186.175 Seminar aus Computergraphik
186.046 Seminar aus Visualisierung

SS 2020

Organizer: Hsiang-Yun Wu

Teaching staff: Aleksandr Amirkhanov, Nicolas Grossmann, Christoph Heinzl, Tobias Klein, David Kouřil, Haichao Miao, Peter Mindek, Renata Raidou, Manuela Waldner, Hsiang-Yun Wu, and Eduard Gröller

Institute of Visual Computing&Human-Centered Technology

TU Wien, Austria

Last updated: 11th Match 2020

Seminars

- 186.175 Seminar aus Computergraphik (by default)
- 186.046 Seminar aus Visualisierung
  - Send me a message that you plan to register Seminar aus Visualisierung
- 186.848 Seminar aus Medizinischer Informatik
  - Send me a message that you plan to register Seminar aus Medizinischer Informatik
  - You are requested to select a medical related topic

Seminar

Get an idea how scientific work is carried out (in CG)

- Practice to review literature and get familiar with a particular scientific topic
  - Selecting, reading and understanding
  - Summarizing and explaining (orally and written)
  - Comparing and discussing
- Write a review on a paper
- Practice to give a talk

Seminar

- **Select a topic**

Topic

- Students can work alone or in groups of 2
- State-of-the-Art
- TUWEL: https://tuwel.tuwien.ac.at/course/view.php?id=21472
- wu@cg.tuwien.ac.at

Important!!

Register your topic on TU WEL

Registration start:

12th March 2020, 10:00

Registration due to:

26th March 2020, 23:59

First come first serve

Seminar

- Select a topic
- **Submit list of literature**

Literature List

- List of papers related to the topic
- Seminar subscription
- **26.03.2020**: List of literature submission deadline
- Approx. 10~15 papers in a list (pdf, no specific template)

Seminar

- Select a topic
- Submit list of literature
- **Attend 3 lectures**
  - All three lectures will be held in the seminar room of institute 186

Attend 3 Lectures

- **01.04.2020 (Wed) 11:00 - 13:00 (s.t.) (Online recording will be provided)**

  Wie schreibt man eine wissenschaftliche Arbeit Professor Wimmer

- **21.04.2020 (Tue) 11:00 - 13:00 (s.t.)**

  Forschung und wie sie funktioniert Professor Gröller

- **13.05.2020 (Wed) 11:00 - 13:00 (s.t.)**

  Wie halte ich einen Vortrag Professor Purgathofer

Seminar

- Select a topic
- Submit list of literature
- Attend 3 lectures
- **Write the report**

Report

- State-of-the-Art report
- Final report: 8 pages (16 pages / group)
- In English
- Regular meetings with supervisor
- Format as for a scientific paper
  - LaTeX (Template on the wepage)
- **20.04.2020**: Report submission deadline (minimum 5 pages)

Seminar

- Select a topic
- Submit list of literature
- Attend 3 lectures
- Write report
- **Write review**

Review

- Review paper of other student (or group of students)
- Fill out review form (will be sent by e-mail)
- **25.04.2020**: Receive a review form and a report from another student.
- **18.05.2020**: Review submission deadline
- **22.05.2020:** Receive two reviews (one from your supervisor and one from another student)

Seminar

- Select a topic
- Submit list of literature
- Attend 3 lectures
- Write report
- Write review
- **Refine report**

Seminar

- Select a topic
- Submit list of literature
- Attend 3 lectures
- Write report
- Write review
- Refine report
- **Give a talk**

Slides

- Use the institute format Candidate for new Powerpoint template 16:9 (https://www.cg.tuwien.ac.at/resources/onTalks/)
- Format: PDF or PowerPoint
- A Mac machine with Microsoft PowerPoint installed (avoid using *.avi for videos)
- **17.06.2020 (17:00)**: Submit on TUWEL

Talk

- 20 + 5 minutes
- In English
- Active discussion participation
- **18.06.2020, 9:00 s.t. – 18:00**: Talks
  - **9:00 - 12:00** in the seminar room 186 (Favoritenstr. 9-11 / 5.floor)
  - **13:00 - 17:00** in the seminar room ZEMANEK (Favoritenstr. 9-11 / EG).

Seminar

- Select a topic
- Submit list of literature
- Attend 3 lectures
- Write report (draft version)
- Write review
- Refine report
- Give a talk
- **Submit final version**

Report

- State-of-the-Art report
- 8 pages (16 pages if working in a group)
- In English
- Format reports in the style of a scientific paper
  - Use LaTeX (template is on the webpage)
- **21.06.2020**: Final report submission deadline

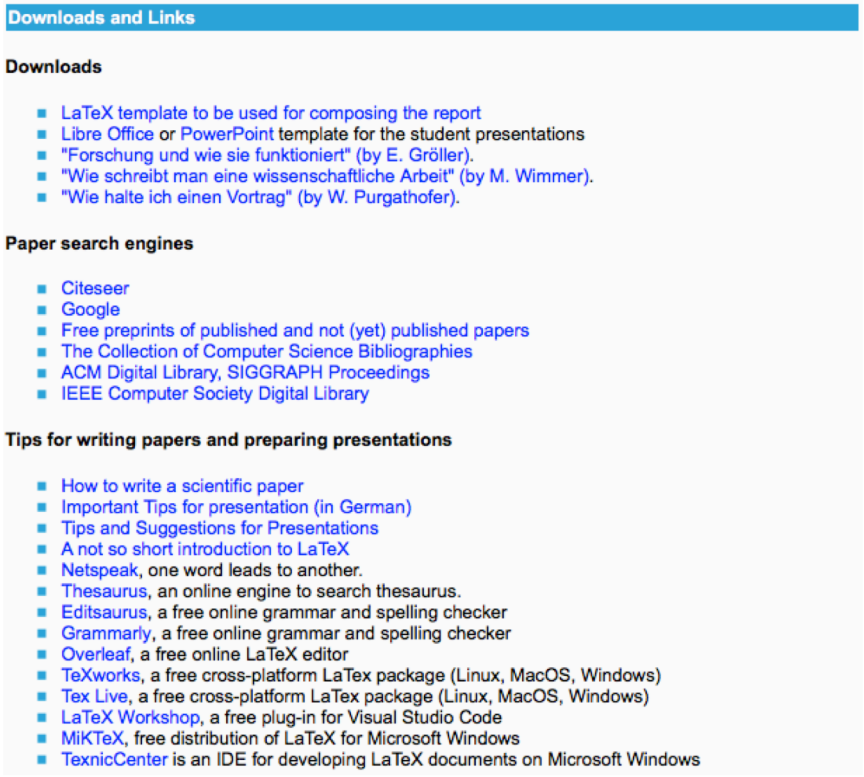
Grading

- It is necessary to attend the 3 lectures to get a positive grade!
- Grading criteria:
  - 40% written report
  - 30% presentation
  - 20% review
  - 5% attendance during the presentations
  - 5% active discussion after the presentations

Anyway…

Report Grading

- Grading criteria:
  - Structure, figures,...
  - Language
  - Content
  - References
  - Checklist
- Practical Tips and Tricks for Paper Writing
  https://www.cg.tuwien.ac.at/research/publications/2010/groeller-2010-PTT/groeller-2010-PTT-.pdf



Downloads and Links

Downloads

- LaTeX template to be used for composing the report
- Libre Office or PowerPoint template for the student presentations
- "Forschung und wie sie funktioniert" (by E. Gröller).
- "Wie schreibt man eine wissenschaftliche Arbeit" (by M. Wimmer).
- "Wie halte ich einen Vortrag" (by W. Purgathofer).

Paper search engines

- Citeseer
- Google
- Free preprints of published and not (yet) published papers
- The Collection of Computer Science Bibliographies
- ACM Digital Library, SIGGRAPH Proceedings
- IEEE Computer Society Digital Library

Tips for writing papers and preparing presentations

- How to write a scientific paper
- Important Tips for presentation (in German)
- Tips and Suggestions for Presentations
- A not so short introduction to LaTeX
- Netspeak, one word leads to another.
- Thesaurus, an online engine to search thesaurus.
- Editsaurus, a free online grammar and spelling checker
- Grammarly, a free online grammar and spelling checker
- Overleaf, a free online LaTeX editor
- TeXworks, a free cross-platform LaTex package (Linux, MacOS, Windows)
- Tex Live, a free cross-platform LaTex package (Linux, MacOS, Windows)
- LaTeX Workshop, a free plug-in for Visual Studio Code
- MiKTeX, free distribution of LaTeX for Microsoft Windows
- TexnicCenter is an IDE for developing LaTeX documents on Microsoft Windows

Report Grading

- Points will be deducted for:
  - Delayed submission
  - Page number below 8 (16 in a group)
- Plagiarism check!

References	
	How many **relevant references** did the student provide?
	How well was the **topic covered** by the related work?

Structure and Format	
	Structure
	Grammar and spelling
	Citations and References
	Figures
	Is the Latex template correctly used?
	Figure and section cross-referencing
	Page limit: How many pages are missing?

Language / writing	
	Red thread / storytelling
	Understandability, accuarcy, compactness
	Consistency

Content	
	Is the topic covered well?
	Discussion / categorization / comparisons
	Abstract
	Introduction
	Conclusion

Plagiarism

Plagiarism

“plagiarism involves the use of another person's work without full and clear referencing and acknowledgement”

http://tim.thorpeallen.net/Courses/Reference/Citations.pdf

Presentation Grading

Grading Criteria

- Content Expertise
- Didactic / Preparation
- Presentation Technique
- Overtime

All the information is here:

https://cg.tuwien.ac.at/courses/SeminarAusCG/

All the questions go here:

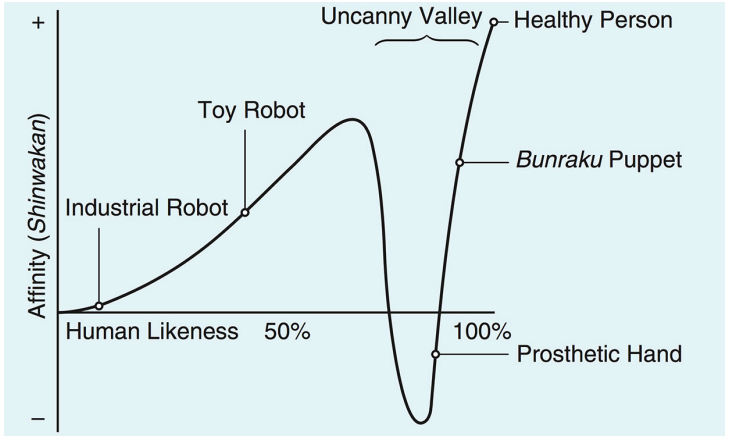
https://tuwel.tuwien.ac.at/course/view.php?id=21472

