Seminar: Recent Advances in 3D Computer Vision

Pre-meeting, 21.07.2022

Björn Häfner, Marvin Eisenberger

3D Reconstruction

https://luanfujun.github.io/InverseMeshSVBRDF/

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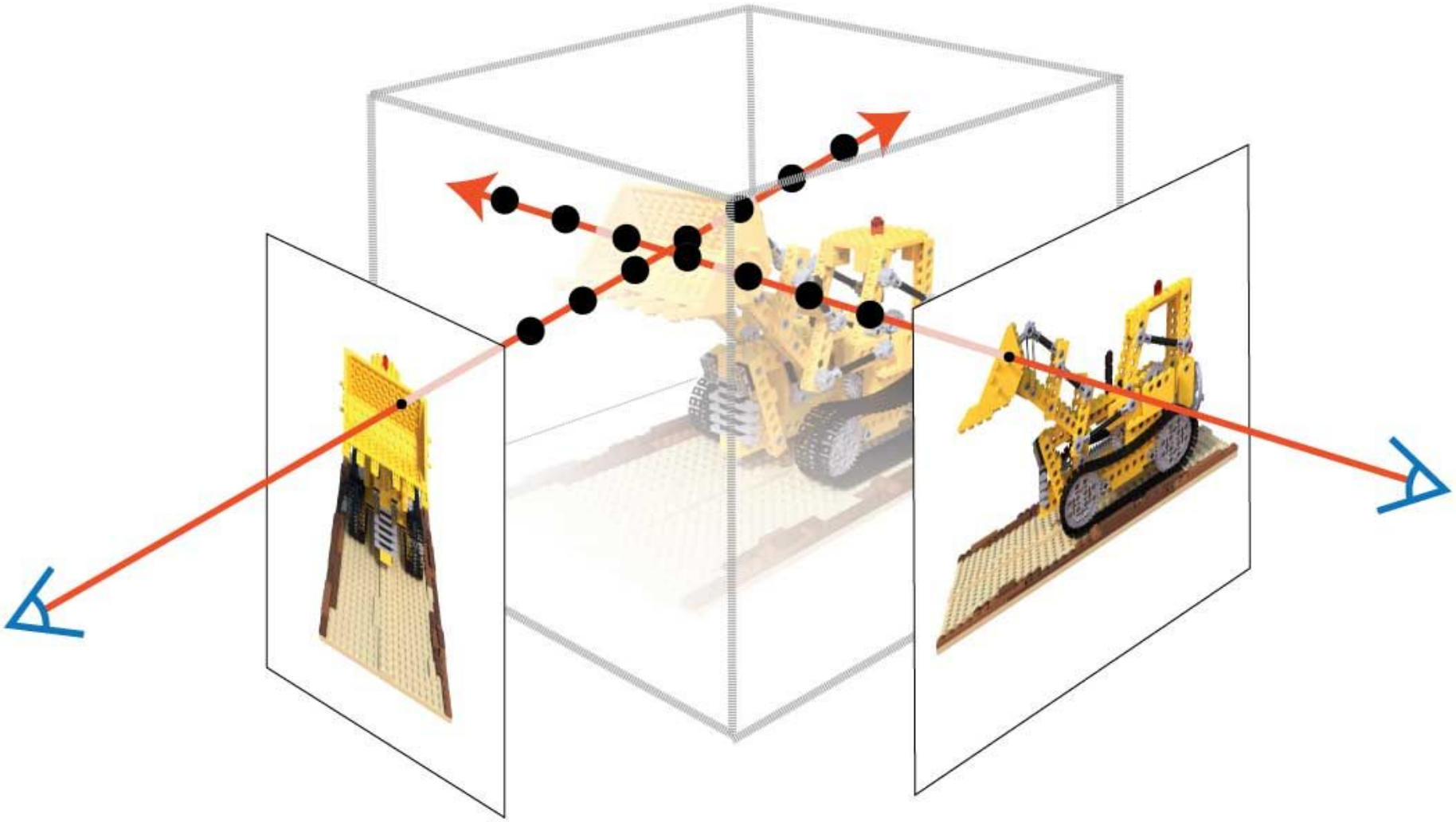
3D Reconstruction



