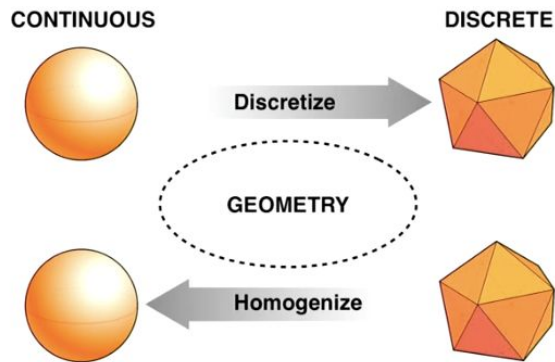


Seminar: Recent Advances in Geometry Processing

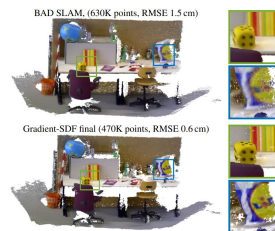
JProf. Zorah Löhner

Geometry Processing

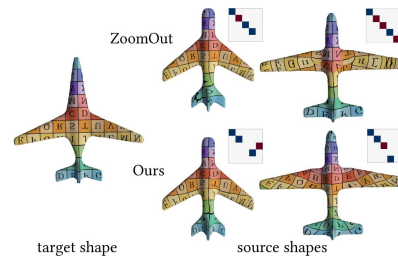
Geometry processing is an area of research that uses concepts from applied mathematics, computer science and engineering to design efficient algorithms for the acquisition, reconstruction, analysis, manipulation, simulation and transmission of complex 3D models. [from Wikipedia]



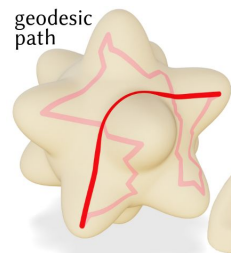
Reconstruction



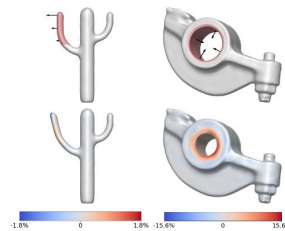
Matching



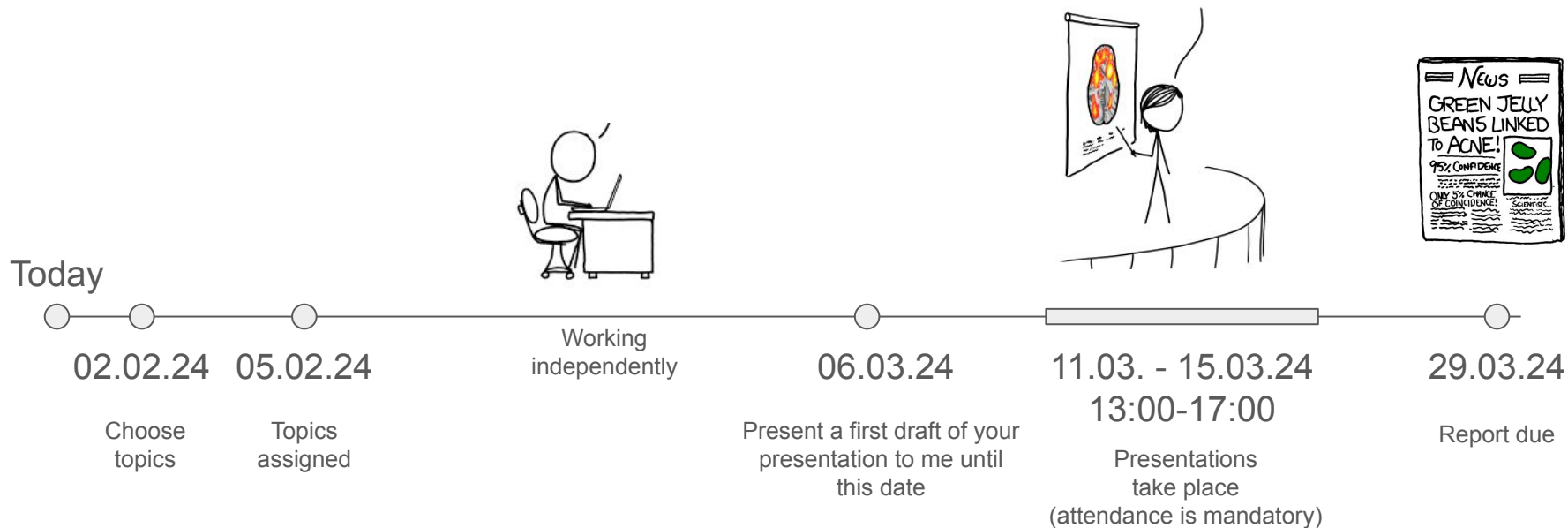
Analysis



Manipulation



Overview



Presentation

- **40 minutes presentation + 15 minutes discussion** about your assigned paper
- Present the topic on a level that is understandable for everyone else (so somebody with a computer science background but not necessarily previous experience in the topic)
- You can choose what parts of the paper are necessary for understanding the bigger picture and what is interesting to present, no need to include everything but consider extending beyond the direct information in the paper to make the background accessible
- If necessary or interesting, you can also include information about previous or follow-up work
- There is no slide template but you need to include
 - Title and authors of the original paper
 - Slide numbers
 - References for figures or text that you directly took from somewhere