or

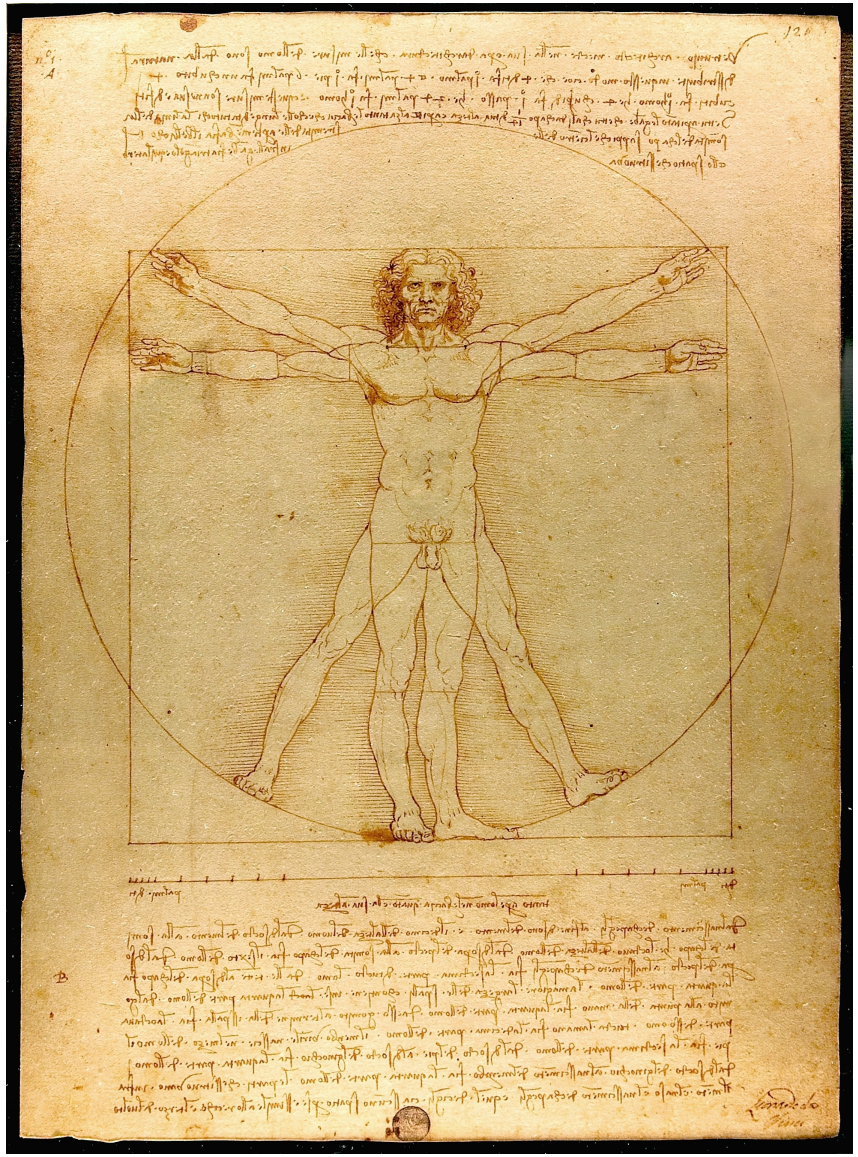
wu@cg.tuwien.ac.at

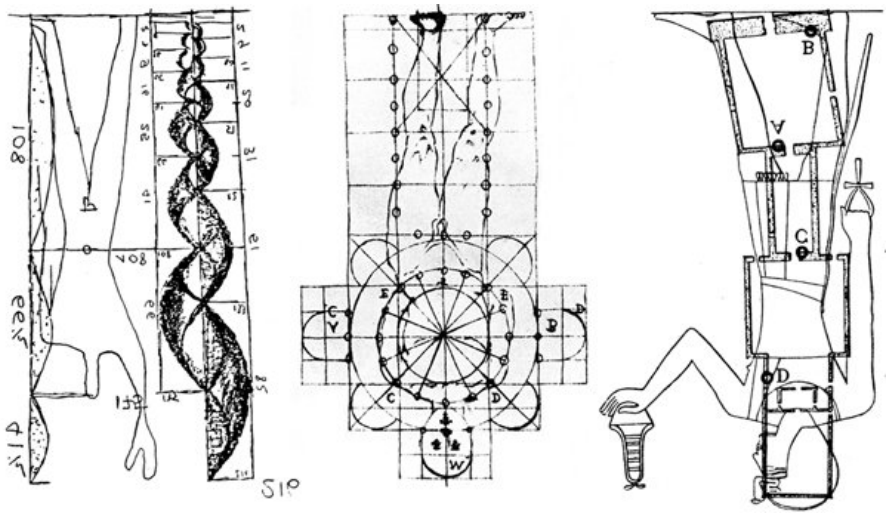
Topics 2020

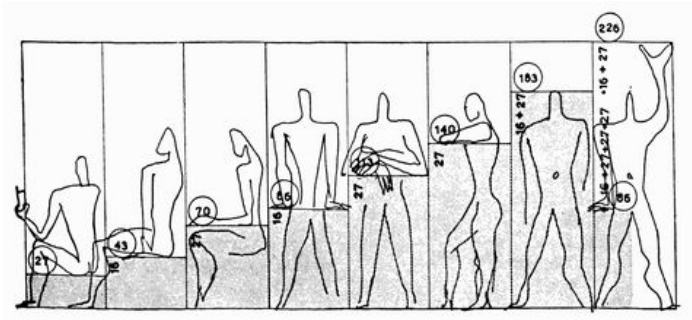
Visualization and uncanny valley

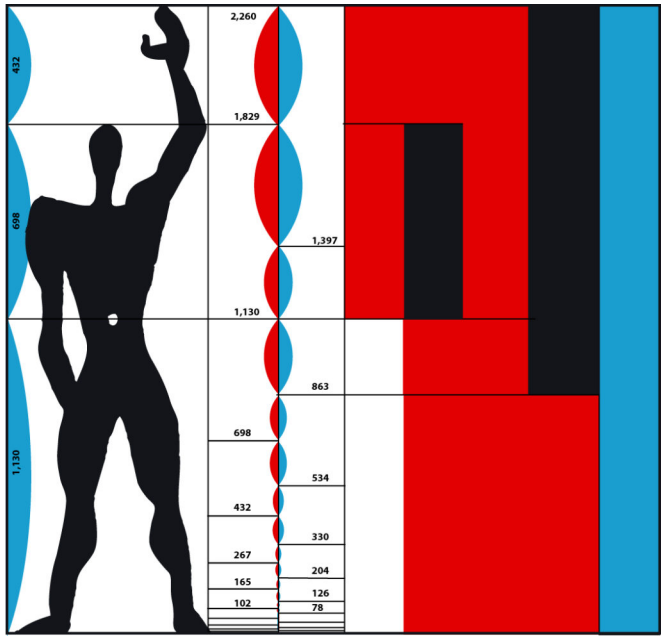


Aesthetic visualization



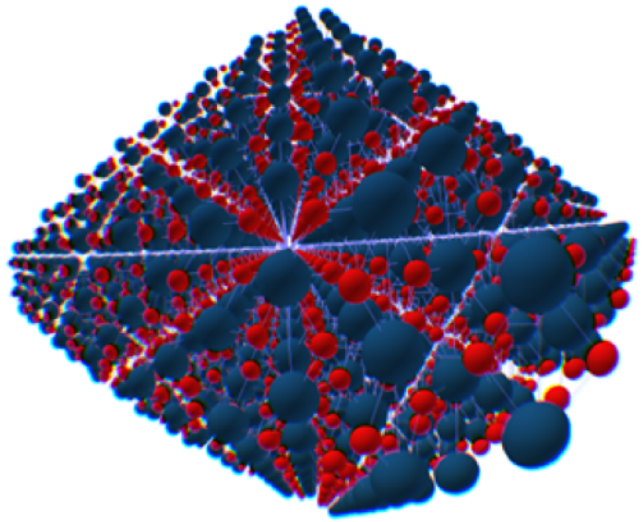






Visualization Techniques for AR/VR Applications in Material Science

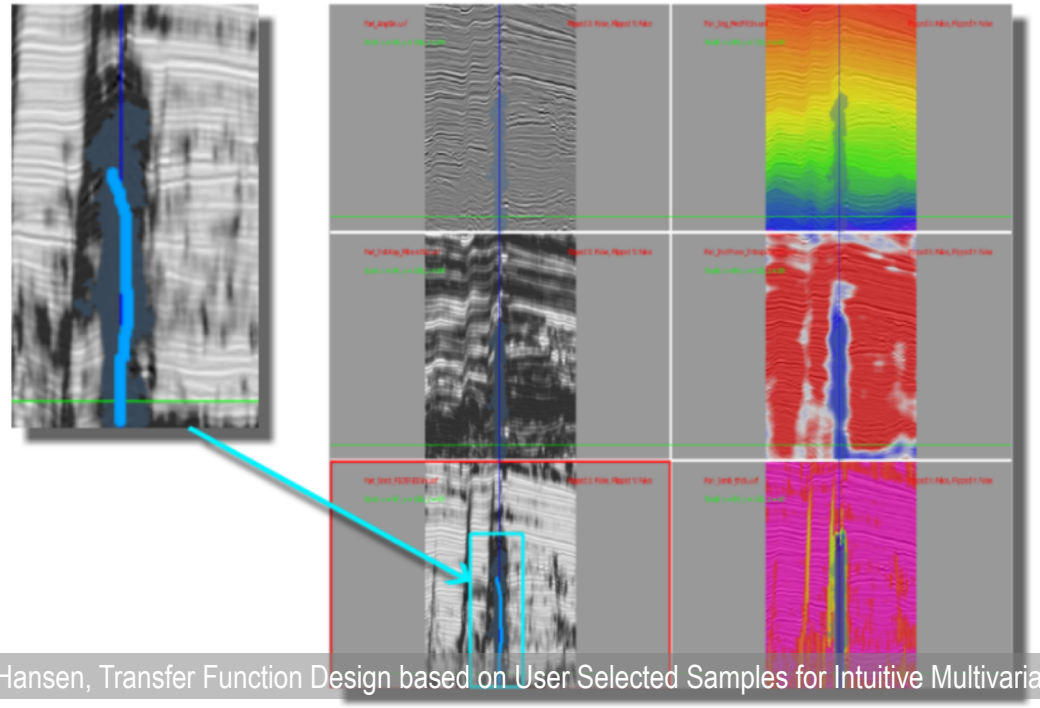
Virtual and augmented reality has come to stay and is used in many application domains. AR and VR feature the potential to boost data analysis through more intuitive insights and more intuitive interactions; the transfer of the spatiality is intuitive and probably more effective than when rendering the same scene on a 2D monitor. Virtual and augmented reality have the potential to help in a variety of tasks such as quality control / parts inspection, the characterization of the micro-structure of materials, or the visualization of atomic structures. Your task is to provide an overview on the state of the art regarding **methods in virtual and augmented reality:** where these be used to support material science tasks, what are their benefit, what are their limitations.



