186.828 Seminar Wissenschaftliches Arbeiten
186.046 Seminar aus Visualisierung

WS 2019

Organizer: Hsiang-Yun Wu

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Institute of Visual Computing&Human-Centered Technology

TU Wien, Austria

Important

- Always check up-to-date information on institute webpage
  https://www.cg.tuwien.ac.at/courses/WissArbeiten/

- Always check up-to-date information on TUWEL page
  https://tuwel.tuwien.ac.at/course/view.php?id=19327

- If you want to participate in other seminars (e.g. Seminar aus Visualisierung),
  please contact: wu@cg.tuwien.ac.at

Seminar

- Get an idea how scientific work is carried out (in Visualization / 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
  - Practice to give a talk
  - Active discussion participation

Seminar - Procedure

1. **Select a topic**

Topic

- Topics are available at http://cg.tuwien.ac.at/courses/WissArbeiten/index.html
- TUWEL: https://tuwel.tuwien.ac.at/course/view.php?id=19327

Important!!

Register on TU WEL

Enrolment: 1th October -10th October 2019

Announcement: 11th October

Topic selection start:

21th October 2019, 08:00

Topic selection due to:

25th October 2019, 23:59

First come first serve

Seminar - Procedure

1. Select a topic
2. **Submit a literature list**

Submit a Literature List

- Meeting with Supervisor
- List of papers related to the topic

- Literature List Deadline: **01.11.2019**

Seminar - Procedure

1. Select a topic
2. Submit a literature list
3. **Attend 3 lectures**

Attend 3 Lectures

- **13.11.2019 (Wed), 13:00-15:00 (s.t.)**

  Wie schreibt man eine wissenschaftliche Arbeit

  Professor Wimmer

- **14.11.2019 (Thu), 13:00-15:00 (s.t.)**

  Forschung und wie sie funktioniert

  Professor Gröller

- **27.11.2019 (Wed), 13:00-15:00 (s.t.)**

  Wie halte ich einen Vortrag

  Professor Purgathofer

Seminar - Procedure

1. Select a topic
2. Submit a literature list
3. Attend 3 lectures
4. **Write a report**

Write a Report

- State-of-the-Art Report
- Final Report: 6-8 pages (min. 6 pages)
- In English
- Format as for a scientific paper
  - LaTeX (Template on the wepage)
- Regular Meetings with Supervisor

Deadline 1st Version Report: **6.12.2019**

Deadline Final Version Report: **15.01.2020**

Seminar - Procedure

1. Select a topic
2. Submit a literature list
3. Attend 3 lectures
4. Write a report
5. **Give a presentation**

Give a Presentation

- Use institute's PowerPoint template for presentations (template is on the webpage)
- In English
- 15 + 3 minutes
- Active discussion participation

Presentation Day: **18.12.2019**

In case of too many students, an additional presentation day will be announced and/or the length of the presentation will be adjusted. This will be communicated in advance.

Seminar - Procedure

1. Select a topic
2. Submit a literature list
3. Attend 3 lectures
4. Write a report
5. Give a presentation

Grading

- Two parts
  - 1st (central) part: 17% of the grade
  - 2nd part: 83% of the grade
    - It is necessary to attend the 3 lectures to get a positive grade!
    - Grading criteria:

      50% written report

      40% presentation

      5% attendance during the presentations

      5% active discussion after the presentations

Report Grading

- Grading criteria:
  - Structure, figures,...
  - Language
  - Content
  - References
- Points will be deducted for:
  - Delayed submission
  - Page number below 6
- Plagiarism check!

Plagiarism

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

http://www.usq.edu.au/library/referencing/what-is-plagiarism

Presentation Grading

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

Important Dates

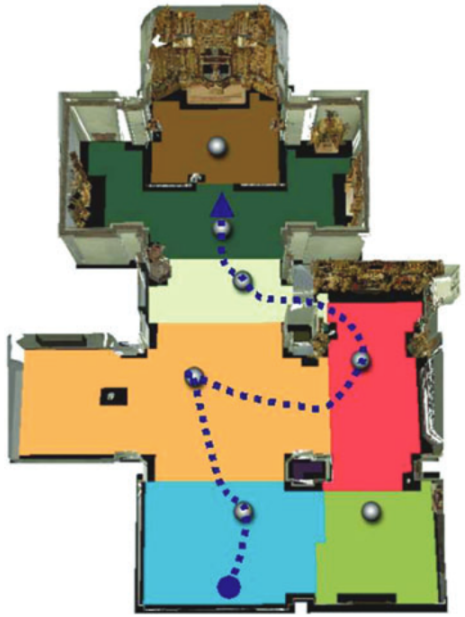
- **21.10.2019:** Select your topic
- **01.11.2019:** Submit your literature list
- Attend 3 lectures (in ICGA seminar room):
  - **13.11.2019 (Wed), 13:00 (s.t.):**
    Wie schreibt man eine wissenschaftliche Arbeit
  - **14.11.2019 (Thu), 13:00 (s.t.):**
    Wie halte ich einen Vortrag
  - **27.11.2019 (Wed), 13:00 (s.t.):**
    Forschung und wie sie funktioniert
- **06.12.2019:** Submit draft report
- **18.12.2019:** Talks
- **15.01.2019**: Submit final report

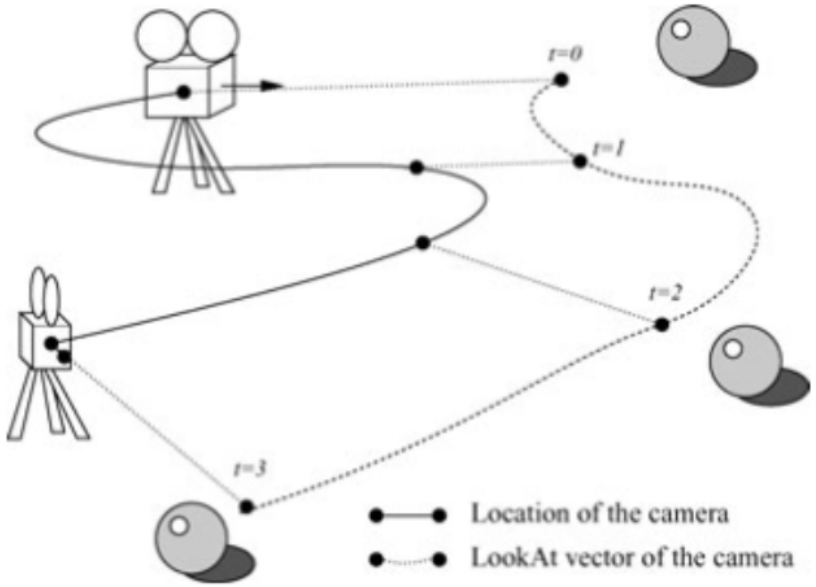
All submissions are done on TUWEL https://tuwel.tuwien.ac.at/course/view.php?id=19327

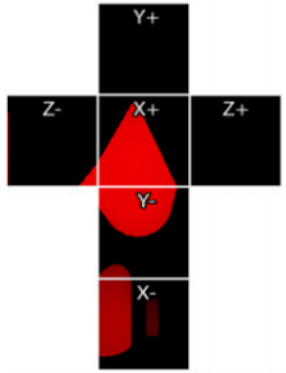
Topics 2019/2020

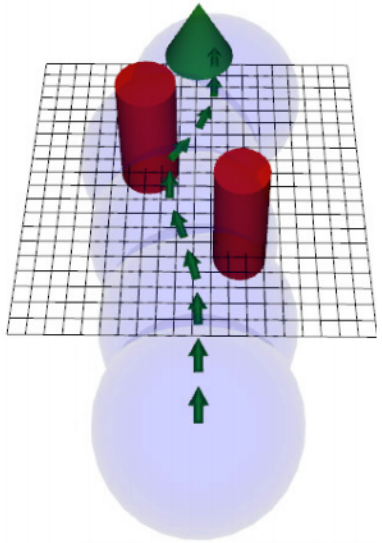
Automated Camera Control

- Research and summarize methods used for (semi-)automated camera control in interactive applications
- Methods which can be applied in scientific visualization and leverage specific data characteristics are to be preferred



