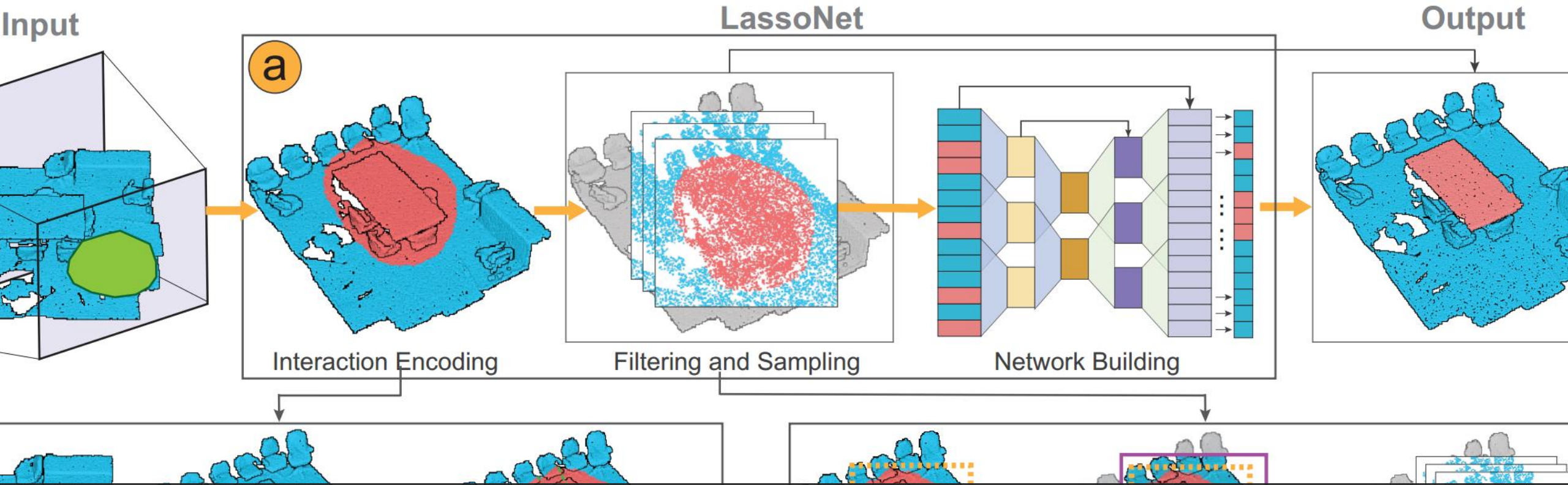
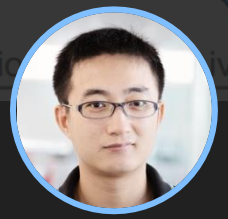