García-Hernández and Kranzlmüller: NOMAD VR: multiplatform virtual reality viewer for chemistry simulations

Guidance Methods for Transfer Function Specification

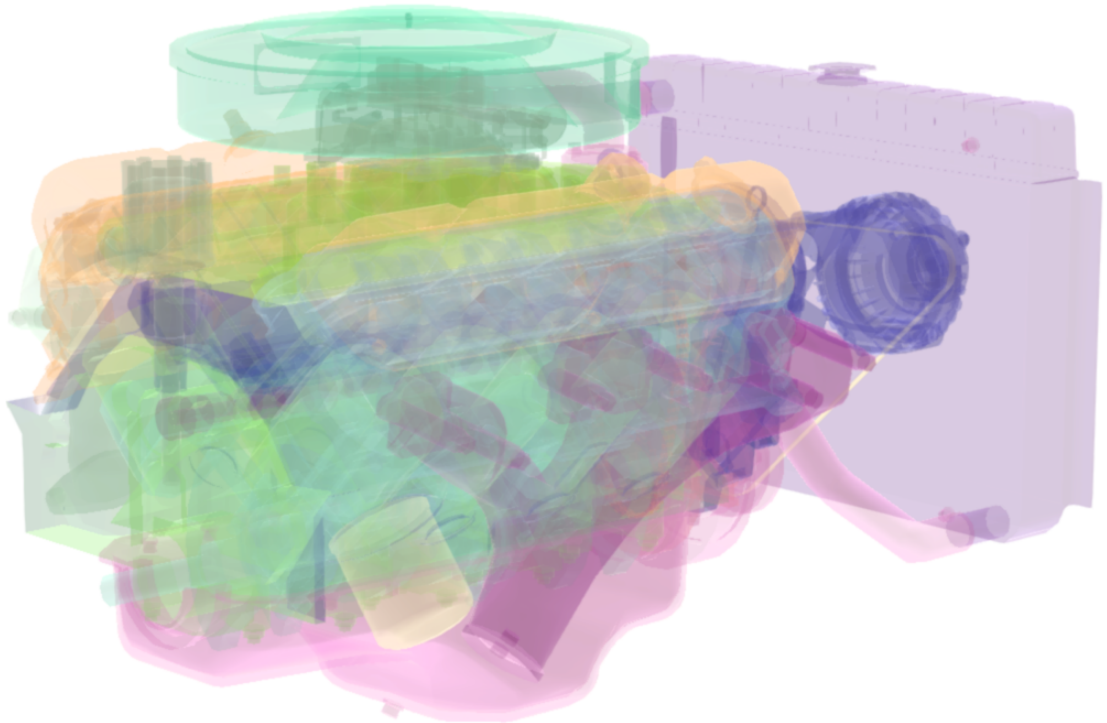
When directly visualizing (potentially multi-variate) volume datasets, a transfer function is required. Current tools for this purpose are often unintuitive; its often not clear how changes in the transfer function will affect the resulting visualization; using volume visualization tools therefore first requires a certain experience by the user, as well as often a trial and error approach to color the volume in the desired fashion. Recently, methods have emerged that simplify this process, or provide guidance to the user. Your task is to provide a survey on the state of the art of **methods guiding users in setting up transfer functions** for volume visualization.

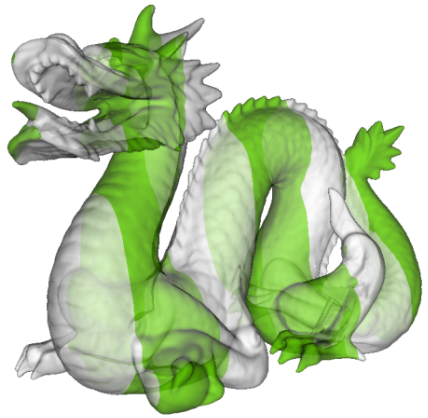


Source: Zhou and Hansen, Transfer Function Design based on User Selected Samples for Intuitive Multivariate Volume Exploration

Real-time Transparency

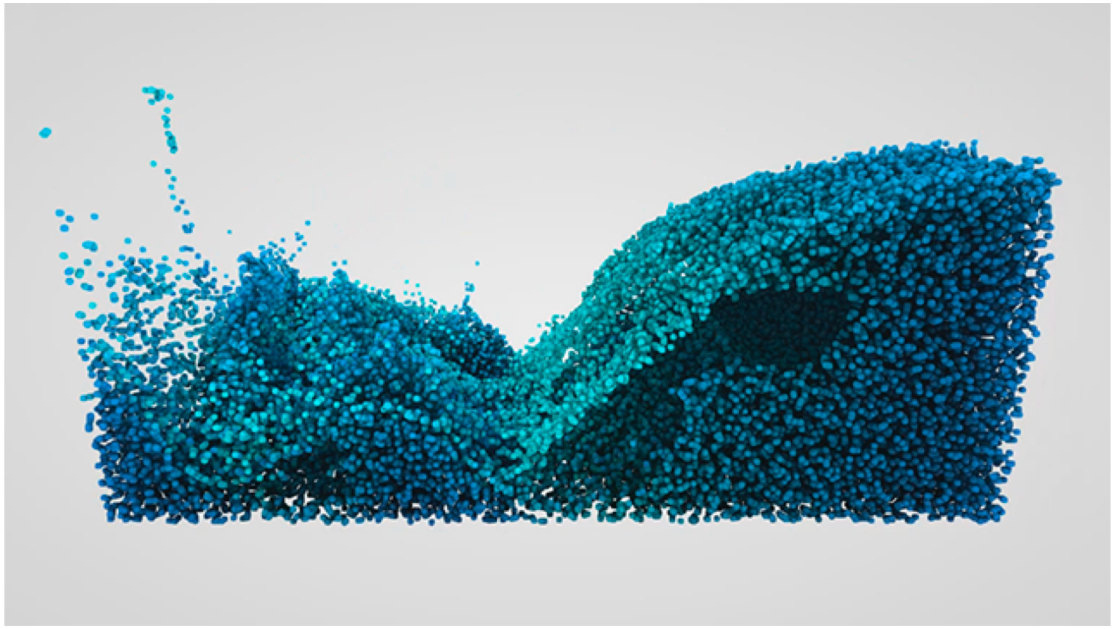
- Research and summarize various approaches that have been suggested to solve transparency in real-time rendering systems

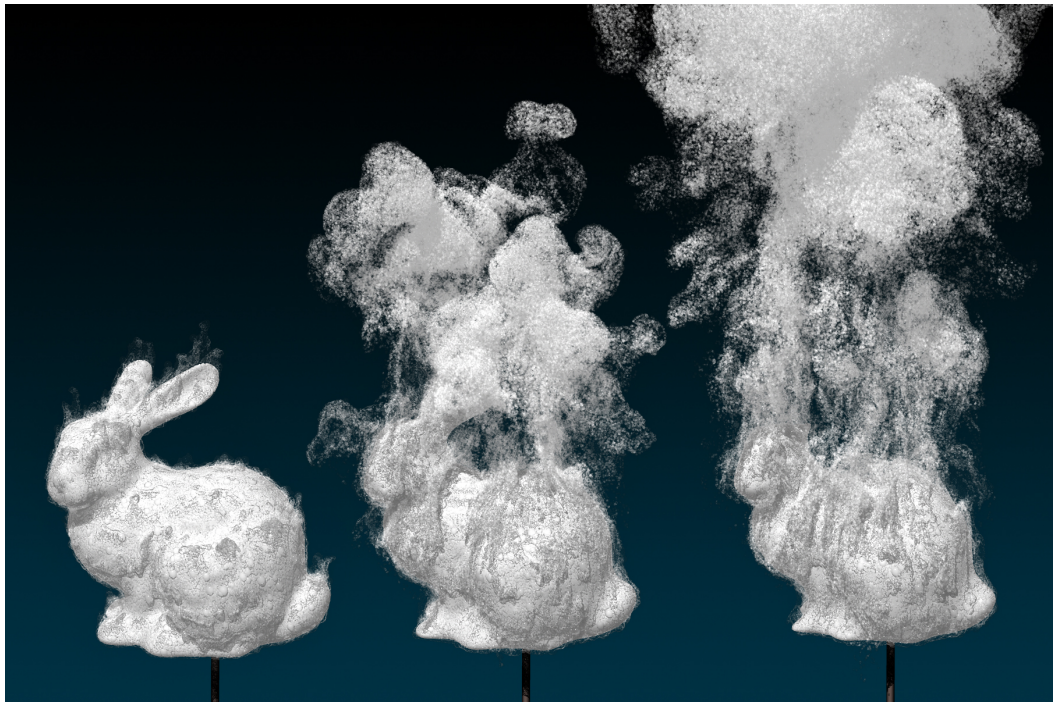




Real-Time Methods for Fluids Simulation

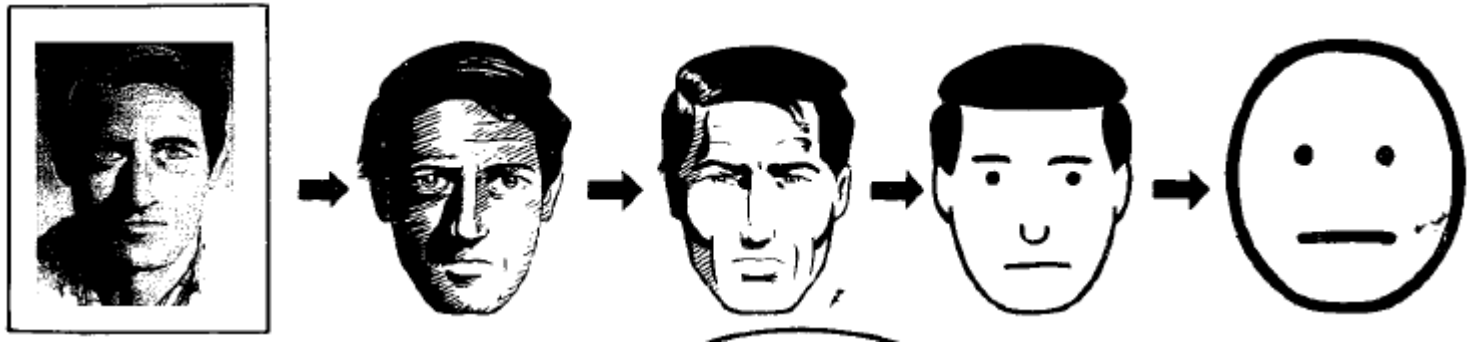
- Research what methods can be used to achieve realistic look and behavior of fluids like water or smoke.
- Find out which of these methods are used in publicly available physics libraries like nvidia FleX



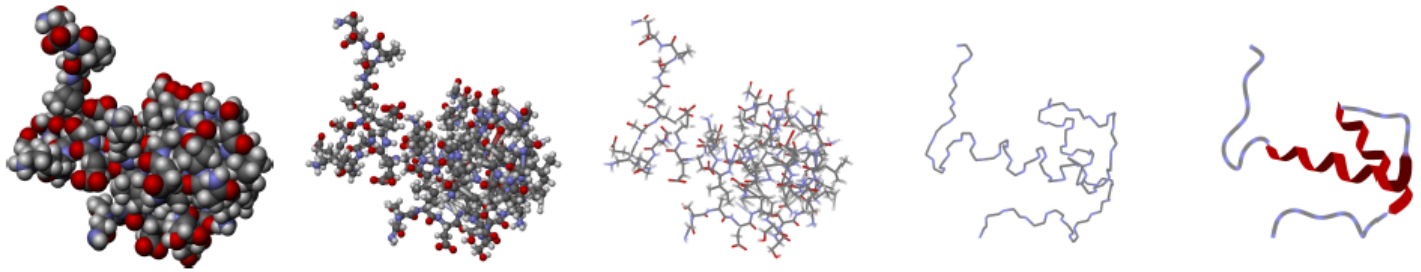


Abstraction in Visualization

- What does abstraction mean in the context of visualization
- For exploration and analysis of data

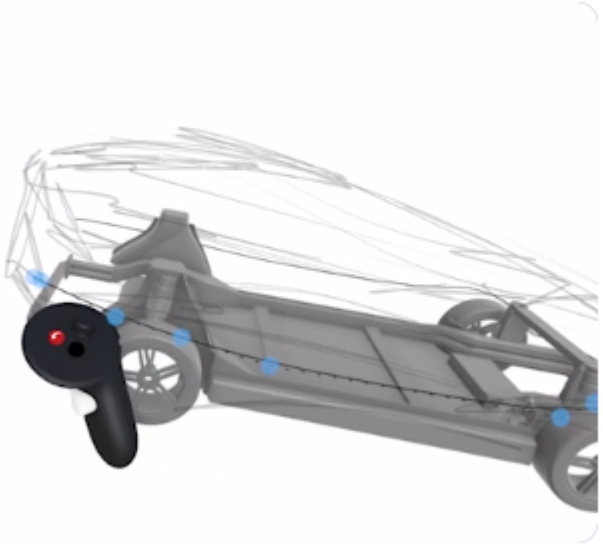


Understanding Comics by Scott McCloud



Structural Molecular Abstraction
[v. d. Zwan et al. 2011]

