193.052 Seminar Wissenschaftliches Arbeiten
186.848 Seminar on medical informatics
193.199 Seminar in Visual Computing (CG & Vis)
Introductory Slides
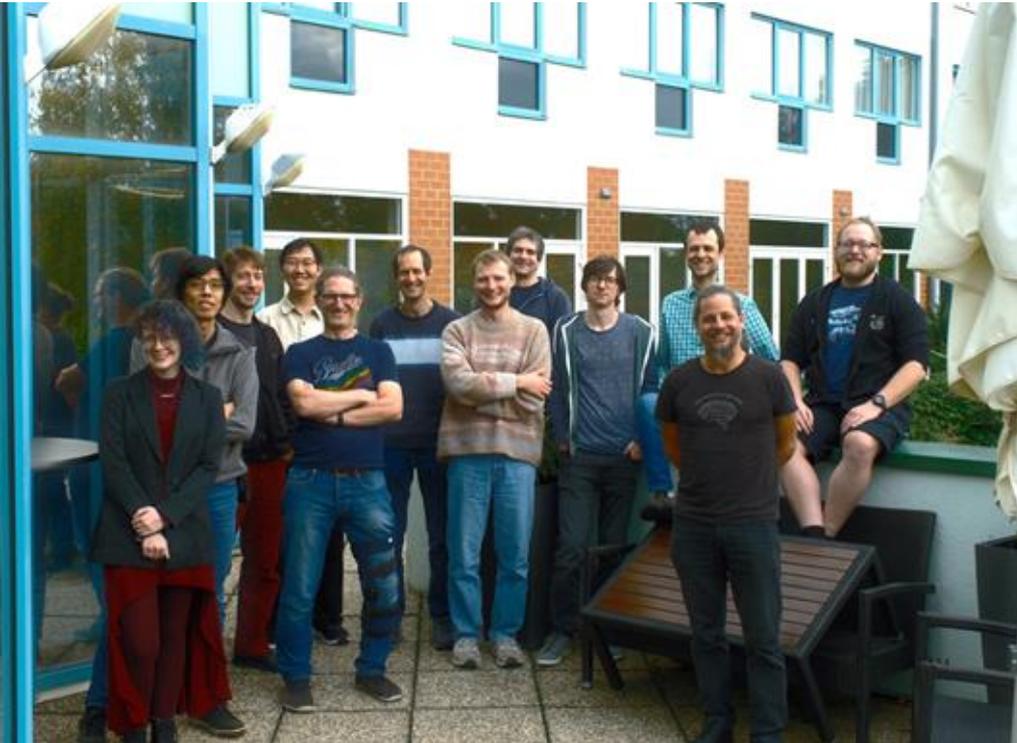## SS 2026

Organizers: Stefan Ohrhallinger, Renata Raidou

👉 https://tuwel.tuwien.ac.at/course/view.php?id=78807

Institute of Visual Computing & Human-Centered Technology

TU Wien, Austria

Rendering Group

Visualization Group

Register to course on TUWEL to get news & updates

All slides and materials will on TUWEL!

Official registration: by submitting the literature list

Topics are presented and chosen by March 08

I am doing the seminar....
Opens: Sunday, 1 March 2026, 1:00 PM   **Closes:** Friday, 6 March 2026, 11:59 PM

Practice selecting, reading and understanding

- Search and select papers relevant to your topic

- Summarize them as a state-of-the-art report

- Prepare a talk about your topic in the seminar

This permits in-depth familiarization with the topic

- Submit a literature list (chosen with supervisor)

- Attendance of 3 lectures (either in-person or recordings)

- Meetings with supervisor: paper selection, discussion of papers, preparing talk slides

- Alternative: evaluate and compare algorithms

- Write a report

- Review a report from a colleague

- Final talk in seminar

Topic Selection

- Select at least <u>five</u> topics you find interesting by March 8!

- We will do the matching and let you know what is your final topic and who your supervisor is.

∨ Step 2: Select your General Topic (4 – 8 March)

In the form below, please select **_at least five_** general topic that you find interesting to work on during this seminar by the **8th of March.** After the deadline, we will match each student to one topic/supervisor and we will announce this information here on the 9th of March.

The selection tool can be found here: https://forms.gle/Z7HoWu9g7VzBBLof9

When the topics/supervisors will be announced:

- Contact your supervisor and discuss with them the specific direction of your seminar report.
- Be proactive: the supervisors will not contact you unless you do!

Literature List

- Analyze recent papers (select with supervisor)

- Study secondary literature to understand topic

- How to find relevant papers:

  - IEEEVis, EuroVis, SIGGRAPH Proceedings

  - TVCG, CGF, C&G,...

  - Google Scholar: find the right key words

- Survey papers, often-referenced papers

- Submit a list of 10+ papers to TUWEL → official registration

- **Not graded but obligatory!**

See on TUWEL the material:

How to find, read, and critically analyze scientific papers

- Analyze recent papers

- Survey papers, often-referenced papers

- Submit **at least 3 pages* (excluding figures/references)**

  * for the vis group topics: submit 3 pages; for the rendering group topics: submit 5 pages (the full report)

- **Final report will be 5 pages:** the more materials you include in your draft, the more/better feedback you get for the final!

- Based on the literature list you created before

See on TUWEL the material:

Writing resources

Peer Review (15%)

- You will get a draft of another student to review

- Typical conference review template

- This helps author to improve the manuscript

- Guides on review writing on course website

- You will receive 2 reviews (student, supervisor)

- Improve final report according to reviews

See on TUWEL some material on how to conduct a peer review

Seminar Presentation (30%)

- Prepare slides in advance, using template

- Each student talks for 10 minutes, in english

- 5 minutes discussion after each talk

- Focus is on overview/comparison of methods

- Present so that other students will understand it

- Active discussion is mandatory and is graded (5%)

- Slides presentation from own laptop or seminar PC

- You are expected to be present during the whole session (but not the other sessions)

- **5 pages per student**, must be in English

- Format in the style of a scientific paper

- Use LaTeX template on course website, can use Overleaf

- Provide a way to show changes from mid-term to final report

- Submit the draft and final report in PDF format

- Report has to be complete and minimum 5 pages (excl. references and figures)!

- Lecture attendance 5%

- Peer Review: 15%

- Seminar slides+talk: 30%, discussion 5%

- Draft Report: 15%

- Final report: 30%

- Late submissions/deadline extensions: not allowed!

- Student declares participation and topic selection **(by March 8)**

- Topic announcement **(March 9)**

- Lecture: Science and how it works, Prof. Gröller **(March 26, 15.00-17.00 SEM186)**

- Deadline: Literature list submission **(by March 23)**

- Lecture recording: Scientific Writing, Prof. Wimmer

- Lecture recording: Scientific Presentation, Prof. Kaufmann

- Deadline: Submit a draft of your report **(by May 18)**

- Deadline: Submit your peer review report **(by June 8)**

- Deadline: Students do their final presentation **(22. or 24.06.2026)**

- Deadline: Submit final report (5 pages, excl. figures/references) **(by June 29)**

- Now several topics will be presented

- Please mark down at least 5 topics that you like

- Add your preferences on the TUWEL link by March 8

- We will try to make a fair assignment of topics in case of conflicts and announce them by March 9