https://www.matthewtancik.com/nerf

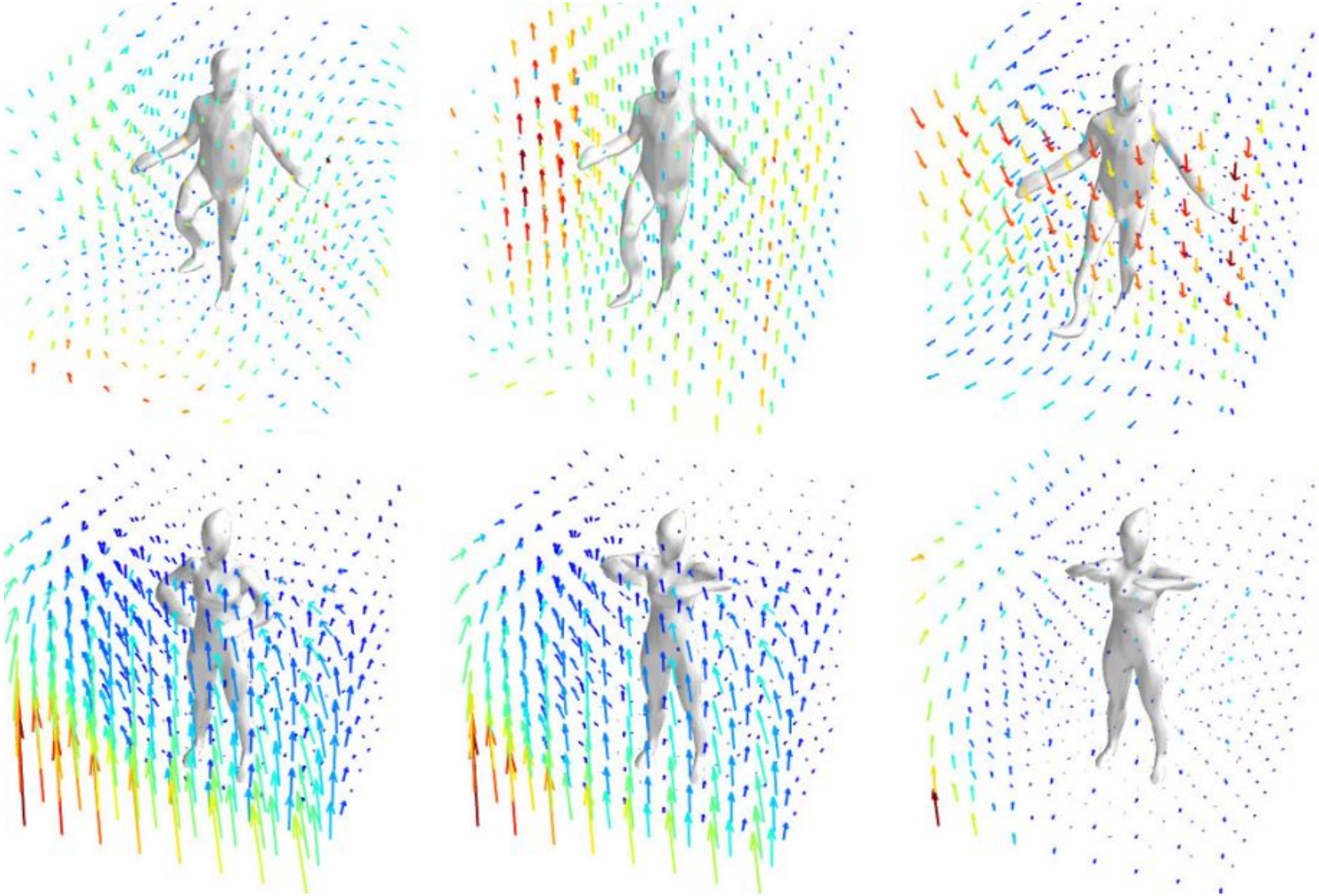
3D Reconstruction

https://www.matthewtancik.com/nerf

3D Shape Analysis

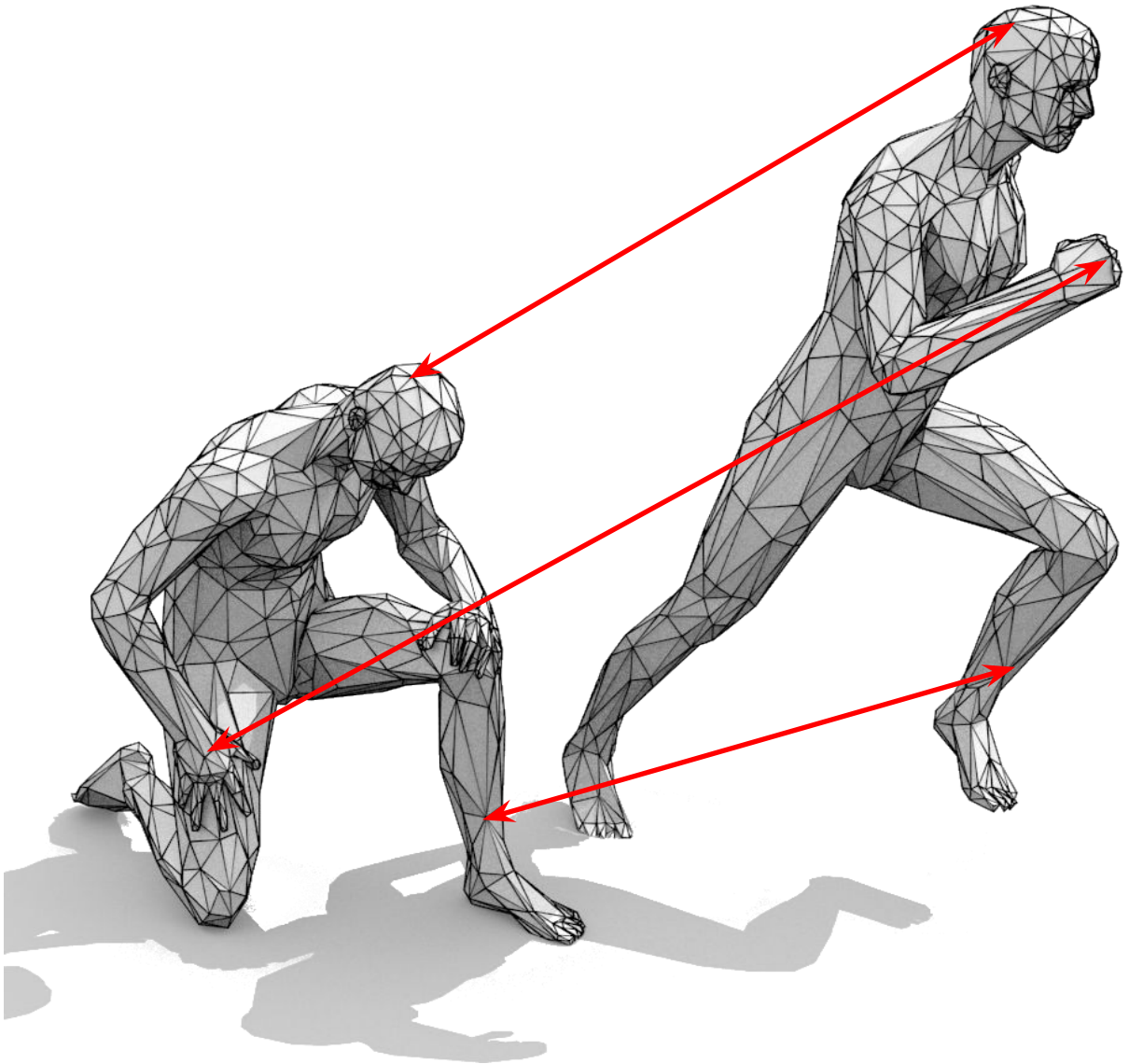
https://people.csail.mit.edu/smirnov/hodgenet/

3D Shape Analysis



https://openaccess.thecvf.com/content_ICCV_2019/papers/Niemeyer_Occupancy_Flow_4D_Reconstruction_by_Learning_Particle_Dynamics_ICCV_2019_paper.pdf

3D Shape Analysis

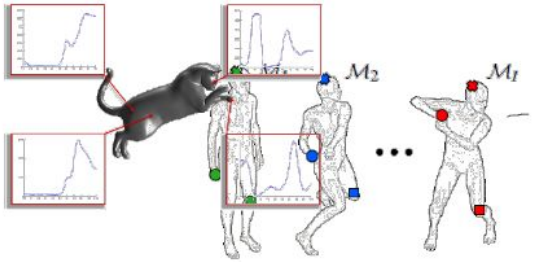


https://openaccess.thecvf.com/content_CVPR_2020/html/Eisenberger_Smooth_Shells_Multi-Scale_Shape_Registration_With_Functional_Maps_CVPR_2020_paper.html

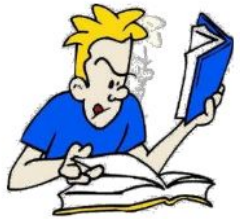
Organisation

- Time: In the week of Oct. 10 - Oct. 14, 2022
- Place: Virtual via Zoom: https://tum-conf.zoom.us/j/65552578169
- Website: https://vision.in.tum.de/teaching/ws2022/3dcv
  Password: 3dcv_ws22
- Email: 3dcv-ws22@vision.in.tum.de