- Modeling 3D environments in Virtual Reality

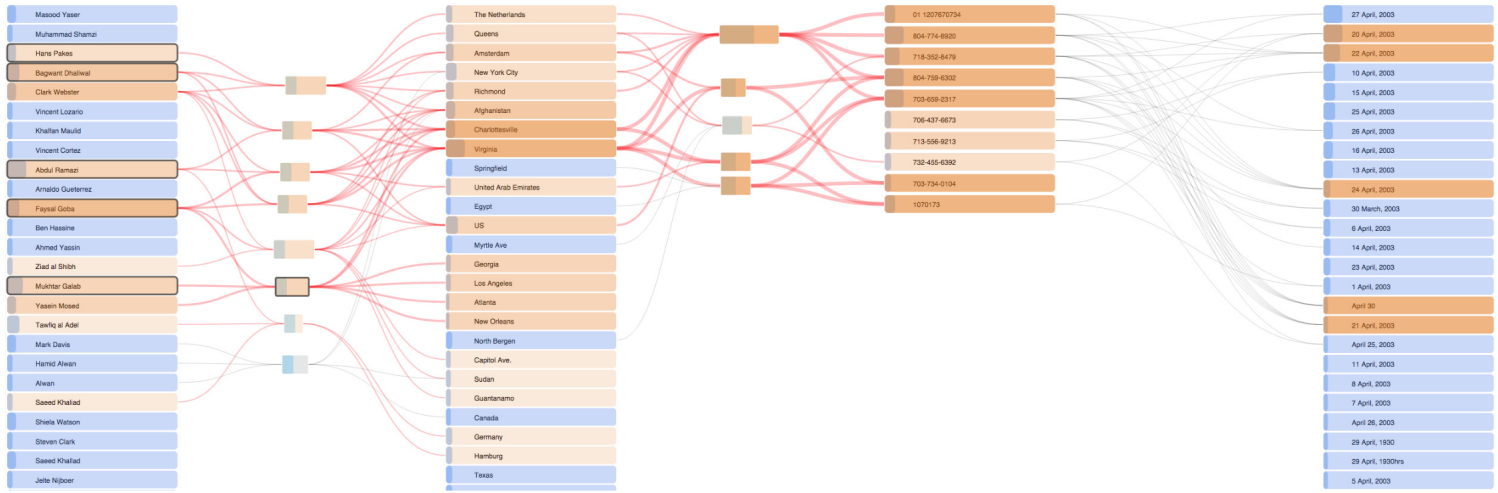


Gravity sketch

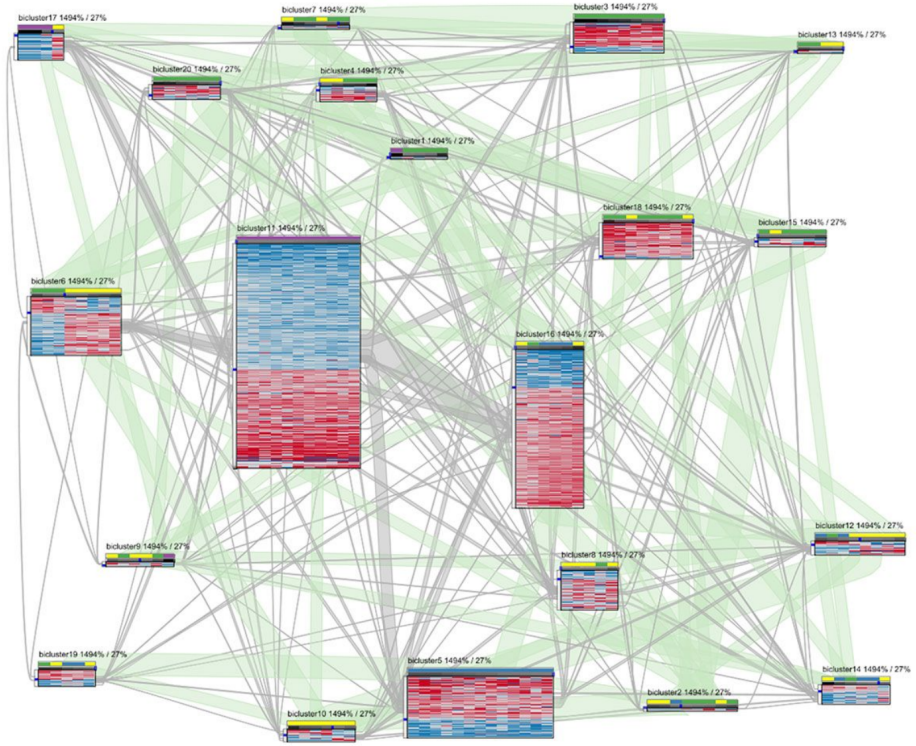
Google Blocks

Visualization of Bipartite / k-Partite Graphs

- Graph with vertices divided into two independent sets, such as
  - Social networks: people and interest groups
  - Biology: genes and conditions
  - Movies: actors, movies, directors



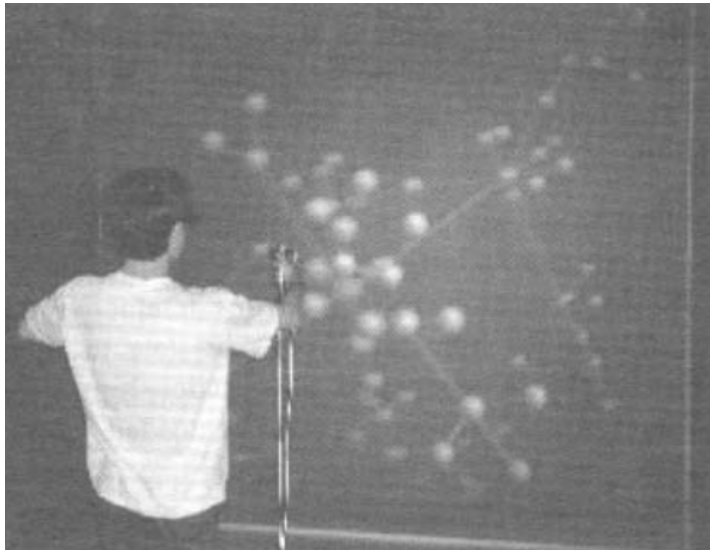
[Sun et al., BiSet, TVCG 2016]



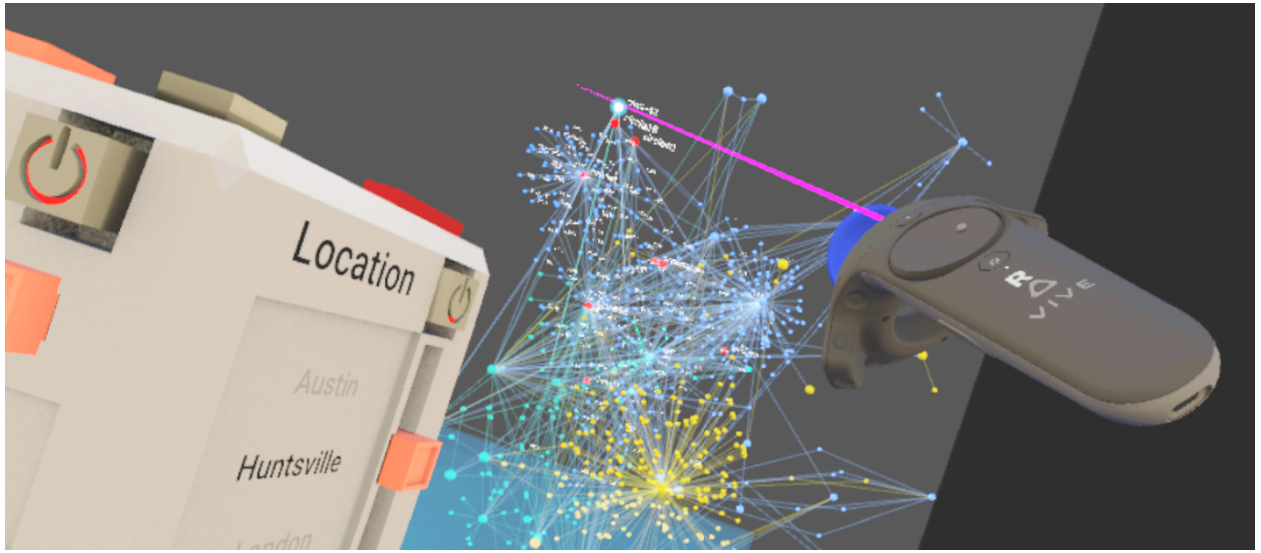
[Streit et al., Furby,
BMC Bioinformatics 2014]

Visualization of Networks in Virtual Reality

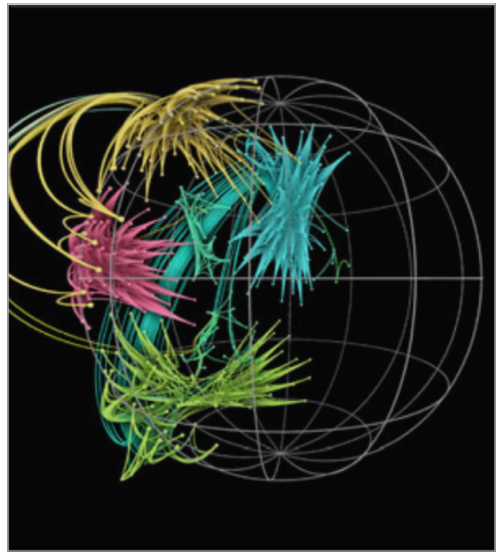
- Immersive analysis of 3D graphs in virtual reality from the 90ies to now:
  - Rendering & layout
  - Interaction & navigation



[Osawa et al., 2000]



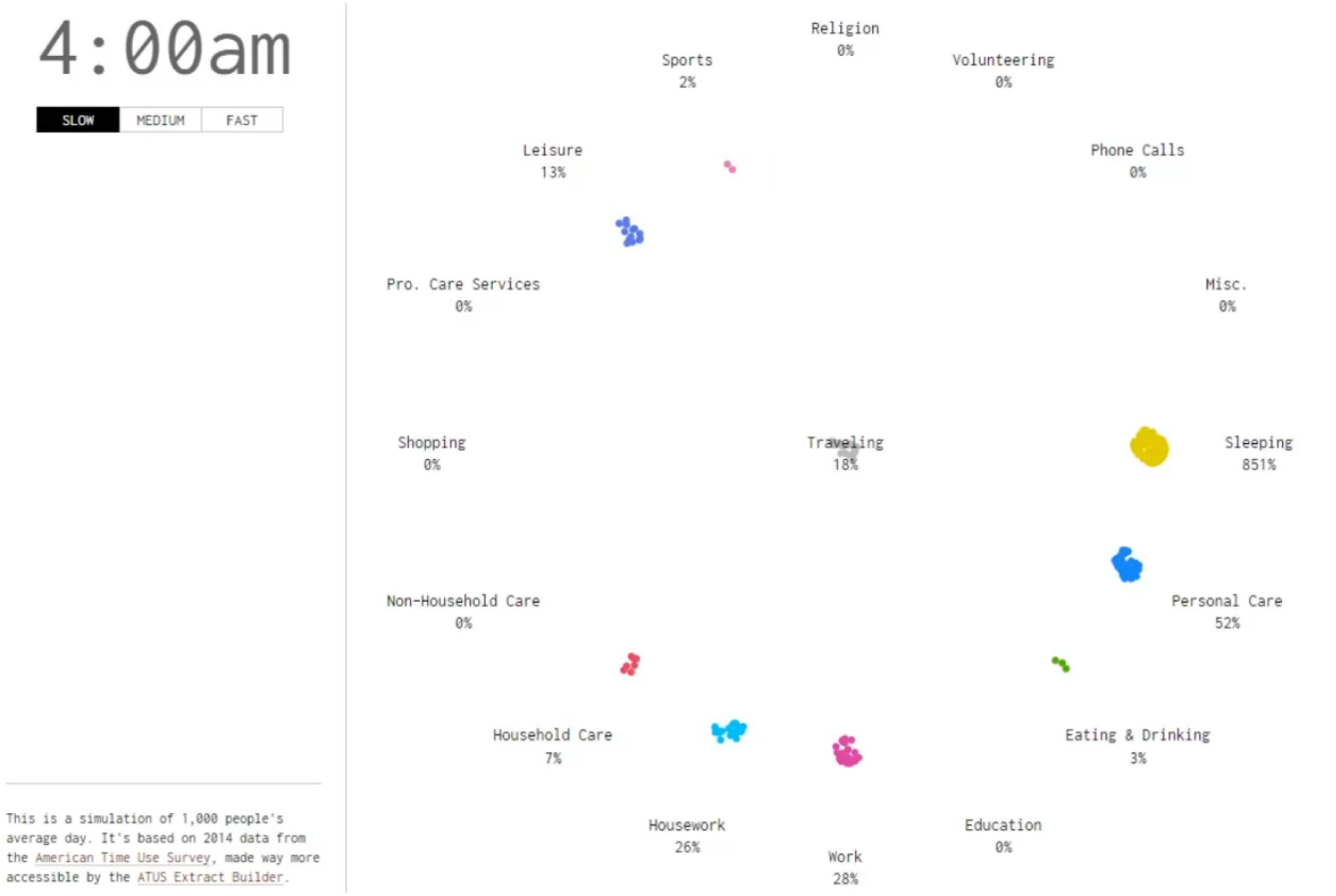
[Drogemuller et al., 2017]