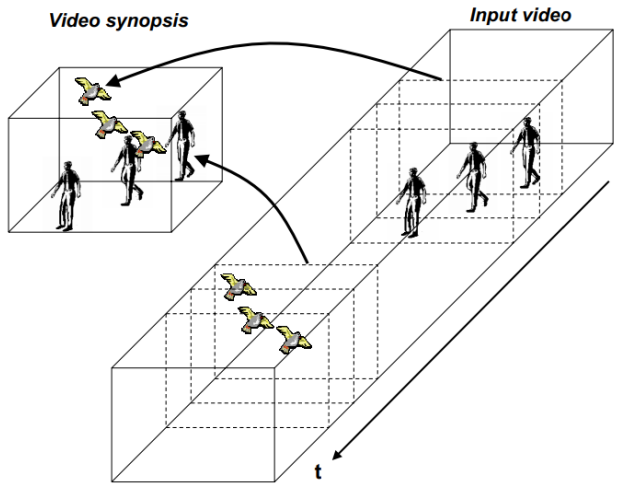


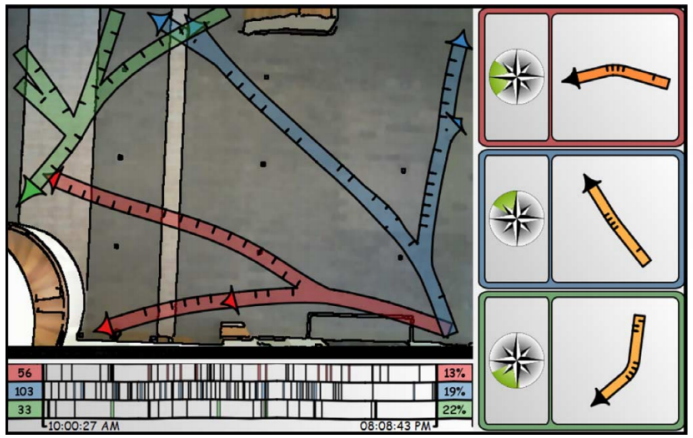


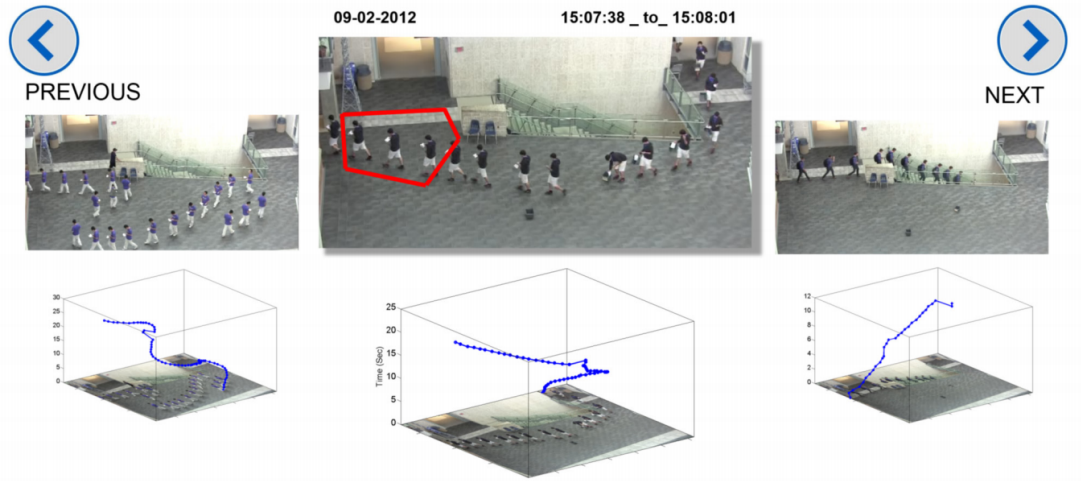


Summarizing and Exploring Extremely Long Videos

- Investigate methods for gaining information from extremely long video footage, e.g., from surveillance cameras
- Focus on methods that either summarize the interesting actions captured or enable less cumbersome exploration (playback) of these media

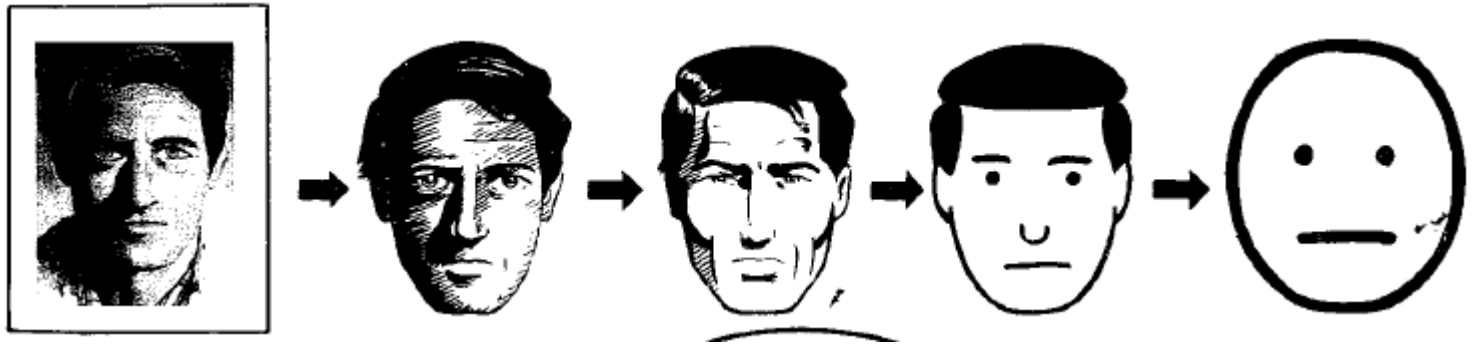




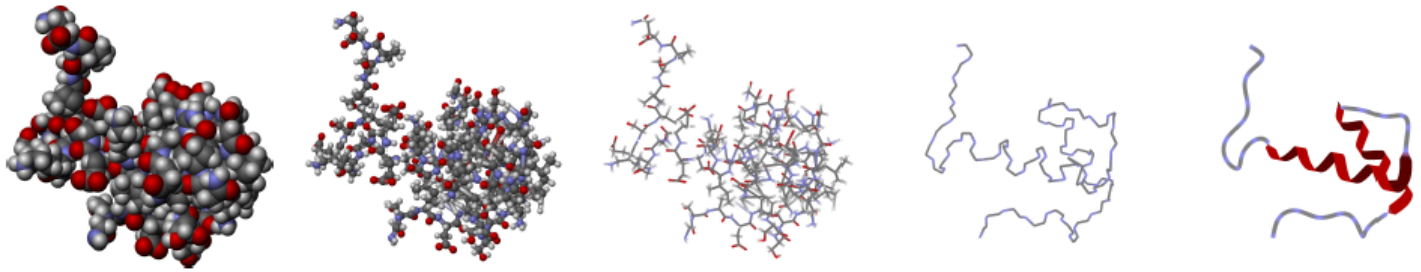


Abstraction in Visualization

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



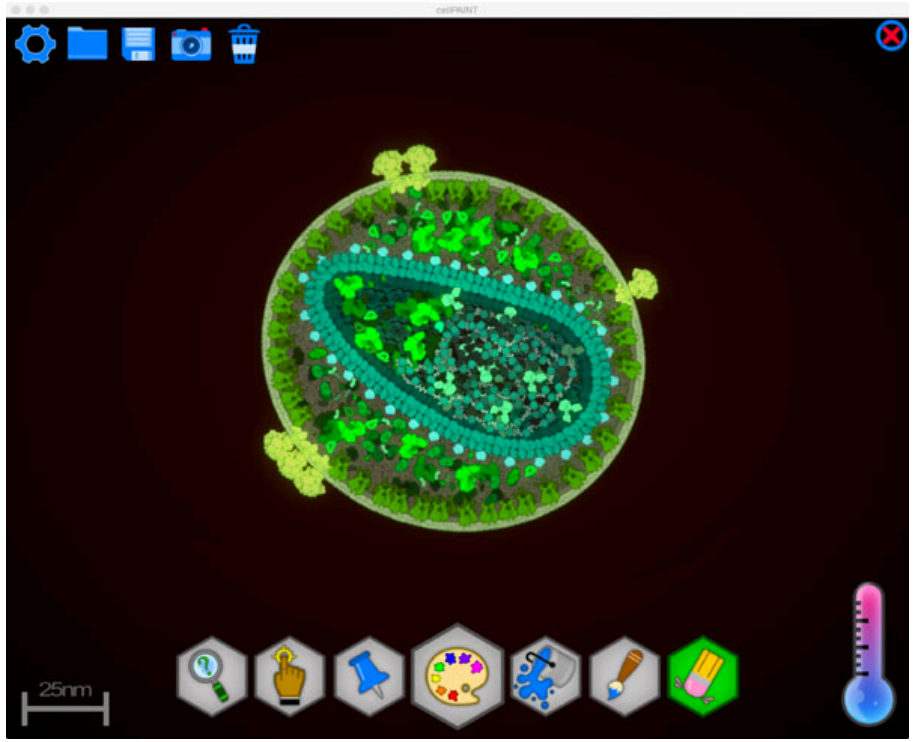
Understanding Comics by Scott McCloud



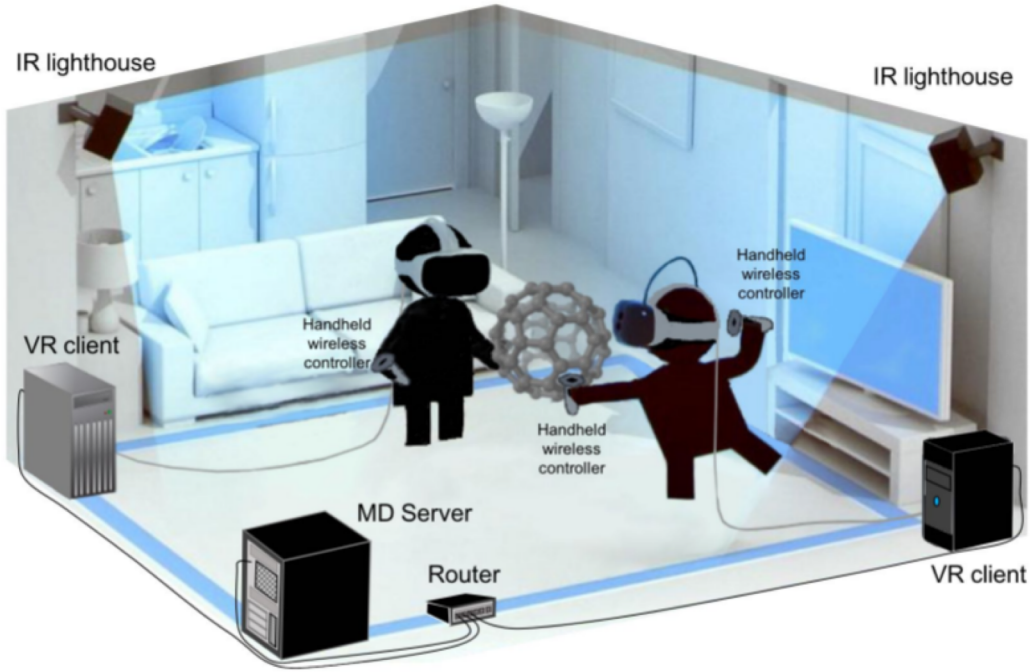
Structural Molecular Abstraction
[v. d. Zwan et al. 2011]

Molecular Environment Visualization for Virtual Reality

- Use virtual reality to explore molecular environments
- Interactions with molecular environments in the virtual reality