What you will learn



- Get an overview on recent research in 3D Computer Vision and Applications



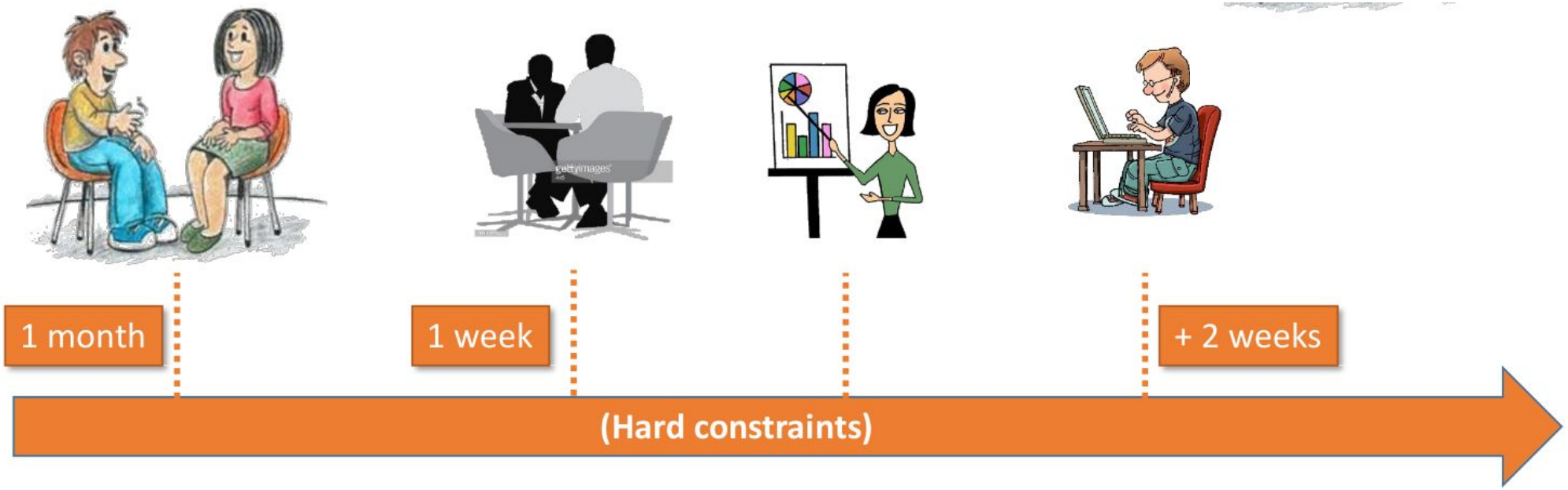
- Read and understand scientific publications

- Prepare and give a talk

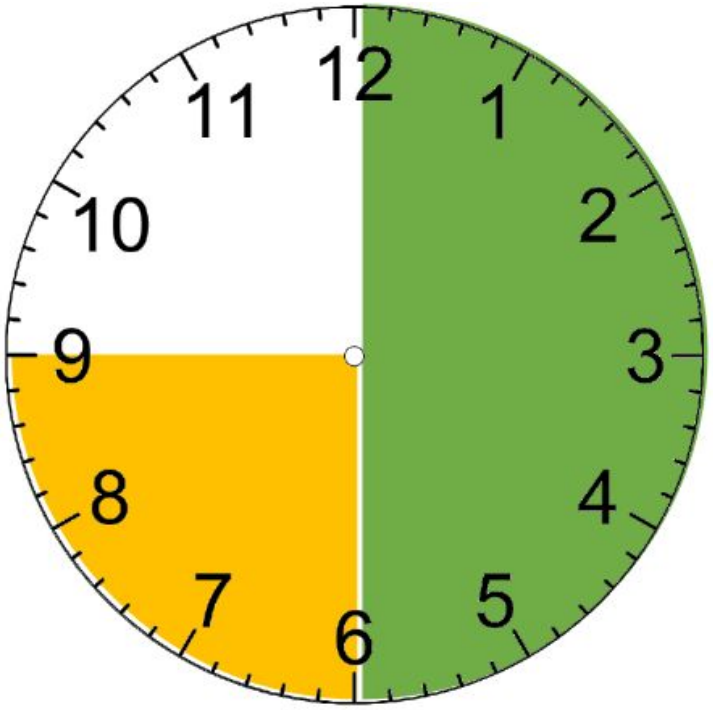
- Write a scientific report

Preparation

- You do not need to (and should not) work on your topic alone
- Meet at least twice with your supervisor
- It is your responsibility to contact your supervisor for these meetings



Presentation



- **25** minutes talk + **15** minutes discussion
- use visualizations
- number your slides
- do not make slides full of text
- explain things you had problems understanding when first reading your paper in more detail
- reference the original author and conference/journal name

Recommended structure
1. Introduction of the problem
2. Approach
3. Results
4. Summary

Report

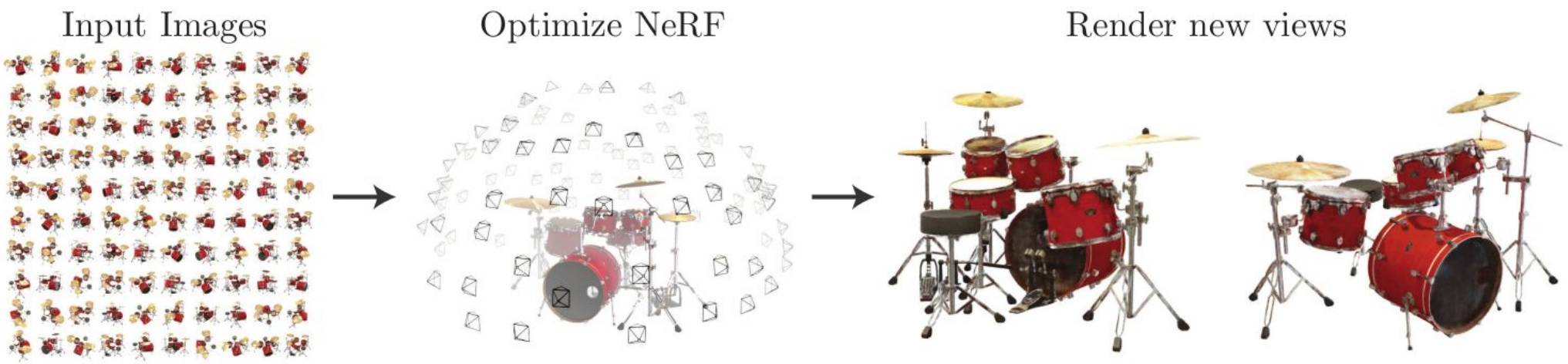
- Overview and main contributions of the assigned topic
- Not a copy of your assigned material, focus on parts that you found interesting but discuss them more in-depth or concepts you had to do additional work to understand
- The report is due 2 weeks after the talk and gives you the chance to make up for questions that were left
- Address the open questions left from the Q&A session.
- 6-10 pages
- Use the LaTeX template from the web page
- Use your text editor of choice if you must but keep the style similar to the template

Evaluation Criteria

- Attendance at each meeting is necessary!
- Participation (questions, discussions) influences the final grade.