[Kwon et al., 2016]

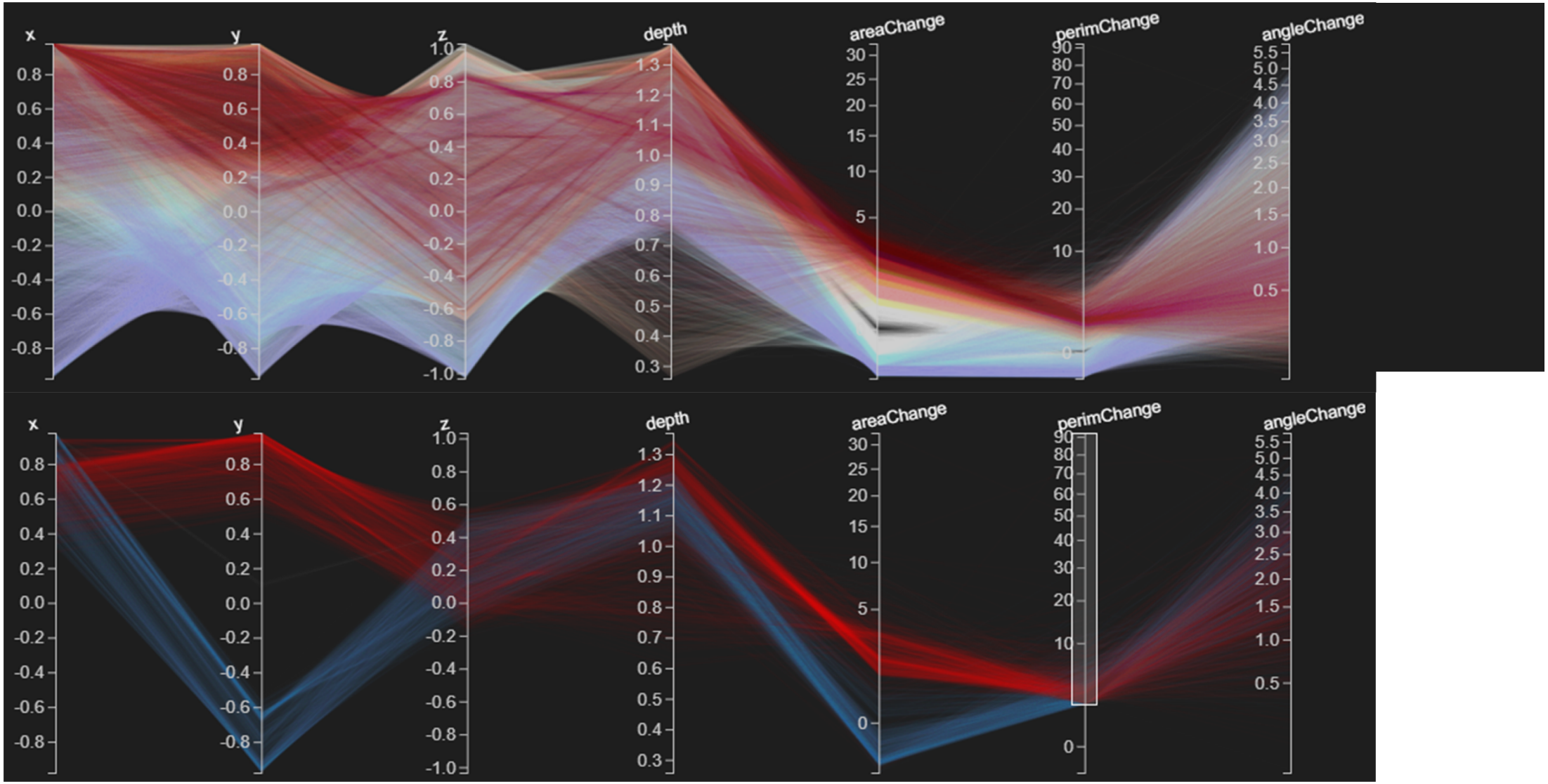
Animated Visual Storytelling

provided 1,440 transition matrices, which let me model a day as a time-varying Markov chain. The simulations below come from this model, and it's kind of mesmerizing.

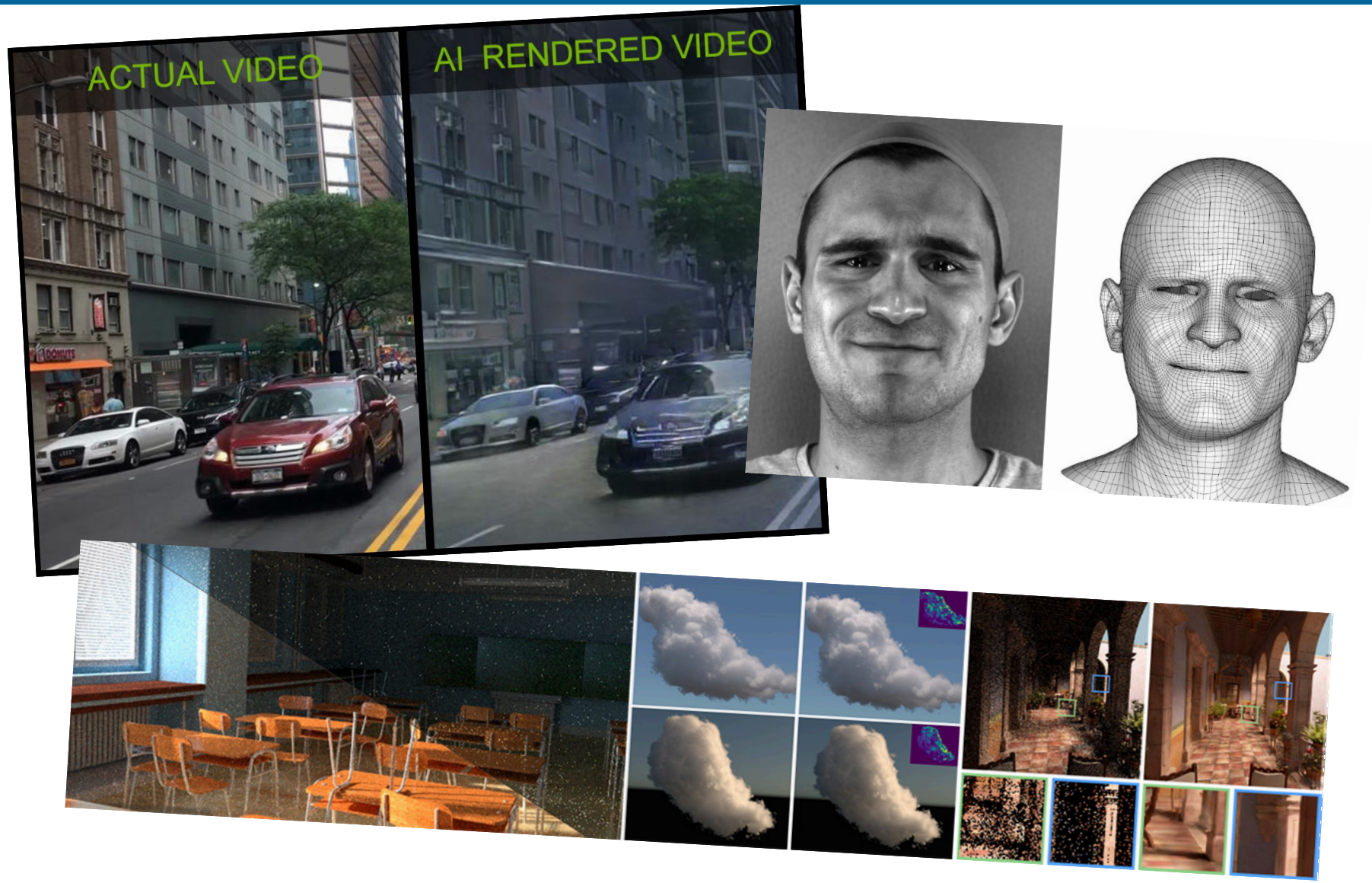


Each dot represents a person, color represents the activity, and time of day is shown in the top left. As someone changes an activity, say from sleep to a

