186.175 Seminar aus Computergraphik
186.046 Seminar aus Visualisierung

SS 2021

Organizer: Hsiang-Yun Wu

Teaching staff: Aleksandr Amirkhanov, Nicolas Grossmann, Christoph Heinzl, Renata Raidou, Manuela Waldner, Hsiang-Yun Wu, and Eduard Gröller

Institute of Visual Computing&Human-Centered Technology

TU Wien, Austria

Last update: 10th March 2021

Seminars

- 186.175 Seminar aus Computergraphik (by default)
- 186.046 Seminar aus Visualisierung
- 186.848 Seminar aus Medizinischer Informatik
  - You are requested to work on 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=35632
- wu@cg.tuwien.ac.at

Important!!

Register your topic on TUWEL

Registration start:

today

Registration due to:

12th March 2021, 23:59

Rank by your preference

Seminar

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

Literature List

- List of papers related to the topic
- Seminar subscription
- **20.03.2021**: List of literature submission deadline
- Approx. 10~15 papers in a list (pdf)

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

- **31.03.2021 (Wed) 11:00 - 13:00 (s.t.)**

  Wie schreibt man eine wissenschaftliche Arbeit Professor Wimmer

- **13.04.2021 (Tue) 11:00 - 13:00 (s.t.) – Zoom Q&A from 13:00**

  Forschung und wie sie funktioniert Professor Gröller

- **27.04.2021 (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)
- **22.04.2021**: Report submission deadline (minimum 6 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)
- **25.04.2021**: Receive a review form and a report from another student.
- **20.05.2021**: Review submission deadline
- **22.05.2021:** 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
- **09.06.2021 (17:00)**: Submit on TUWEL

Talk

- 15 + 3 minutes
- In English
- Active discussion participation
- **10.06.2021, 9:00 s.t. – 17:00**: Talks
  - on Zoom, Check the link on TUWEL

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

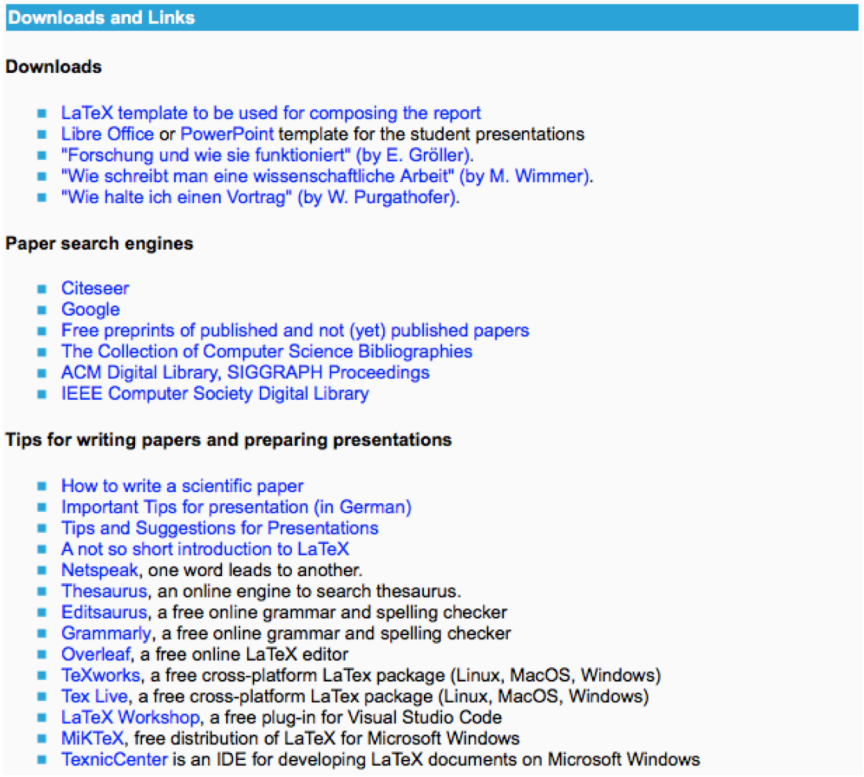
- State-of-the-Art report
- 8 pages (16 pages if working in a group)
- In English
- Format reports in the style of a scientific paper
  - Use LaTeX (template is on the webpage)
- **18.06.2021**: Final report submission deadline

Grading

- It is necessary to attend the 3 lectures to get a positive grade!
- Grading criteria:
  - 45% written report
  - 30% presentation
  - 15% review
  - 5% attendance during the presentations
  - 5% active discussion after the presentations

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://www.cg.tuwien.ac.at/courses/SeminarAusCG/SE/2021S

All the questions go here:

https://tuwel.tuwien.ac.at/course/view.php?id=35632

or

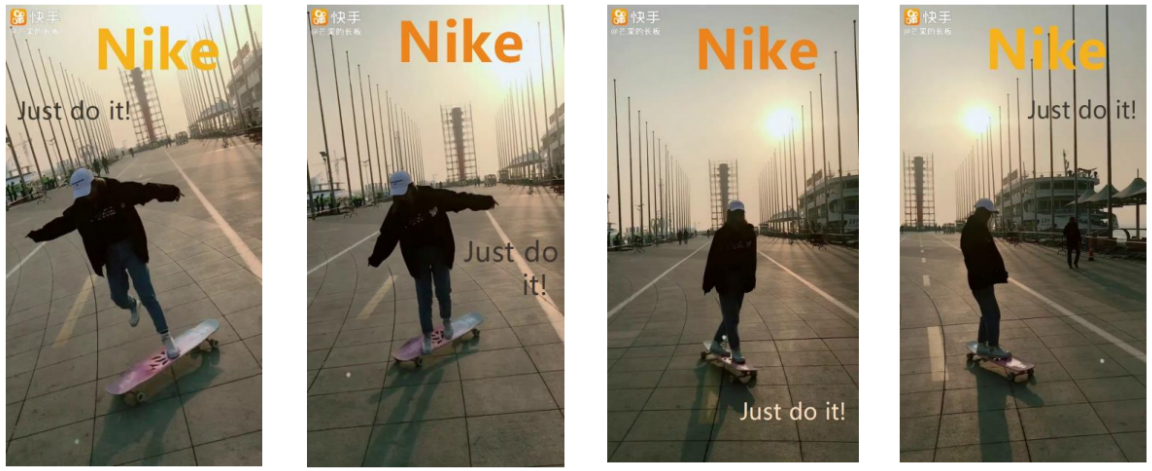
wu@cg.tuwien.ac.at

Topics 2021

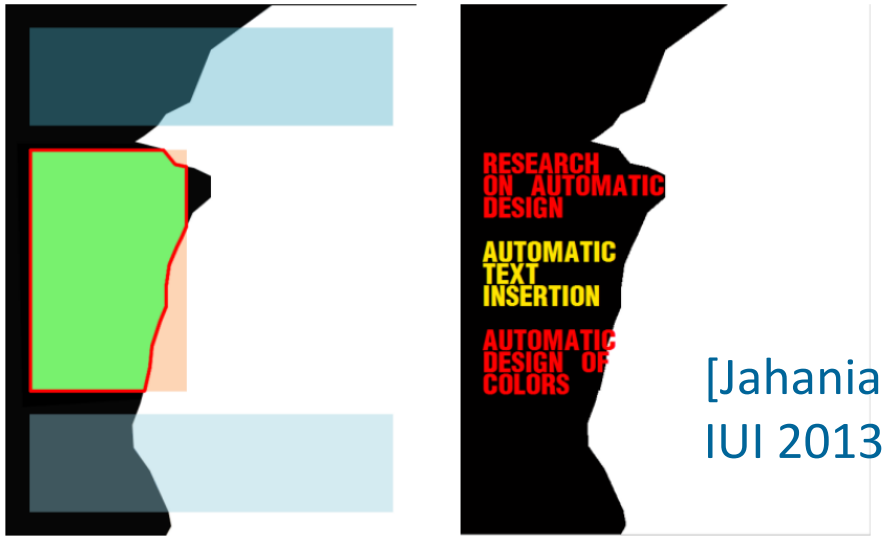
1. Automatic Layout Generation

- Layout algorithms for computational composition of many media (text, images, etc.) into a single:
  - Magazine cover
  - Advertisement or banner
  - Poster …

[Yin et al., MM 2013]