Rendering Group

Visualization Group
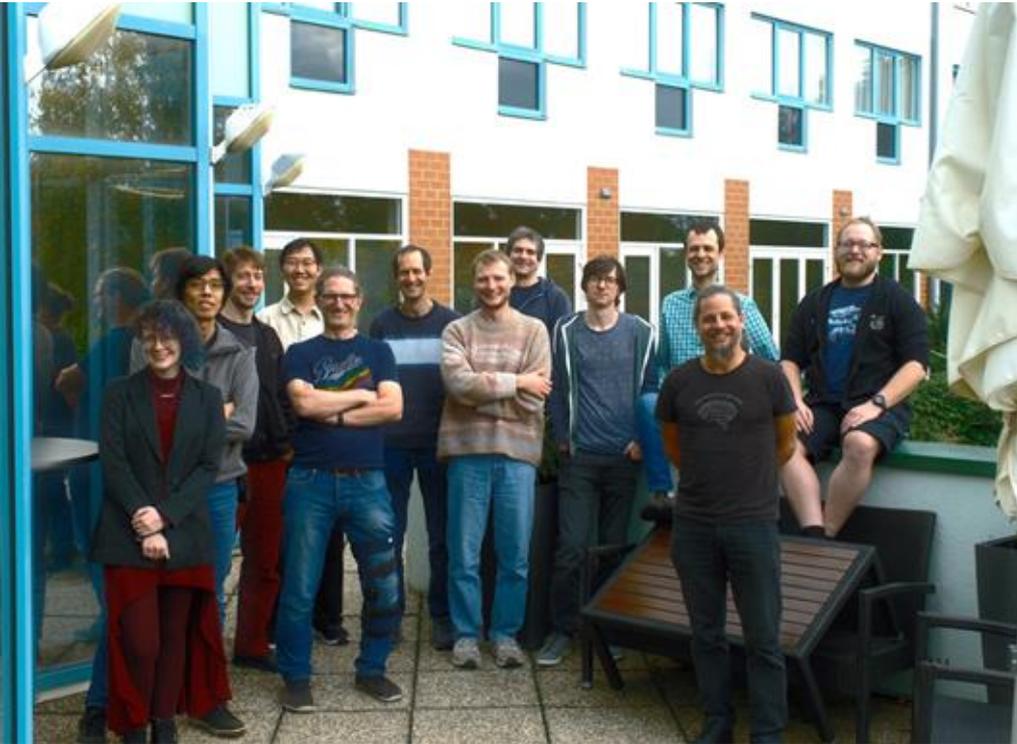
Conduct a survey of recent advances in the representation and application
of measured materials
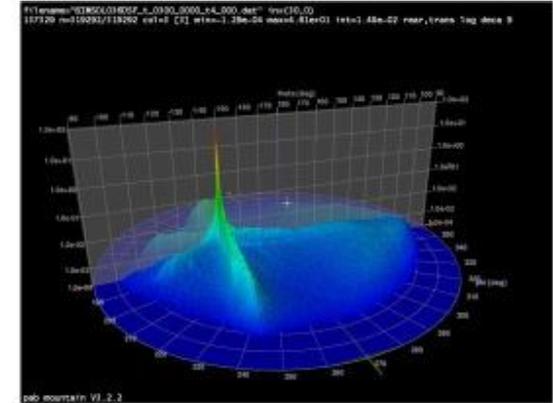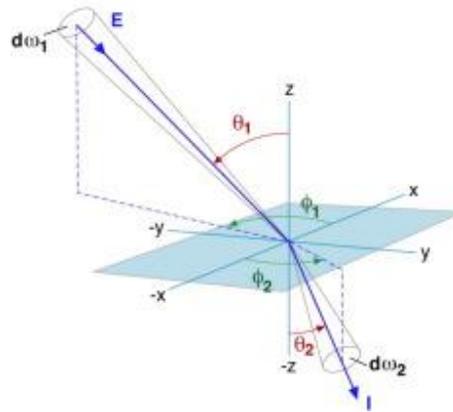
Christian Freude

- Super resolution and frame generation allows games to be rendered at lower spatial and temporal resolution, and then upsampled for better performance.
- Solutions like DLSS, FSR and XeSS are already put into production, but there is still space for improvement, for instance:
    - higher supersampling rate (higher resolution / multiple frame generation)
    - better spatio-temporal stability in predicted frames
    - compatibility with low-end hardware/mobile devices

Chuyan Zhang

17
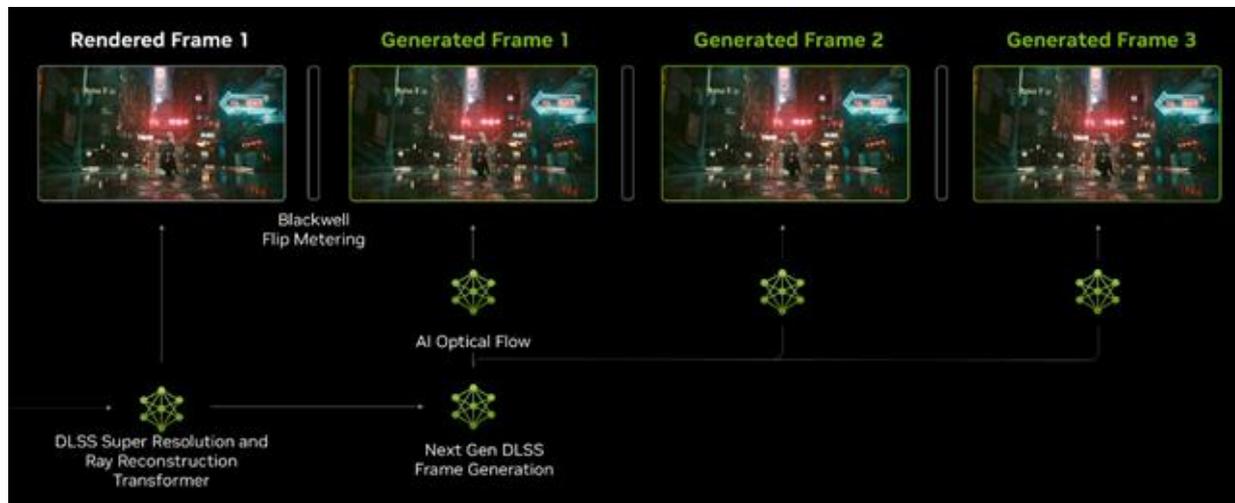
- stroke-based
- mesh-based
- time-reversed
- …
- character animation

https://diglib.eg.org/server/api/core/bitstreams/5a2348b1-93e2-4d6d-ad03-0a3feabc4448/content

https://graphics.pixar.com/library/ElementalAir/paper.pdf

https://diglib.eg.org/server/api/core/bitstreams/ff65f713-b902-4b79-a6bf-43dbc4eabf42/content

Annalena Ulschmid
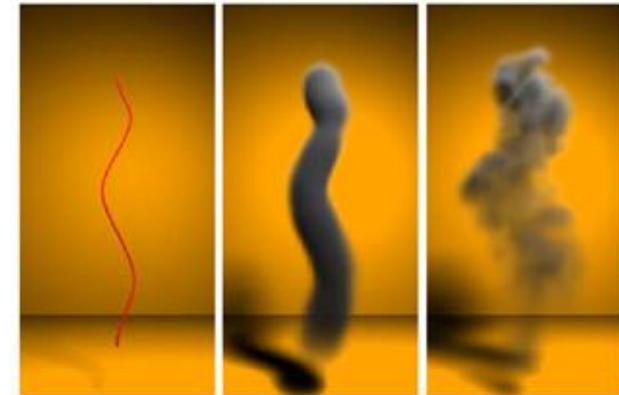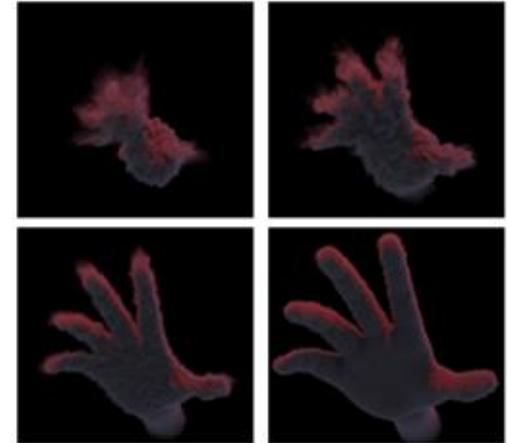
- particle-based
- mesh-based
- …
- character animation