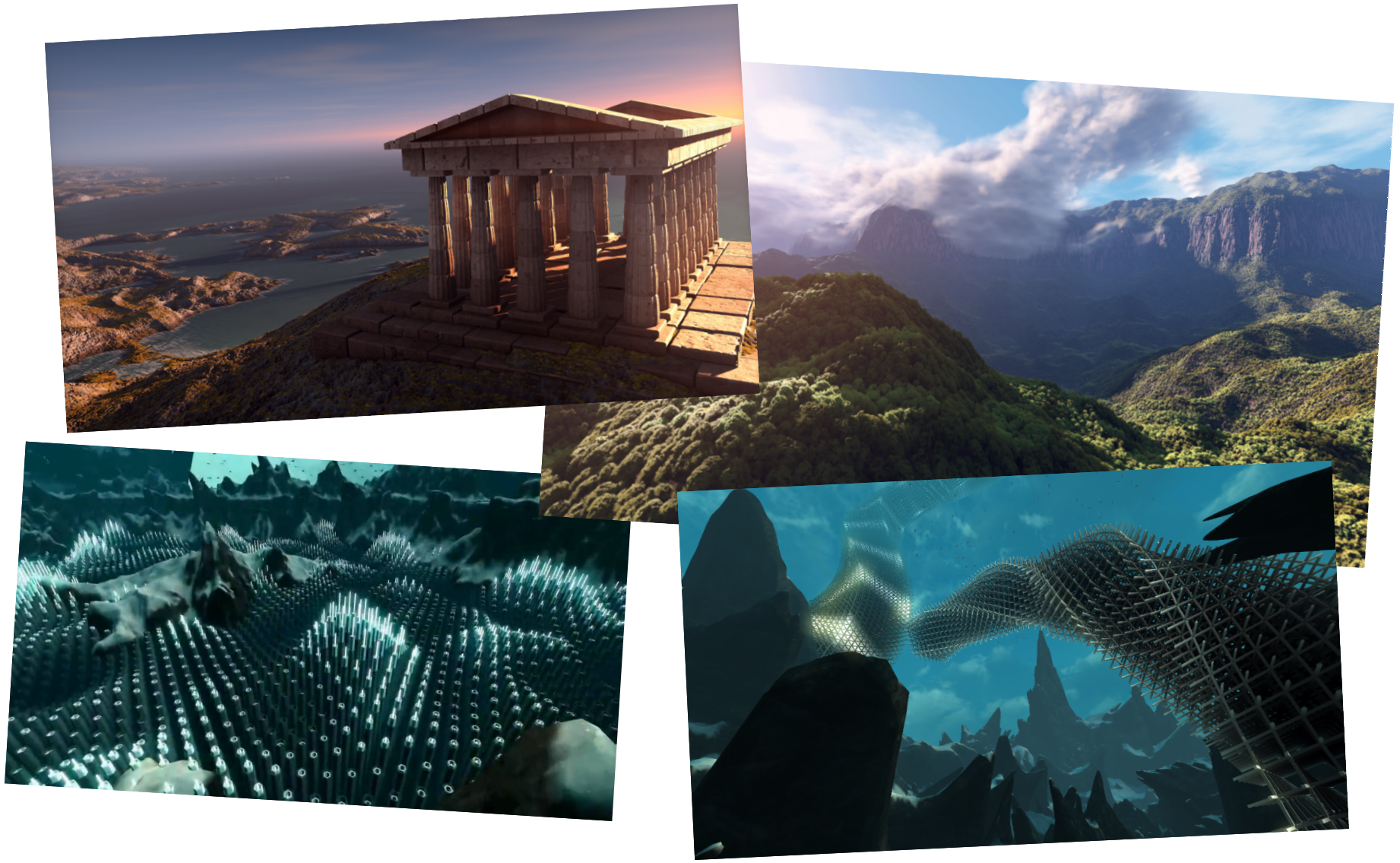
Parallel Coordinates



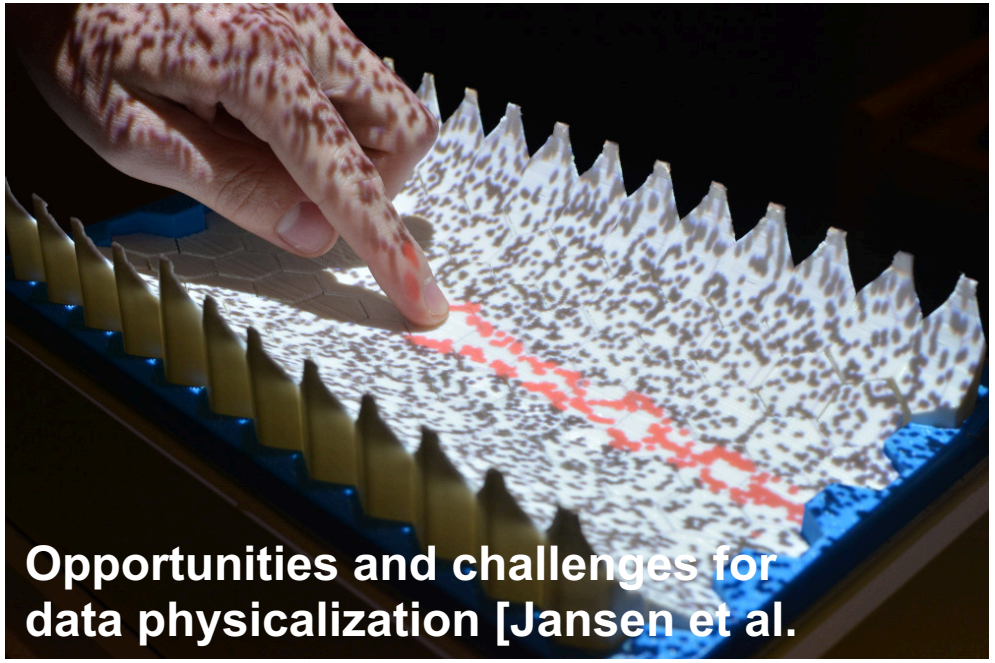
Machine Learning in Computer Graphics



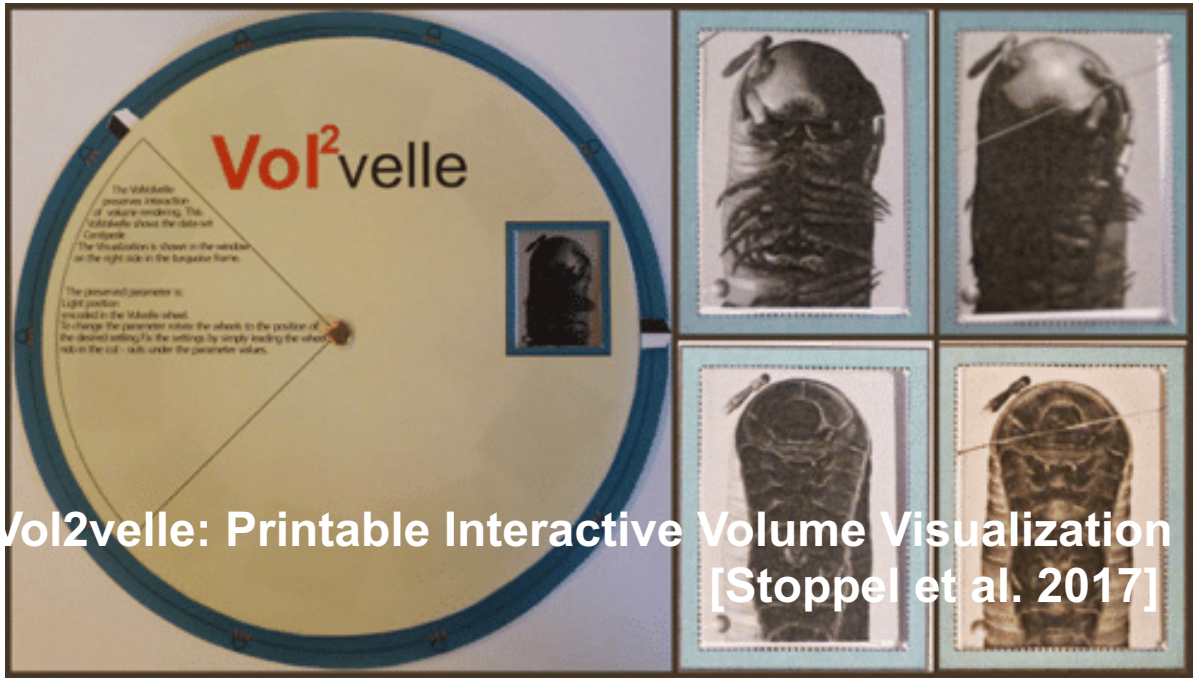
Special Effects in Computer Graphics



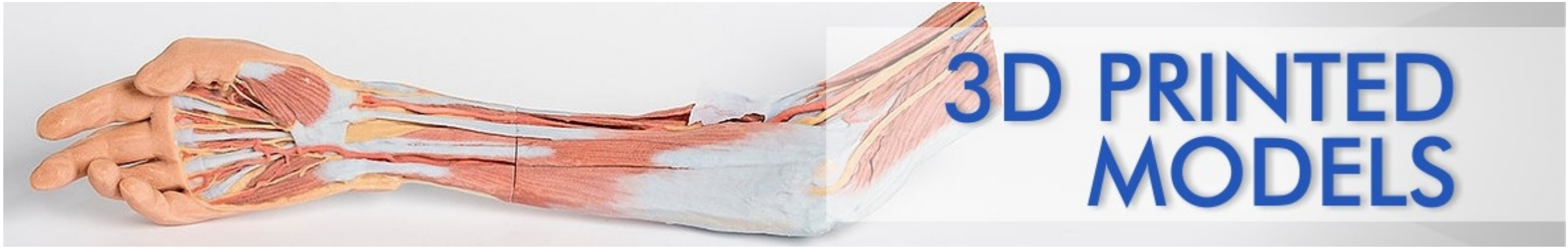
Using Physicalization for Medical Visualization



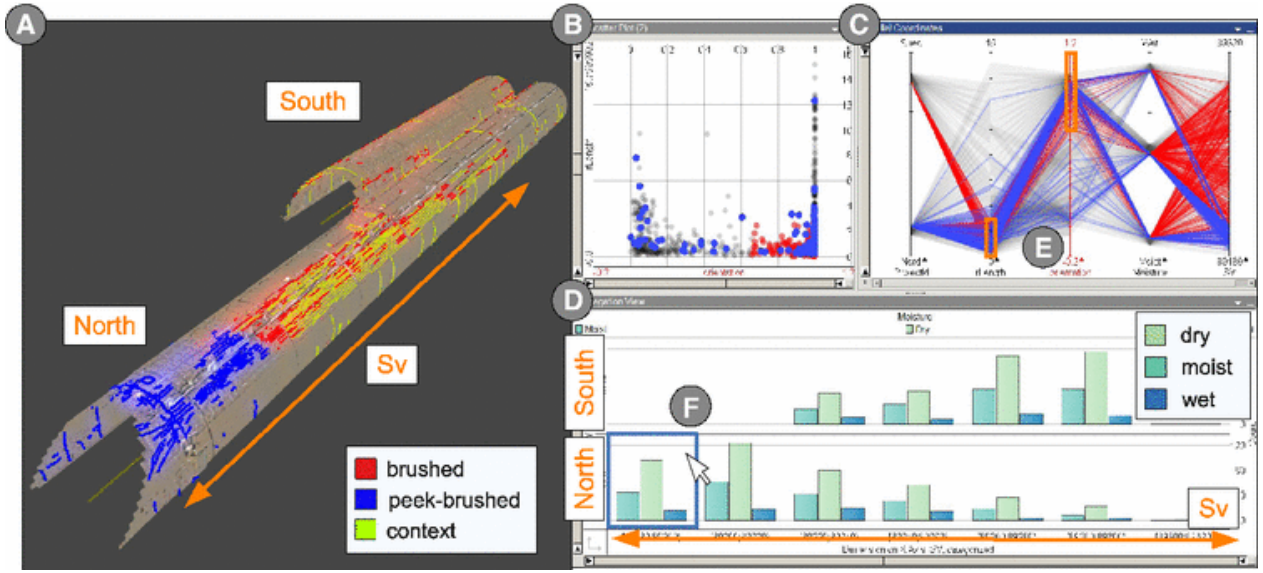
Opportunities and challenges for data physicalization [Jansen et al.