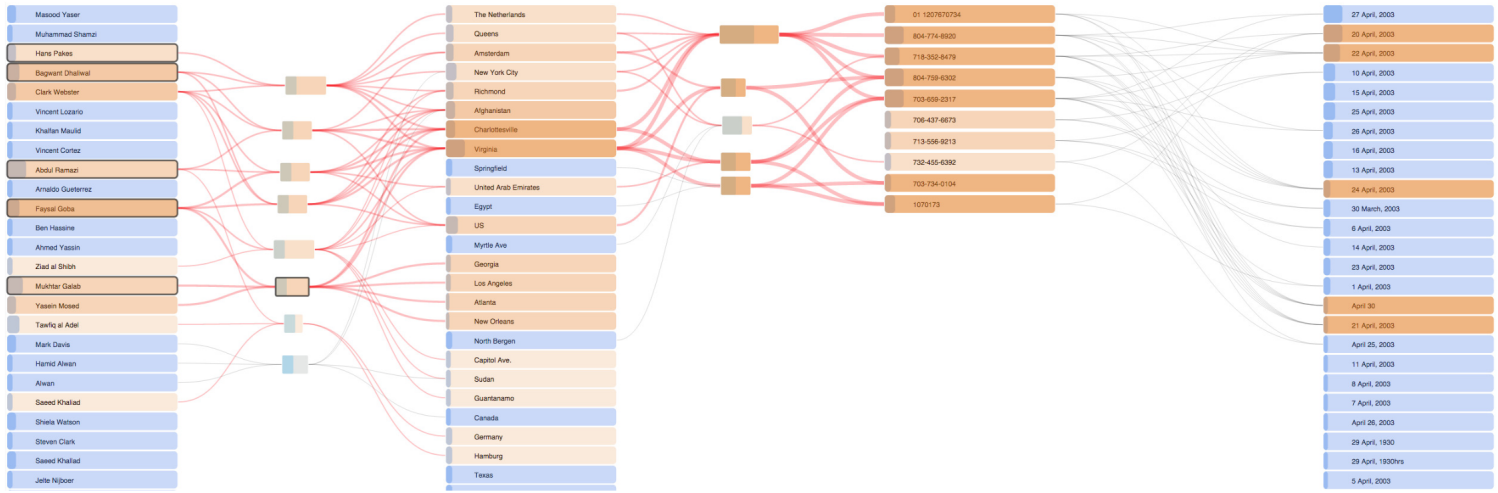
[Liang et al., BigMM 2018]



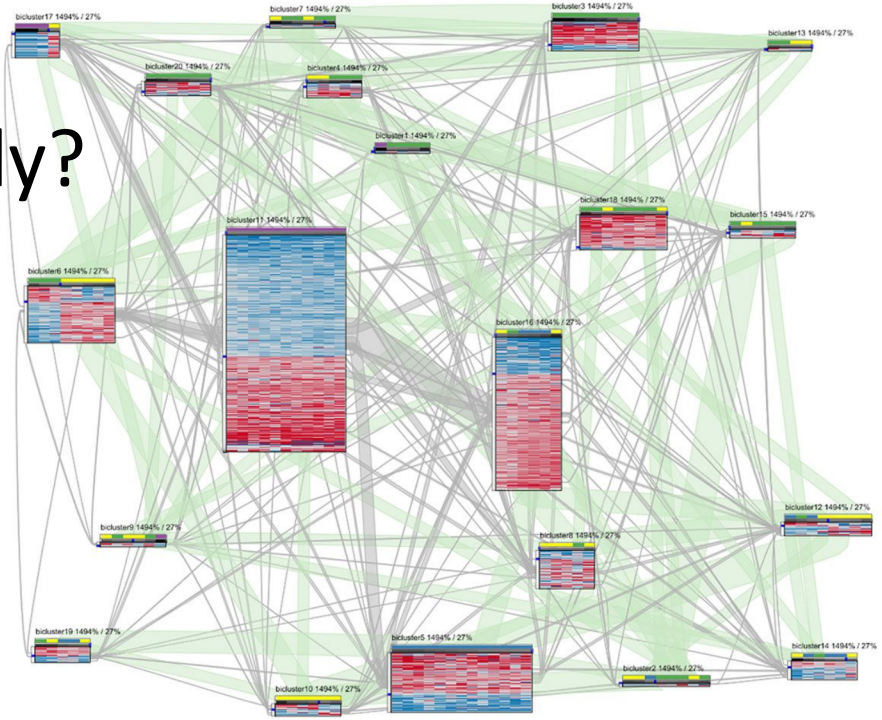
[Jahanian et al., IUI 2013]

2. Visualization of Bipartite / k-Partite Graphs

- Graph with vertices divided into two independent sets, such as
  - People and affiliations, genes and conditions, actors and movies
- Which visualization techniques exist?
- How to explore a k-partite graph interactively?



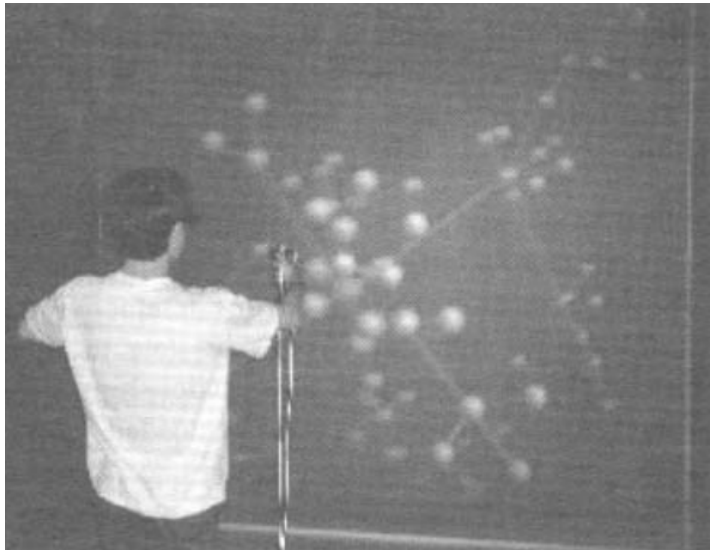
[Sun et al., BiSet, TVCG 2016]



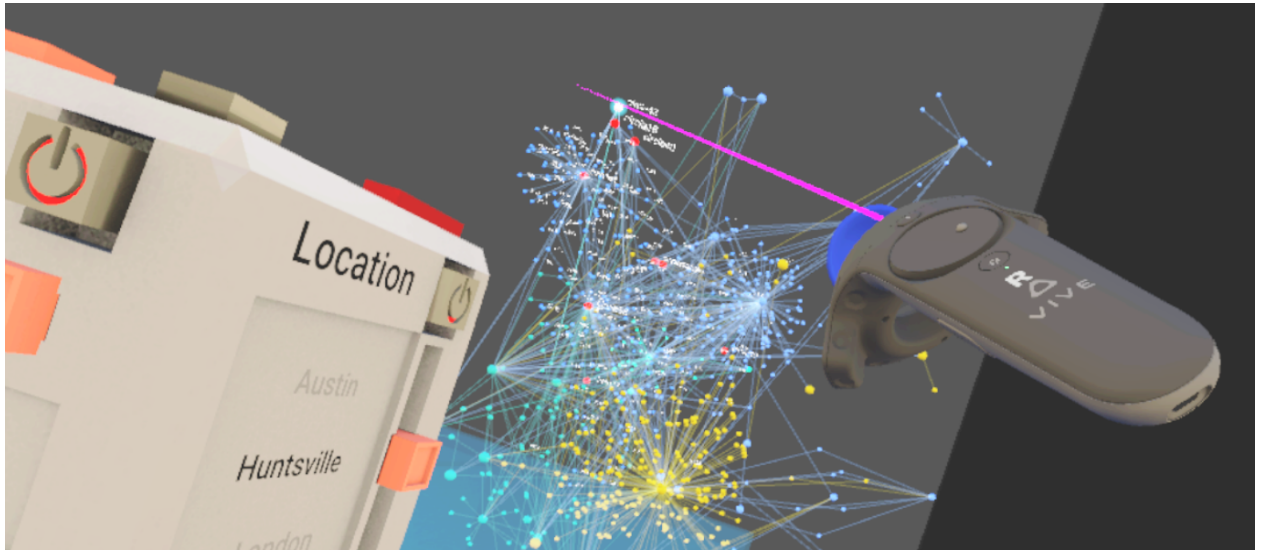
[Streit et al., Furby,
BMC Bioinformatics 2014]