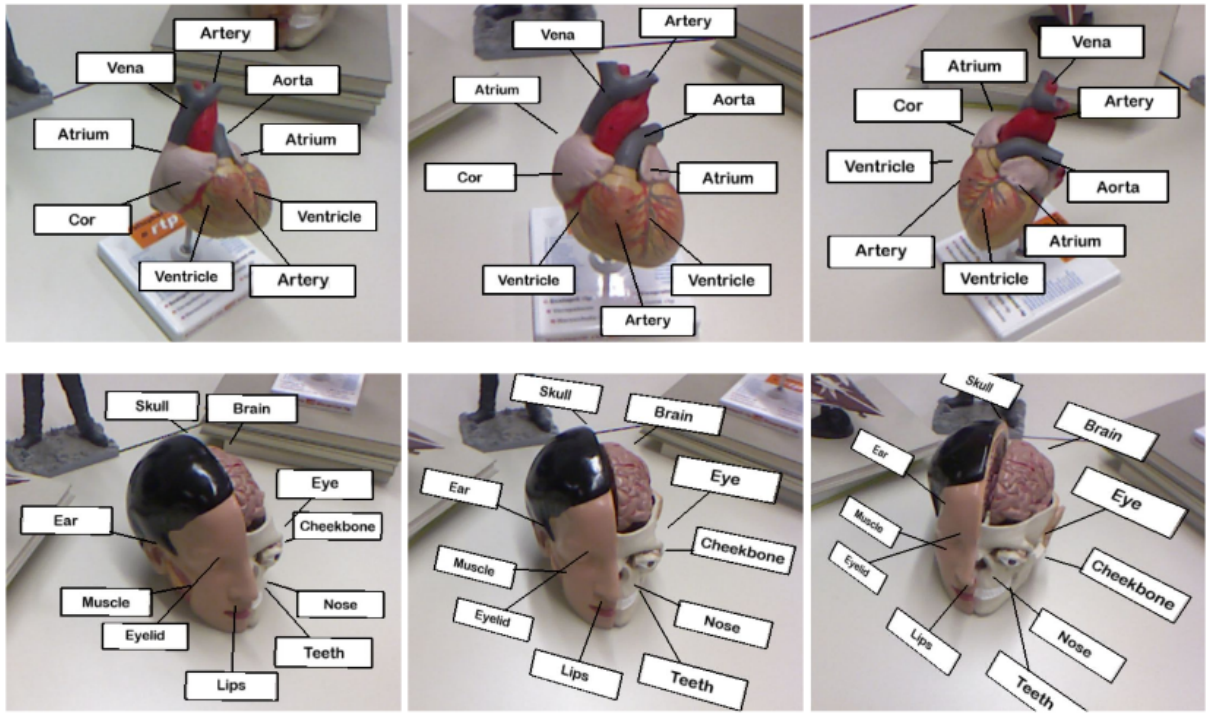
CellPaint by Gardner et al. 2018



NarupaXR

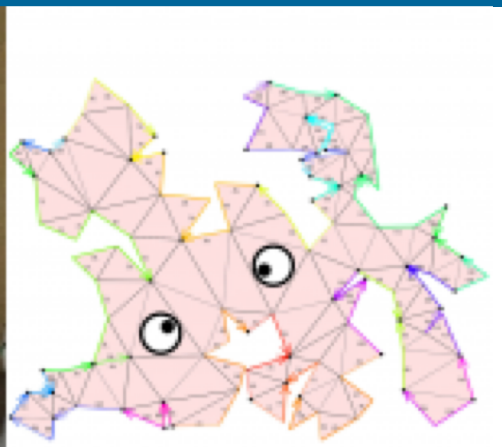
Text and Image Labeling in AR

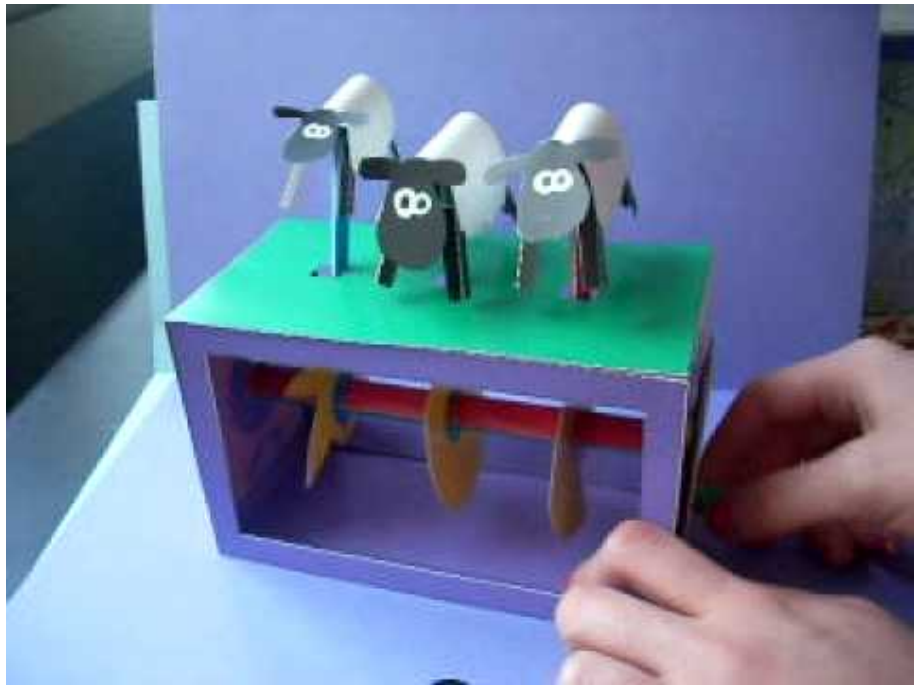
- **Challenge:**
  - Combinatorial complexity
  - Optimization



3D Mesh Unfolding, Origami, and Paper Automata

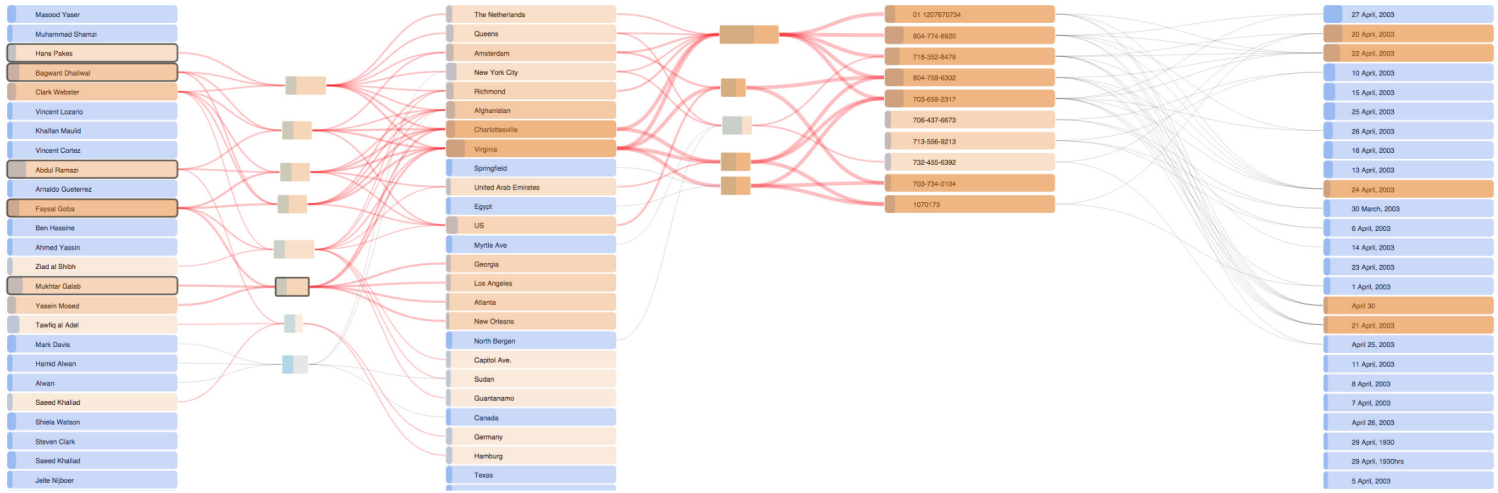
- **Challenge:**
  - Geometry
  - Combinatorial complexity
  - Optimization