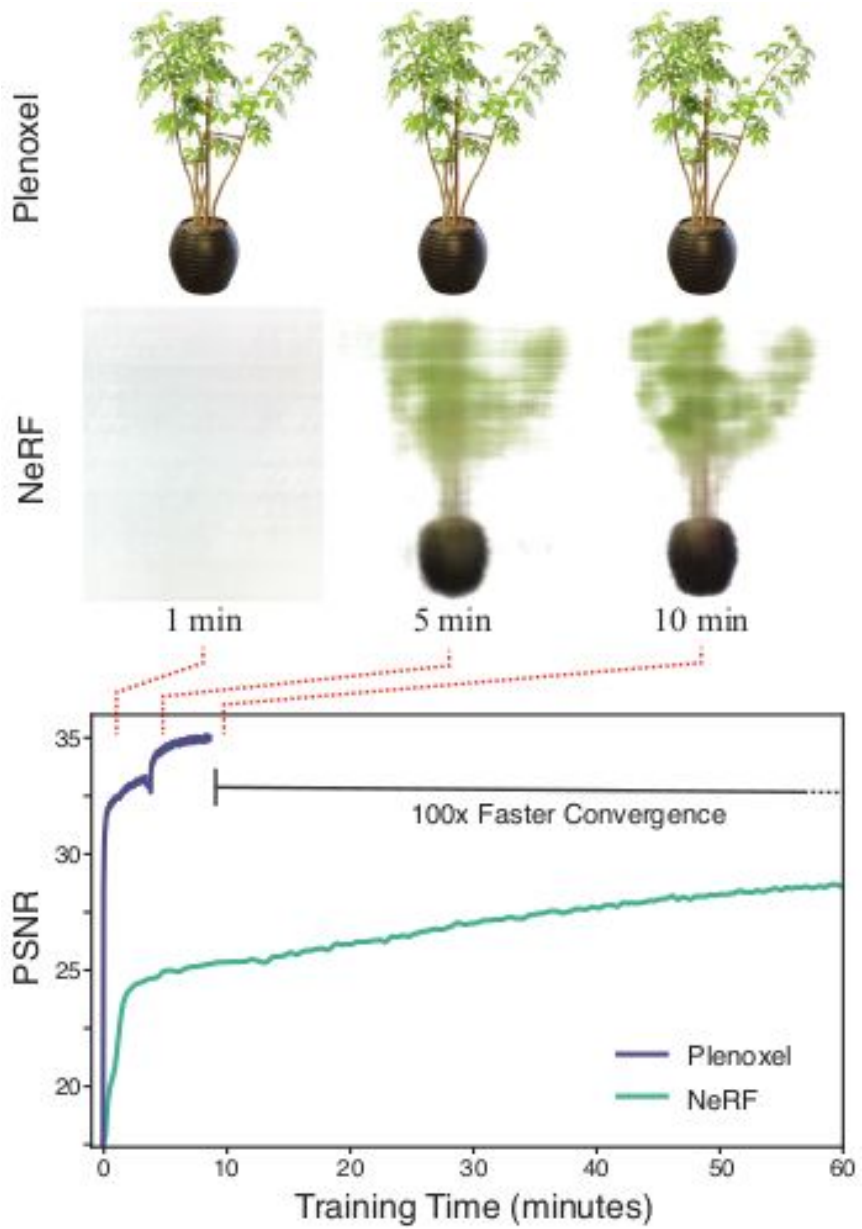
a. Choose the main aspects and interesting subtopics
b. Understand them in every detail (it may be necessary to check related articles or text books)
c. Prepare the topic such that it is understandable to the other participants of the seminar

1. NeRF: Representing Scenes as Neural Radiance Fields for View Synthesis



https://www.matthewtancik.com/nerf

2. Plenoxels: Radiance Fields without Neural Networks

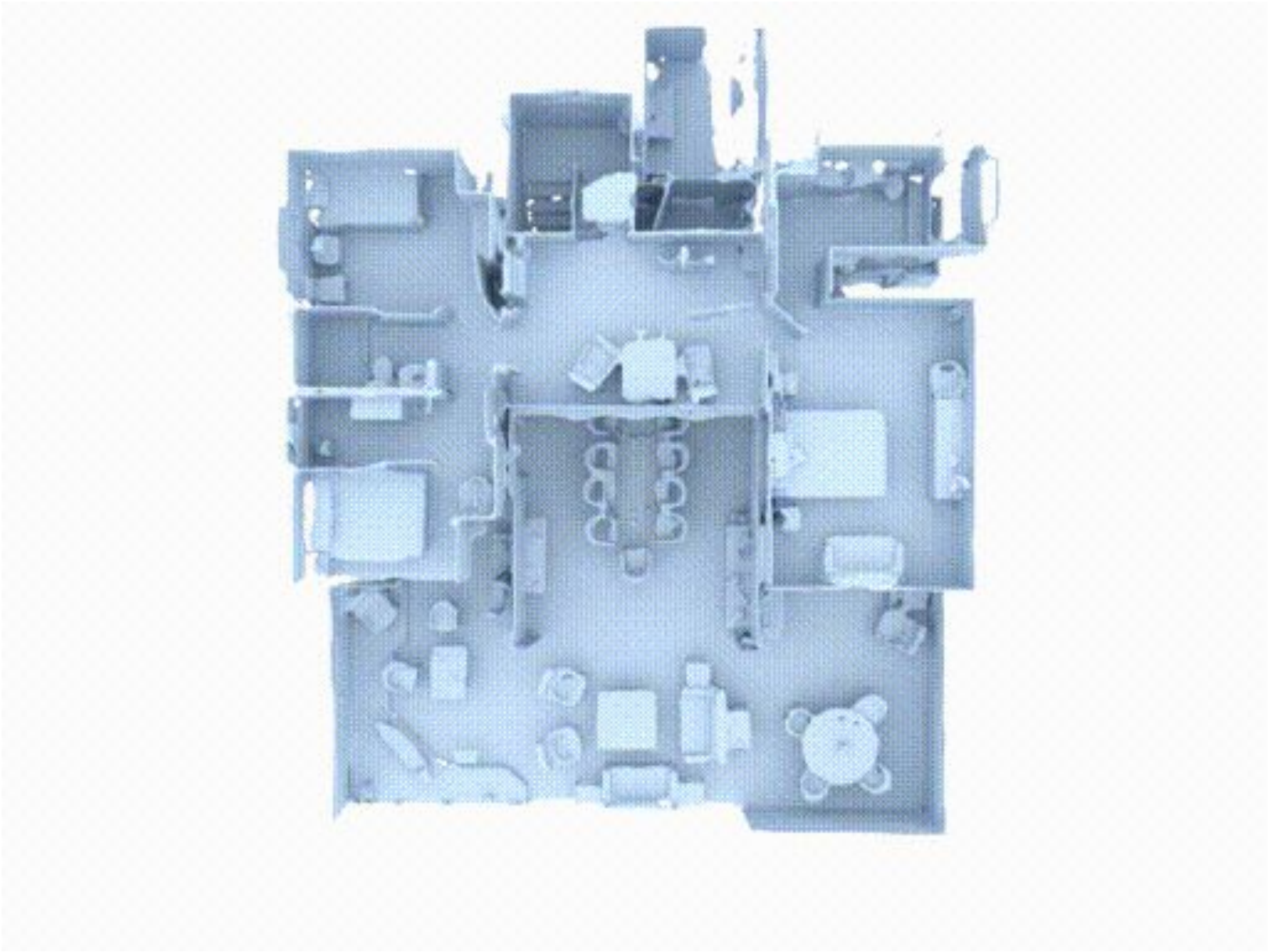


https://alexyu.net/plenoxels/

3. DeepSDF

https://openaccess.thecvf.com/content_CVPR_2019/html/Park_DeepSDF_Learning_Continuous_Signed_Distance_Functions_for_Shape_Representation_CVPR_2019_paper.html