3. Visualization of Networks in Virtual Reality

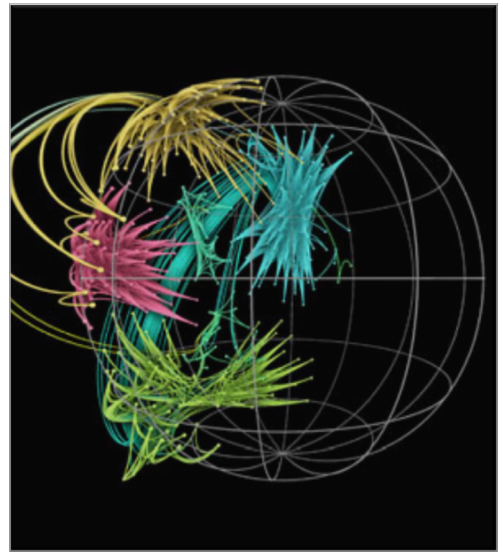
- Immersive analysis of 3D graphs in virtual reality from the 90ies to now:
  - Rendering & graph layout
  - Embodied interaction & effective locomotion



[Osawa et al., 2000]

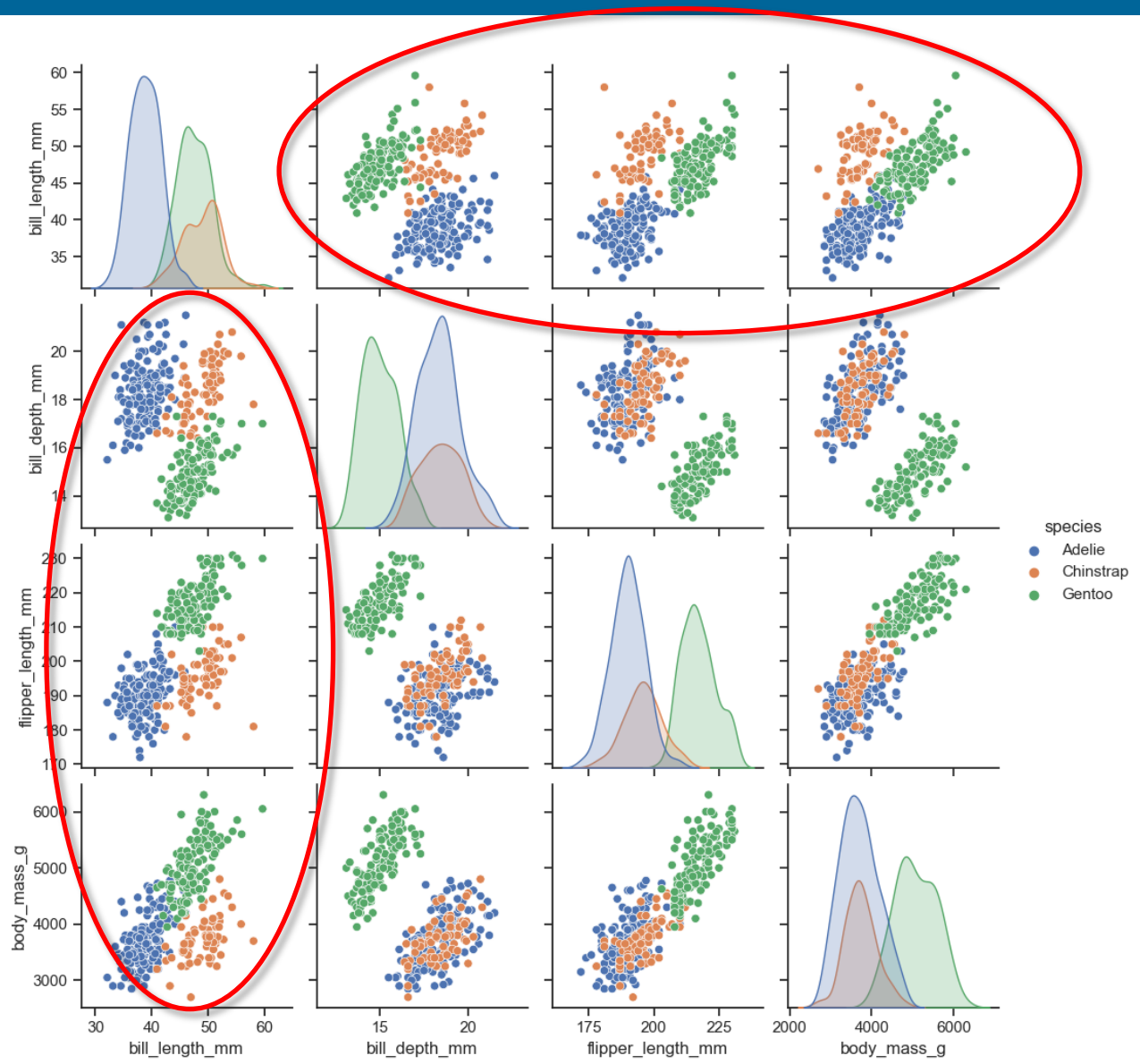


[Drogemuller et al., 2017]



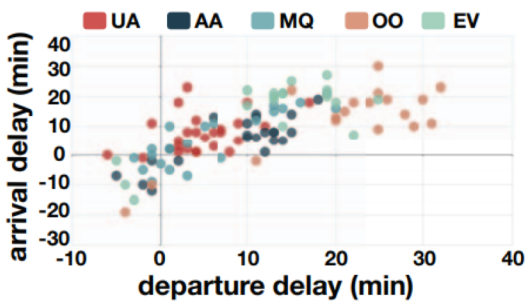
[Kwon et al., 2016]

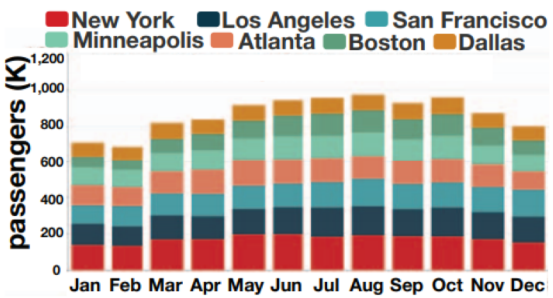
4. Cluster-Separation Measures

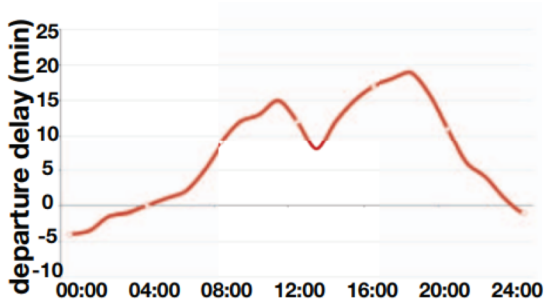


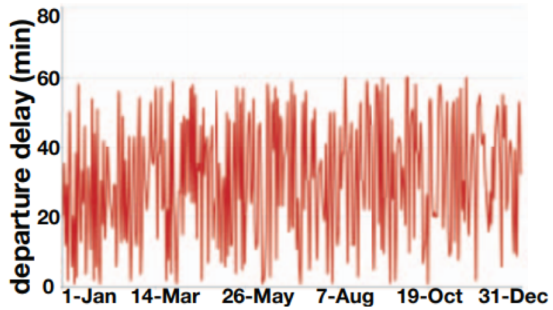
5. Automated Generation of Infographics

A. scheduled	B. carrier	C. destination city name	D. departure delay (min)	E. arrival delay (min)	F. passengers
01-Jan 00:05	UA	New York	-4	1	193
01-Jan 04:00	AA	Los Angeles	0	-2	204
01-Jan 06:13	MQ	San Francisco	7	-11	96
01-Jan 07:33	OO	Atlanta	11	-2	112
...	...	...	...	...	...