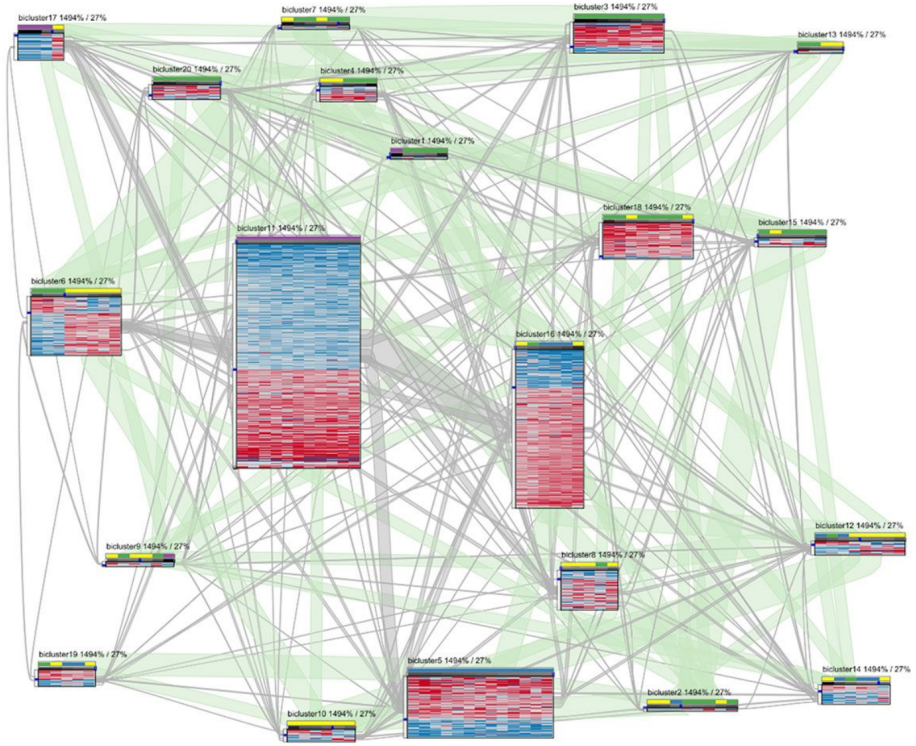


Visualization of Bipartite / k-Partite Graphs

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



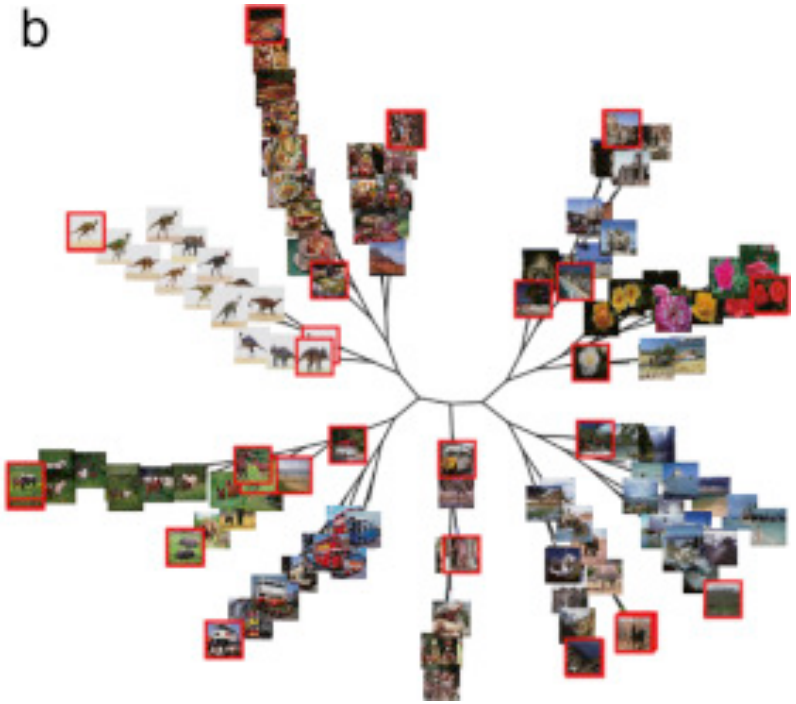
[Sun et al., BiSet, TVCG 2016]



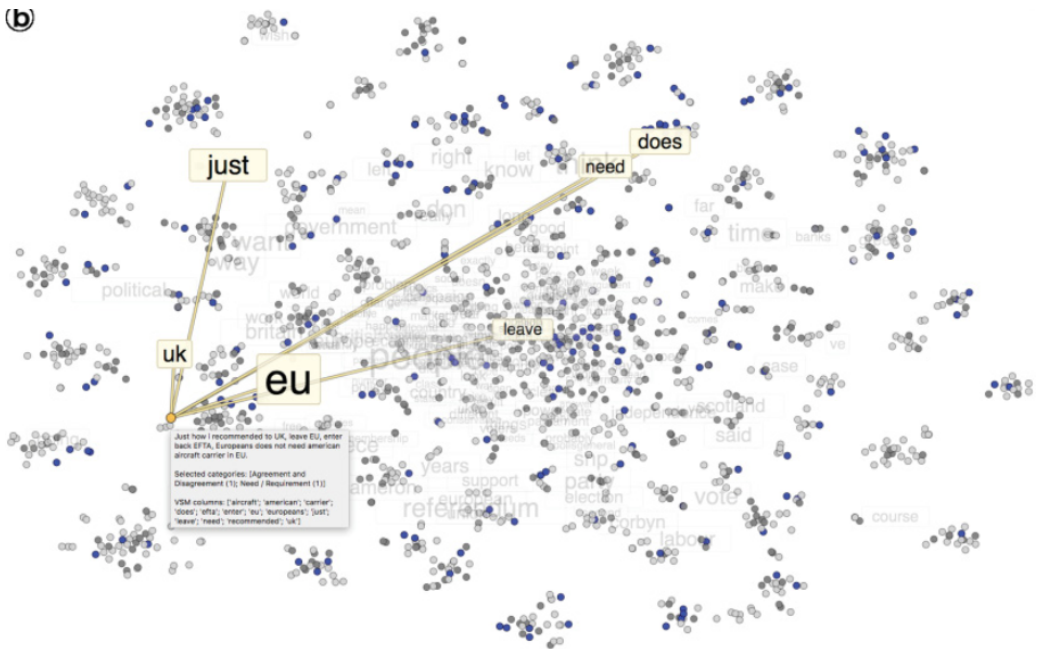
[Streit et al., Furby,
BMC Bioinformatics 2014]

Visually Aided Classification

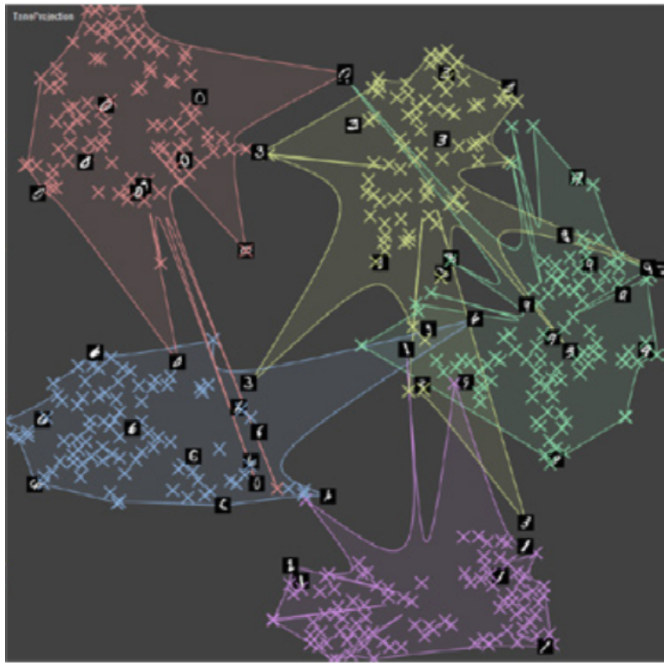
- Visual interfaces supporting classifier refinement
  - Visualization of machine learning models
  - Active learning interfaces



[Paiva et al., TVCG 2015]

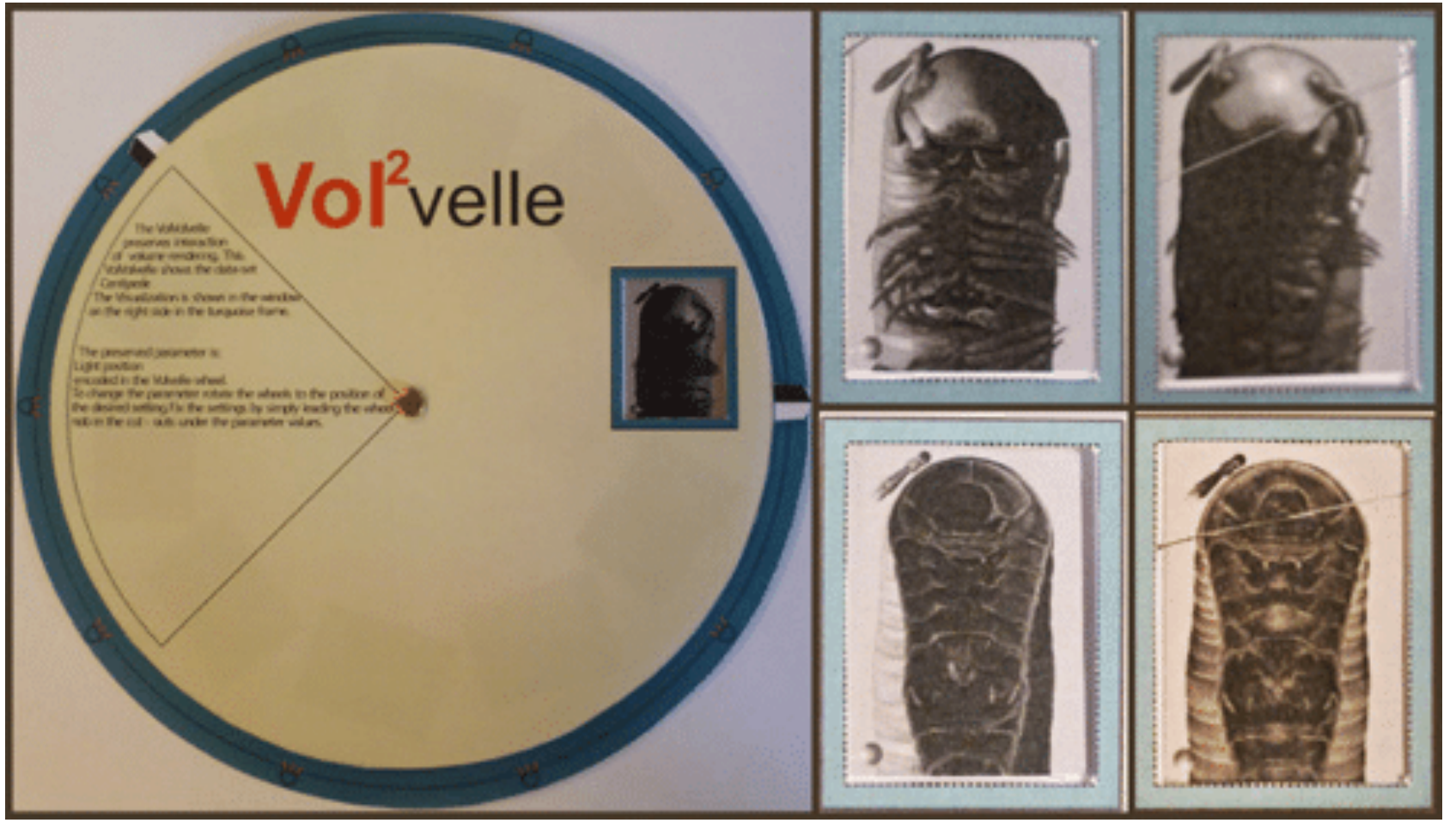


[Kucher et al., ALVA, ACM TIIS 2017]



