

Introduction to visualization

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What is visualization?

- **Definition**

Techniques of creation of images, diagrams and animations for the purpose of information transfer.

- **Examples**

- From real to abstract phenomena
- From ancient paintings to computer graphics

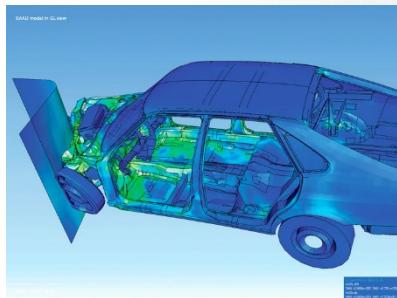
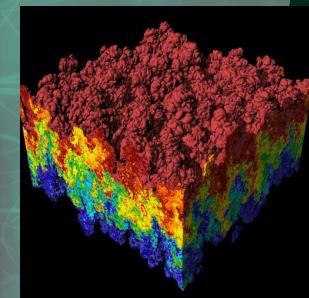
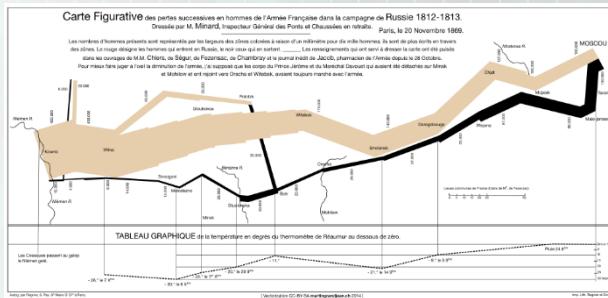


Image source: Wikipedia



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3 faces of visualization

- **Descriptive**

- The represented phenomenon is known
- The need for presentation or verification
- Usually in purpose of communication

- **Analytical**

- Directed search
- The goal of the analytical process is known
- Usually for hypothesis verification

- **Explorative**

- Undirected search
- The goal of the analytical process is unknown
- Helps to understand the phenomenon and state new hypotheses
- Reveals patterns