LassoNet: Deep Lasso-Selection of 3D Point Clouds


Zhutian Chen


Wei Zeng


Zhiguang Yang


Lingyun Yu


Chi-Wing Fu

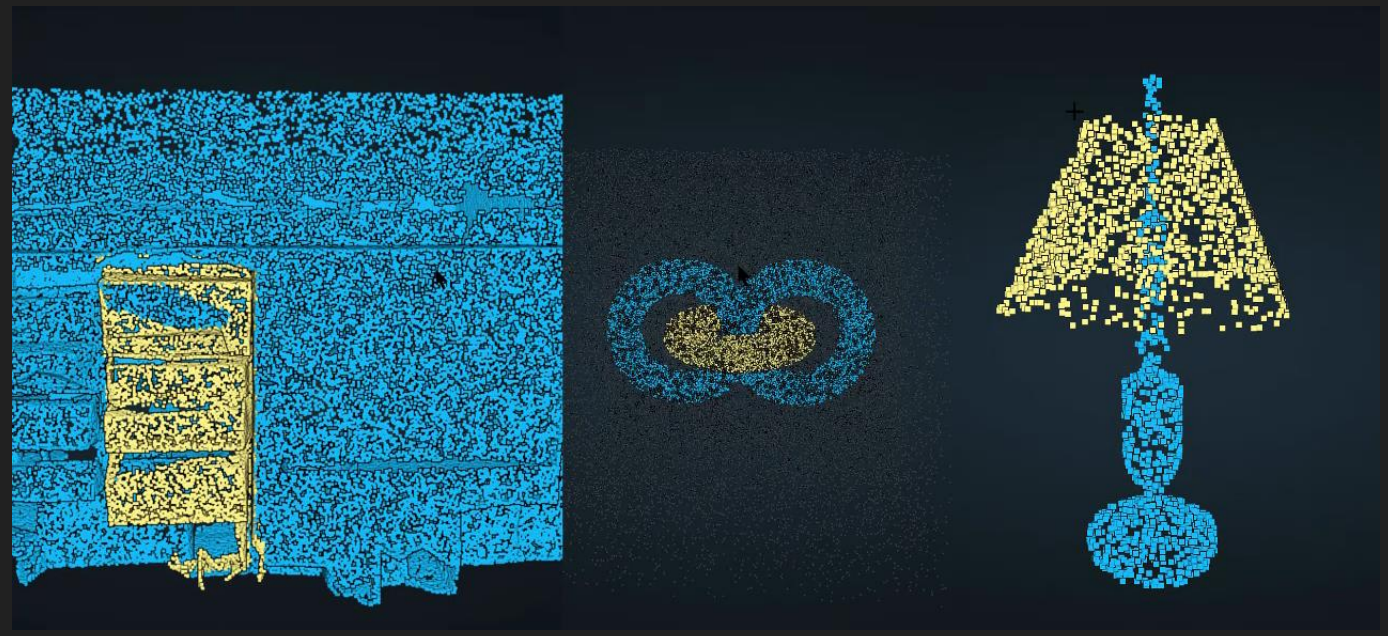

Huamin Qu

VIS2019

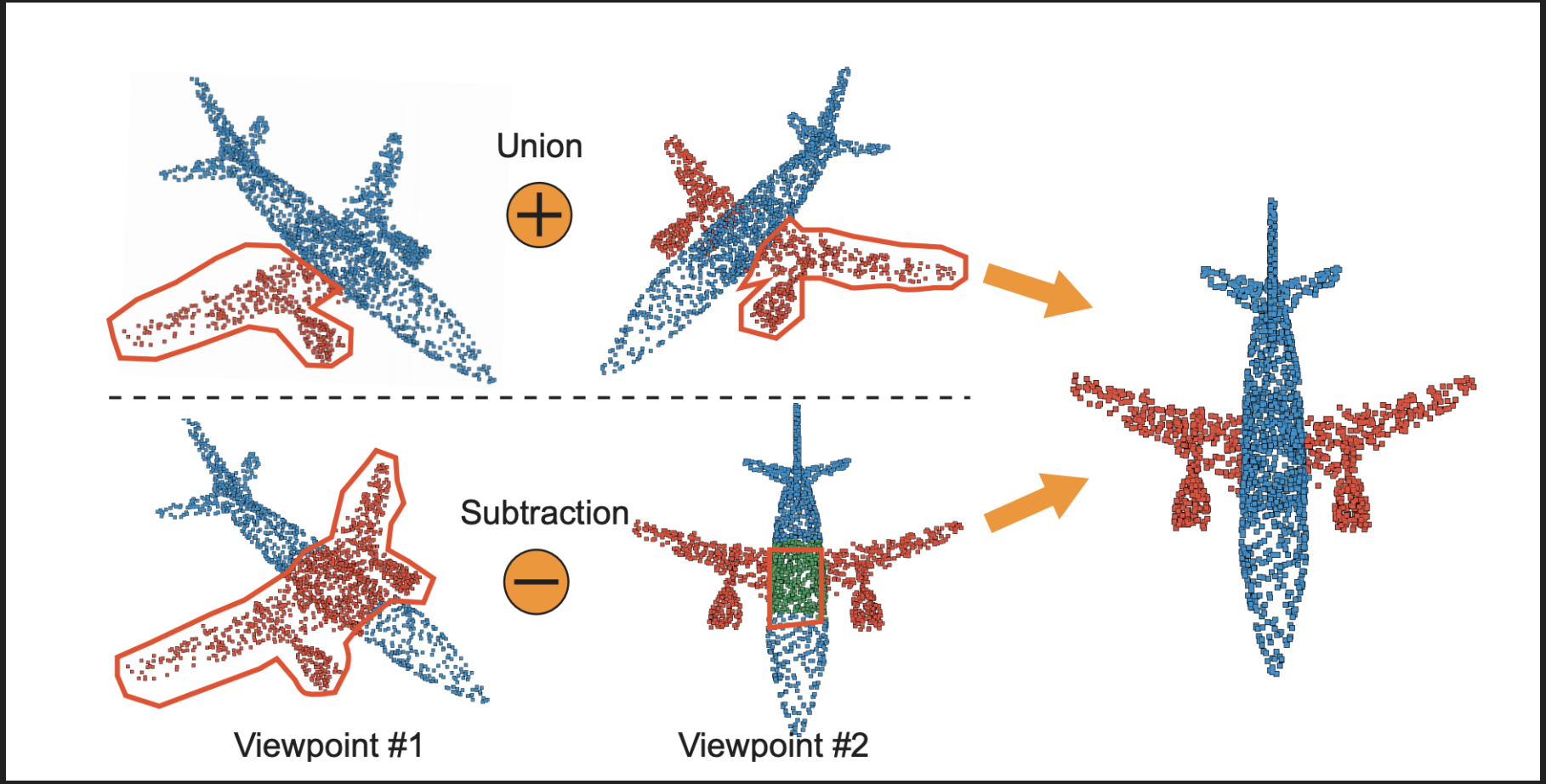
How to select a subset of points from a 3D point cloud?