4. Convolutional Occupancy Networks



https://pengsongyou.github.io/conv_onet

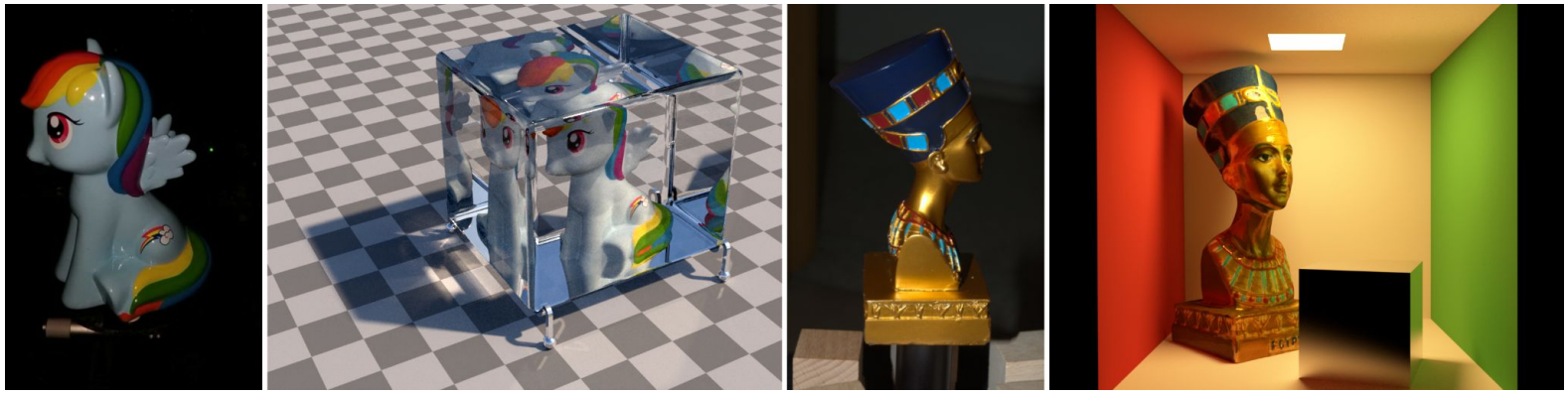
5. Volume Rendering of Neural Implicit Surfaces

https://lioryariv.github.io/volsdf/

6. IRON: Inverse Rendering by Optimizing Neural SDFs and Materials from Photometric Images

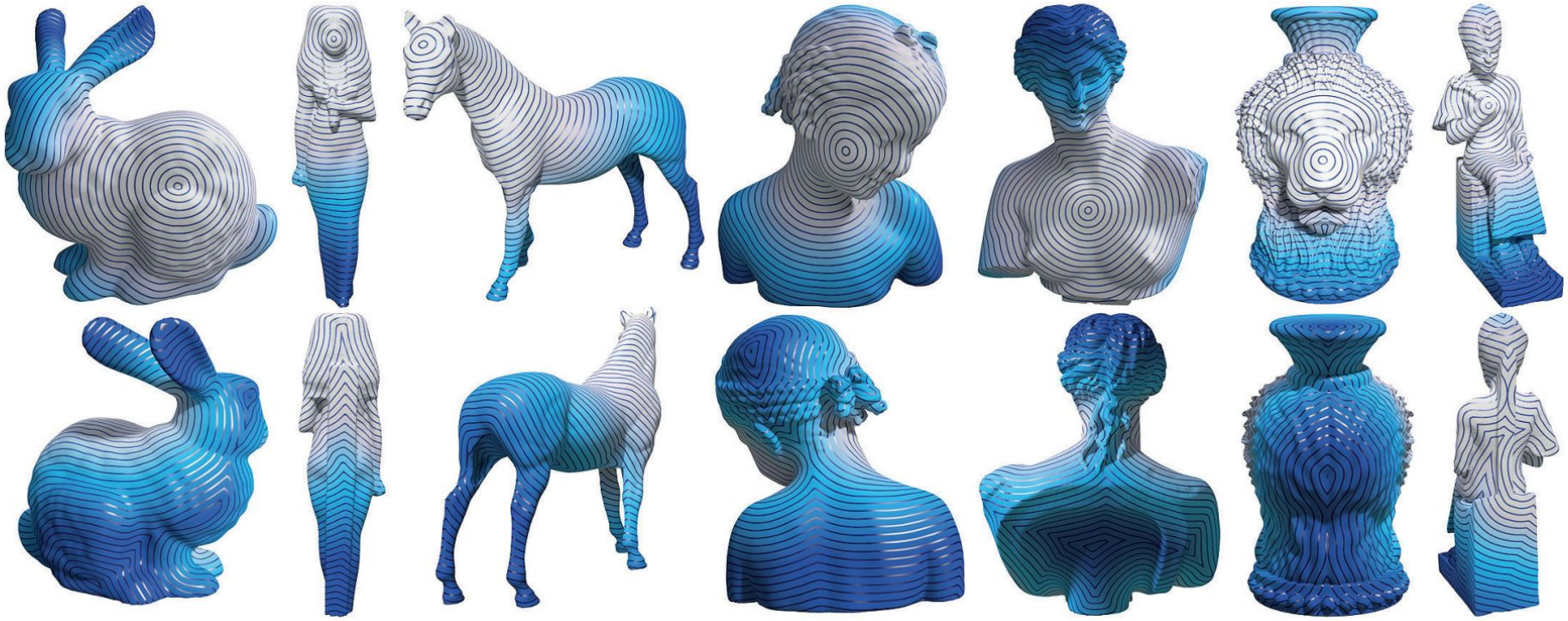
https://kai-46.github.io/IRON-website/

7. Unified Shape and SVBRDF Recovery using Differentiable Monte Carlo Rendering



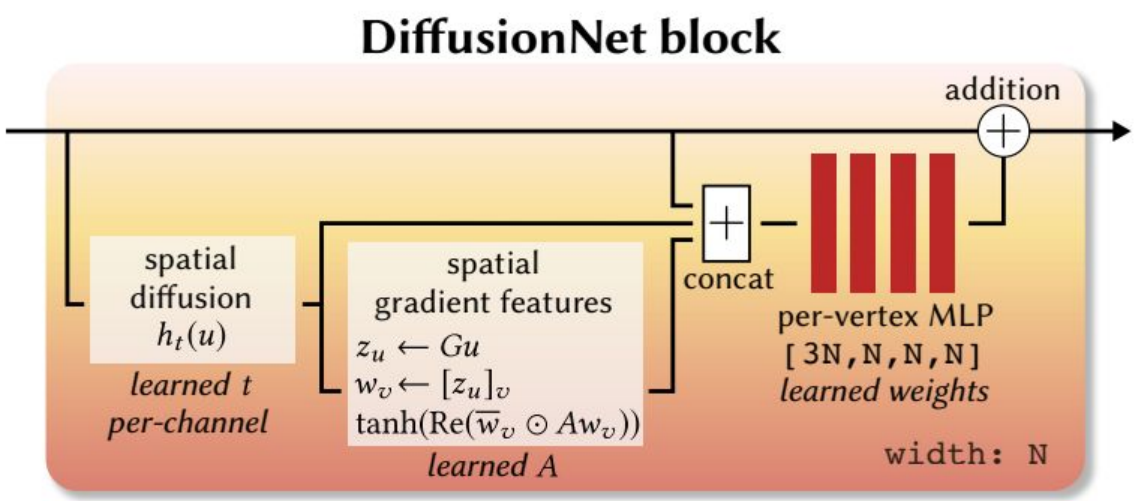
https://luanfujun.github.io/InverseMeshSVBRDF/