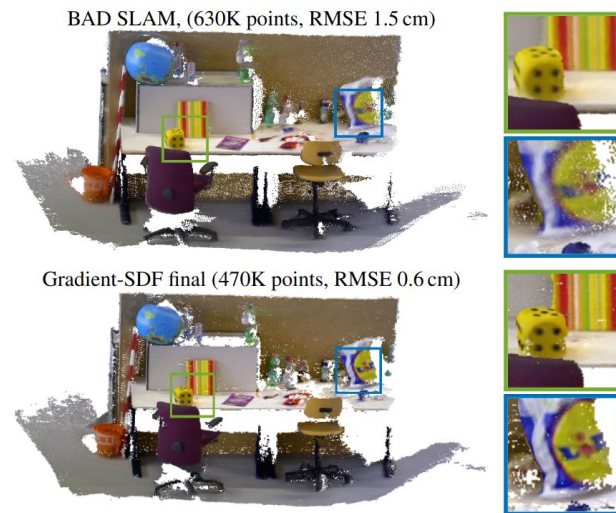
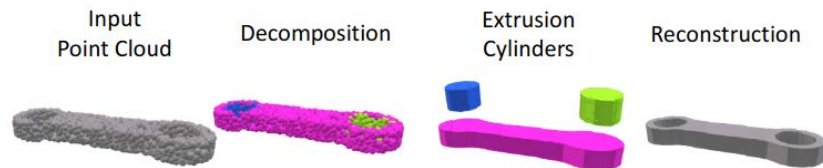
Report

- 4 page report in this template format: <https://github.com/cvpr-org/author-kit/releases>
- The report should contain a short sum-up of the method. However, it should not simply rephrase the content but work as an extension of the background needed to understand it
 - That means: go into detail about what parts you were struggling with first and summarize the background reading you did or write about interesting parallel/previous work and the differences and open problems
- Additionally, if your presentation lacked depth on specific points or you were not able to answer an important question, you can make up for it by explaining it well in the report

Grading

- The grade will be 80% based on the presentation and 20% the report
- Presentation criteria are:
 - Clearness of presentation
 - Sufficient material covered
 - Timit limit kept (35 - 45 minutes is acceptable)
 - Extra points for creativity (making your own figures, showing live demo, finding an interesting way of explaining something)
- Report criteria are:
 - Clearness and accuracy of writing
 - Extended upon the base publication instead of just rephrasing
 - Appropriate use of figures

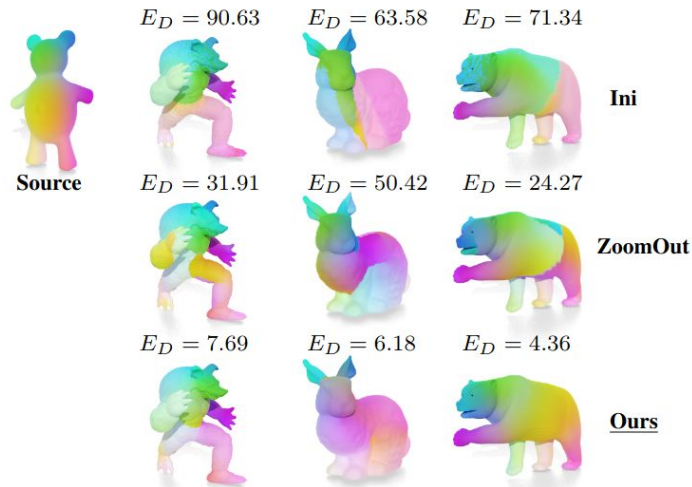
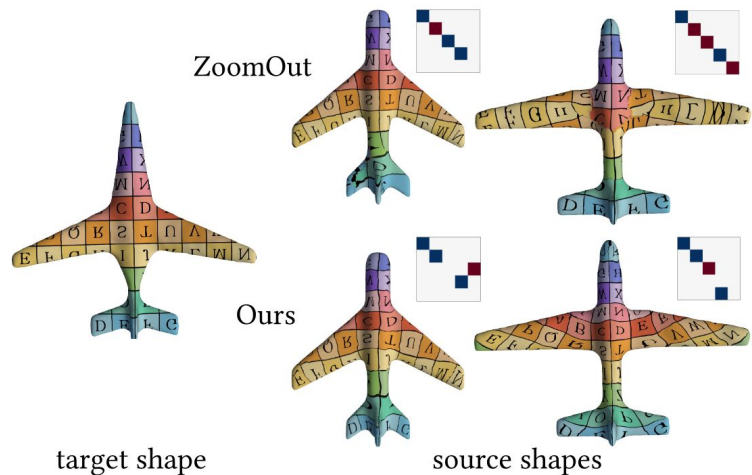
Topics: Reconstruction



Point2Cyl: Reverse Engineering 3D Objects from Point Clouds to Extrusion Cylinders. By Uy, Chang, Sung, Goel, Lambourne, Birdal, Guibas. Published in CVPR 2022.

