






Presenting
ABC Geometry Reconstruction Challenge
at the
Deep Learning for Geometric Computing
CVPR 2020 Workshop and Challenge








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 Grant title: "Machine Learning Technologies for 3D Data Processing in Computer Vision and Remote Sensing Applications".

Deep Learning Geometric Deep Learning



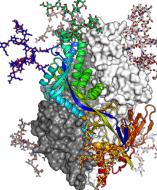
RGB images
Video/audio



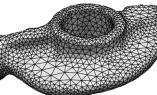
Surfaces & manifolds



Point sets

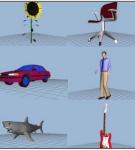


Graphs



Meshes

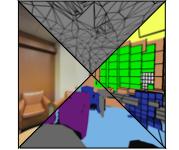
3D Shape Datasets



PSB
(Shilane et al., 2005)



ModelNet
(Wu et al., 2015)



J2D3DS
(Armeni et al., 2017)



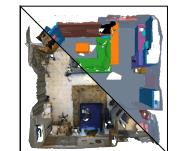
FAUST
(Bogo et al., 2014)



ShapeNet
(Chang et al., 2016)



Thingi10K
(Zhou et al., 2016)

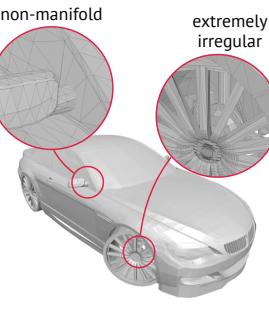


ScanNet
(Dai et al., 2017)



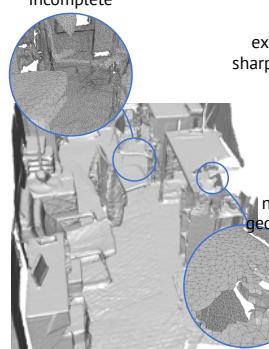
MPII HS
(Pishchulin et al., 2017)

Irregular 3D modalities



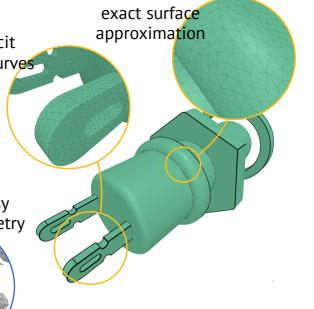
non-manifold
extremely irregular
incomplete

ShapeNet (CAD models)
(Chang et al., 2016)



noisy geometry
sharp curves
exact surface approximation

ScanNet (3D scans)
(Dai et al., 2017)



ABC (parametric CAD models)
(Koch et al., 2019)

ABC: A Big CAD Model Dataset for Geometric Deep Learning

(Koch et al., CVPR 2019)



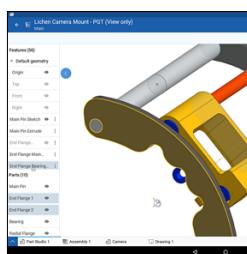
Features:

- 1,000,000 *parametric* 3D CAD models
- Accurate geometric ground truth
 - patch decomposition
 - sharp feature lines
 - analytic differential properties

Applications:

- Resampling at arbitrary resolutions
- Support connectivity, point-set, and parametric representations