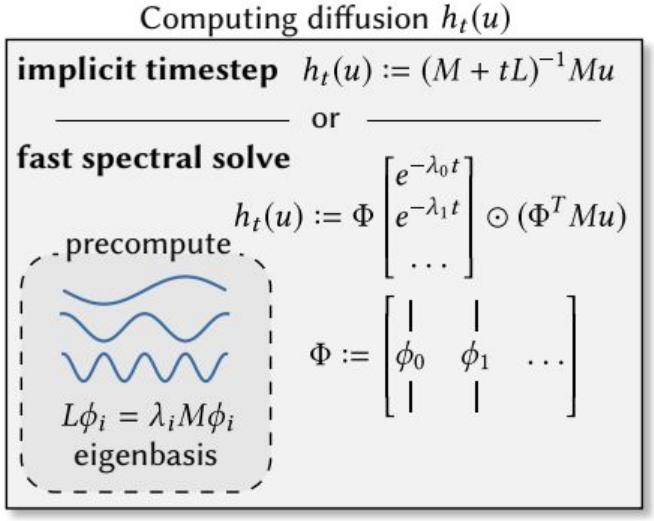
8. The Heat Method for Distance Computation

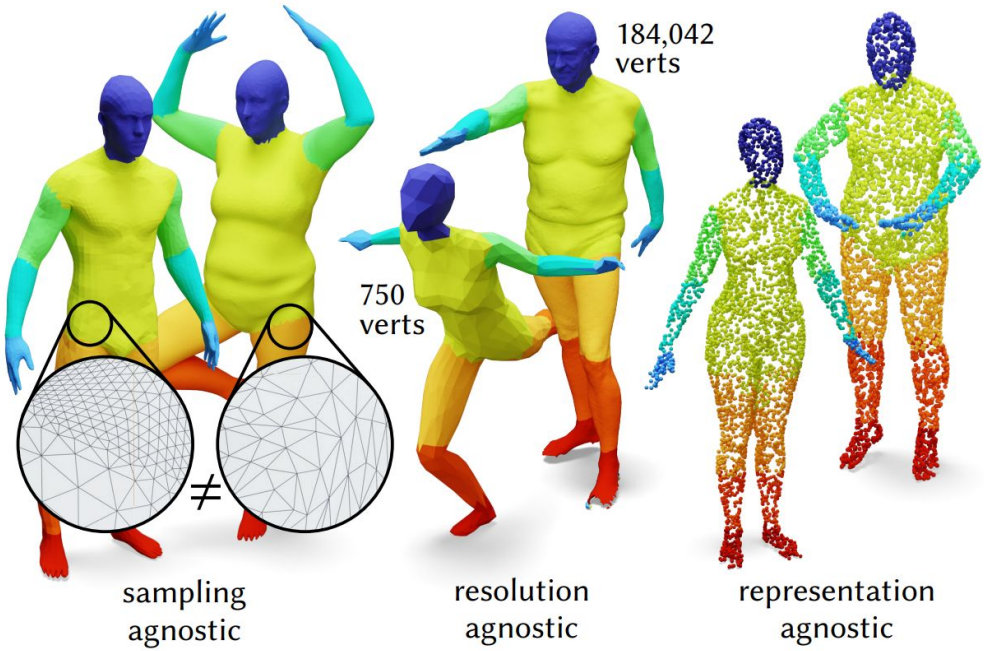


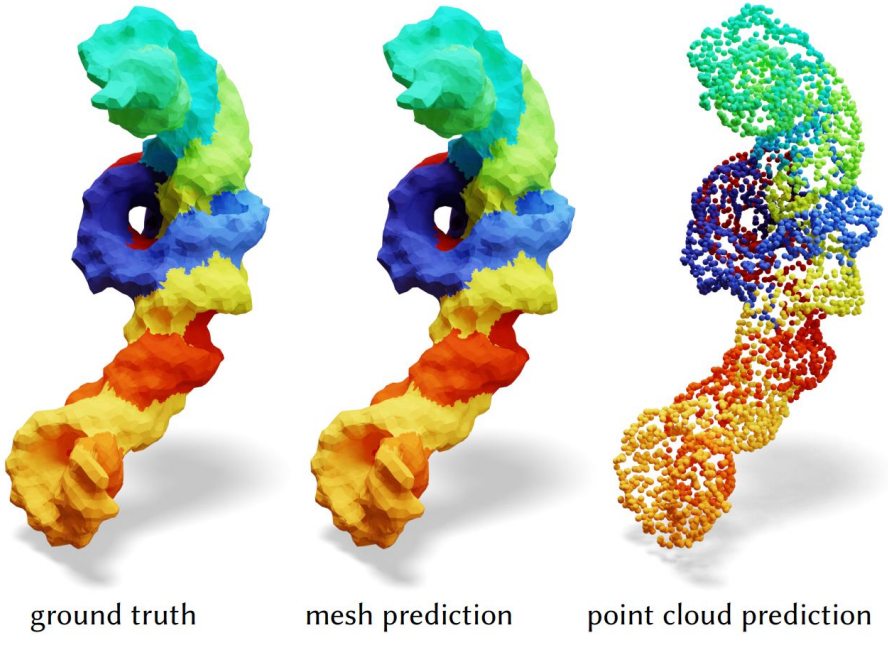
https://www.cs.cmu.edu/~kmcrane/Projects/HeatMethod/paper.pdf