Naïve Lasso Selection

Will select all the points inside the lasso



Naïve Lasso Selection

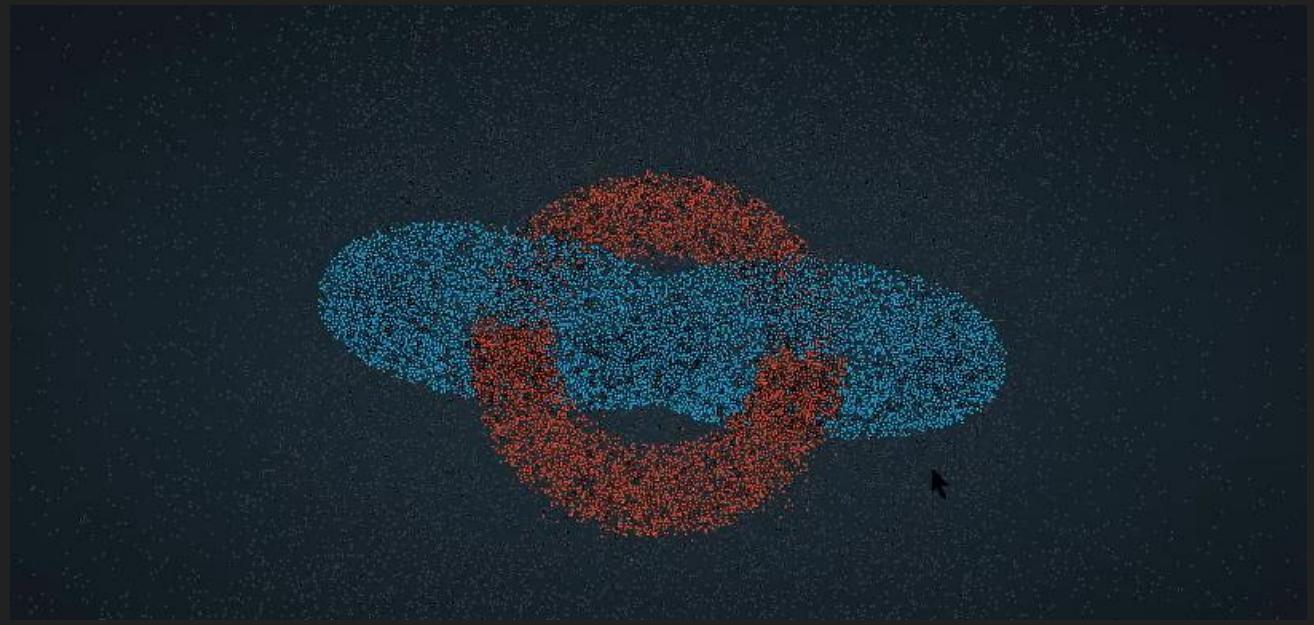


Our Goal

$$Input \xrightarrow{f} Output$$

A 2D lasso on an un-labeled 3D point cloud

The prediction of the target points



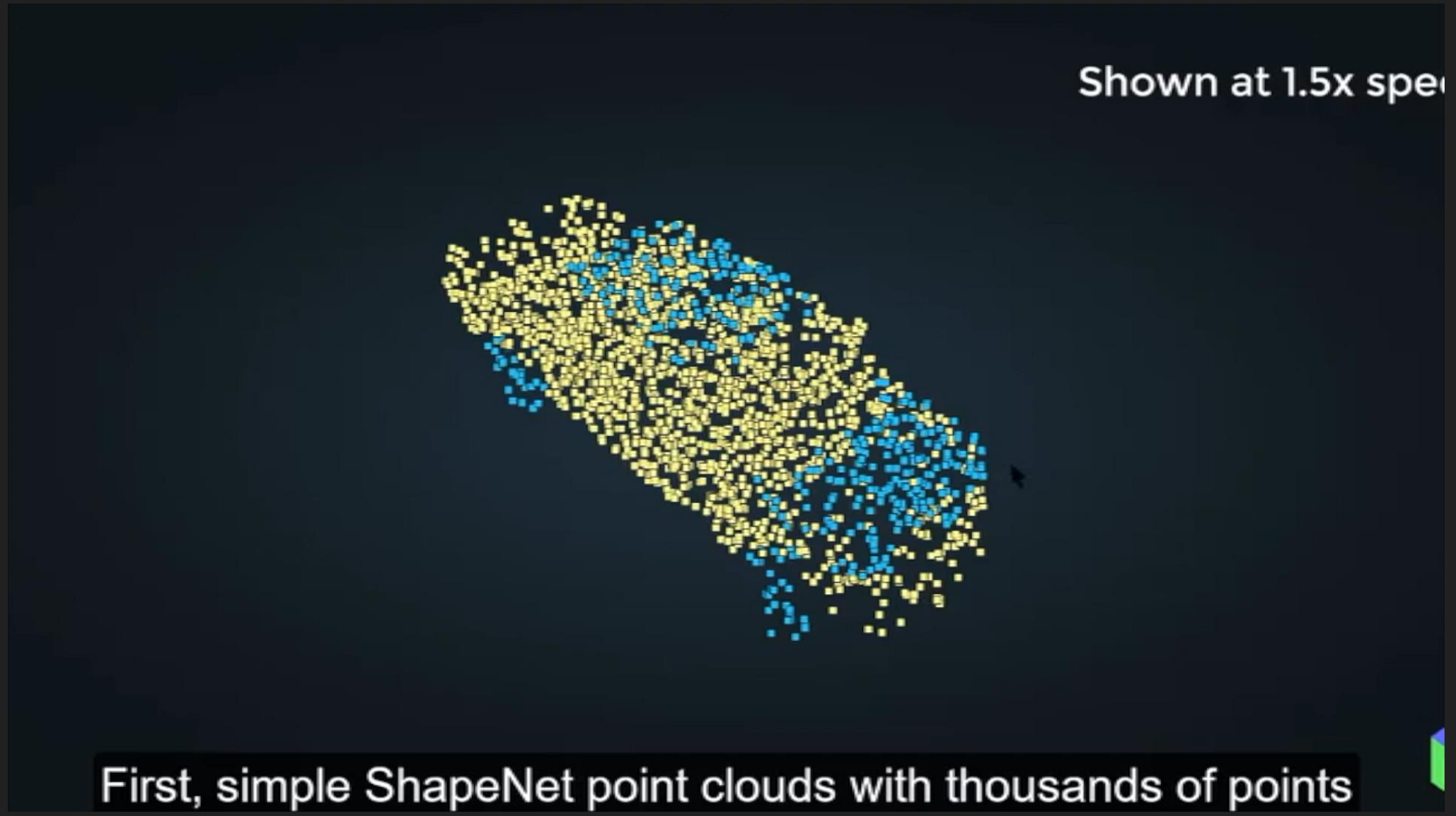
Challenges

$$Input \xrightarrow{f} Output$$

Great variabilities of the input:

- **Lasso** • 2D, large vs. small, any shapes
- **Viewpoint** • several degrees of freedom
- **Point cloud** • 3D, unlabeled, dense vs. sparse

Result Examples

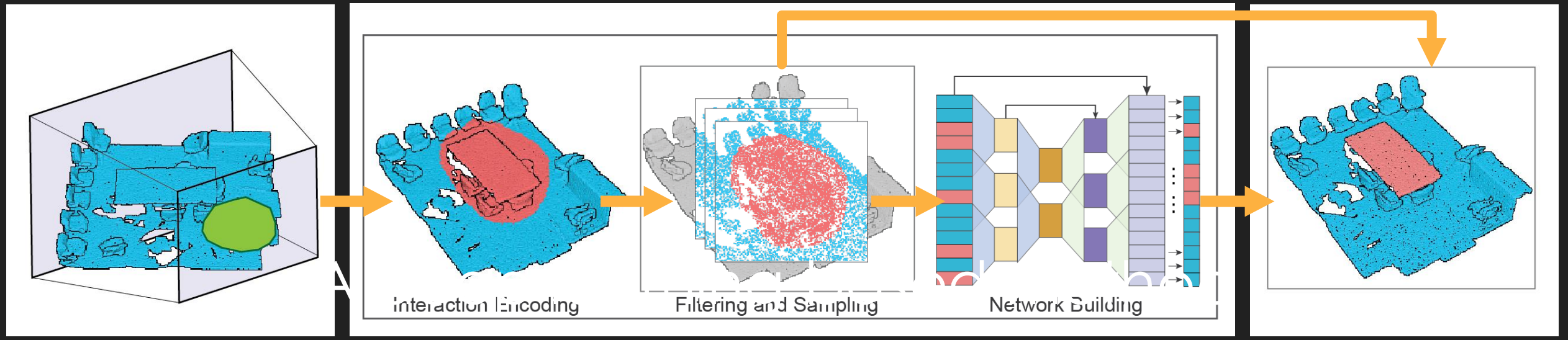


LassoNet

Input

LassoNet

Output

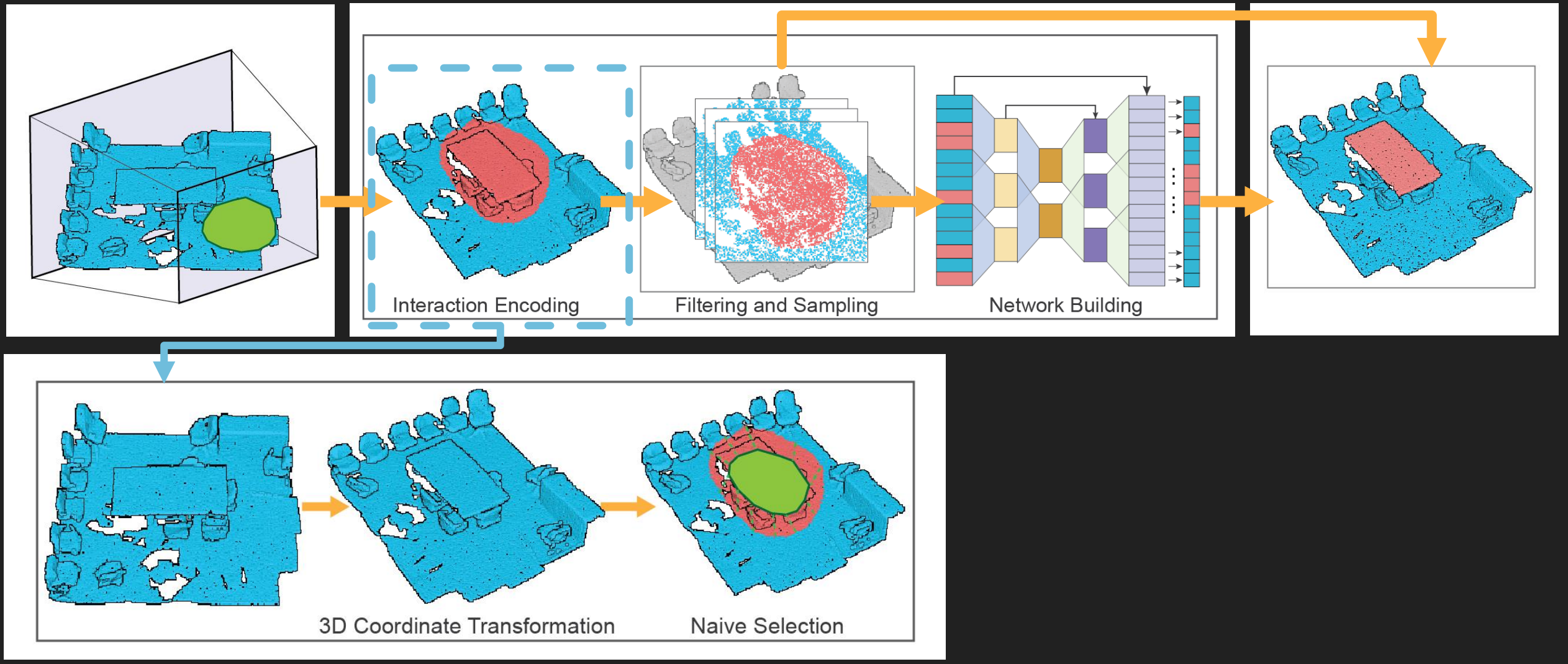


LassoNet – Interaction Encoding

Input

LassoNet

Output

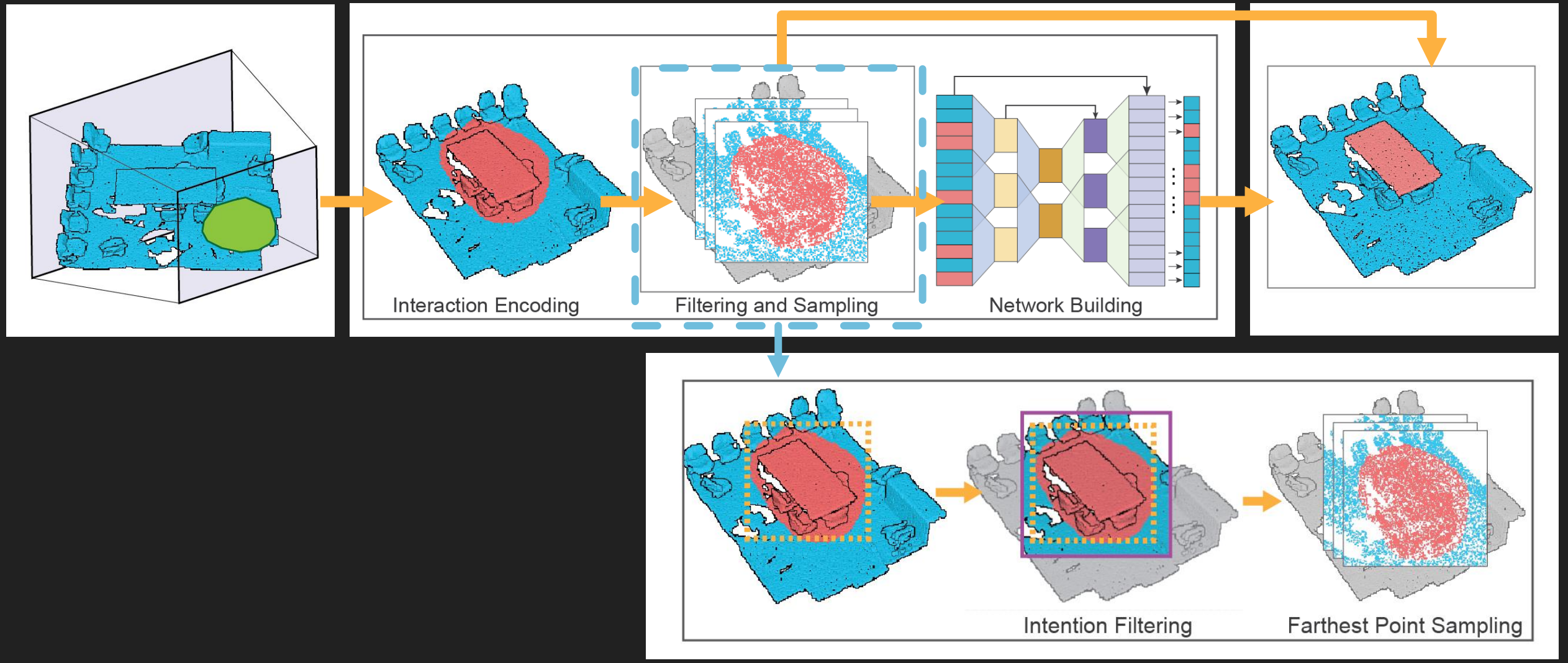


