		
		Error(**t**)	Error(**R**)	Ch. dist.	Error(**t**)	Error(**R**)	Ch. dist.
Finet/OS	train	0.0195	0.759	0.0004	0.1194	4.695	0.0100
	val	0.0212	0.852	0.0004	0.1303	4.973	0.0100
	test	0.0481	2.851	0.0015	0.1732	7.773	0.0156
Lepard/OS	train	0.0802	8.510	0.0065	0.2958	37.215	0.0214
	val	0.0802	8.213	0.0053	0.3111	39.061	0.0219
	test	0.0791	8.586	0.0082	0.2765	35.057	0.0236

Table 2

Experiment 3: Accuracy on the test set per category. A significant drop in accuracy in some categories.

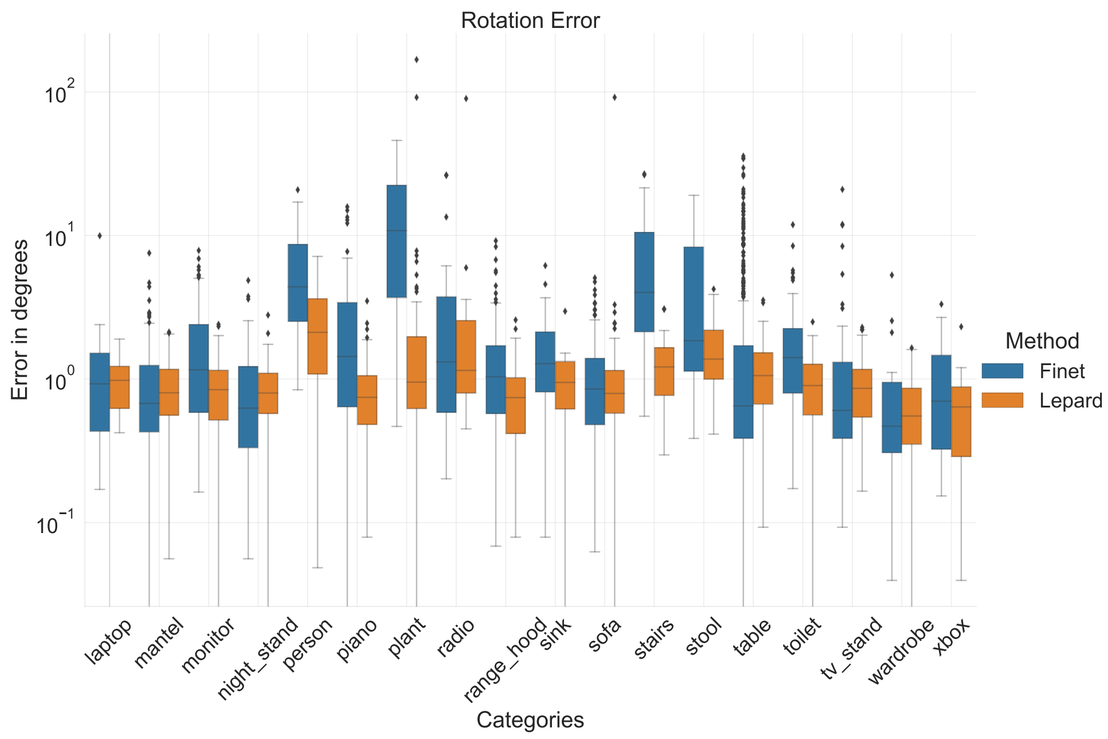
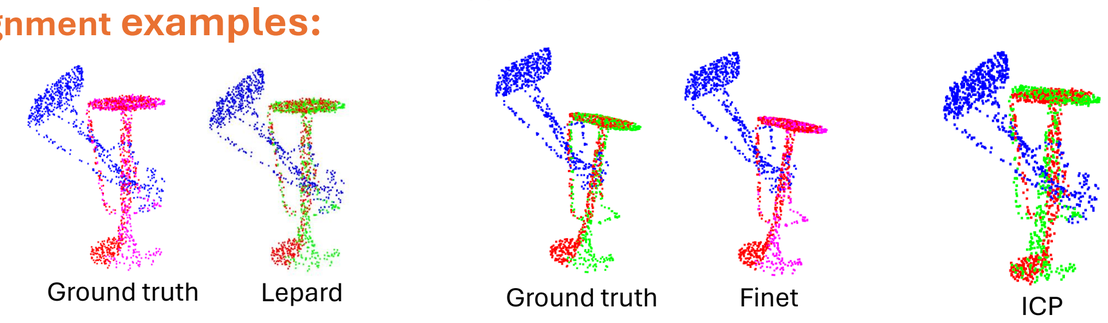
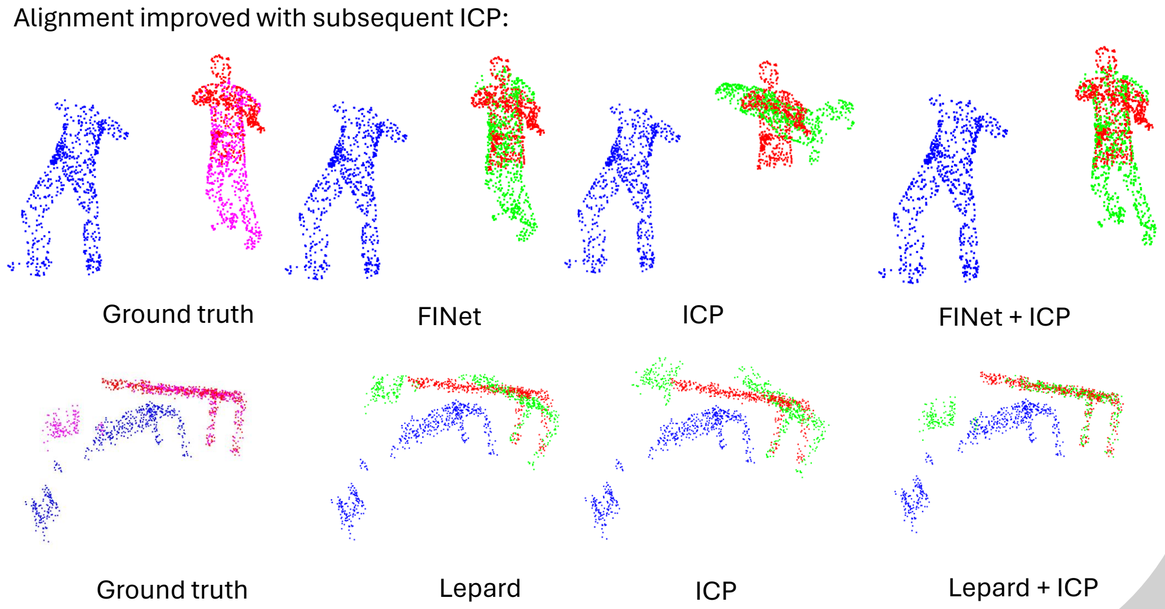


Figure 3

Alignment examples:





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