9. DiffusionNet: Discretization Agnostic Learning on Surfaces



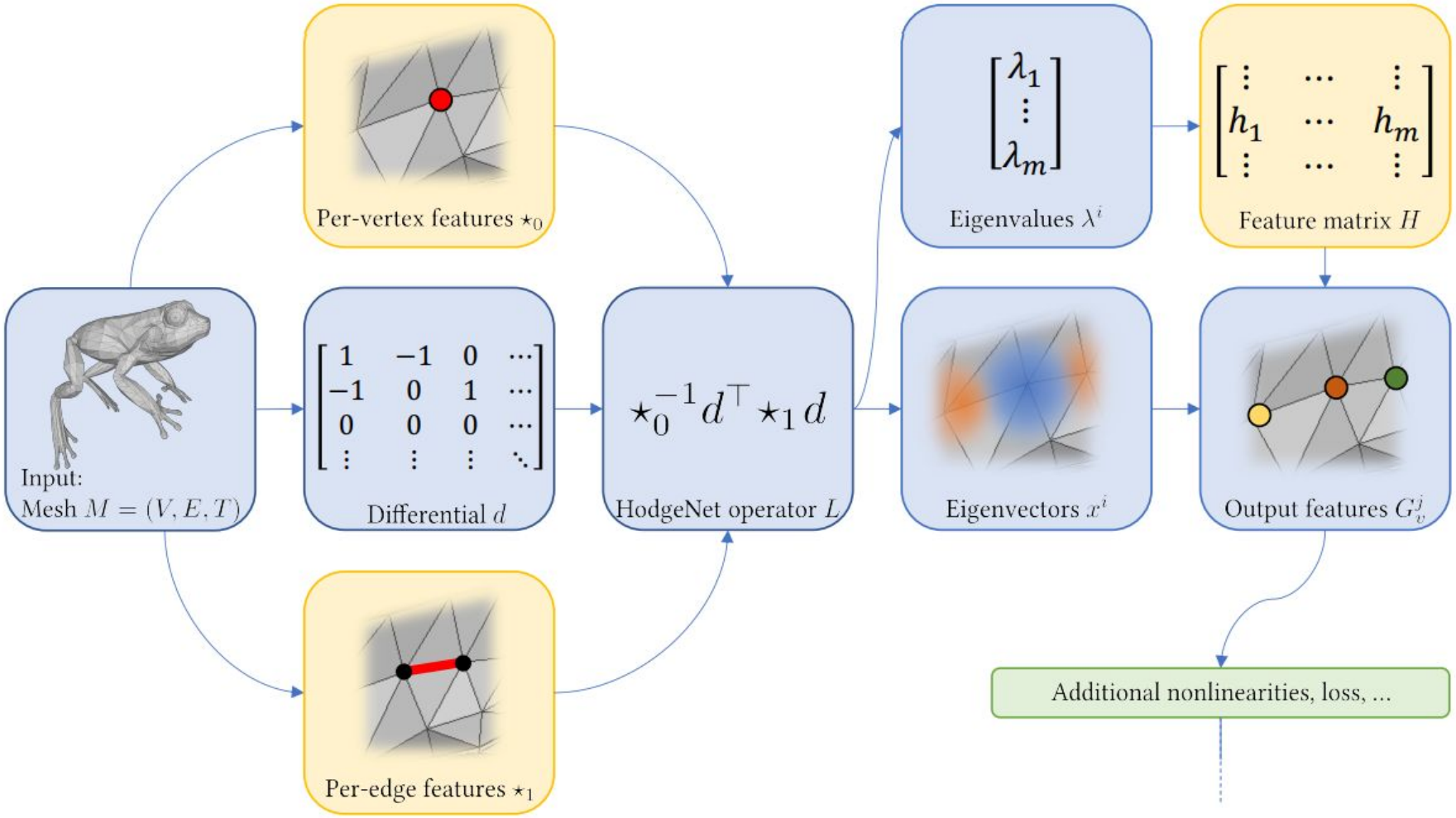






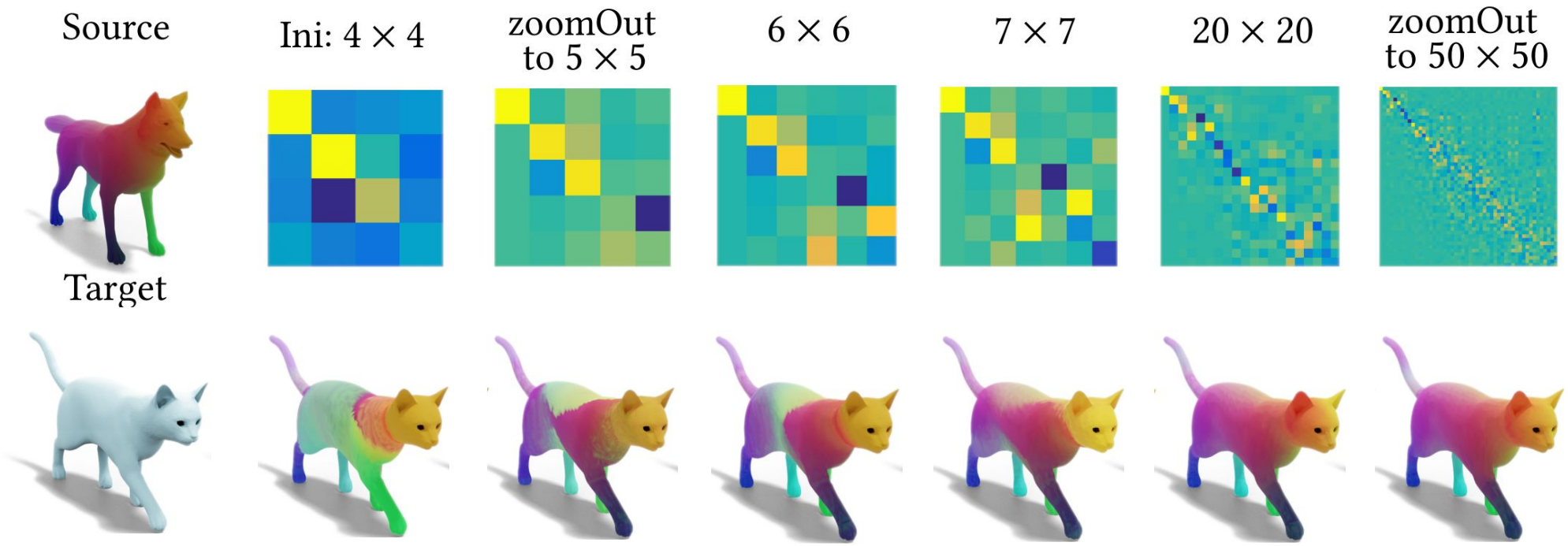
http://www.lix.polytechnique.fr/~maks/papers/DiffusionNet_final.pdf

10. HodgeNet: Learning Spectral Geometry on Triangle Meshes



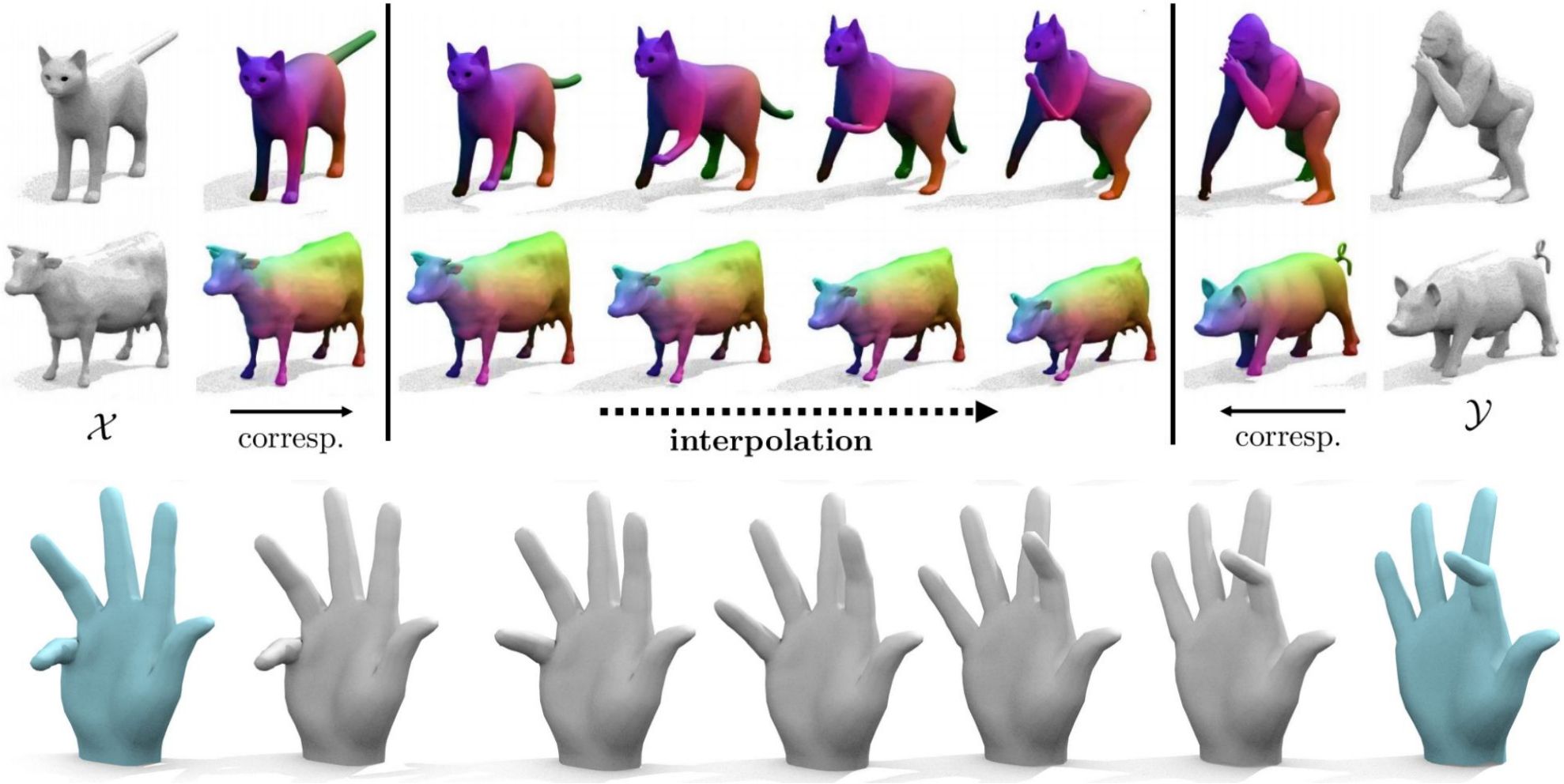
https://dl.acm.org/doi/pdf/10.1145/3450626.3459797