Data Acquisition



Onshape



Boundary representation
(STEP/Parasolid) models

CAD Data Processing



Parametric
representation



Meshering
& discretization



Extracting
annotation

.STL

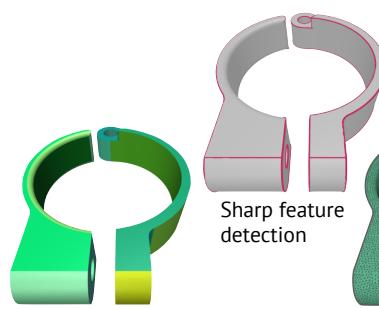
YAML

.STEP

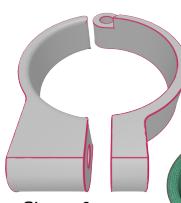
OBJ

Released
in common
file formats

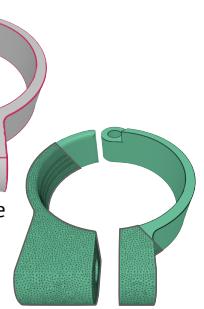
Supported Applications



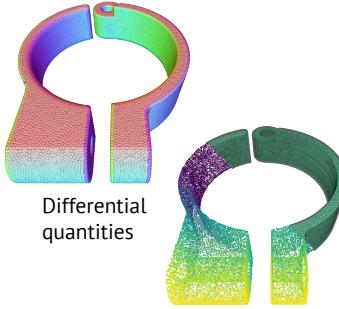
Patch decomposition



Sharp feature detection



Surface vectorization

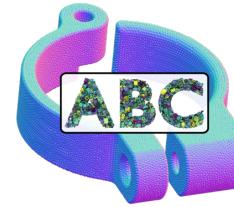


Differential quantities

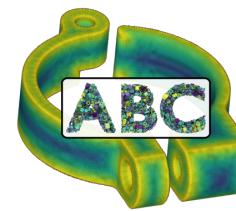


Shape reconstruction

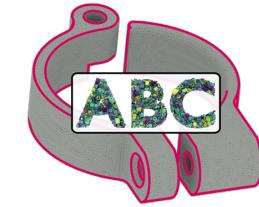
ABC Geometry Reconstruction Challenges



Surface Normal Estimation



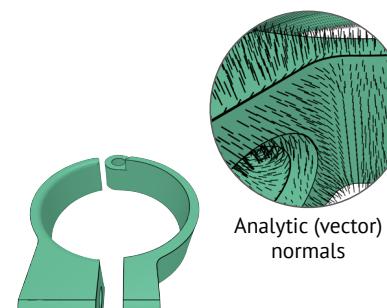
Sharpness Fields Extraction



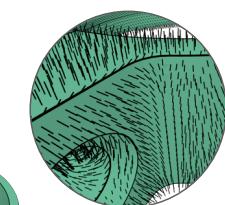
Geometric Shape Segmentation

Surface Normal Estimation

Surface Normal Estimation Dataset



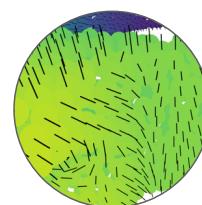
3D shape



Analytic (vector) normals

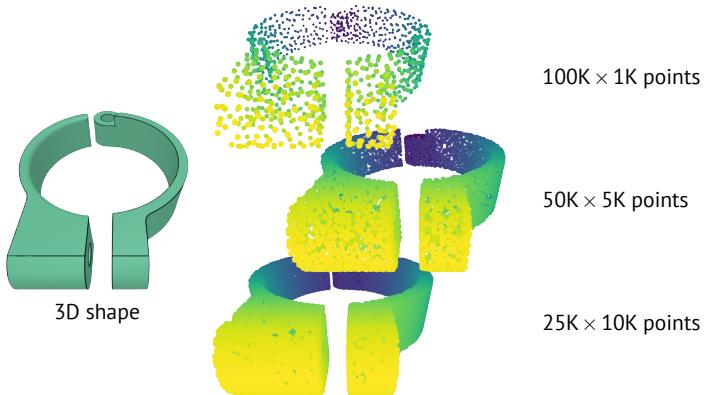


Point sampling

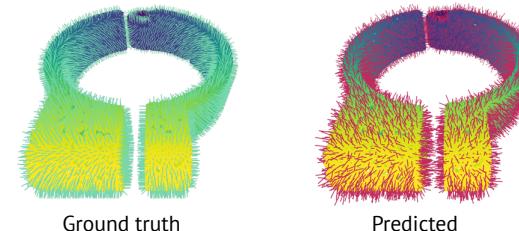


Annotated data instances

Surface Normal Estimation Dataset



Surface Normal Estimation Evaluation



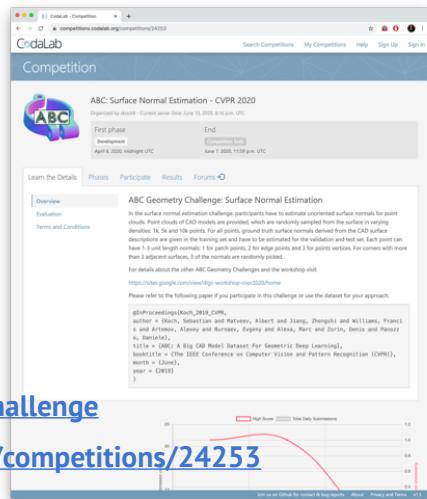
- Score using mean orientation similarity: $(\mathbf{n} \cdot \mathbf{e})^2$
- Non-oriented normals
- Average over dataset
- *No-edge* and *All* evaluation modes

Join the Challenge!

- Now Live! Follow the links to join
- Phase 1 ends: November 30th, 2020, 23:59
- Phase 2 ends: December 31st, 2020, 23:59
- Prizes coming!