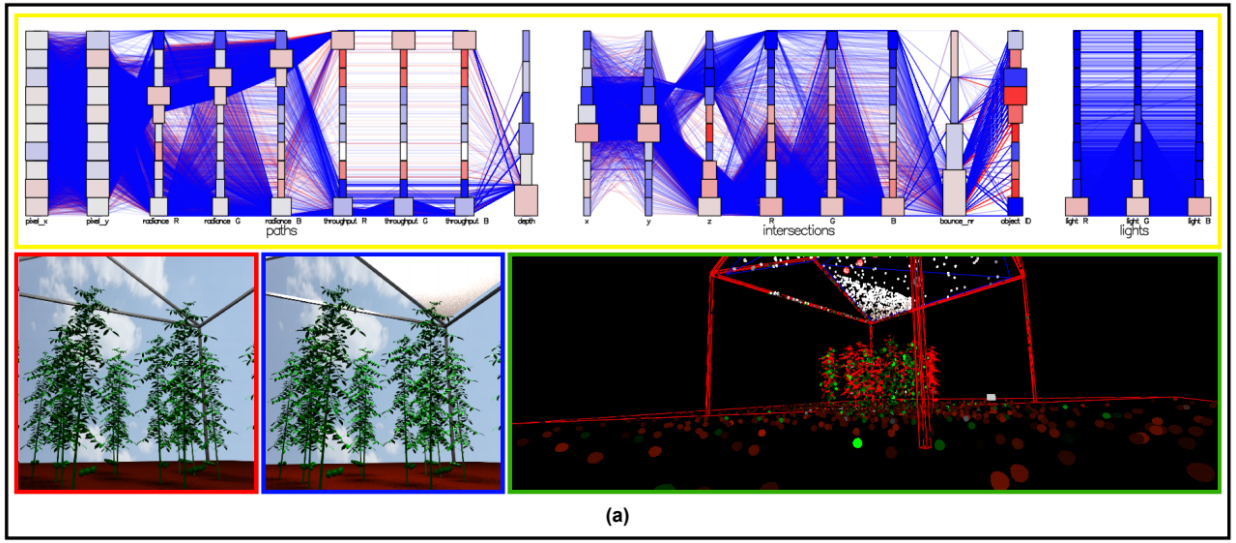
Vol2velle: Printable Interactive Volume Visualization [Stoppel et al. 2017]



Visual Analytics for Rendering



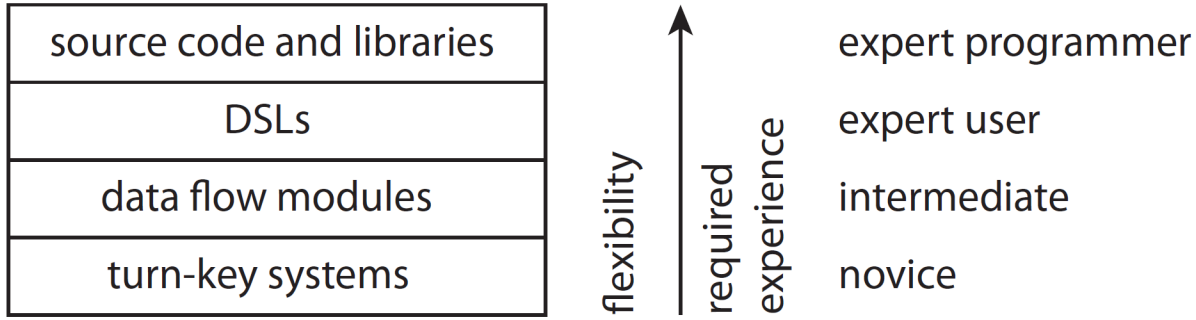
Visual analytics and rendering for tunnel crack analysis [Ortner et al. 2016]

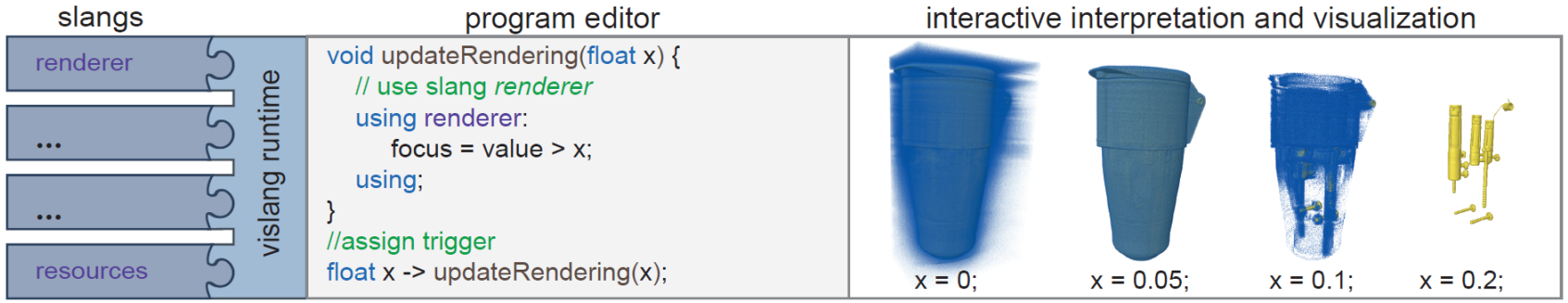


Applying Visual Analytics to Physically-Based Rendering [Simons et al. 2019]

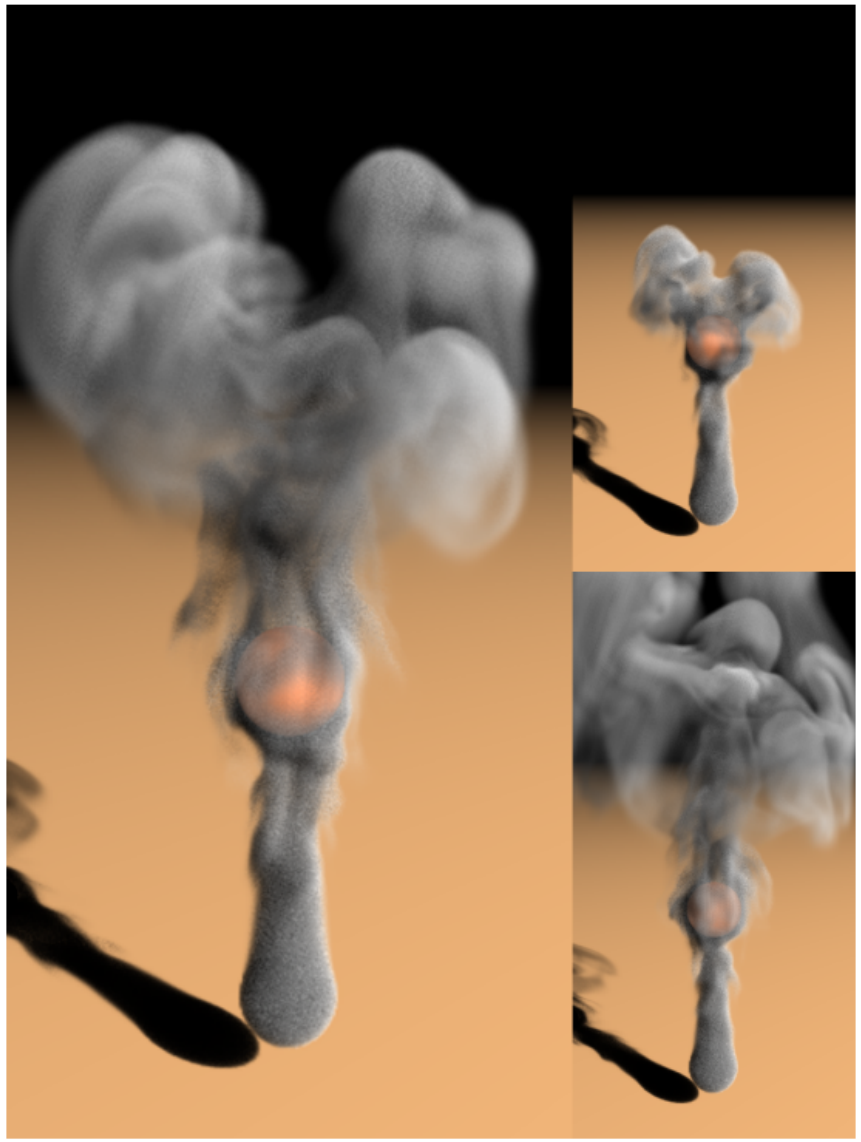
DSLs in Visualization

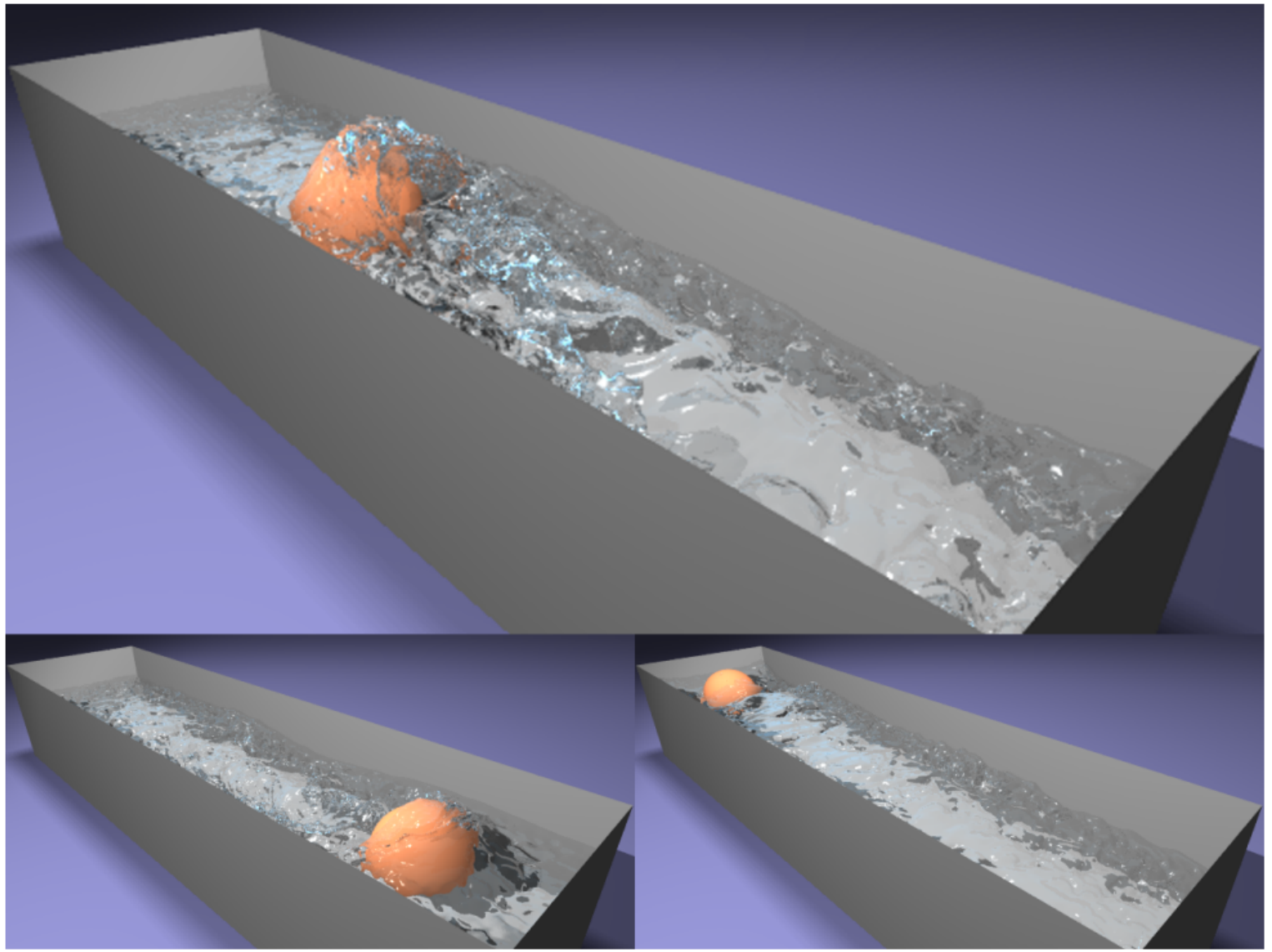
- DSL = Domain-specific language
- How to incorporate domain knowledge in a language