LassoNet – Filtering and Sampling

Input

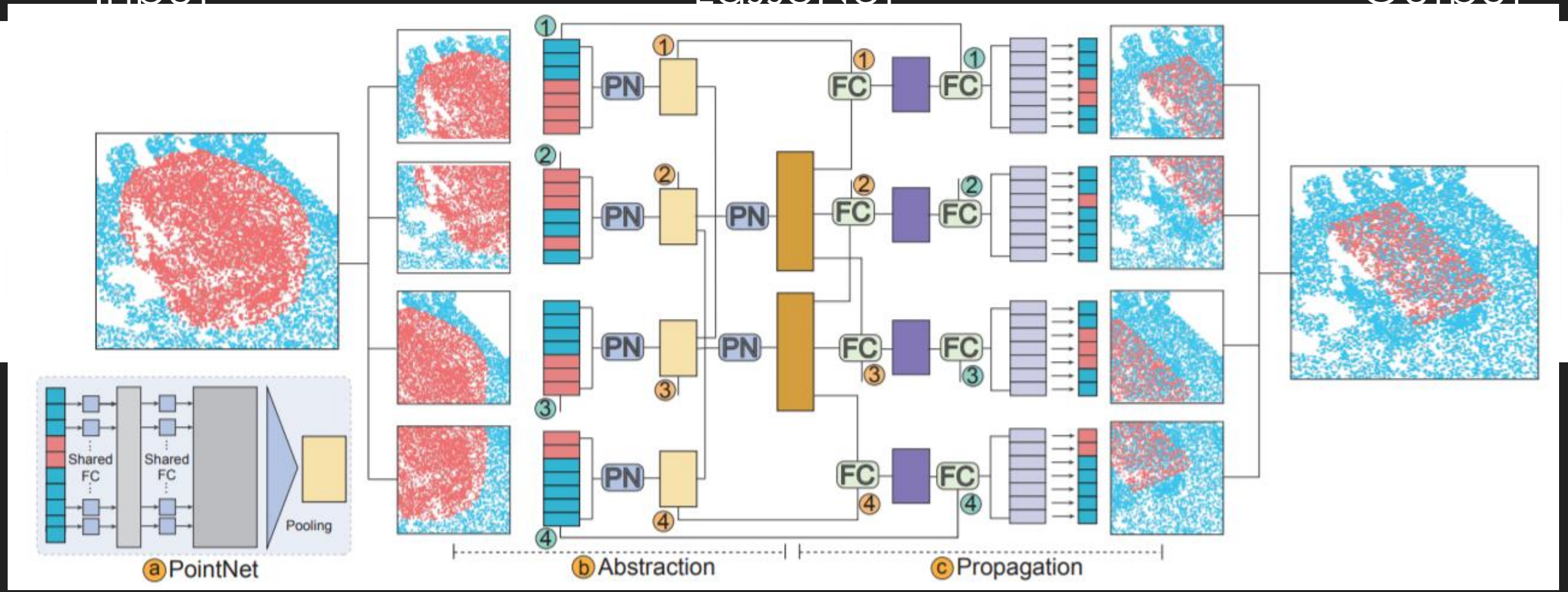
LassoNet

Output



LassoNet – Network Building

Input LassoNet Output



Adapted from PointNet

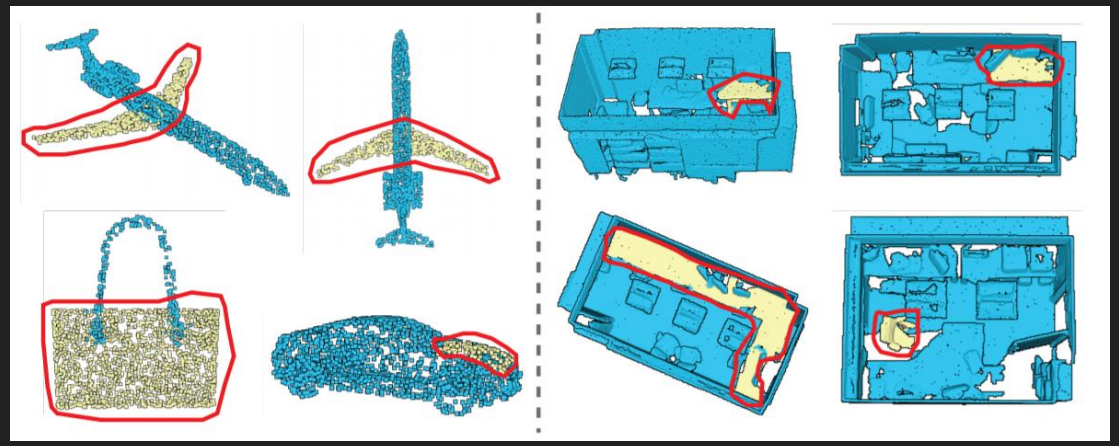
Dataset

Step1. Collect point clouds datasets

Step2. Remove all semantic labels

Step3. Highlight a target of a point cloud