6. Hierarchical Aggregation for Information Visualization

7. The Use of Markerless Augmented Reality in Anatomical Education

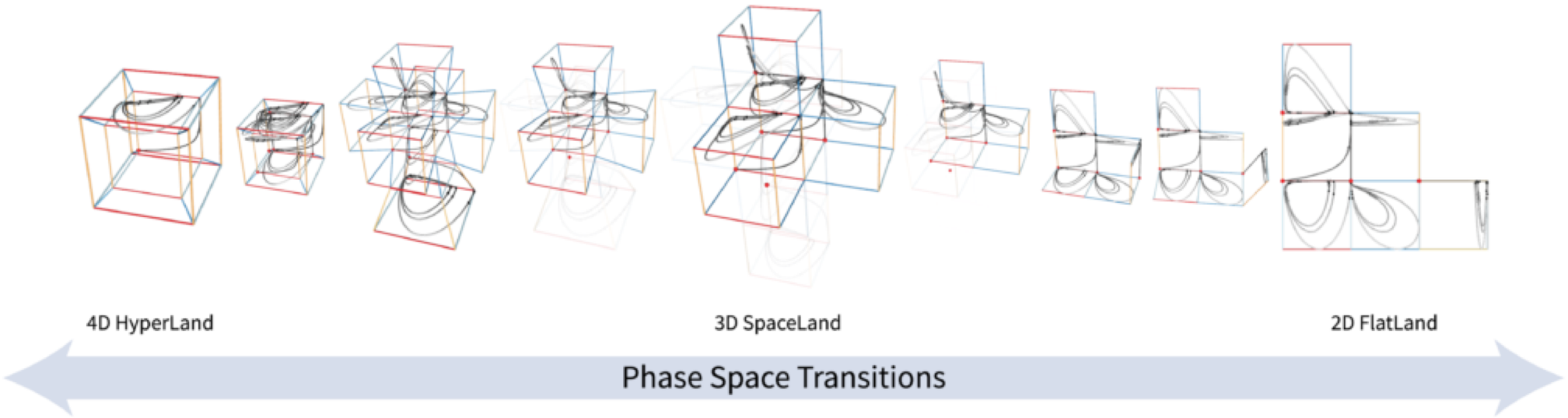
Figure 1: An X-ray is augmented onto the user. The X-ray is simulated from a CT of the same person. The printed image is a real X-ray of the same person.

[Blum 2016, mirracle]

8. Style Transfering

[Gatys 2016]

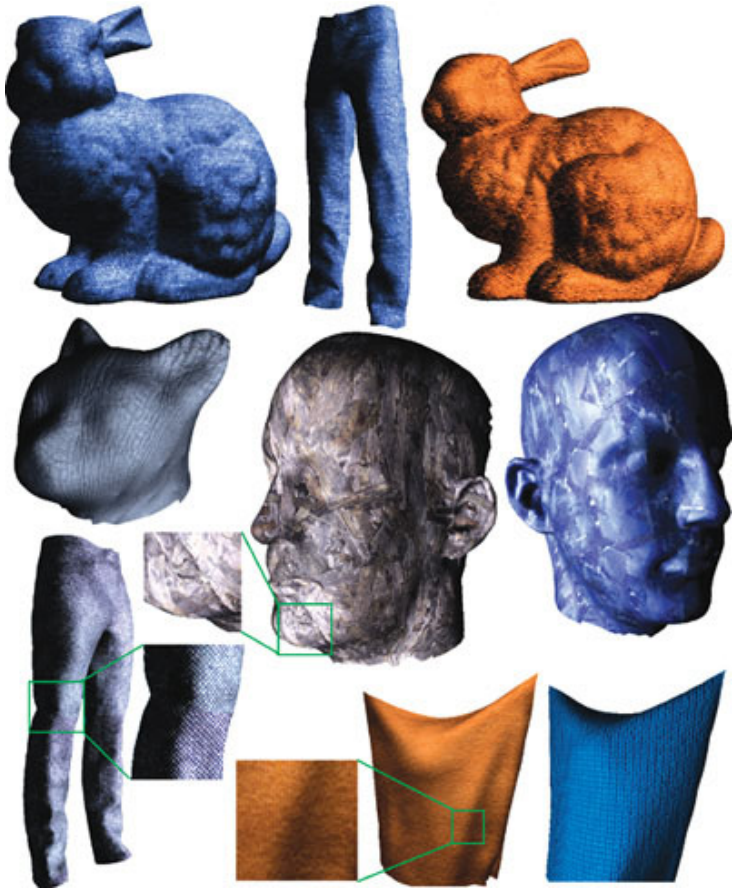
9. Visualizing Dynamical Systems in Biology



[Amirkhanov et al. 2019]

10. Texturing: Past and Present

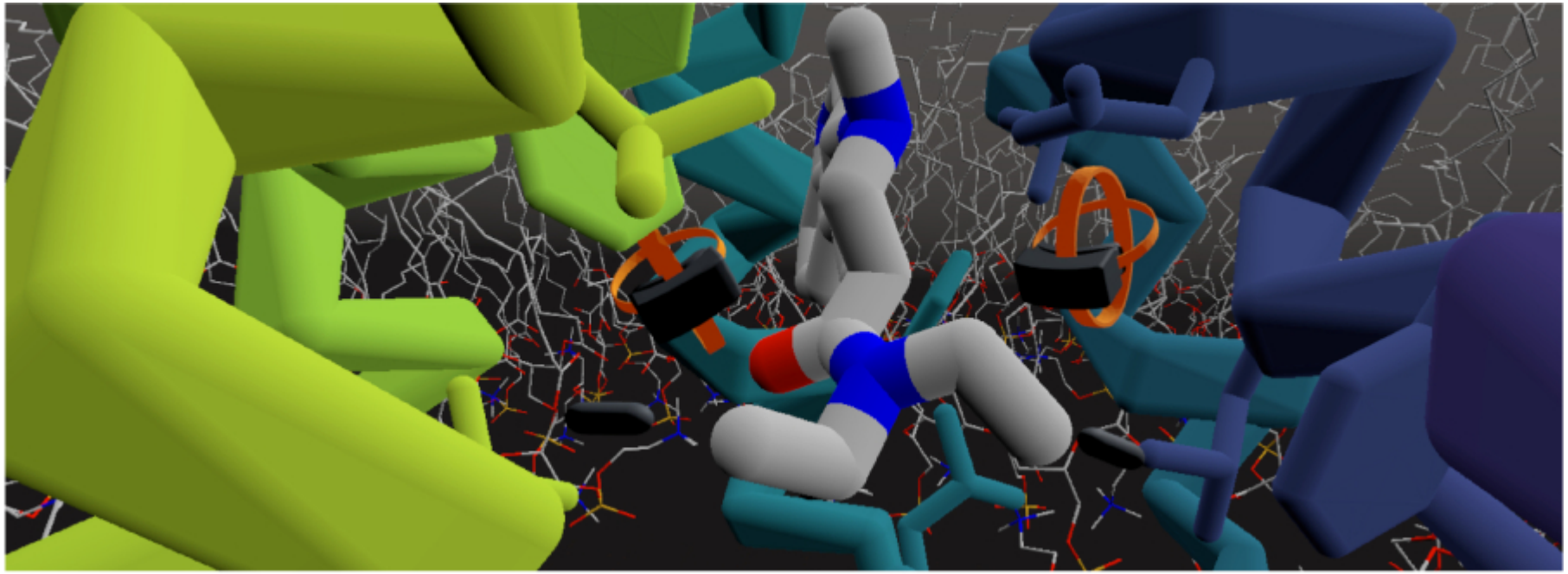
- Conduct a survey of the **history** and the **state of the art** in **texturing**



https://developer.nvidia.com/gpugems/gpugems2/part-ii-shading-lighting-and-shadows/chapter-11-approximate-bidirectional-texture

11. Molecular VR

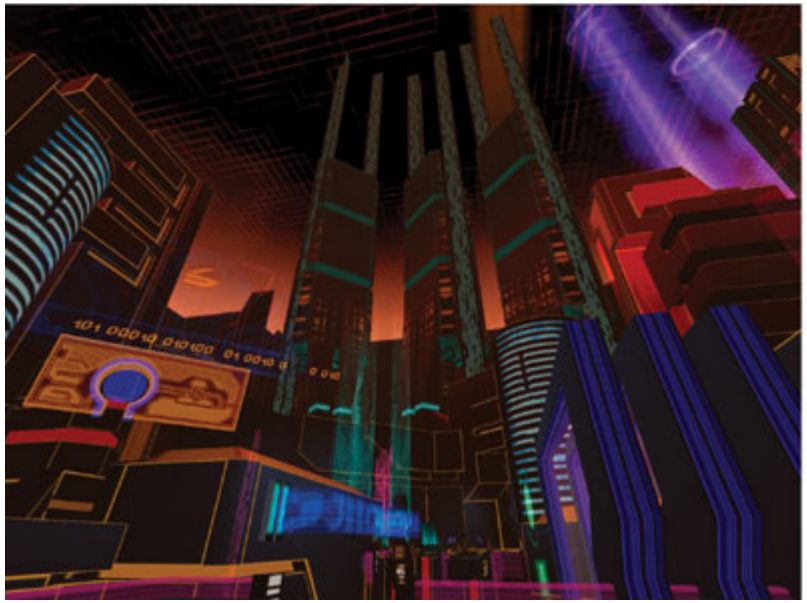
- Conduct a survey of the **state of the art** in **molecular VR**