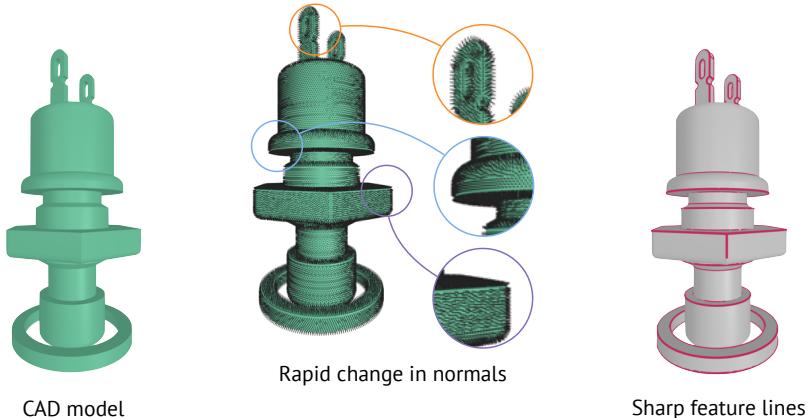
adase.group/3ddl/abc-normals-challenge

<https://competitions.codalab.org/competitions/24253>



Sharpness Fields Extraction Geometric Shape Segmentation

Sharp Features: Fields and Segments

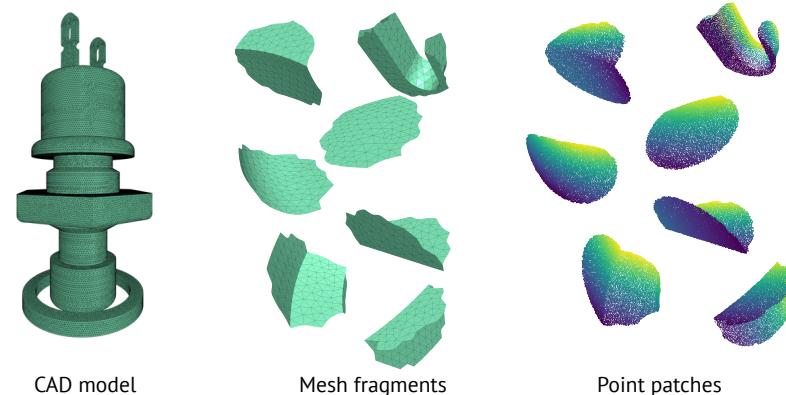


CAD model

Rapid change in normals

Sharp feature lines

Sharp Features Datasets

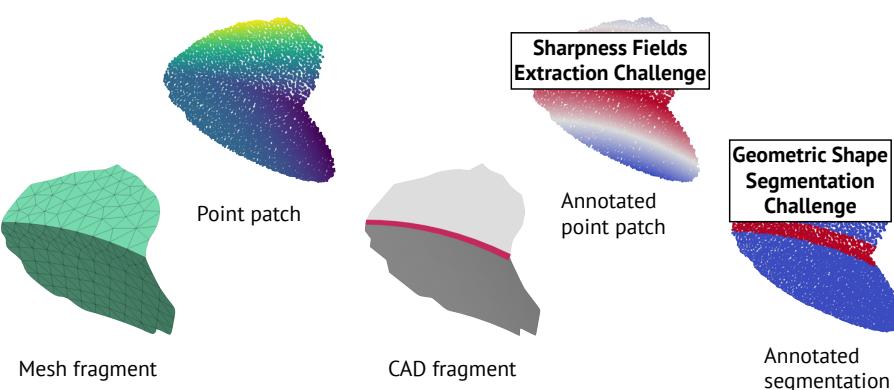


CAD model

Mesh fragments

Point patches

Sharp Features Annotation



Mesh fragment

Point patch

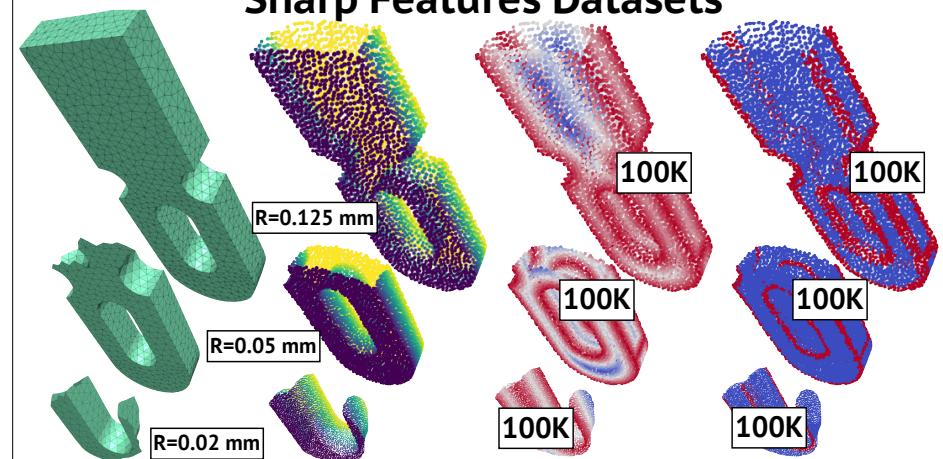
CAD fragment

Sharpness Fields
Extraction Challenge

Geometric Shape
Segmentation