https://dl.acm.org/doi/pdf/10.5555/2422356.2422393

https://onlinelibrary.wiley.com/doi/epdf/10.1111/cgf.14103

Annalena Ulschmid

https://graphics.pixar.com/library/ElementalShaping/paper.pdf
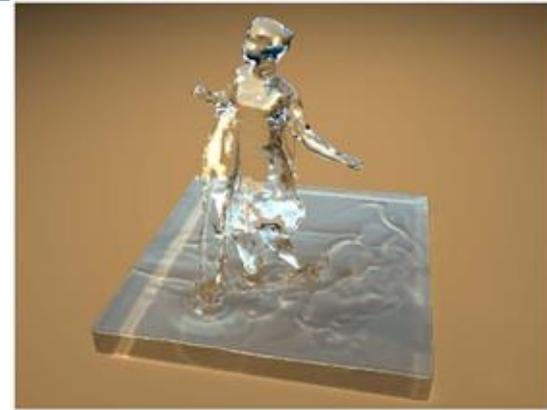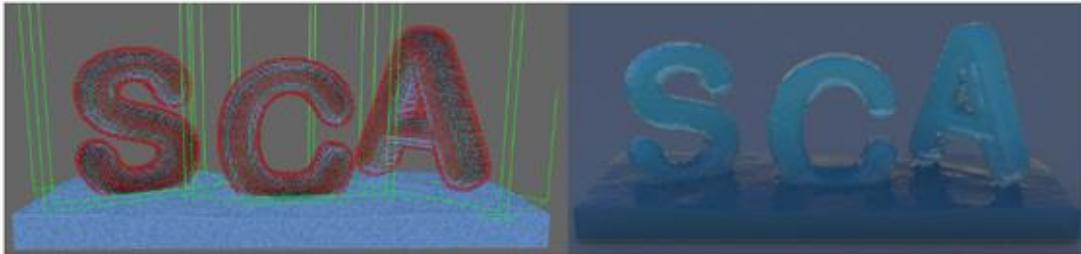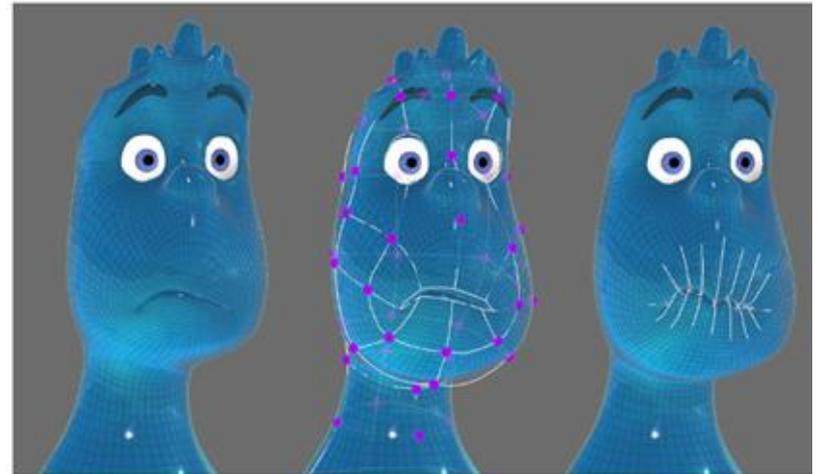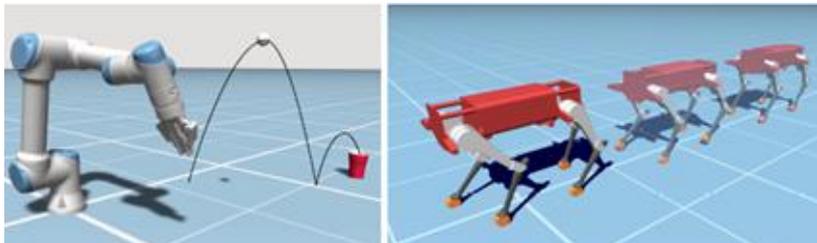
ADD: Analytically Differentiable Dynamics for Multi-Body Systems with Frictional Contact, Geilinger et al., SIGGRAPH Asia 2020

Computational Design of Planar Multistable Compliant Structures, Zhang et al., SIGGRAPH Asia 2021

$$\min \ f(\mathbf{x})$$
$$\text{s. t.} \ \ \mathbf{g}(\mathbf{x}) = 0$$

Real2Sim: Visco-elastic parameter estimation from dynamic motion, Hahn et al., SIGGRAPH Asia 2019

Optimization Integrator for Large Time Steps, Gast et al., TVCG 2015

Computing Minimal Surfaces with Differential Forms, Wang and Chern, SIGGRAPH 2021

David Hahn

Conduct a survey methods that estimate material scattering (BSDFs) based on images

Input Image

Material Diffusion

Albedo

Roughness

Metallic

Hiroyuki Sakai

How do Lidar rays interact with materials?
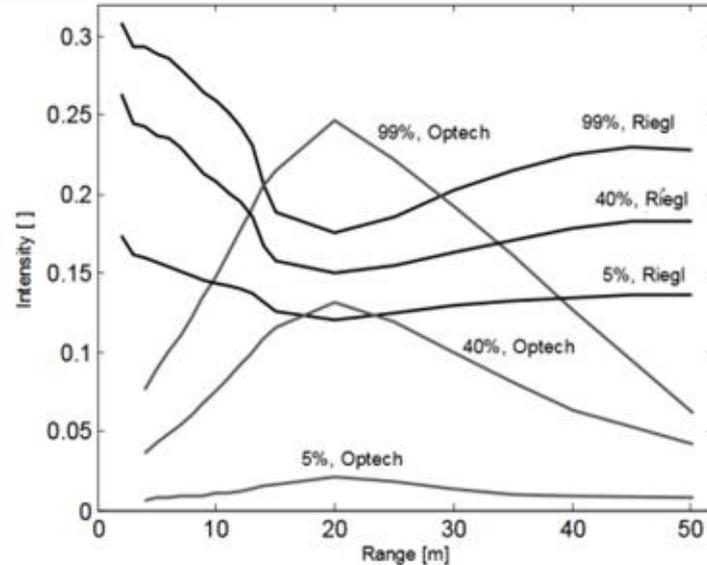
Figure 3: Mean intensities for the Riegl and the Optech laser scanner for three targets (99%, 40%, and 5% reflectivity) at different distances.

10% Reflectivity   20% Reflectivity

Reflectivity below threshold for given distance   Just enough reflectivity to produce an echo at the given distance

Philipp Erler
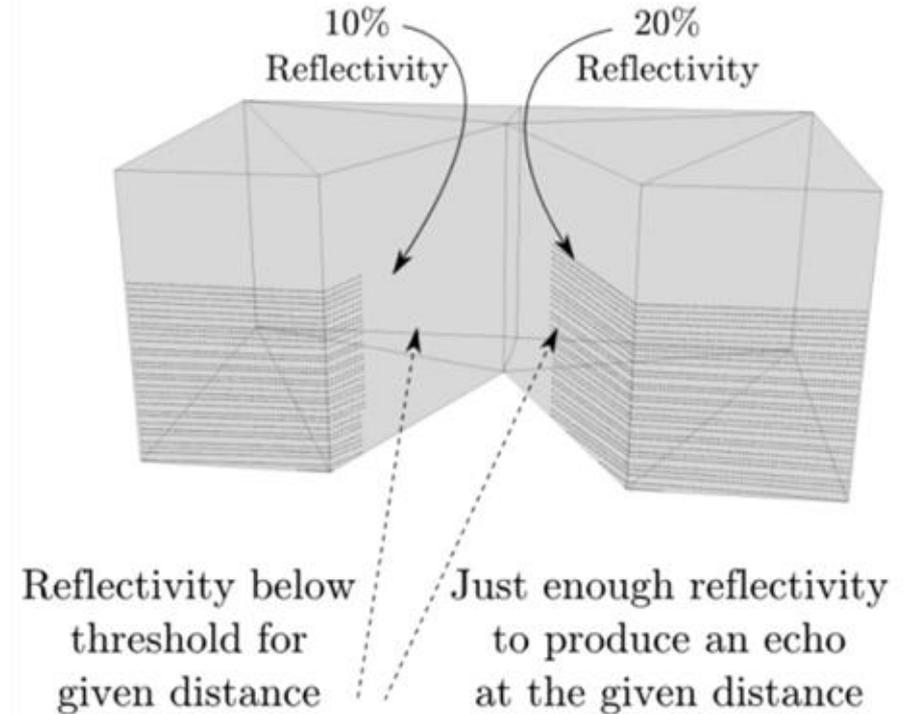
- Old and new techniques
- Aliasing in texture sampling, ray-tracing, rasterization, etc.
- What do current games use?