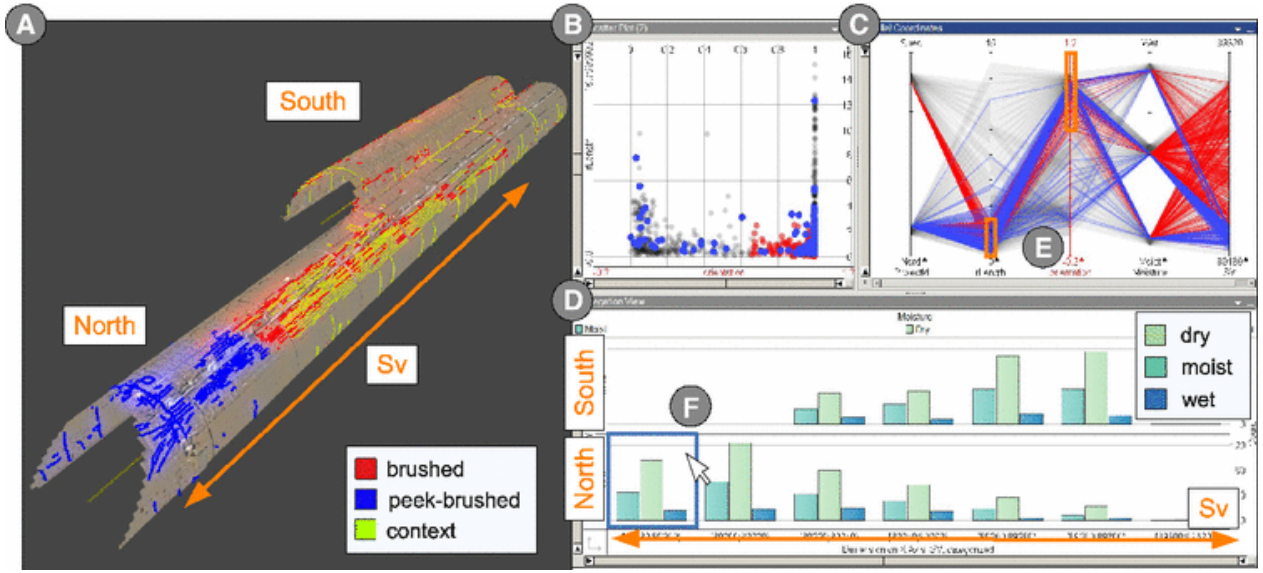
[Bernard et al., TVCG 2017]

Rethinking Medical Visualization

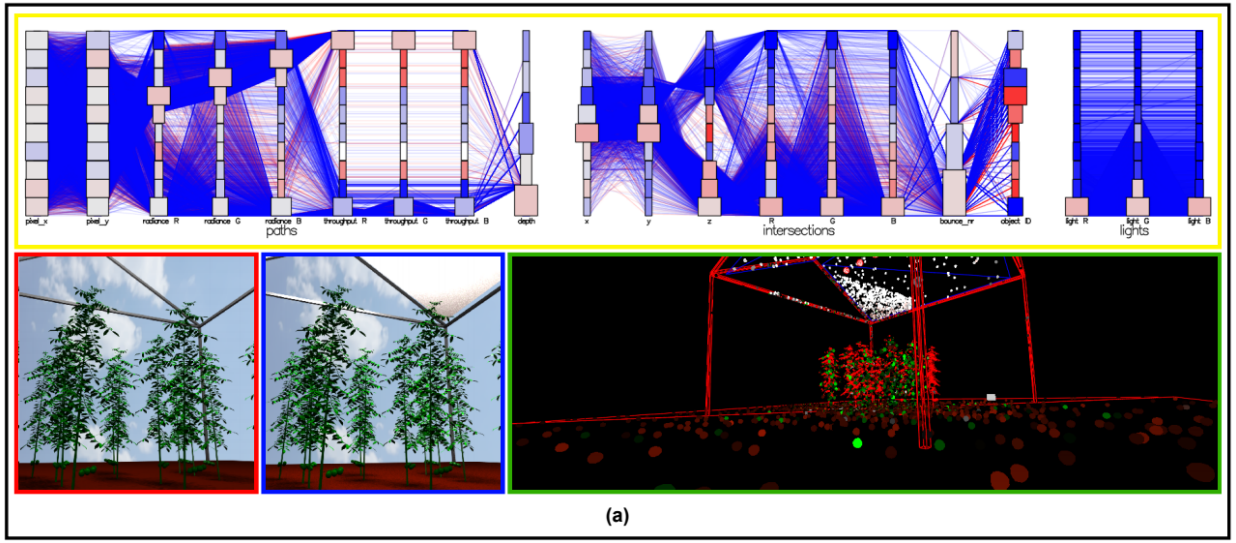


Vol2velle: Printable Interactive Volume Visualization
[Stoppel et al. 2017]

Visual Analytics for Rendering

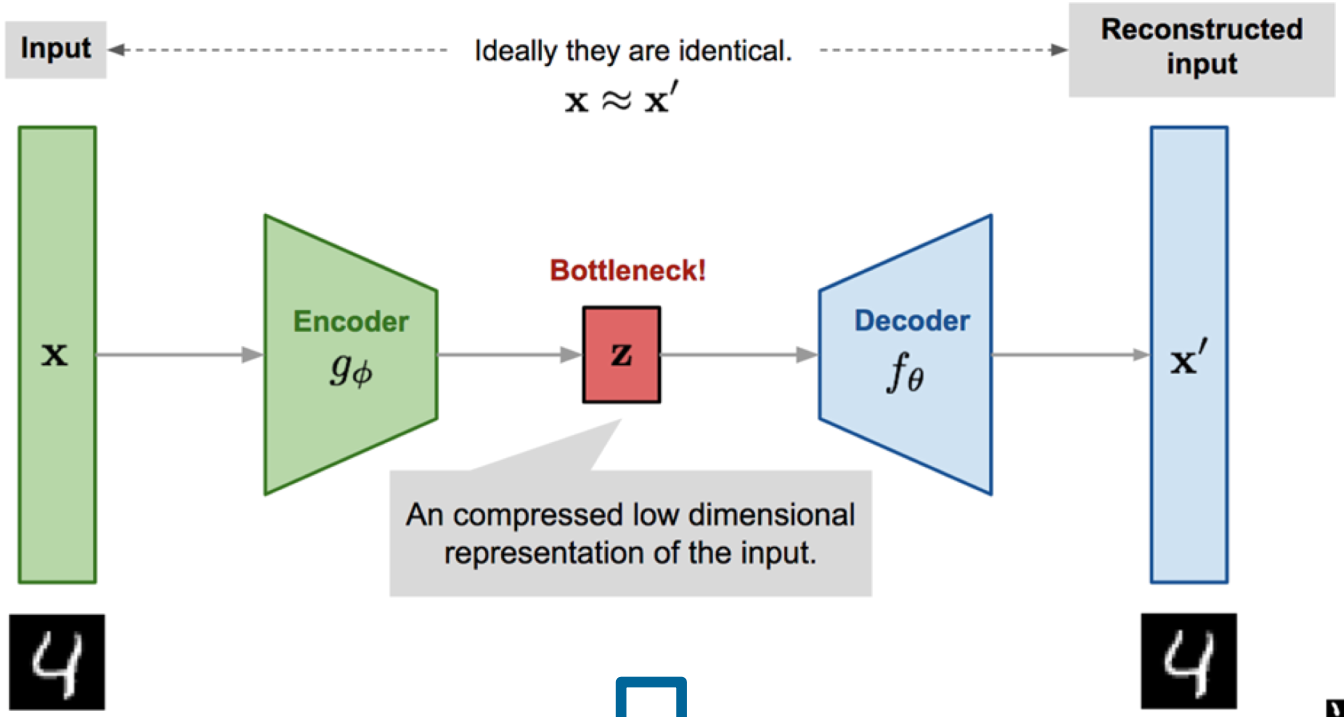


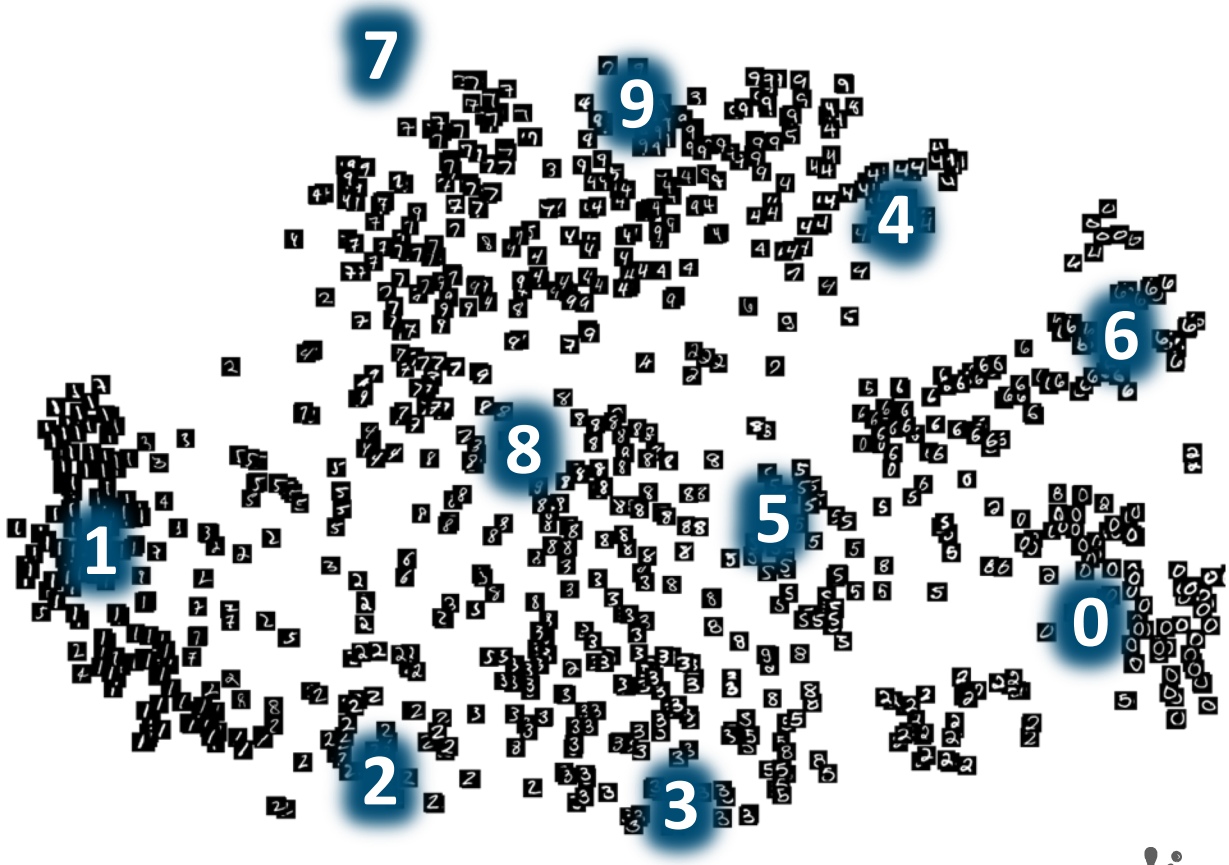
Visual analytics and rendering for tunnel crack analysis [Ortner et al. 2016]