Step4. Ask the user to select the target



19K on ShapeNet 12K on S3DIS

Dataset	#Point Clouds	#Targets	#Records
ShapeNet	2332	6297	19432
S3DIS	272	4018	12944

Evaluation

1. Model experiment
2. User study

Evaluation – Model Experiment

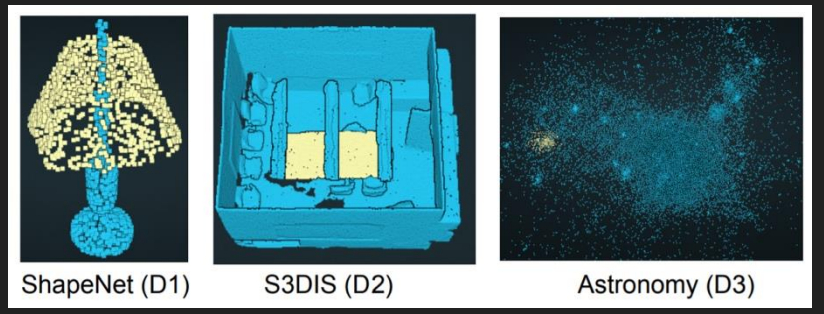
Dataset	#Training Point Clouds	#Testing Point Clouds
ShapeNet	2092	240
S3DIS	242	30