https://dl.acm.org/doi/fullHtml/10.1145/3388536.3407891

12. Post Processing

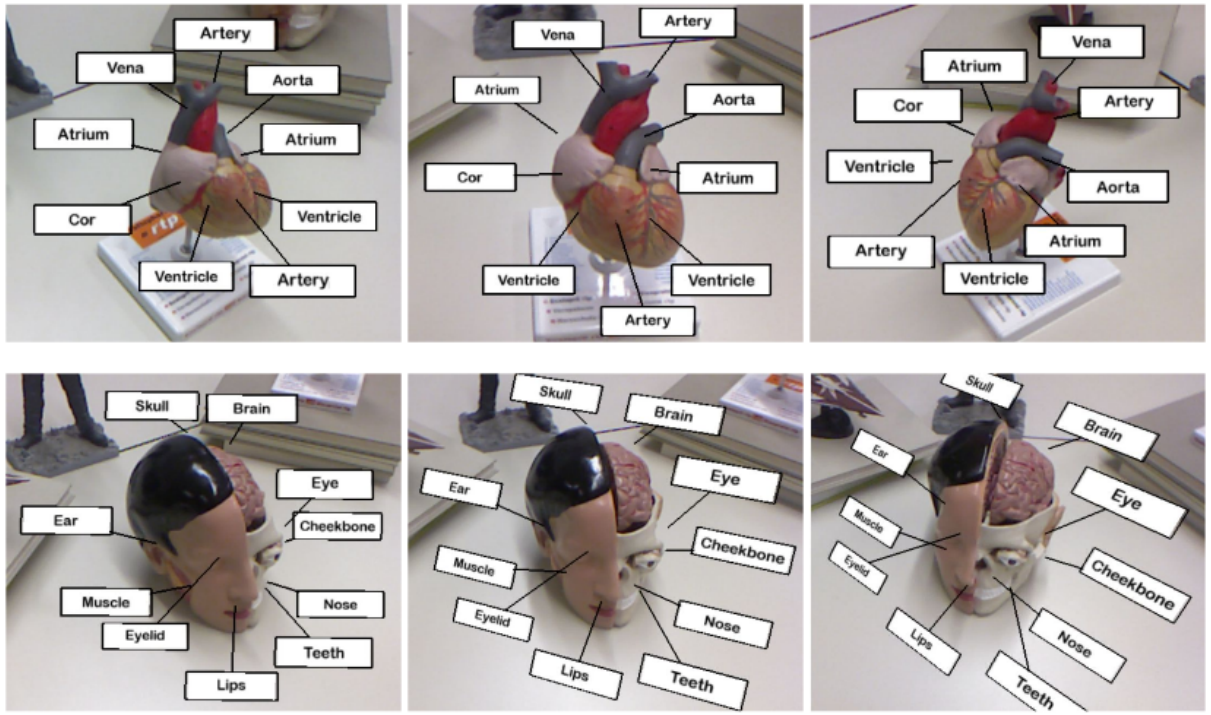
- Conduct a survey of the **state of the art** in **post processing**



https://developer.nvidia.com/gpugems/gpugems/part-iv-image-processing/chapter-21-real-time-glow

13. Text and Image Labeling in AR

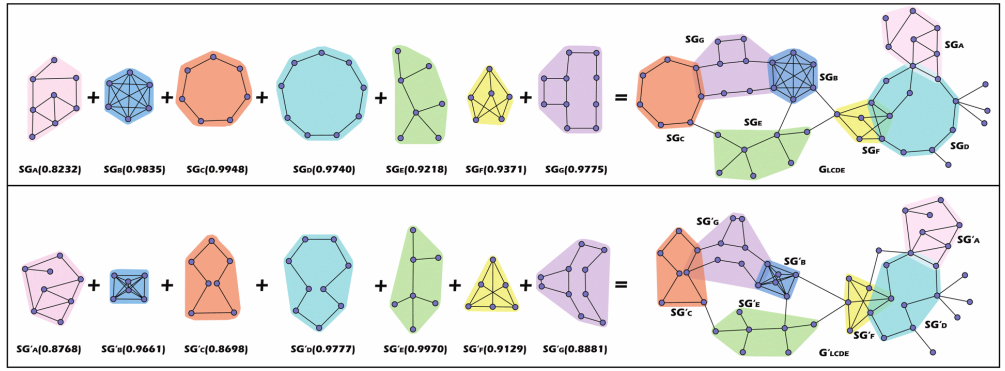
- **Challenge:**
  - Combinatorial complexity
  - Optimization

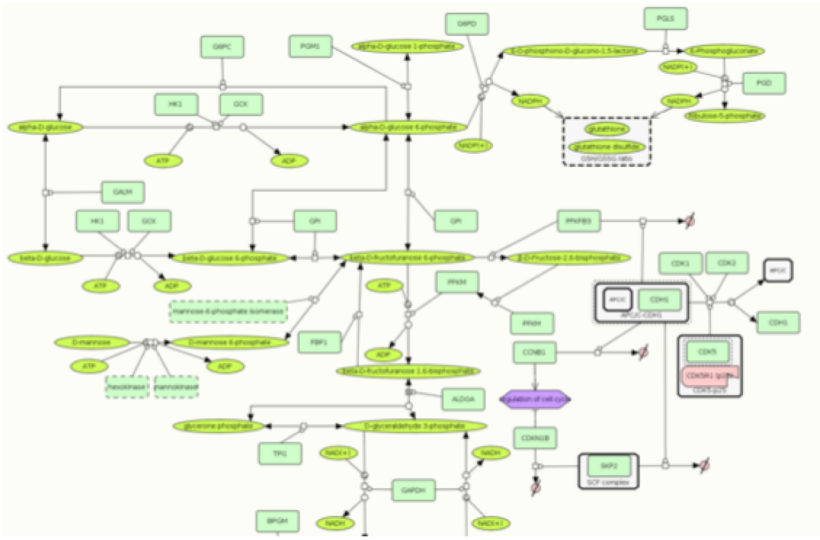


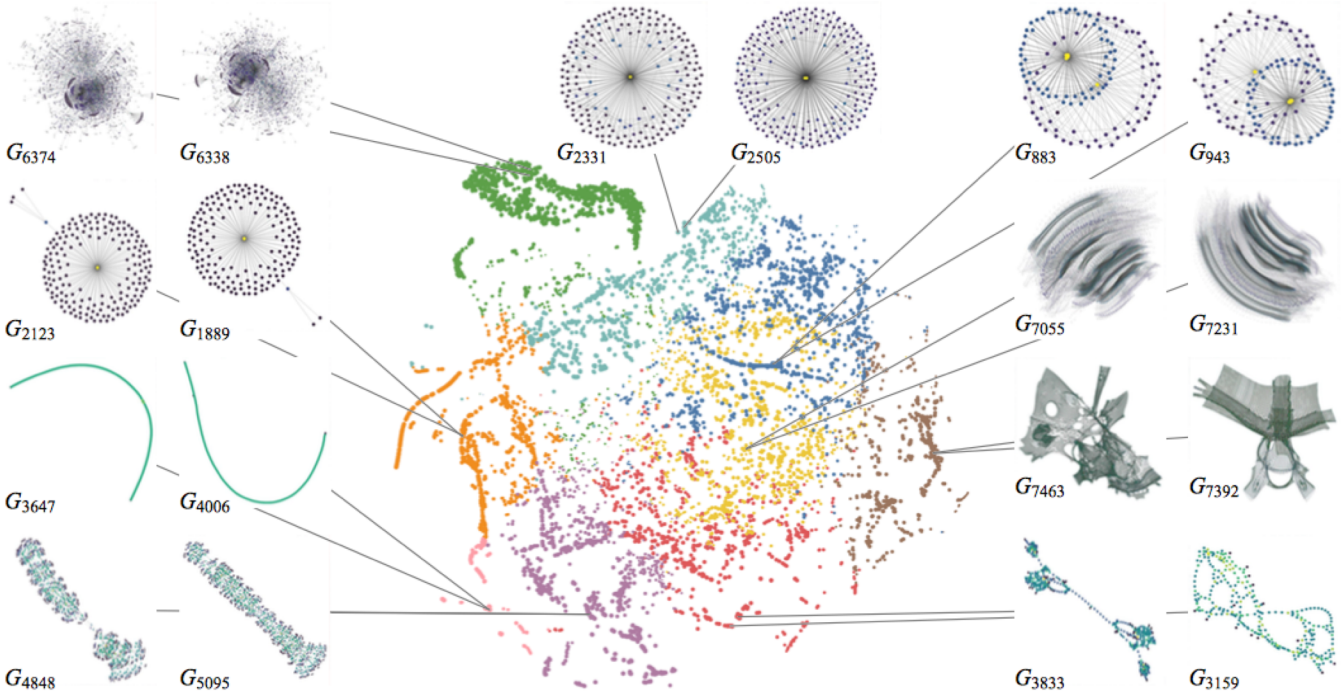
14. Visualization of Knowledge Graphs

Challenge:

Formulation for machine learning technique

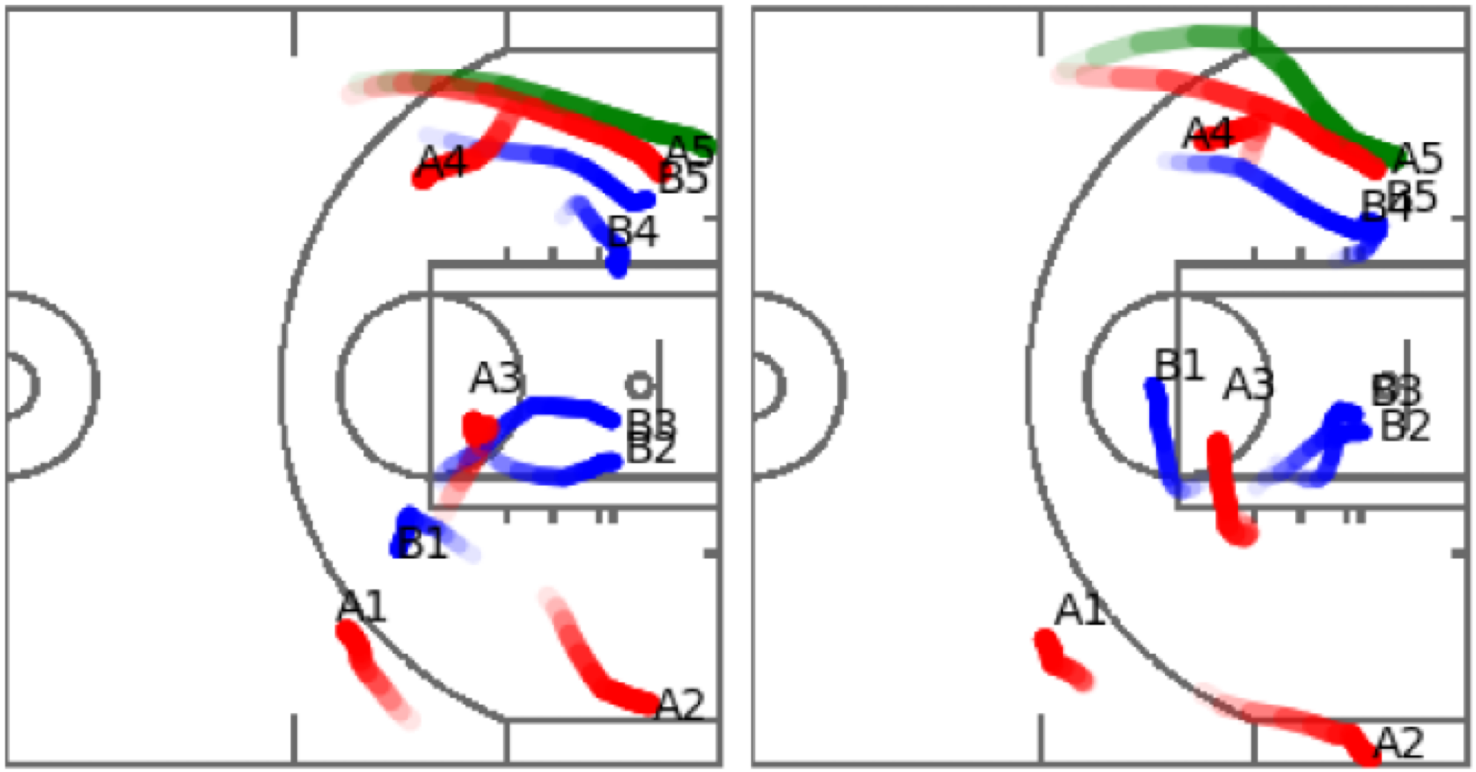






15. Sport Analytics

- Tactic development
- Education and training
- Visualization



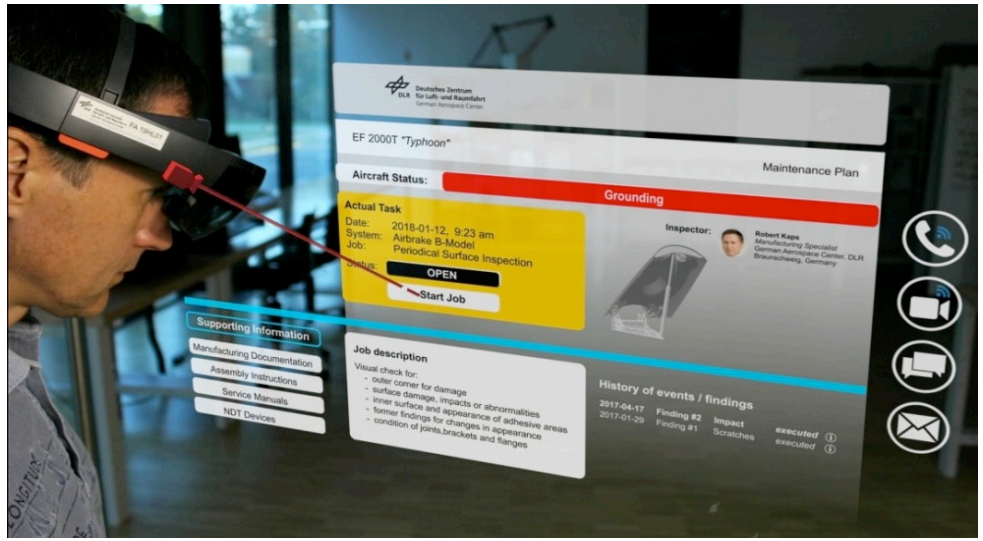
with dribbler loss

without dribbler loss

16. Visualization & 3D Interaction Techniques for Remote Analysis in AR/VR Applications

The testing or exploration of components or products over long distances (remote analytics) is of high importance in industry. By **supporting or guiding the analysis on-site** by a remote expert, a strong cost reduction can be achieved by eliminating the need for experts on-site and thus enabling much faster decision making. Multidimensional data which has a physical reference, i.e. from material structures, can rarely, or only to a limited extent, be evaluated on desktop monitors using standard 2D visualization techniques. This requires new **immersive visualization and interaction techniques** that realize efficient remote collaboration or telepresence between off-site experts and on-site technicians. Your task is to provide an overview over the state-of-art methods which can be used to enable a **Remote Analysis** in AR/VR applications.

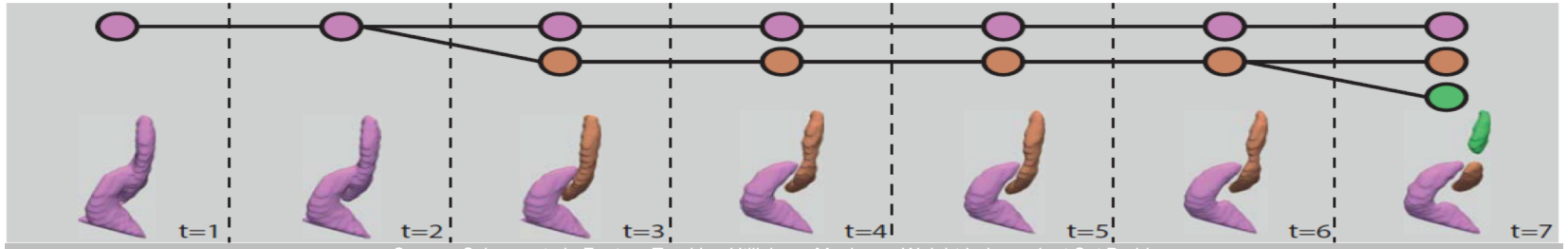
[2] "3D Collaboration Method over HoloLens™ and Skype™ End Points"



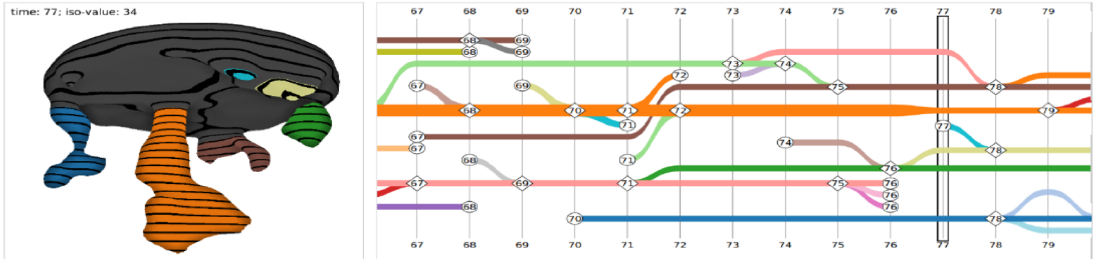
[1] "Augmented Reality for Remote Collaboration in Aircraft Maintenance Tasks"

17. Tracking and Visualization of Features

Feature tracking and visualization has long been an important topic in the field of time-varying volume visualization, and its objective is to identify features and determine the correspondence between them in adjacent time steps. Tracking the evolutionary process of features not only has the potential to improve understanding scientific phenomena, but also to lead to new insights into the mechanisms underlying evolutionary events. Feature tracking algorithms aim at identifying the temporal evolution of features in a series of raw data snapshots, as XCT scans of in situ experiments or time-varying multidimensional datasets. In order to trace or understand the evolution of the features, a visualization of their changes is necessary.