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

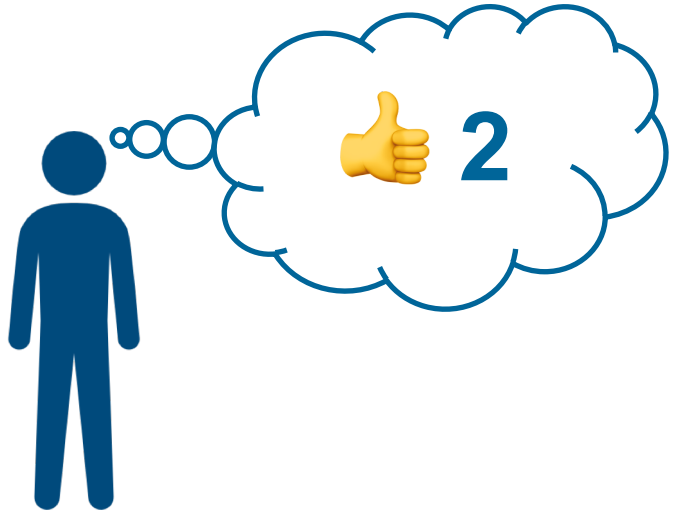
Latent Space Visualization

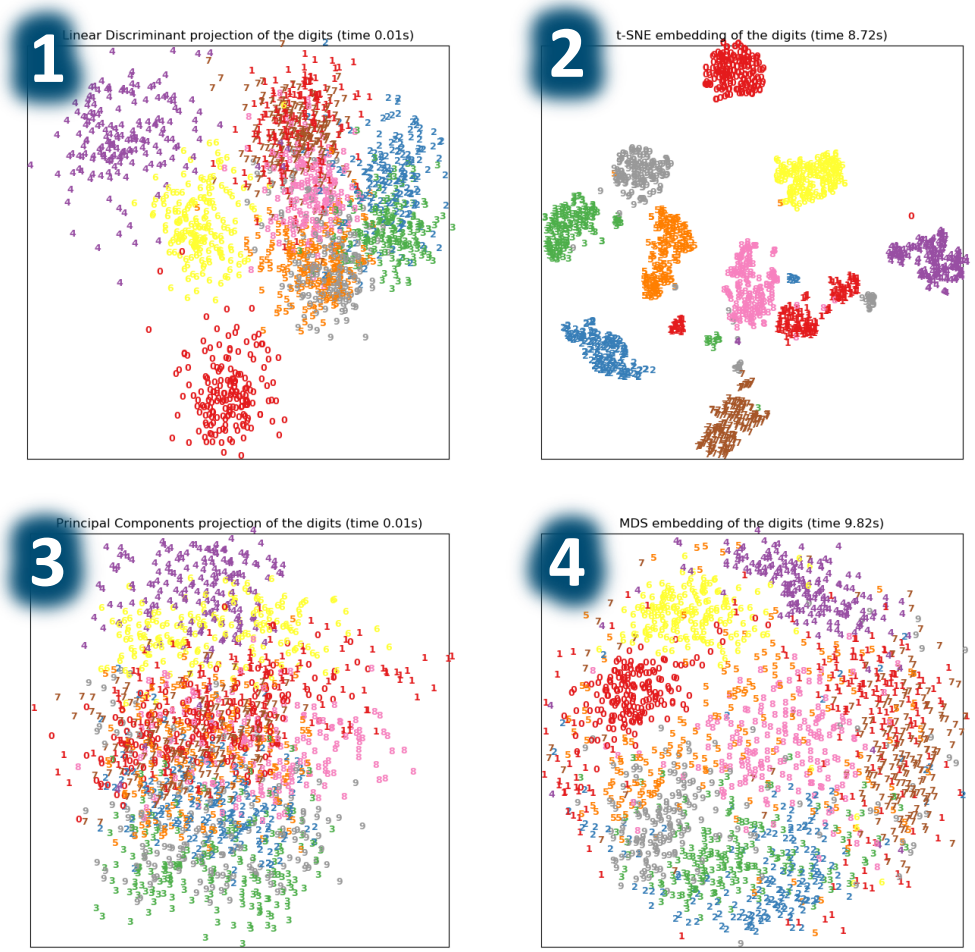




Understand neural networks through visualization

Visual Quality Measures

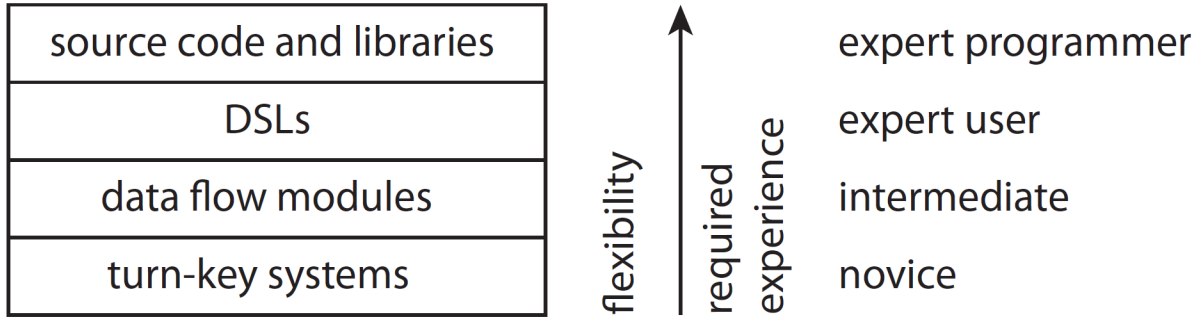


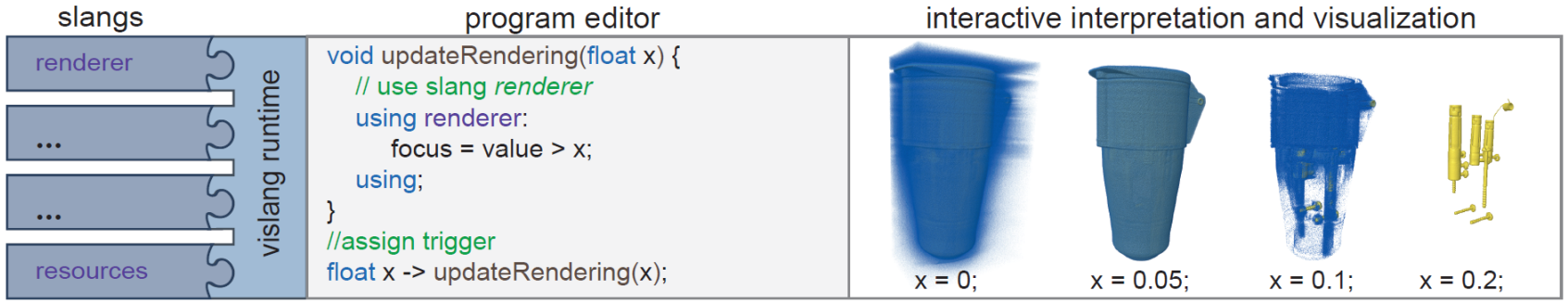


Can we model how humans see visualizations?