Markus Schütz
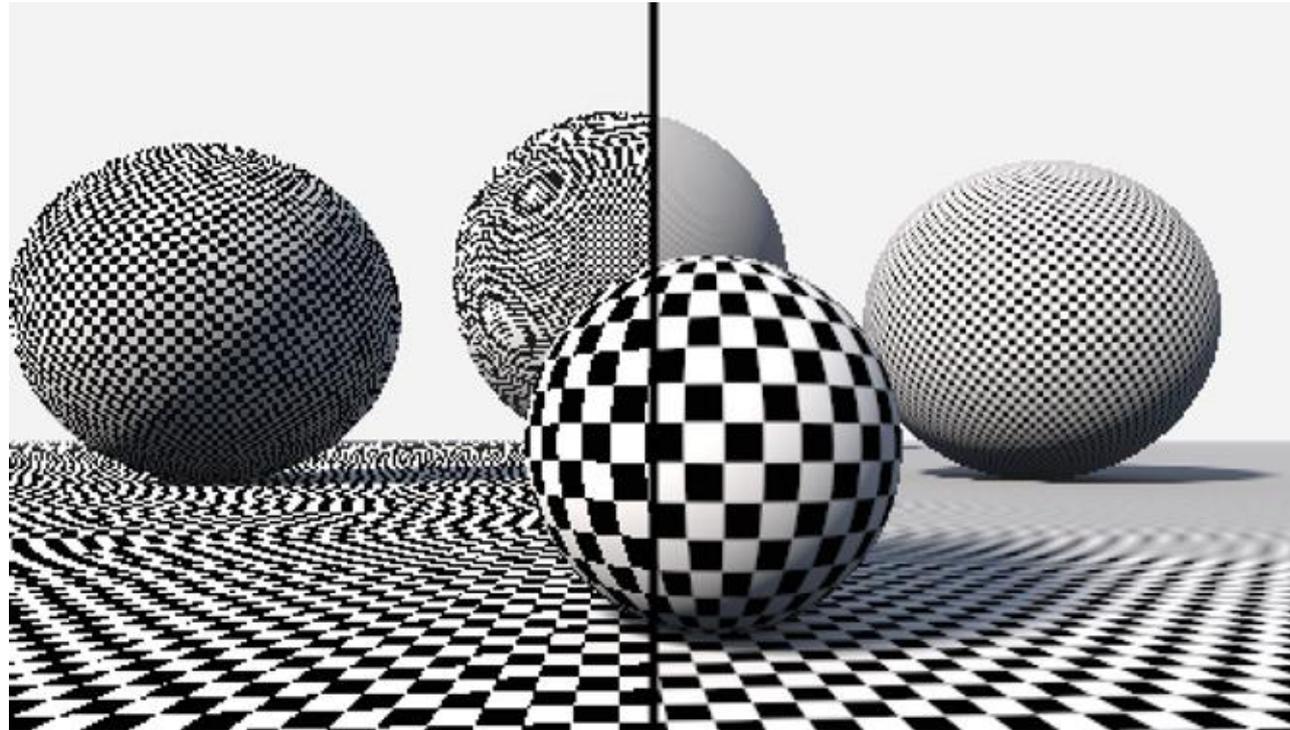
- State-of-the-art techniques
- Where is it used? (e.g. Nanite, …)
- CPU vs. GPU-based methods
- Perhaps also rasterization algorithms in hardware

Markus Schütz
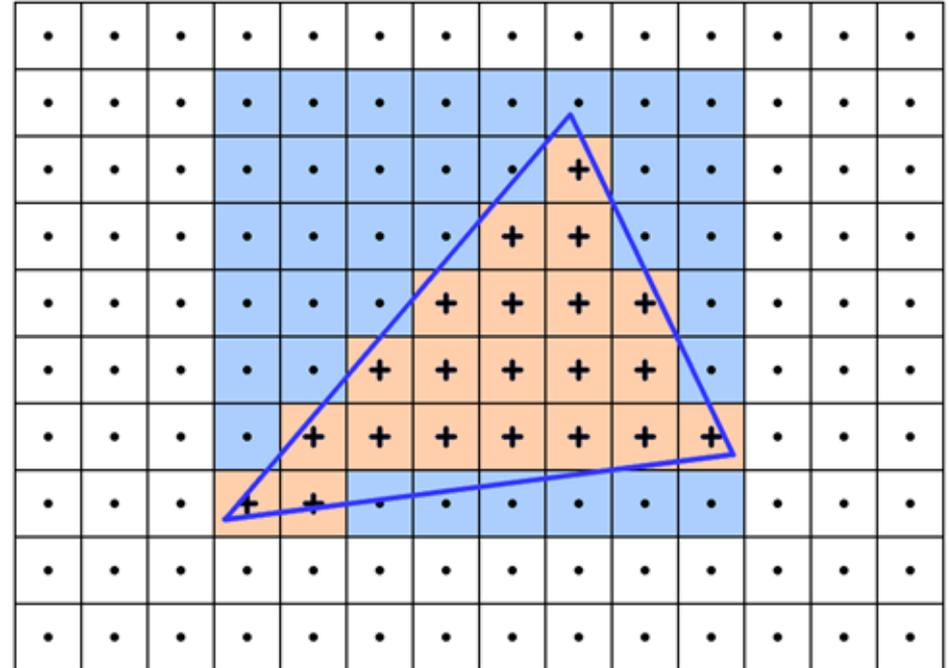
- Signed Distance Fields (SDF) can be used to represent a surface
- Compare methods inferring SDFs from 3D Scans and reconstructing surfaces