Source: Schnorr et al., Feature Tracking Utilizing a Maximum-Weight Independent Set Problem

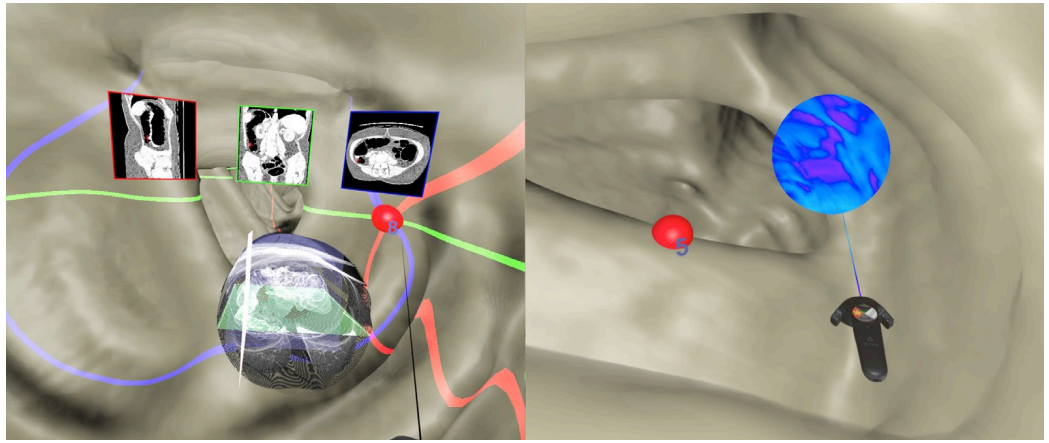


Source: Lukasczyk et al Viscous fingering: A topological visual analytic approach

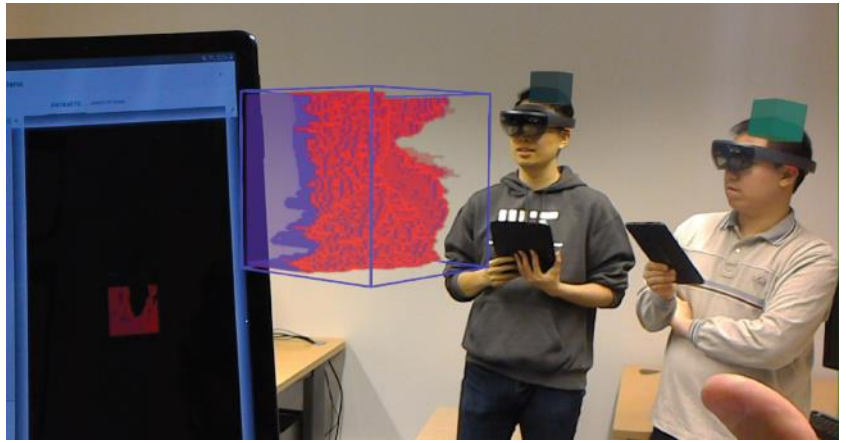
Your task is to provide an overview over the state-of-art methods for **feature tracking and visualization techniques** which help the users to identify and interpret their evolution.

18. Immersive Analytics for Volumetric Data

In recent years, augmented and virtual reality have gained attention, due to head-mounted displays and mobile devices supporting such immersive environments becoming more and more affordable. Immersive analytics systems implemented on such devices are increasingly used, also in the analysis of large volumetric data, such as acquired from magnetic resonance imaging or X-ray computed tomography. Volumetric datasets are acquired and analyzed in a wide variety of domains, such as the medical sciences, biology, or in material sciences. Immersive analytics systems require new visualization and interaction paradigms, when compared to traditional desktop computer systems; in the context of the immersive analysis of volumetric data, this applies for example for tasks such as refining the viewing parameters, or analyzing data derived from the volumetric data. Your task is to provide an overview over the state-of-the-art of immersive analytics methods for exploring volumetric data.



Source: Mirhosseini et al., 2019 [1]

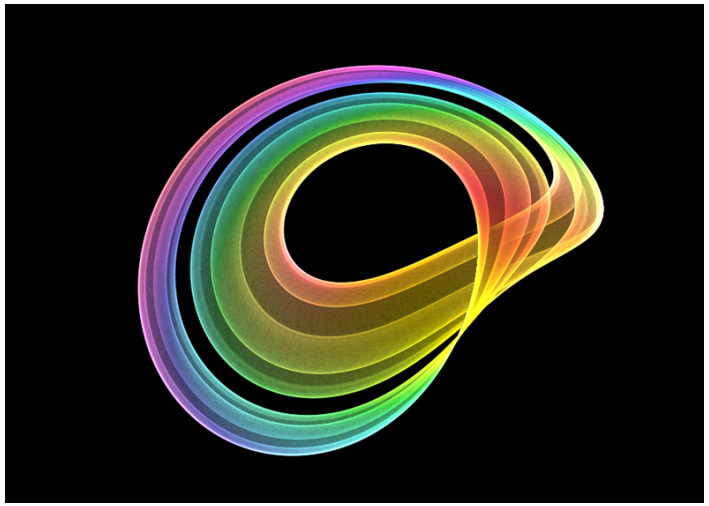


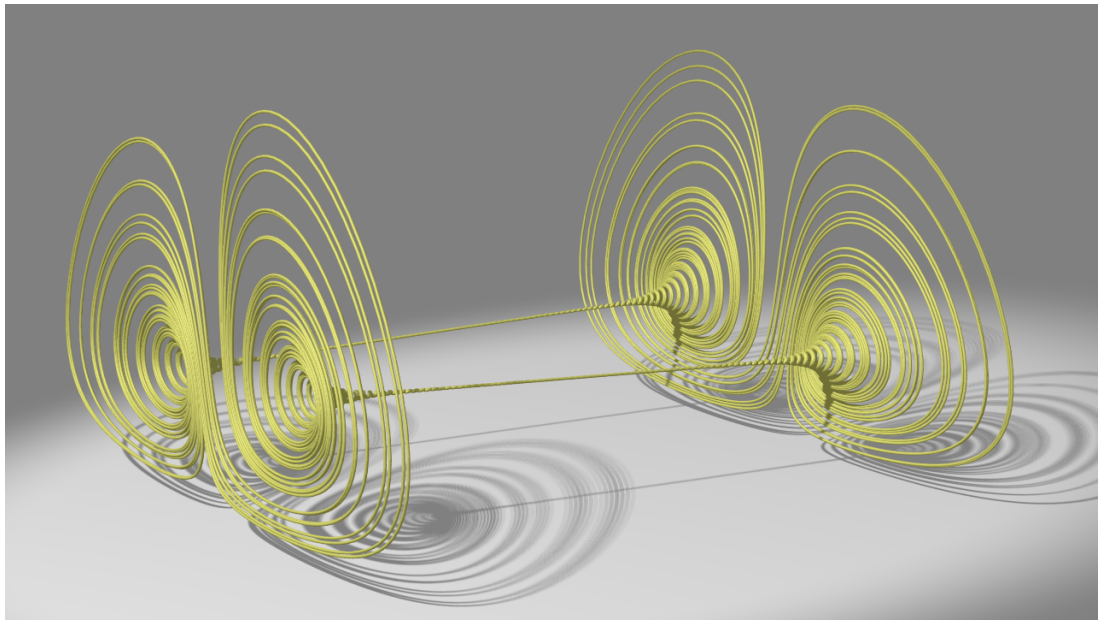
Source: Sereno et al., 2019 [1]