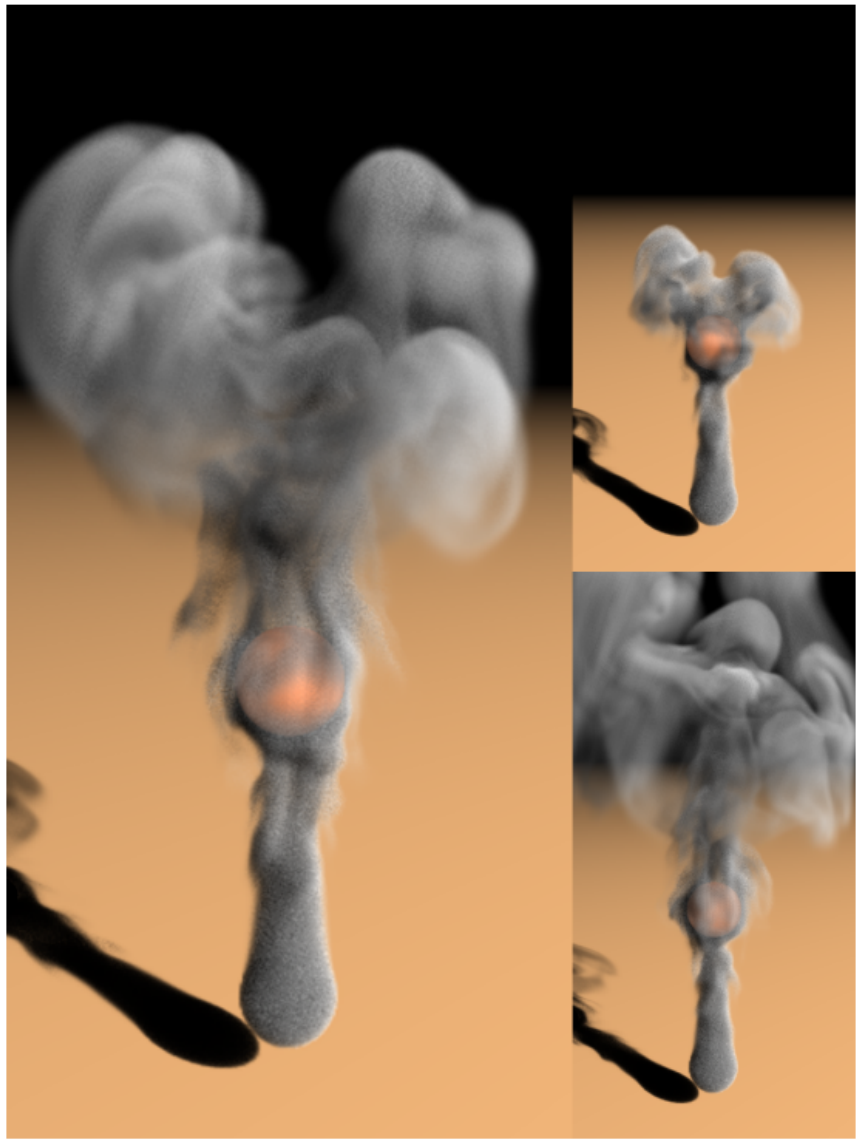
DSLs in Visualization

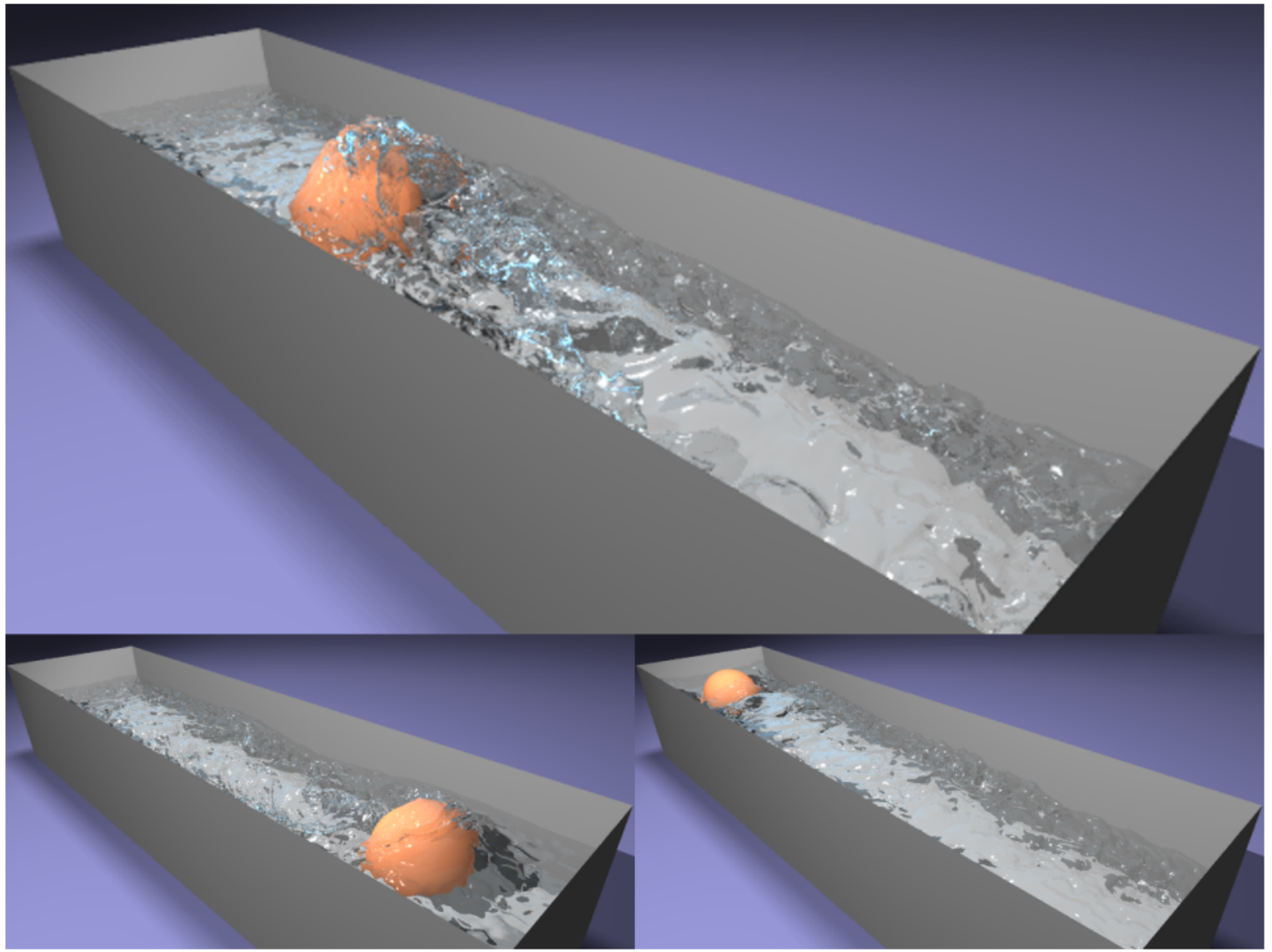
- DSL = Domain-specific language
- How to incorporate domain knowledge in a language





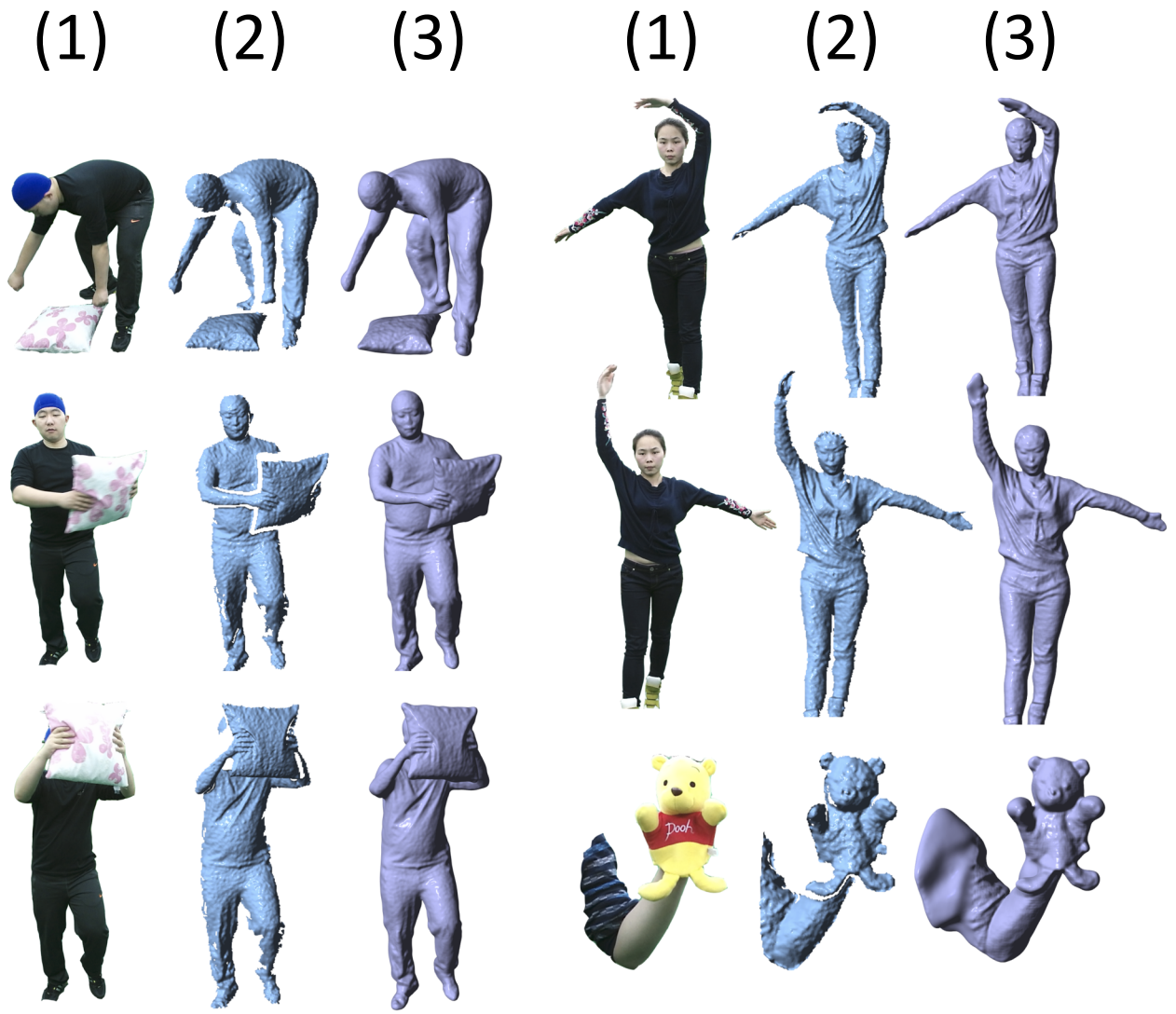
Procedural Animation





Motion tracking and geometry reconstruction

- RGB-D cameras such as Kinect or RealSense allow capturing 3D models of objects
- Explore methods to track motions of captured by RGB-D cameras



(1) Input color image
(2) Input depth image
(3) Reconstruction

Realistic teeth rendering

- Explore state-of-the-art approaches of realistic teeth modeling and rendering

Blockchain visualization

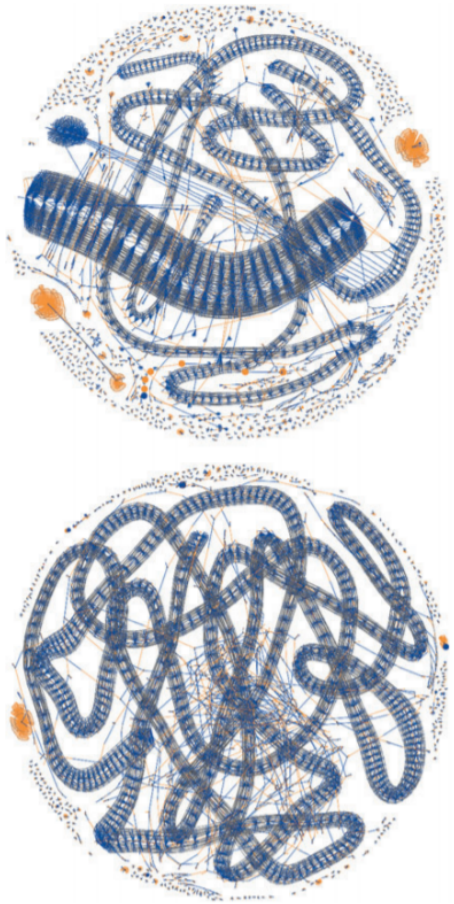


FIG. 7. Blocks#364133,364618: Initial "parasitic worm" transaction rate attack.