Gradient-SDF: A Semi-Implicit Surface Representation for 3D Reconstruction. By Sommer, Sang, Schubert, Cremers. Published in CVPR 2022.

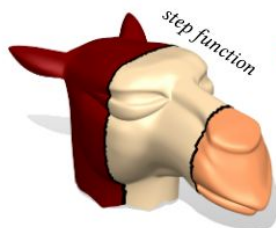
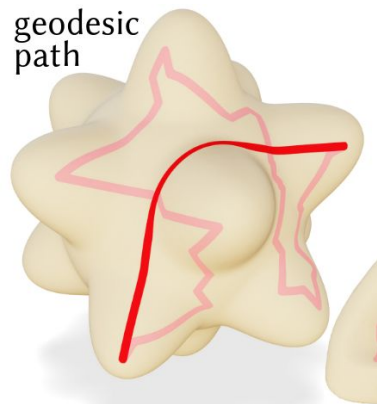
Topics: Shape Matching



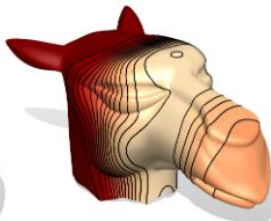
An Elastic Basis for Spectral Shape Correspondence. By Hartwig, Sassen, Azencot, Rumpf, Ben-Chen. Published in Siggraph 2023.

Smooth Non-Rigid Shape Matching via Effective Dirichlet Energy Optimization. By Magnet, Ren, Sorkine-Hornung, Ovsjanikov. Published at 3DV 2022.

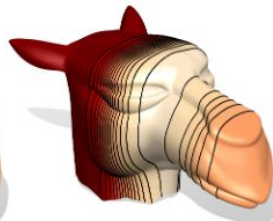
Topics: Geometric Properties



input



Stein et al.
[2018]

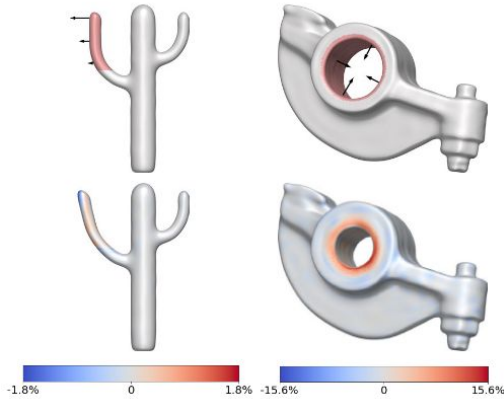


our Hessian
energy

You Can Find Geodesic Paths in Triangle Meshes by Just Flipping Edges. By Sharp and Crane. Published in Siggraph Asia 2020.

A Smoothness Energy without Boundary Distortion for Curved Surfaces. By Stein, Jacobson, Wardetzky, Grinspun. Published in Transactions on Graphics 2020.

Topics: Shape Deformation and Synthesis



(a) Generated 3D shapes.

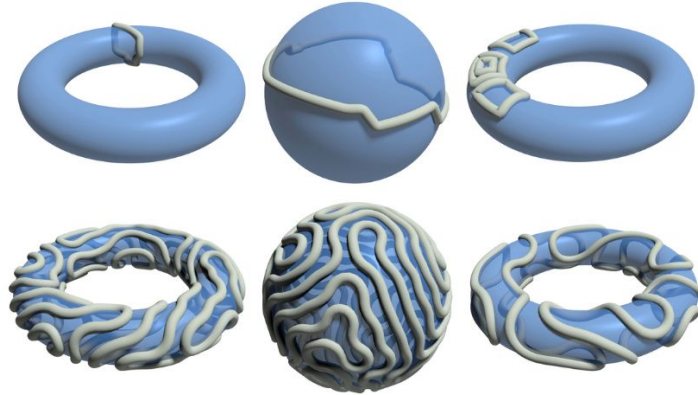


(b) Generated 4D animation sequence.

Neural Implicit Shape Editing using Boundary Sensitivity. By Berzins, Ibing, Kobbelt. Published in ICLR 2023.

HyperDiffusion: Generating Implicit Neural Fields with Weight-Space Diffusion. By Erkoc, Ma, Shan, Niessner, Dai. Published in ICCV 2023.

Topics: Fun on Manifolds



b/Surf: Interactive Bézier Splines on Surface Meshes. By Mancinelli, Nazzaro, Pellacini, Puppo. Published at SGP 2022.

Repulsive Curves. By Yu, Schumacher, Crane. Published at Transactions on Graphics 2021.

How to Participate

- Send your 3 top topic choices to laehner@uni-bonn.de until end of Friday (02.02.24)
- Topics and presentation slots will be assigned 05.02.24
- Schedule at least one meeting with me until 06.03.24 to show a draft of your presentation. (If you do not, your presentation will be automatically cancelled.)
- Send in your report to me until 29.03.24

You can download the slides with the list of topics here:

https://zorah.github.io/files/seminar_geometry.pdf