Stefan Ohrhallinger
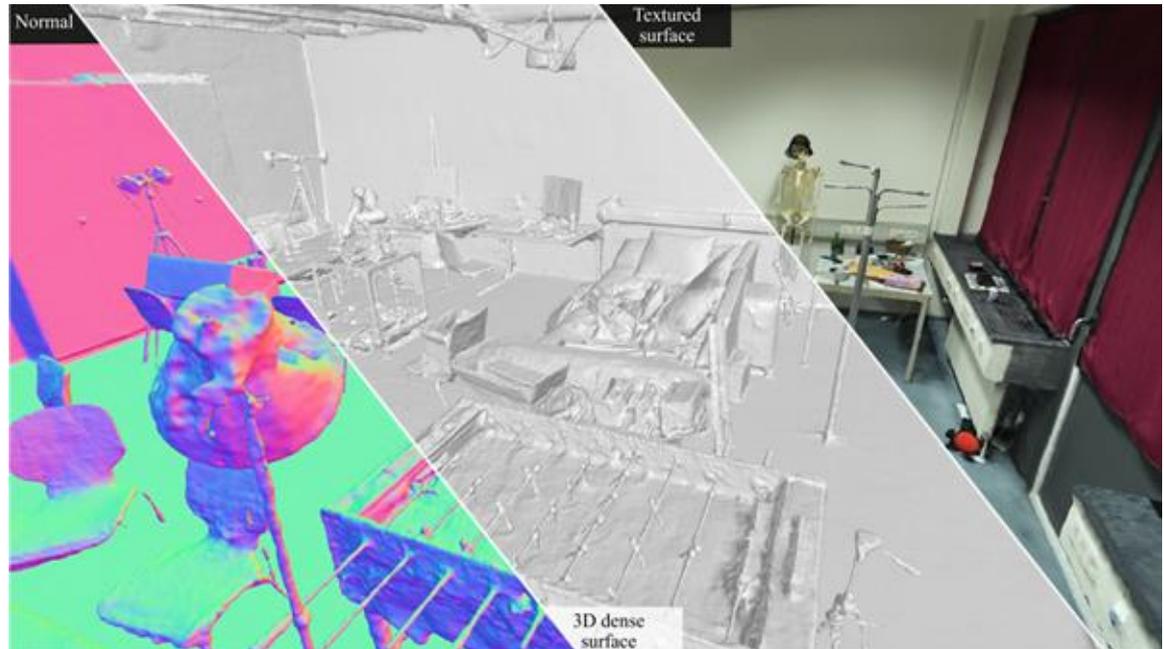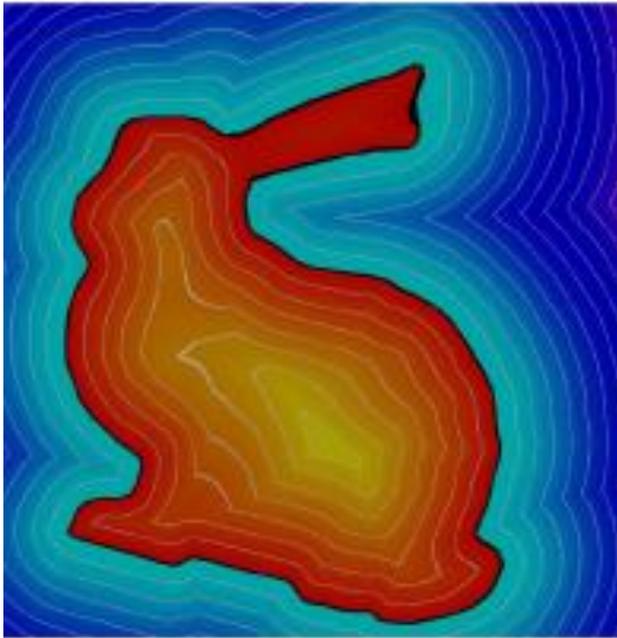
Methods for detecting traffic violations from video:
- Speed limits
- Traffic lights
- Traffic signs
- Keeping inside lanes
- Analyze state in successive frames

Stefan Ohrhallinger
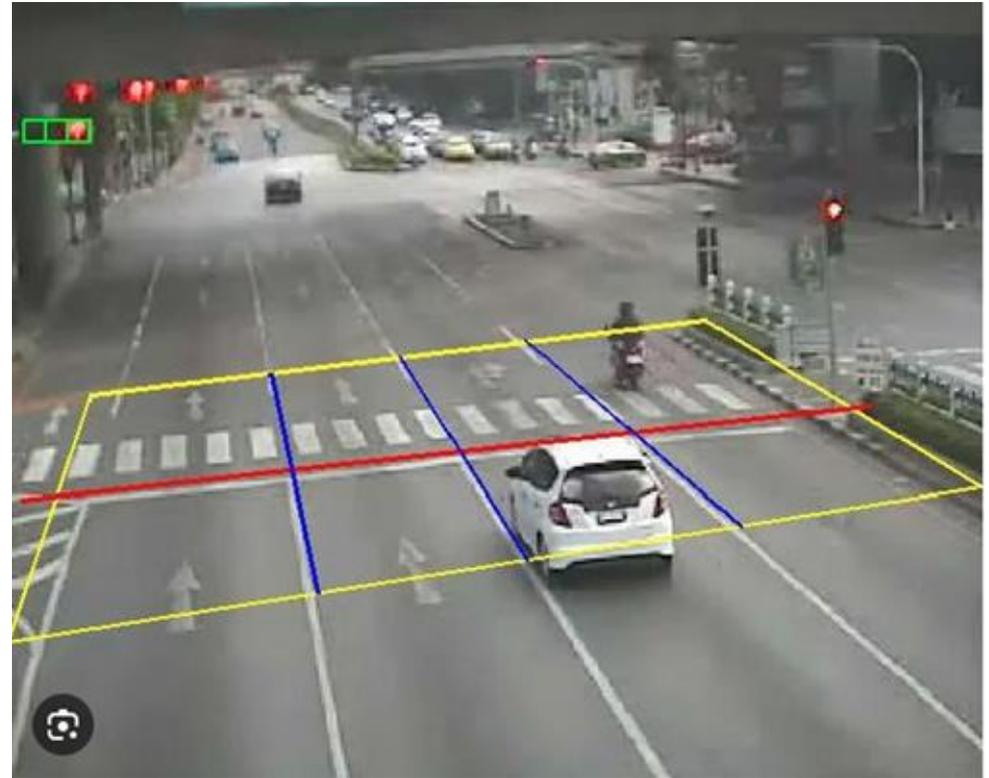
- Stochastic Geometry
- Non-Exponential Transmittance Model

$$f \sim GP(\mu, k)$$

$$\mathcal{L}\langle f \rangle_{GP} \quad \neq \quad \langle \mathcal{L}f \rangle_{GP}$$

Seyb, et al. "From microfacets to participating media: A unified theory of light transport with stochastic geometry." ACM Transactions on Graphics (Proceedings of SIGGRAPH). Vol. 43. No. 4. ACM, 2024.
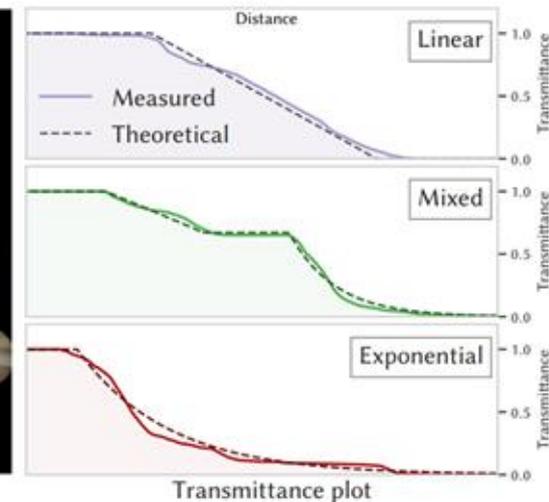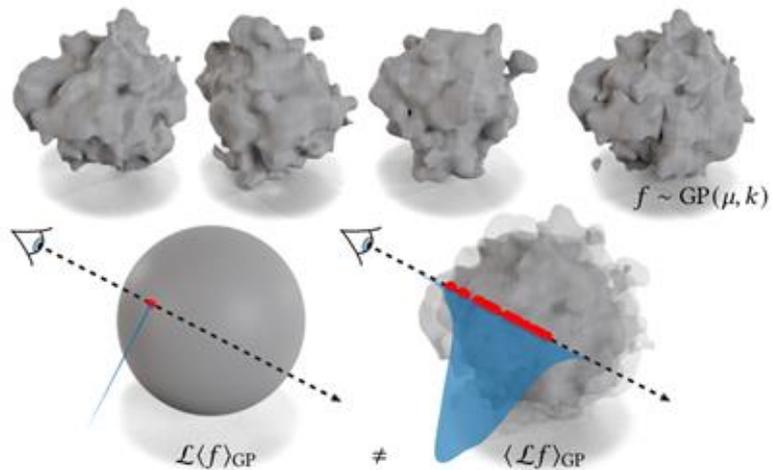
Vicini, et al. "A Non-Exponential Transmittance Model for Volumetric Scene Representations." ACM Transactions on Graphics (Proceedings of SIGGRAPH). Vol. 40. No. 4. ACM, 2021.