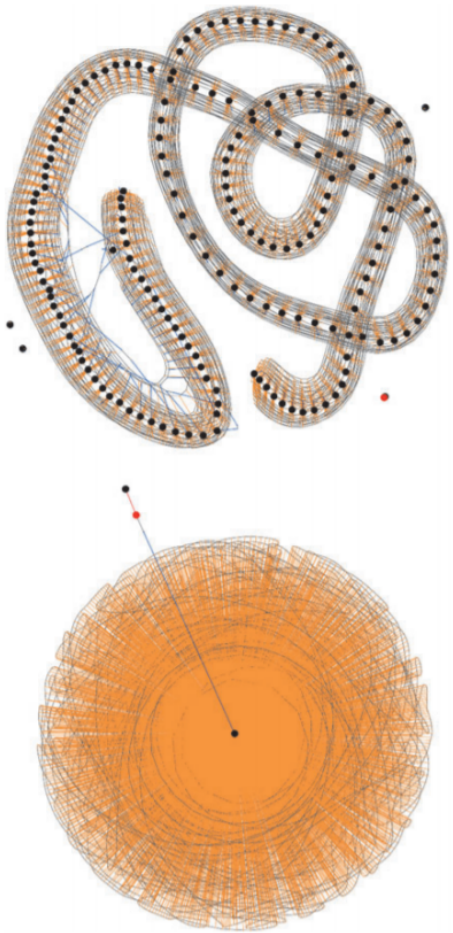
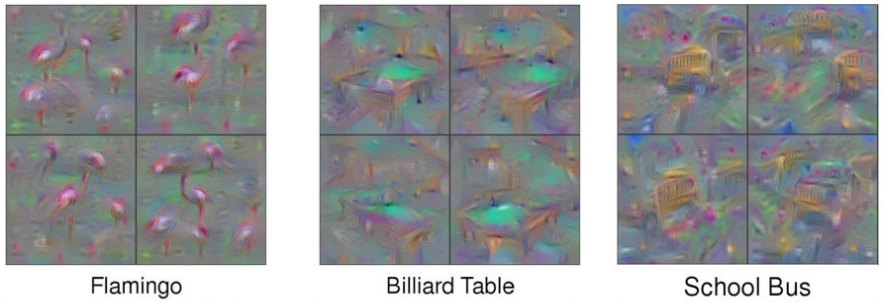
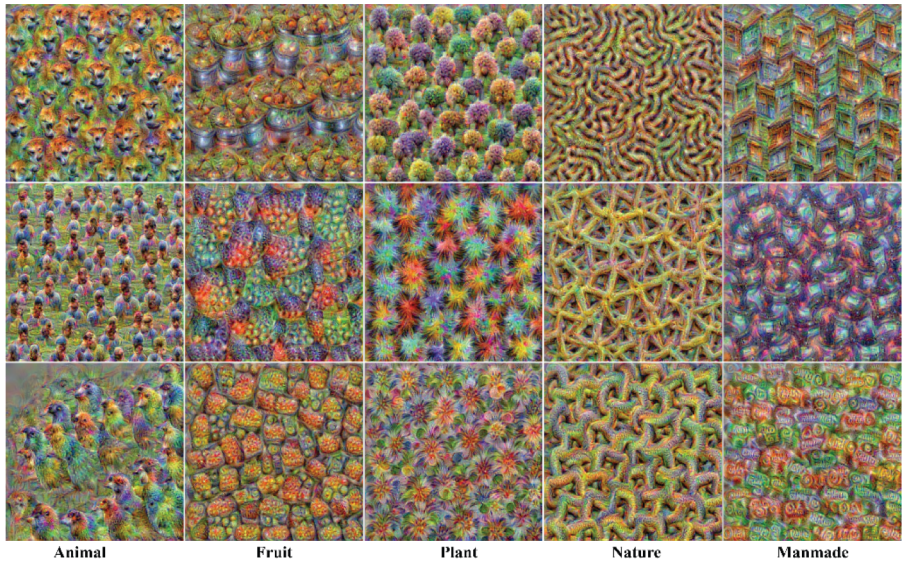


FIG. 8. Blocks#364281,364292: Initial algorithmic responses to spam, the lower block showing the largest possible transaction.

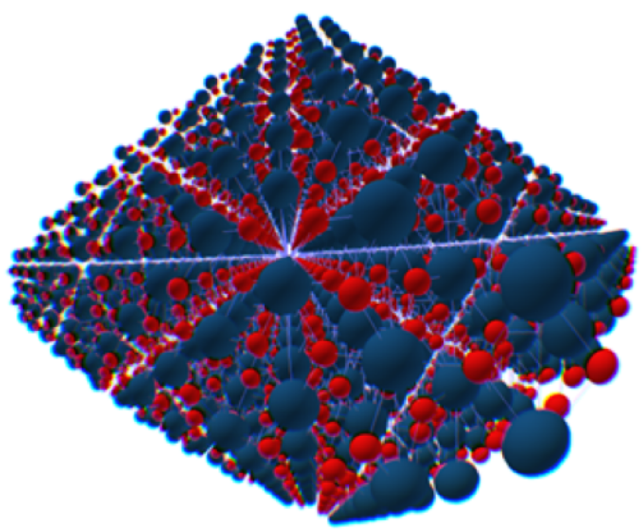
Visualization of neural networks





Virtual/Augmented Reality Visualization in Material Science

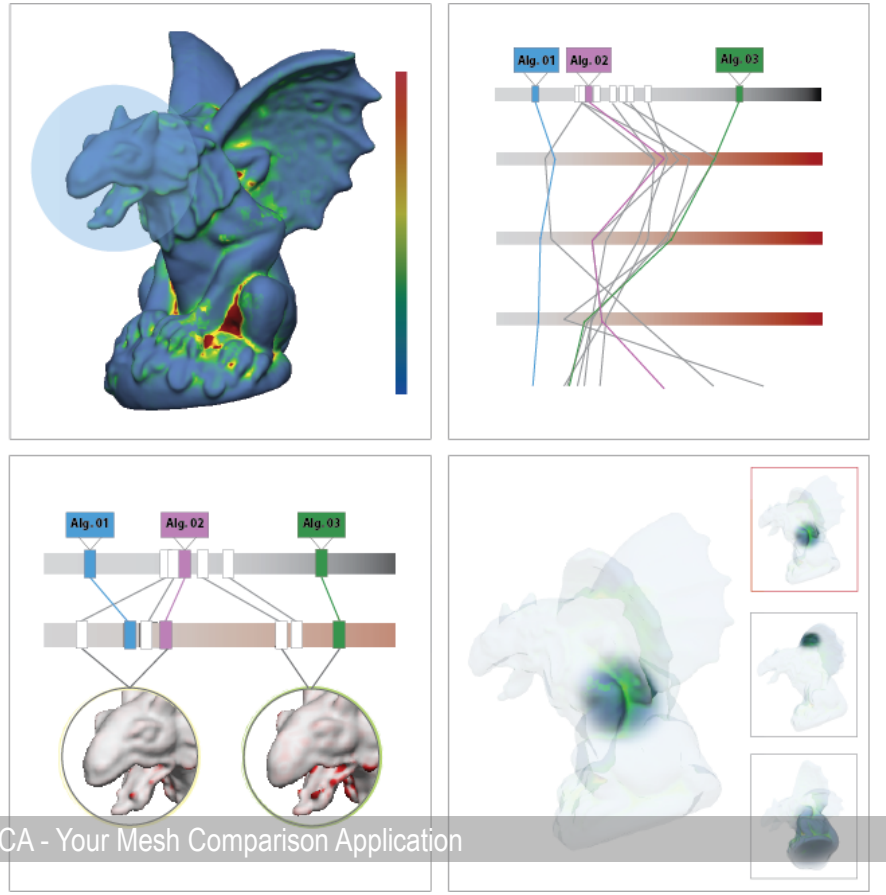
Virtual and augmented reality has come to stay and is used in many application domains. It has the potential to give more intuitive insight into 3D scenes; the transfer of the spatiality is intuitive and probably more effective than when rendering the same scene on a 2D monitor. Virtual and augmented 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 in how **methods in virtual and augmented reality** can be used to support such material science tasks.



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

Comparative Visualization of Polygonal Mesh Datasets

Scientists as well as practitioners often need to compare multiple polygonal mesh datasets, e.g., for exploring results of surface extraction algorithms, or for comparing surface models. Of special importance regarding comparative visualization is, to identify critical areas and to evaluate how the different models behave in these areas. Your task is to provide an overview over the state-of-art in methods **for comparing multiple polygonal mesh datasets**.



Source: Schmidt et al., YMCA - Your Mesh Comparison Application

Topics 2019/2020

1. Automated Camera Control
2. Summarizing and Exploring Extremely Long Videos
3. Abstraction in Visualization
4. Molecular Environment Visualization for Virtual Reality
5. Text and Image Labeling in AR
6. 3D Mesh Unfolding, Origami, and Paper Automata
7. Visualization of Bipartite / k-Partite Graphs
8. Visually Aided Classification
9. Rethinking Medical Visualization
10. Visual Analytics for Rendering
11. Latent Space Visualization
12. Visual Quality Measures
13. DSLs in Visualization
14. Procedural Animation
15. Motion tracking and geometry reconstruction
16. Realistic teeth rendering
17. Blockchain visualization
18. Visualization of neural networks
19. Virtual/Augmented Reality Visualization in Material Science
20. Comparative Visualization of Polygonal Mesh Datasets

Questions?

Always check up-to-date information on institute webpage
https://www.cg.tuwien.ac.at/courses/WissArbeiten/

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