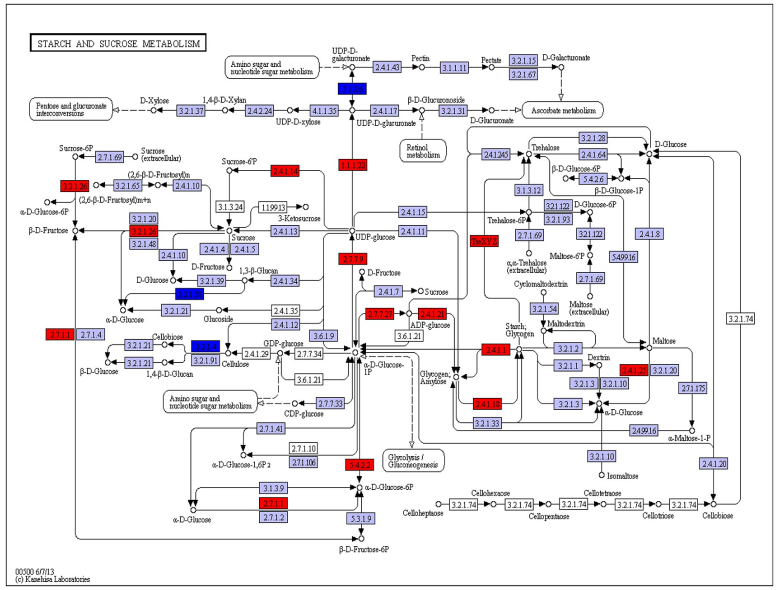
Procedural Animation

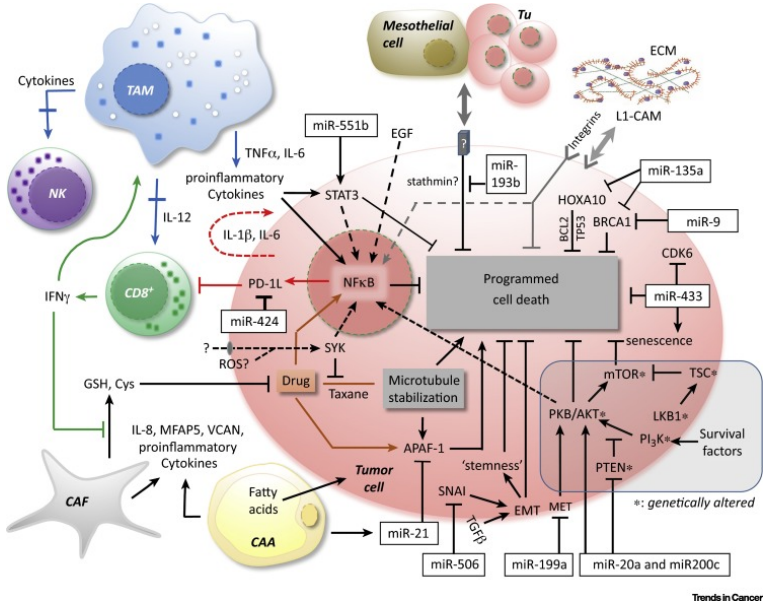


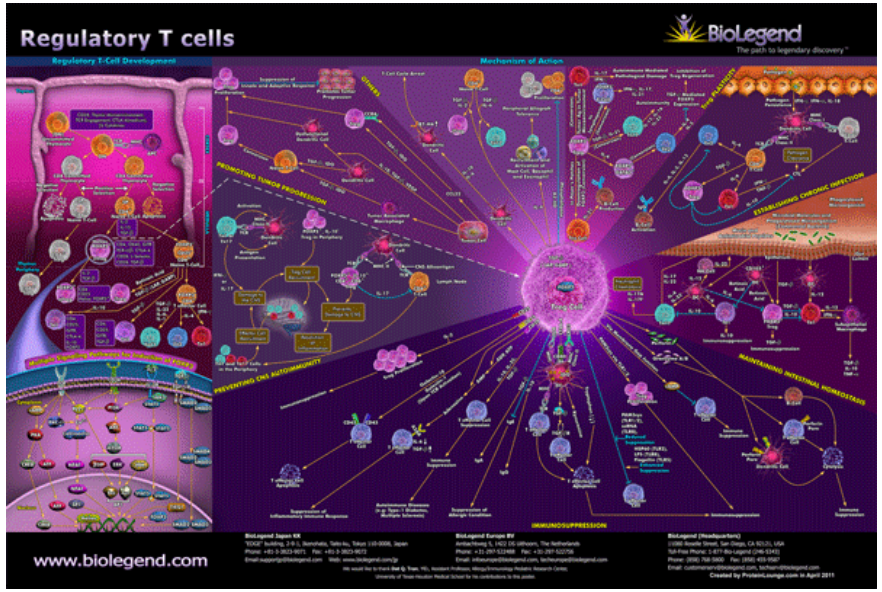


Network Visualization for Biological Pathways

- **Challenge:**
  - Layout simplification and arrangement
  - Scalability, complexity, and usability



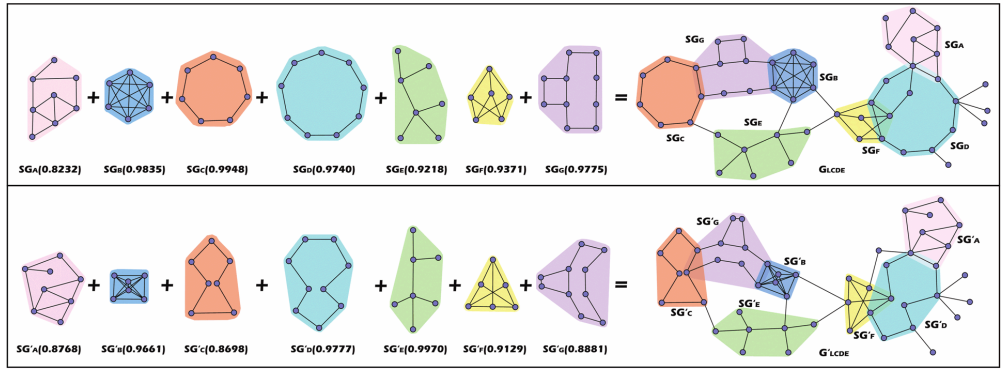


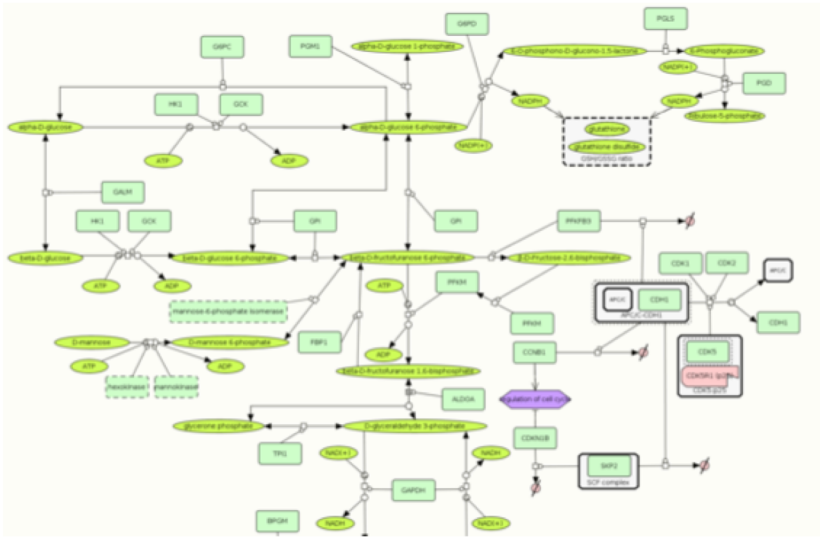


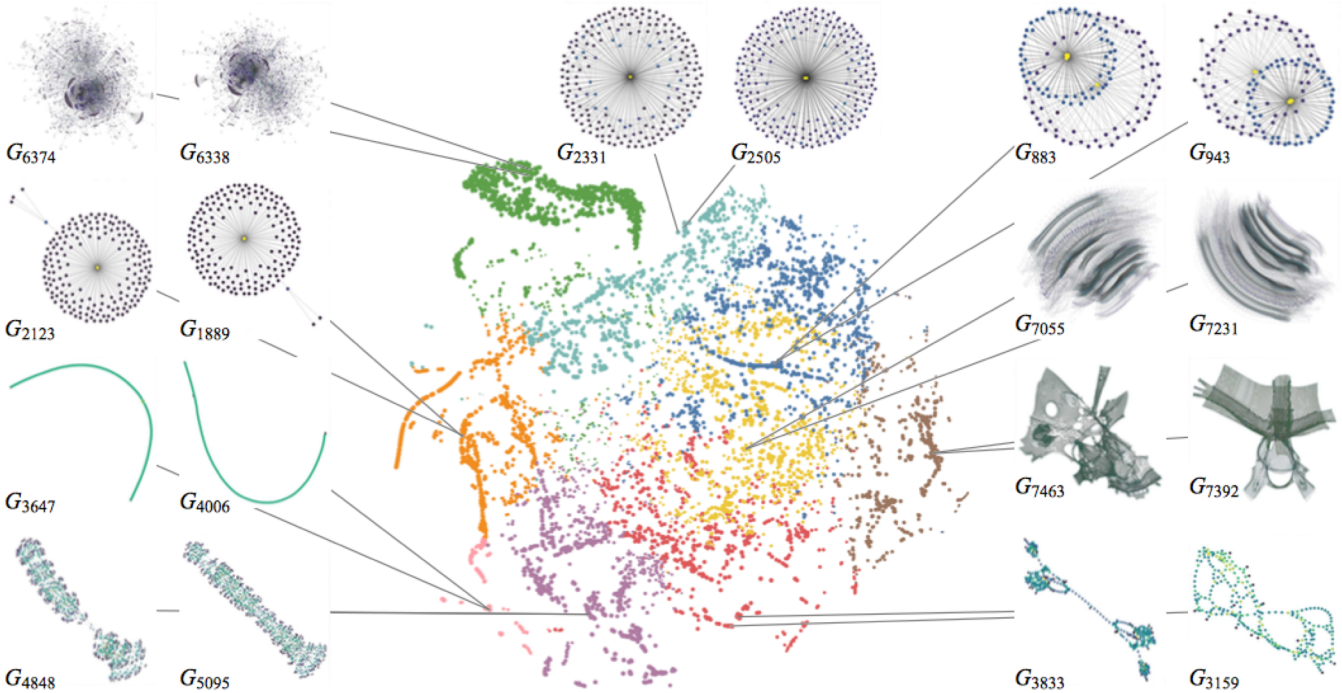
Machine Learning in Graph Visualization

Challenge:

Formulation for machine learning technique







Topics 2020

1) Visualization and uncanny valley
2) Aesthetic visualization
3) Visualization Techniques for AR/VR Applications in Material Science
4) Guidance Methods for Transfer Function Specification
5) Real-time Transparency
6) Real-Time Methods for Fluids Simulation
7) Abstraction in Visualization
8) 3D Modeling in Virtual Reality
9) Visualization of Bipartite / k-Partite Graphs
10) Visualization of Networks in Virtual Reality
11) Animated Visual Storytelling
12) Parallel Coordinates
13) Machine Learning in Computer Graphics
14) Special Effects in Computer Graphics
15) Using Physicalization for Medical Visualization
16) Visual Analytics for Rendering
17) DSLs in Visualization
18) Procedural Animation
19) Network Visualization for Biological Pathways
20) Machine Learning in Graph Visualization

Important!!

Register your topic on TU WEL

Registration start:

12th March 2020, 10:00

Registration due to:

26th March 2020, 23:59

Thank you.

Projects:
https://www.cg.tuwien.ac.at/courses/projekte/

wu@cg.tuwien.ac.at