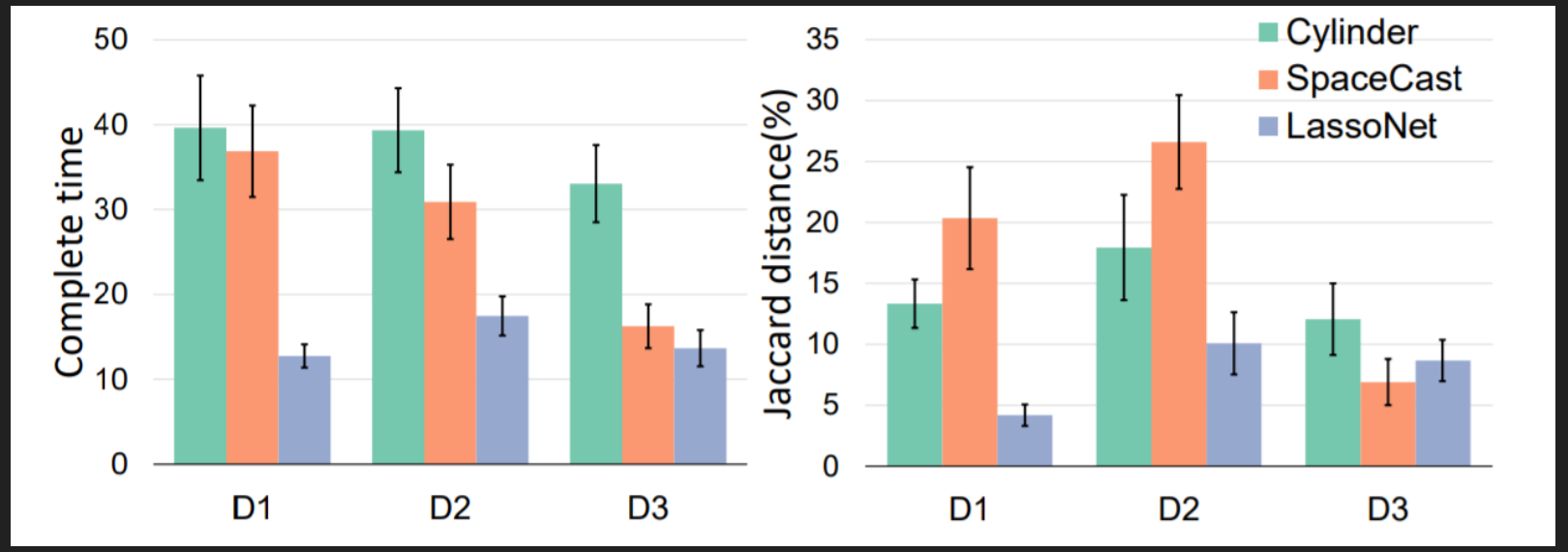
Selection records are split by point clouds

	ShapeNet			S3DIS		
	Jaccard Distance	F1	Time(ms)	Jaccard Distance	F1	Time(ms)
Naïve	0.28	0.84	16.67	0.61	0.57	18.86
Ours	0.08	0.95	20.47	0.17	0.90	69.46