Lukas Lipp

ComparisonVideo-based (projecting 3D to 2D) versus Geometry-based (using Octrees) compression.

Focus on real-time decompression
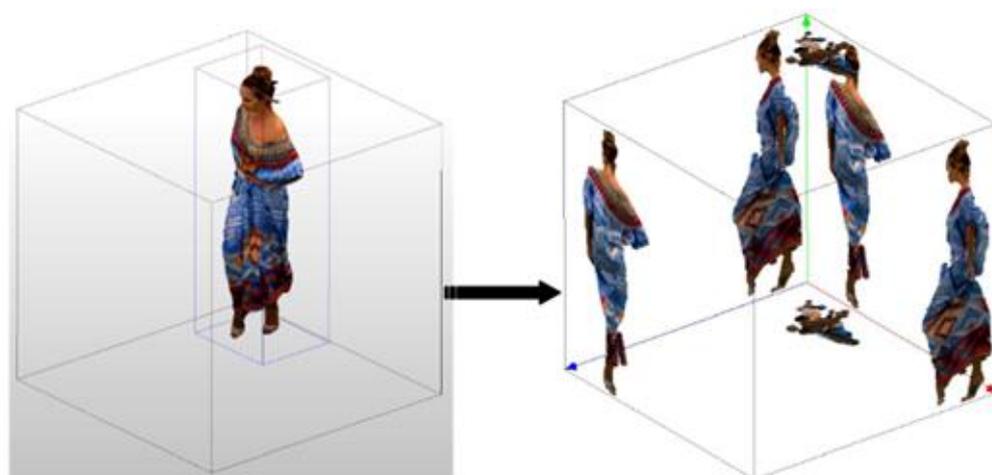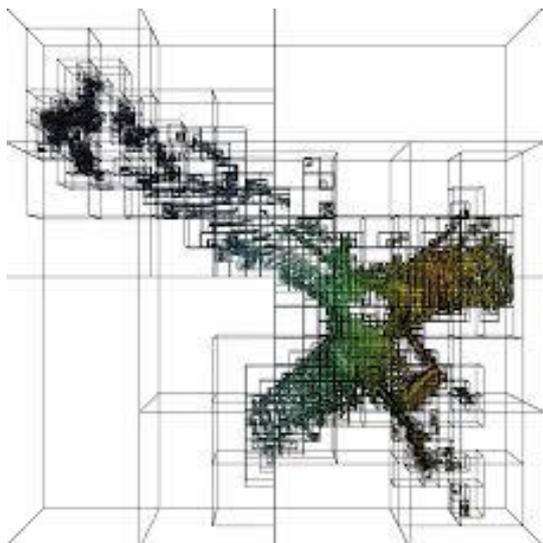
(a) 3-D Point Cloud   (b) Projected 2-D patches

Bound box ⟶ X axis ⟶ Y axis ⟶ Z axis

Instead of saving pixels, just save the "concept"
Reconstructs it as close as possible at the destination with generative AI

Image:

Promt:

Image:

compress

Golden Retriever

decompress

Rendering Group

Visualization Group

Geographic Visualization

EuroVis 2023
Best Poster 🏆

https://ccexplorer.github.io/

netidee
FÖRDERUNGEN

WebGPU

presented at
Lawinensymposium 2023

Interactive exploratory analysis of large and complex data

Illustrative motion smoothing [EuroVis / CGF 2023]
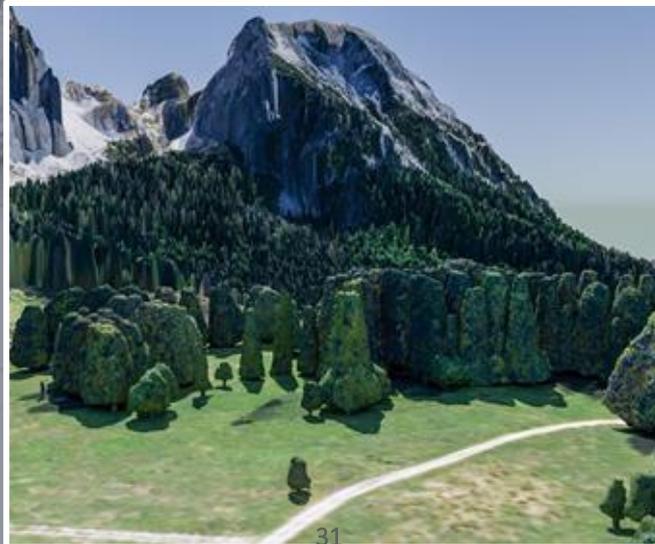
Joint Human-Machine Data Exploration

Interactive exploration of bias in LLMs [EuroVis 2023]

In collaboration with

32

EuroVis 2025
Best Paper

[Pahr et al., CGF 2025]

[Pahr et al., CGF 2024]

[Pahr et al., TVCG 2024]
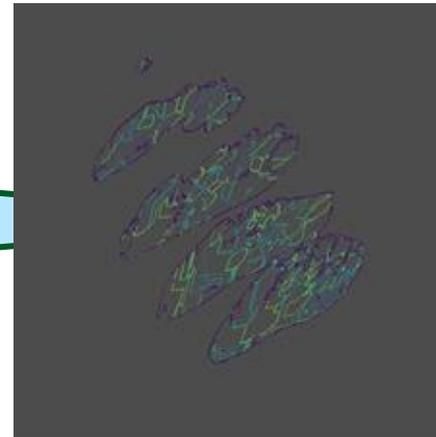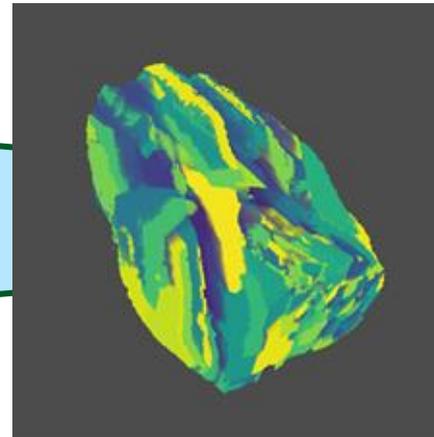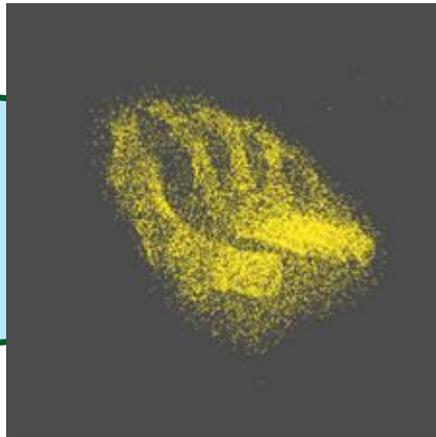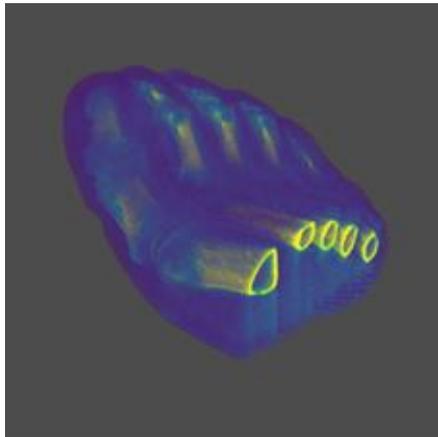
(a) No Splits   (b) 1 Split   (c) 2 Splits   (d) 3 Splits   (e) 4 Splits
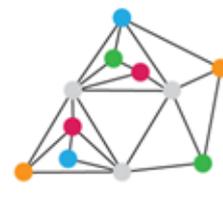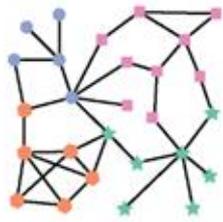
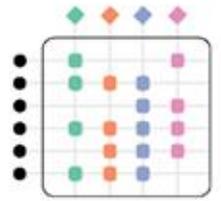(a) Node Attribute   (b) Overlay   (c) Bipartite N.L.D.   (d) Multiples
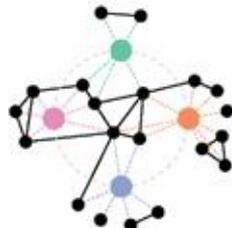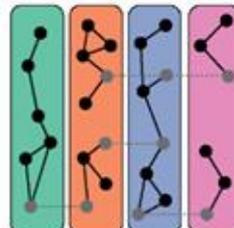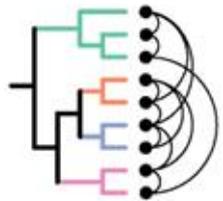
(e) Trees   (f) Matrix   (g) Abstraction   (h) Hybrid