Challenge

Annotated
segmentation

Sharp Features Datasets



$R=0.125 \text{ mm}$

$R=0.05 \text{ mm}$

100K

100K

100K

100K

100K

100K

Join the Challenge!

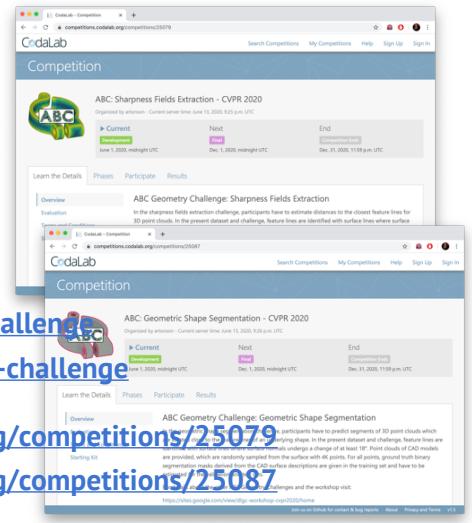
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adase.group/3ddl/abc-sharpf-challenge

adase.group/3ddl/abc-geomseg-challenge

<https://competitions.codalab.org/competitions/25079>

<https://competitions.codalab.org/competitions/25087>



Learn more at <https://deep-geometry.github.io/abc-dataset/>

Challenges at <https://sites.google.com/view/dlgc-workshop-cvpr2020>

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