Selection records are split by point clouds

Evaluation – User Study



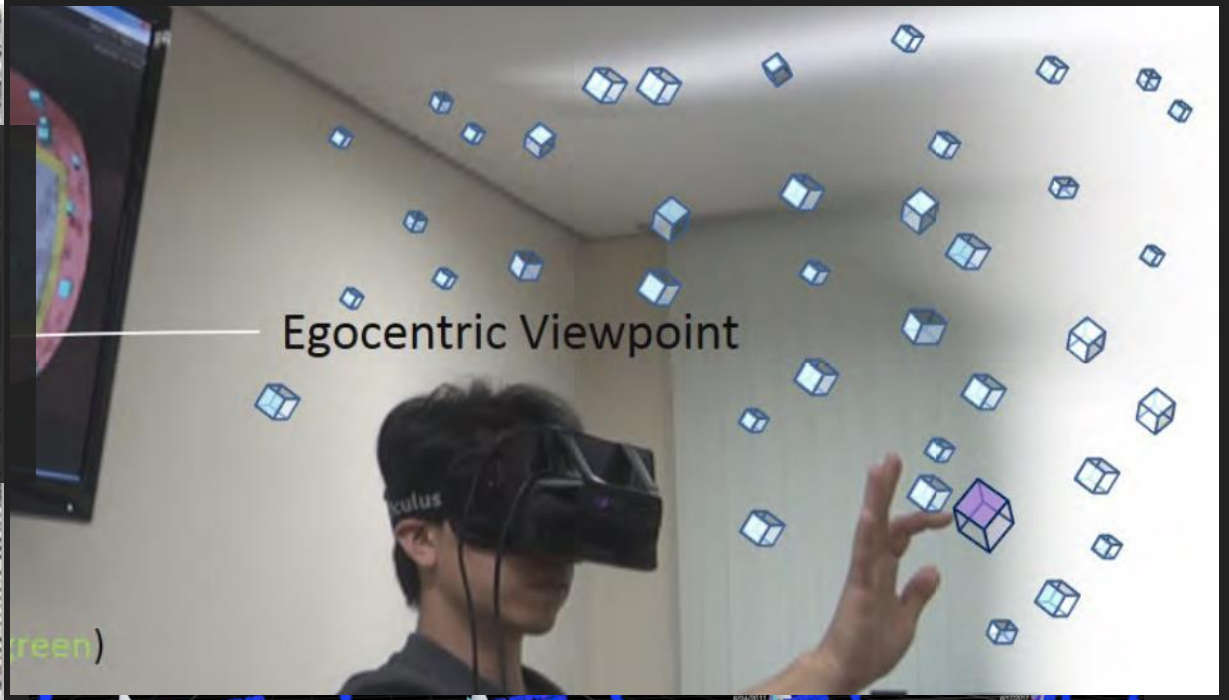


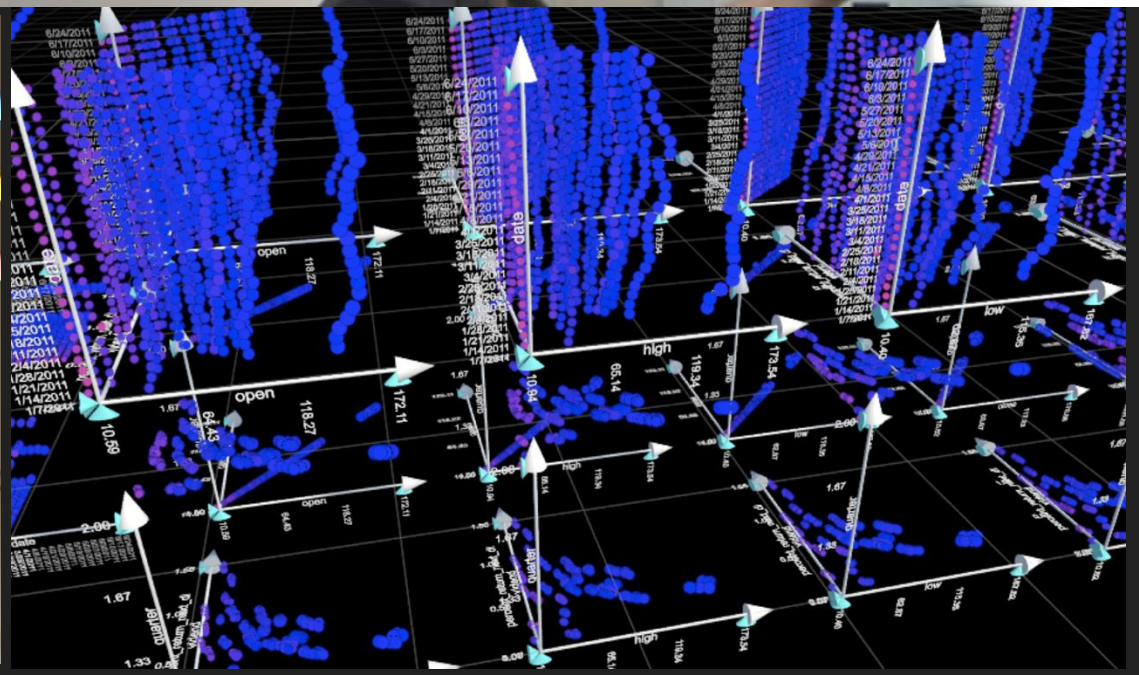
The results of 16 participants.
Left: complete time. Right: Jaccard distance.

Limitations

Failed cases

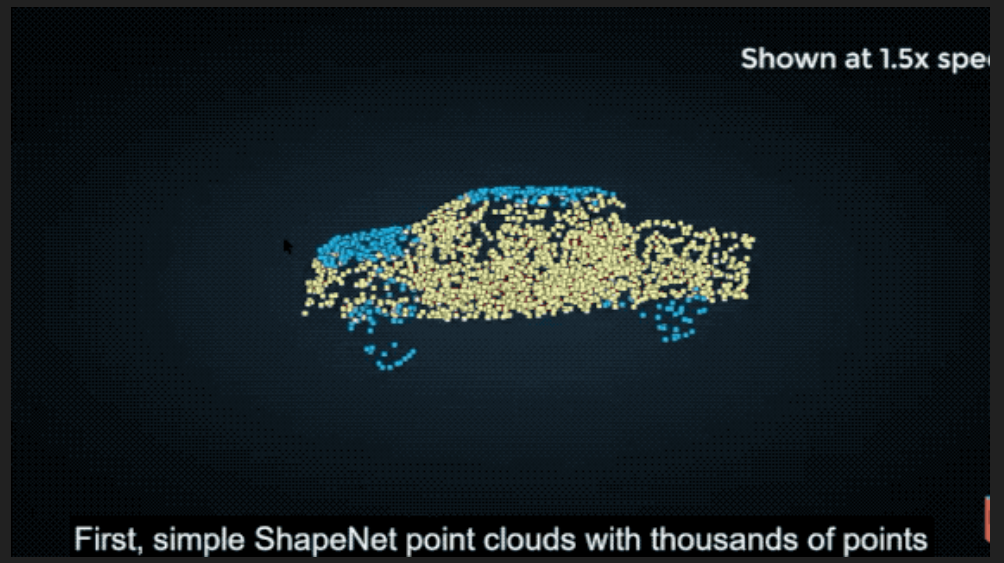
Extend to immersive environments?





Takeaway

- An approach to predict 3D point clouds based on a 2D lasso



- Code → Open source
- Dataset → Open source

- Job hunting!
  Graduate in Dec.12
  Research position & Worldwide

lassonet.github.io