11. ZoomOut: Spectral Upsampling for Efficient Shape Correspondence



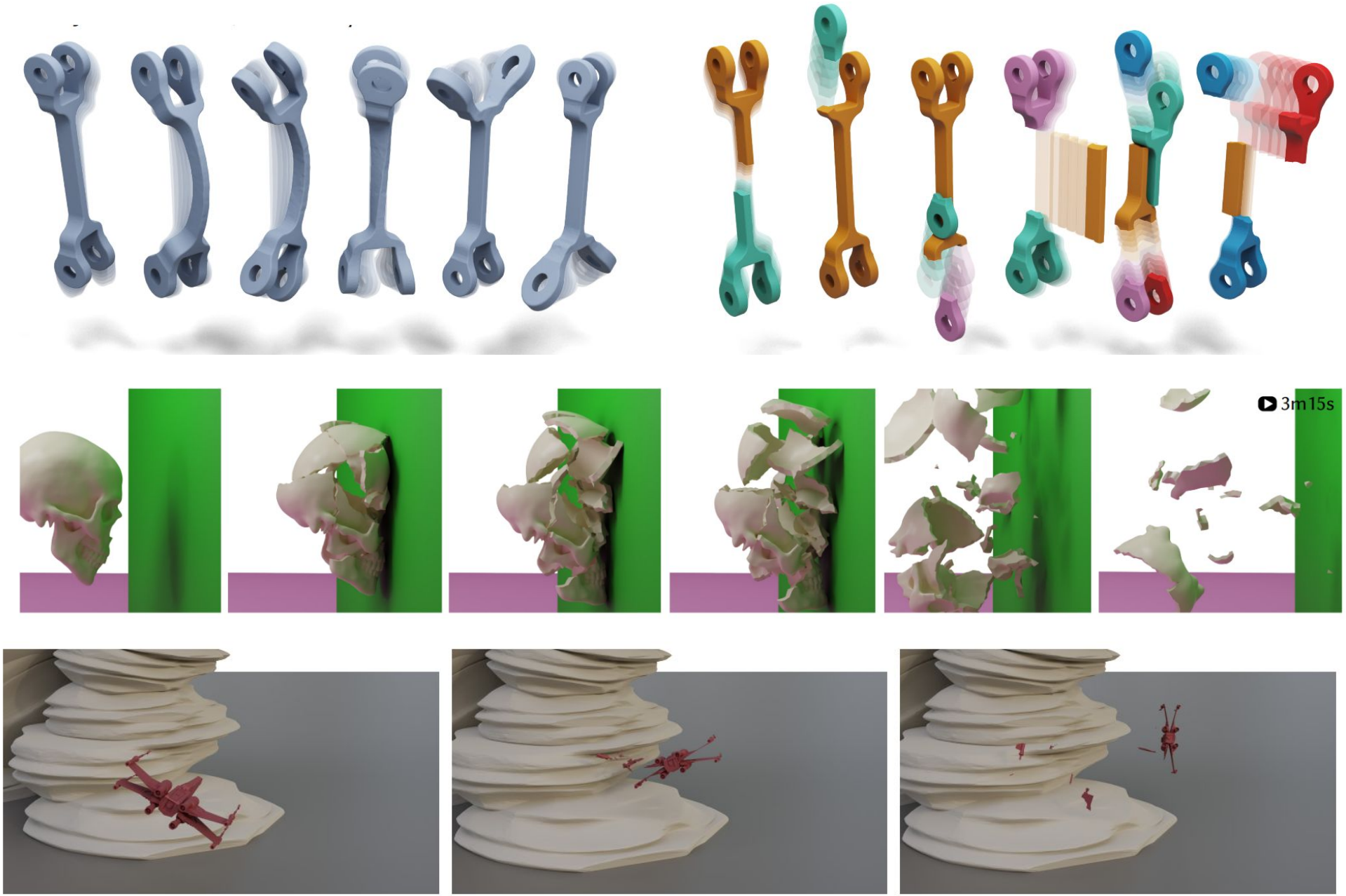
http://www.lix.polytechnique.fr/~maks/papers/SGA19_zoomOut.pdf

12. NeuroMorph: Unsupervised Shape Interpolation and Correspondence in One Go



https://openaccess.thecvf.com/content/CVPR2021/papers/Eisenberger_NeuroMorph_Unsupervised_Shape_Interpolation_and_Correspondence_in_One_Go_CVPR_2021_paper.pdf

13. Breaking Good: Fracture Modes for Realtime Destruction



https://www.silviasellan.com/pdf/papers/fracture-harmonics.pdf

Registration

- Computer Science & exchange students apply through the TUM Matching platform (matching.in.tum.de)
- There are 12 places in total
- Everyone present at the pre-meeting gets priority in the matching system, please post your name, TUM-Kennung and email in the chat in one message

Assignment of Topics

- Website: https://vision.in.tum.de/teaching/ws2022/3dcv
  Password: 3dcv_ws22

- If you got assigned to this seminar, send us an email to 3dcv-ws22@vision.in.tum.de with your **four** favorite topics

- Topics will be assigned by first come first serve

Any Questions?

- Webpage: https://vision.in.tum.de/teaching/ws2022/3dcv
- Password: 3dcv_ws22
- Email: 3dcv-ws22@vision.in.tum.de