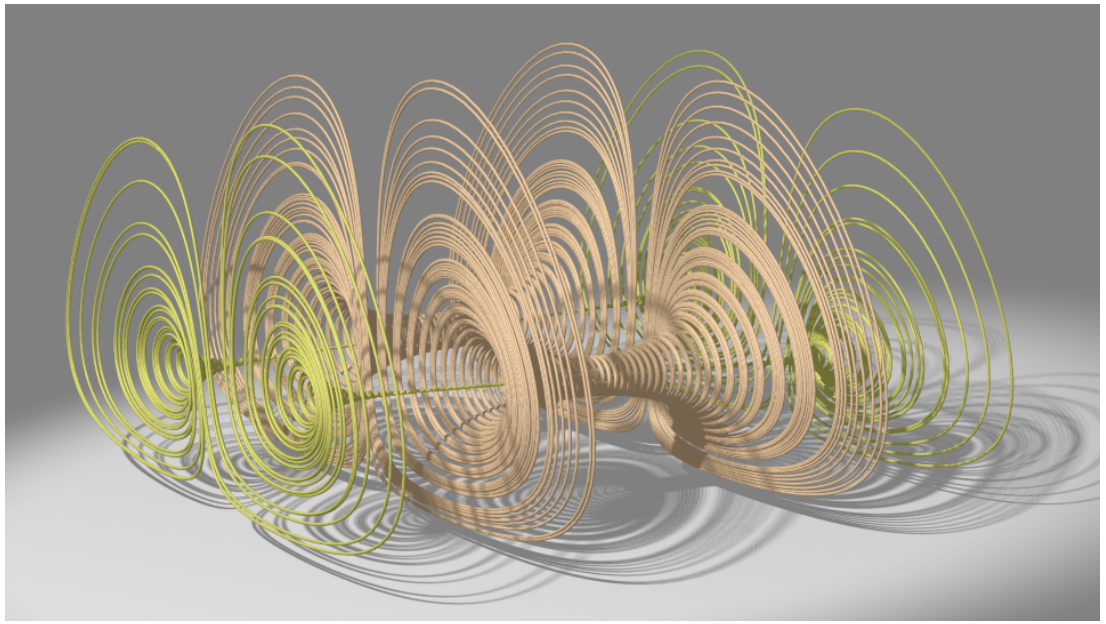
19. Neural Volume Rendering

https://dellaert.github.io/NeRF/

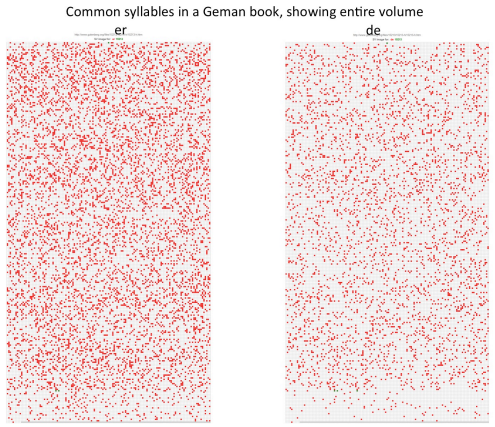
20. Visualization of Dynamical Systems

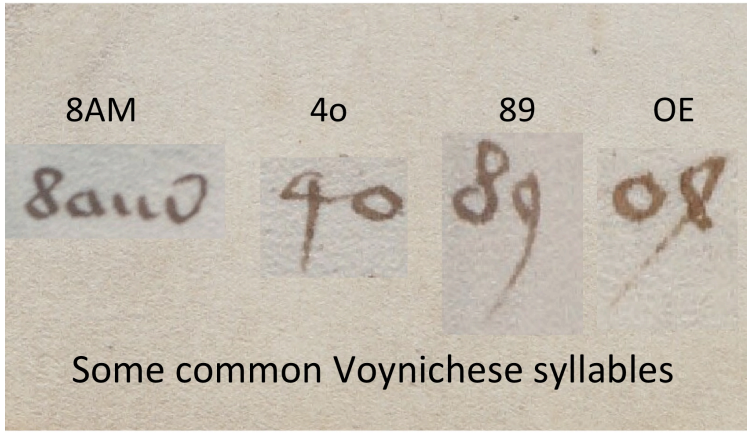






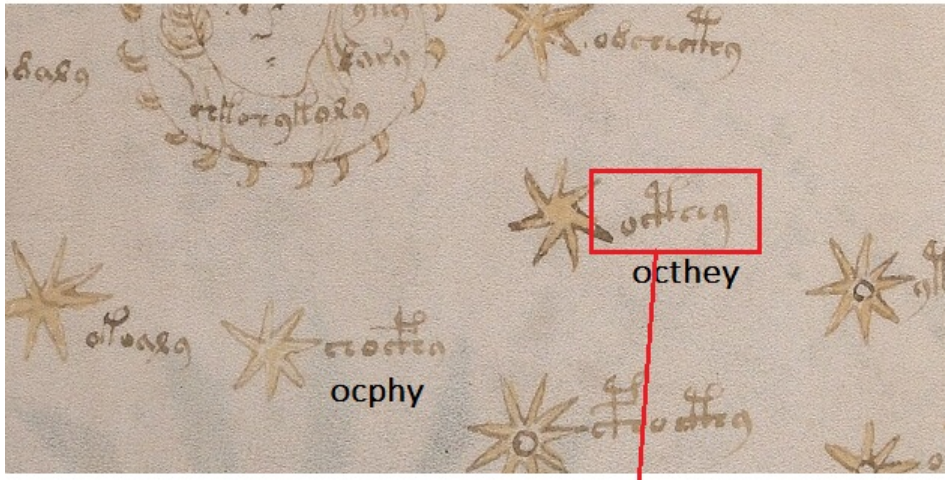
21. Visualization of Text in Voynich Manuscript



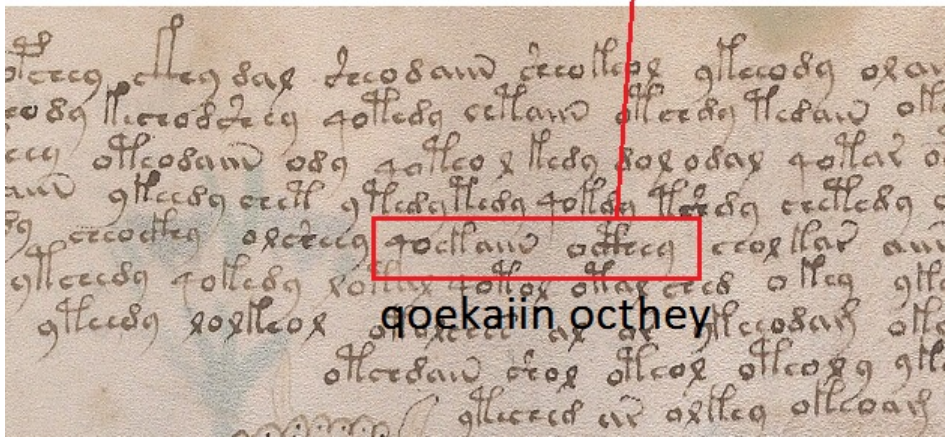


Some common Voynichese syllables

Folio 68



Folio 48



Topics 2020

1) Automatic Layout Generation
2) Visualization of Bipartite / k-Partite Graphs
3) Visualization of Networks in Virtual Reality
4) Cluster-Separation Measures
5) Automated Generation of Infographics
6) Hierarchical Aggregation for Information Visualization
7) The Use of Markerless Augmented Reality in Anatomical Education
8) Style Transfering
9) Visualizing Dynamical Systems in Biology
10) Texturing: Past and Present
11) Molecular VR
12) Post Processing
13) Text and Image Labeling in ARSpecial Effects in Computer Graphics
14) Visualization of Knowledge Graphs
15) Sport Analytics
16) Visualization & 3D Interaction Techniques for Remote Analysis in AR/VR Applications
17) Tracking and Visualization of Features
18) Immersive Analytics for Volumetric Data
19) Neural Volume Rendering
20) Visualization of Dynamical Systems
21) Visualization of Text in Voynich Manuscript

Important!!

Register your topic on TUWEL

Registration start:

today

Registration due to:

12th March 2021, 23:59

Thank you.

Projects:

https://www.cg.tuwien.ac.at/courses/Topics

wu@cg.tuwien.ac.at