**Motivation**

SAP efficiently and differentiably bridge oriented point clouds and meshes.

**Differentiable Poisson Solver**

\[ \nabla^2 \chi := \nabla \cdot \nabla \chi = \nabla \cdot \mathbf{v} \]

We solve the Poisson equation with GPU-accelerated spectral methods. (12 ms for computing a $128^3$ indicator grid, 140 ms for $256^3$)

**Application: 3D Reconstruction from Point Clouds**

Shape-As-Points

Optimization-based Setting

DPSR

Marching Cubes

\[ \mathcal{L}_{CD} \]

Target PCL

IGR

Point2Mesh

SPSR

SAP

GT Mesh

Noisy Input

Features (\( n \) Offsets \( \mathcal{E}_i \), Normals \( \mathcal{N}_j \))

Optimized Indicators and Normals

DPSR

Marching Cubes

Mesh Output

PSR

Sample

Ground Truth

Target PCL

IGR

Point2Mesh

SPSR

SAP

GT Mesh

Paper, code, and video are available: [https://pengsongyou.github.io/sap](https://pengsongyou.github.io/sap)