34

[Ehlers et al. 2024 C&G]

RGB (content)
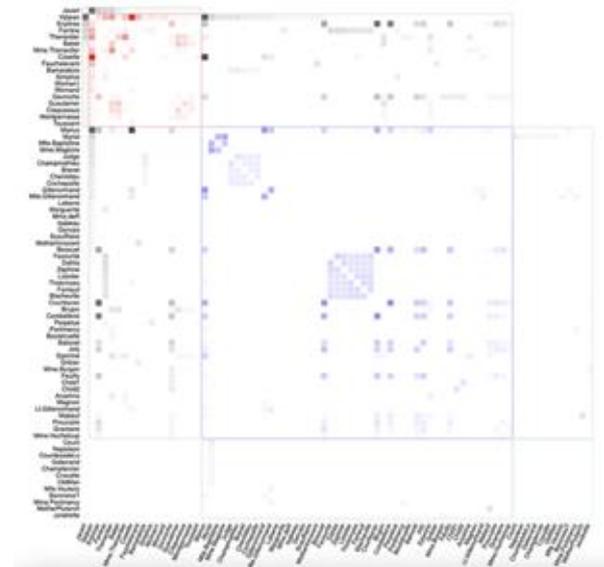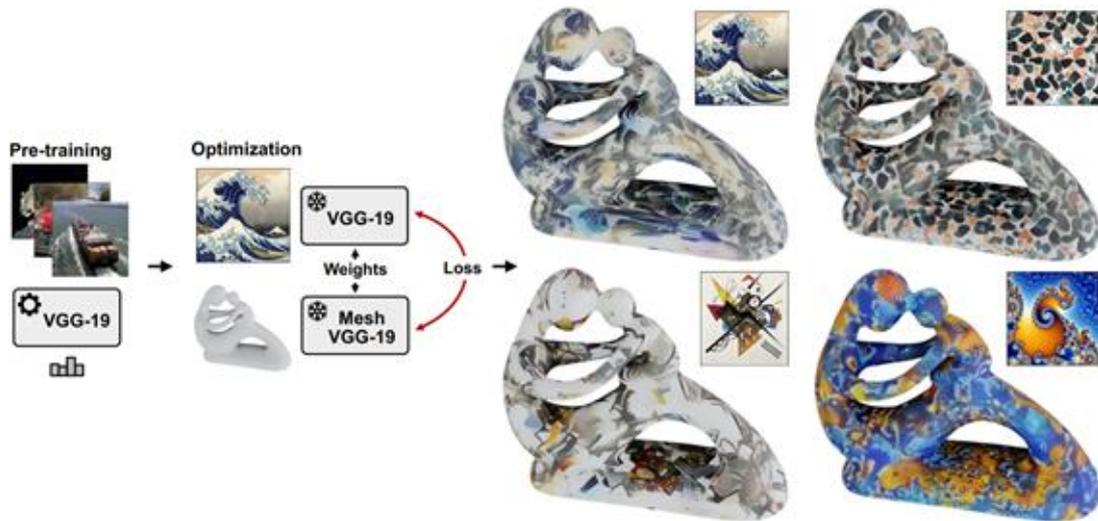
[Kovacs et al. CGF 2024]

[Kovacs et al. CGF 2024 (b)]
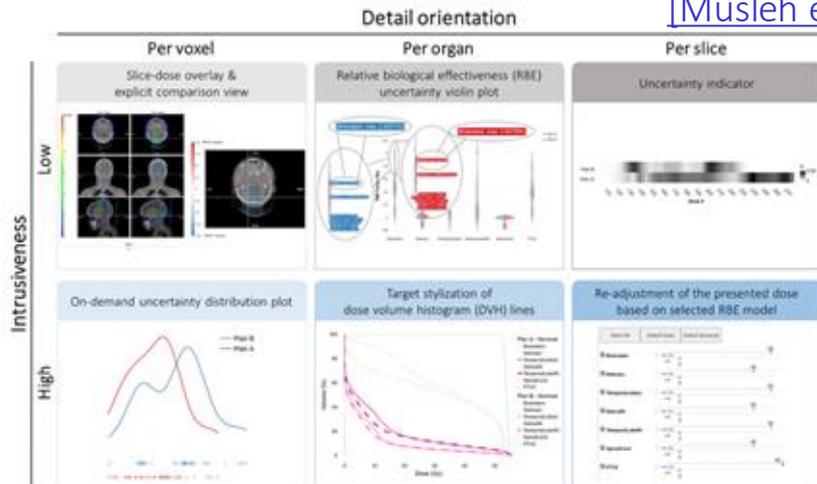
[Musleh et al. 2023, C&G]

[Musleh et al. 2024, CGF]
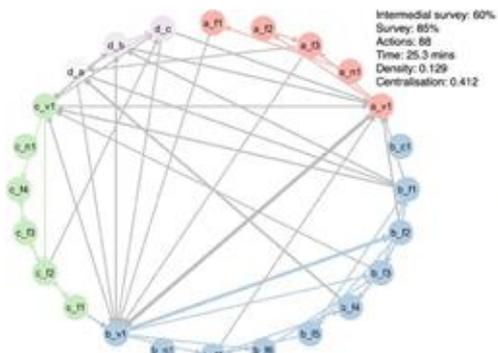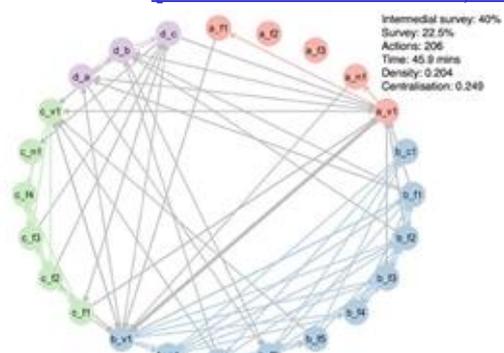
[Musleh et al. 2024, TVCG]

[El-Sherbiny et al. 2023, EG VCBM]

[Magg et al. 2022, EG VCBM]

(a) Generative model

(b) Shape prediction

37

[Borondy et al., 2022 EG VCBM
EG VCBM Best Paper Award]
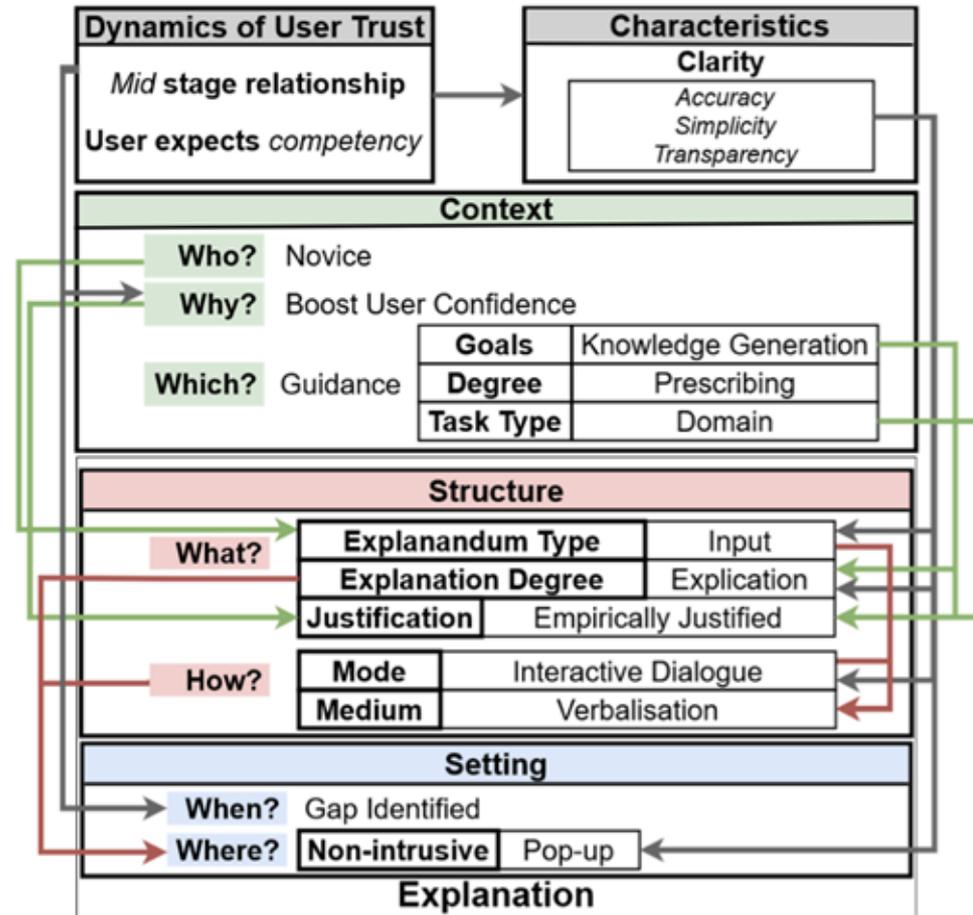
[Usul et al. (Submitted to TVCG] Vis/TVCG)]
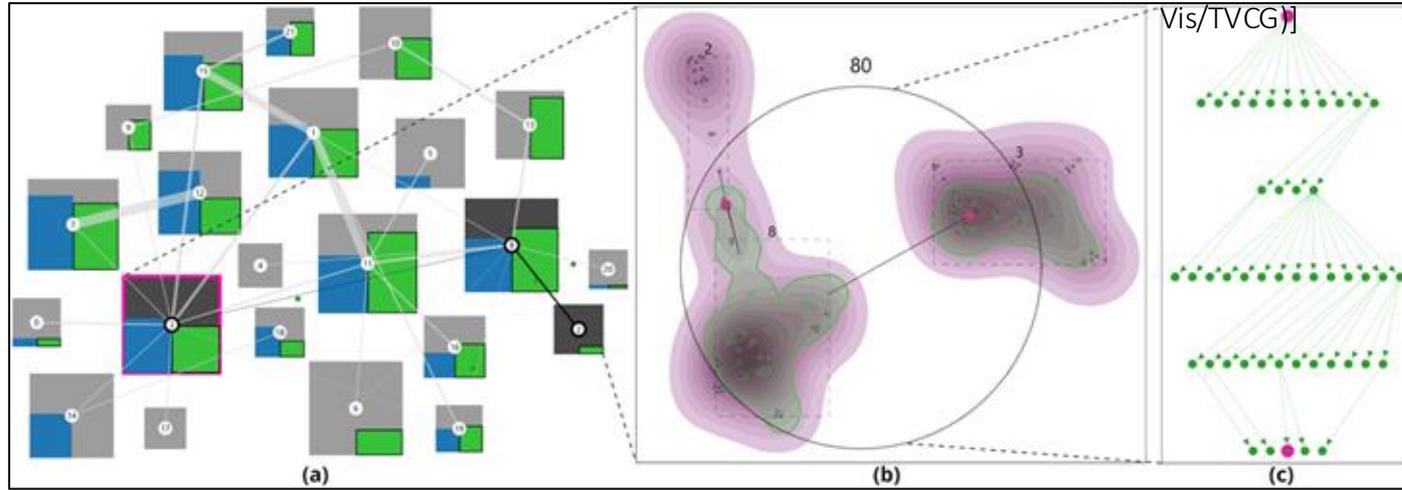
[Schindler et al. 2023, EG VCBM
🏆 EG VCBM Best Paper Award]

[Peischl et al. 2024, IVAPP]

[Häusle et al. (Work in Progress)]

[Bayat et al. 2024, IEEE CG&A]
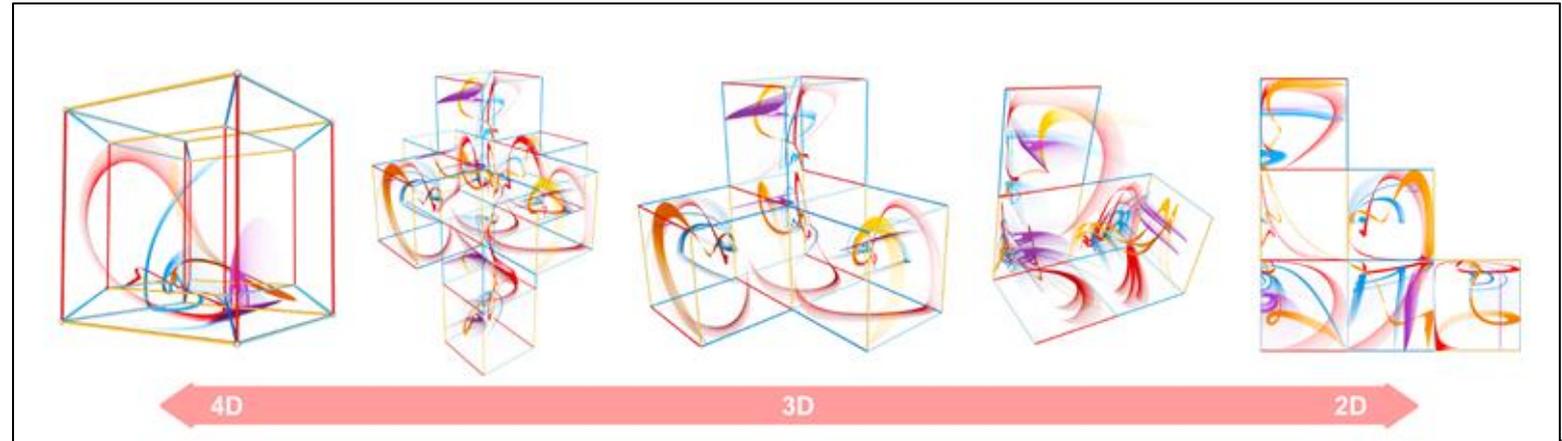
Comparative Visualization

Uncertainty Visualization

Decision-making in Visualization

Scalable Visualization

Chart Design Guidelines

Annotations in Information Visualization

User Studies in Healthcare

LLMs for Visualization

Visualization in Education

The Downside of Visualization

Human-AI Collaboration for Data Analysis

Geospatial Visualization

Animation and Simulation

Visualization in Astrophysics

Environmental and Climate Change Data Visualization

Neural Procedural Modeling

Structure-aware generative models

Dynamic Network Visualization