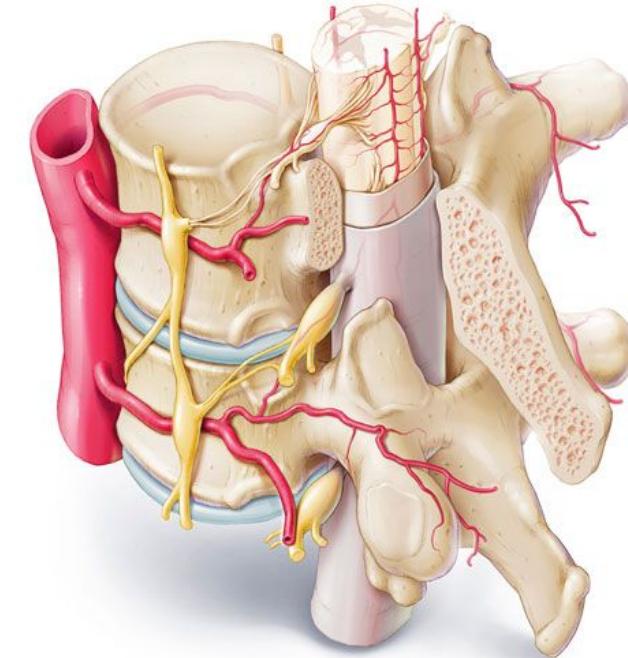
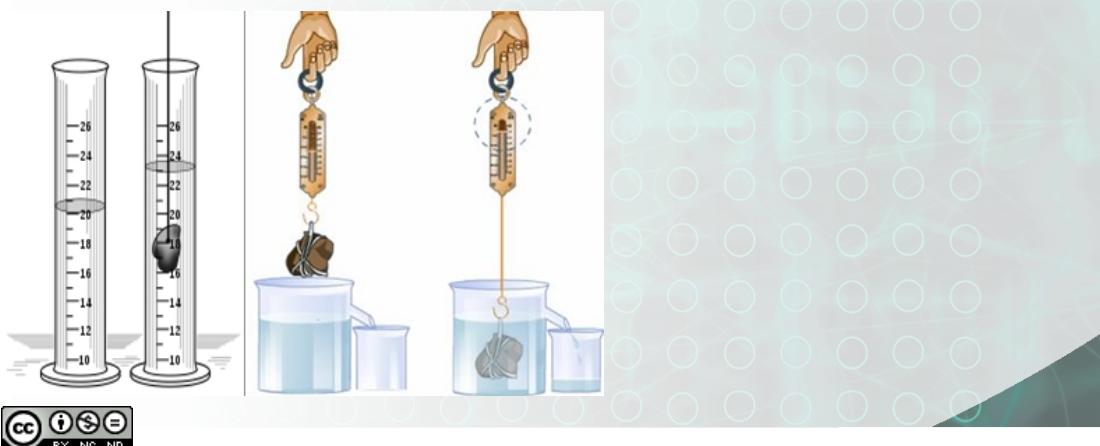
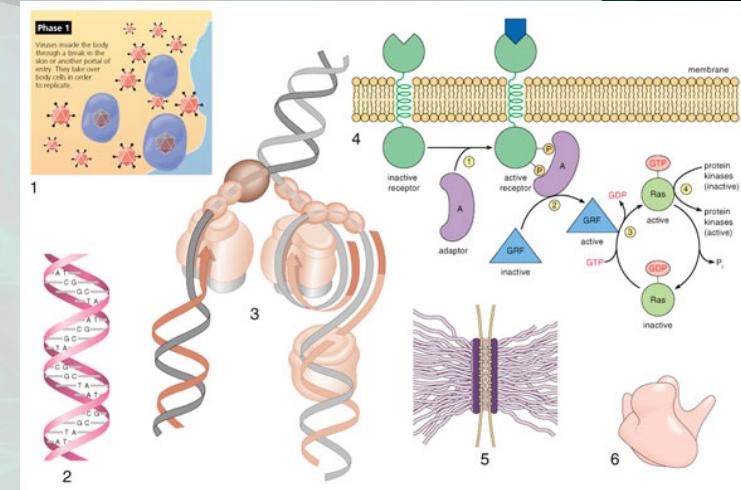
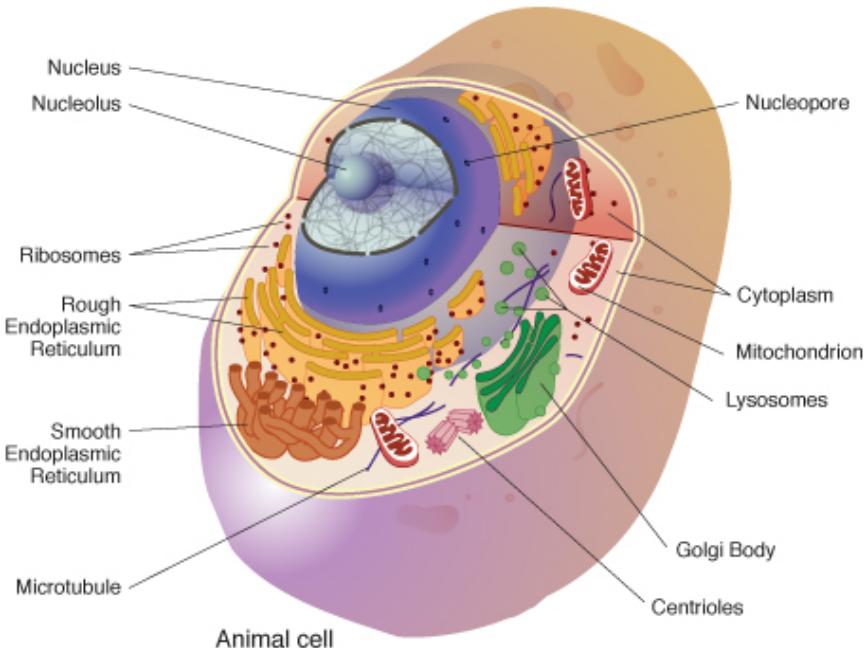
By R.D.Bergeron, 1993

D.M. Butler, J.C. Almond, R.D. Bergeron, K.W. Brodlie, R.B. Haber
„Visualization Reference Models”, Proc. Of the 4th Conf on Vis ,93, 1993

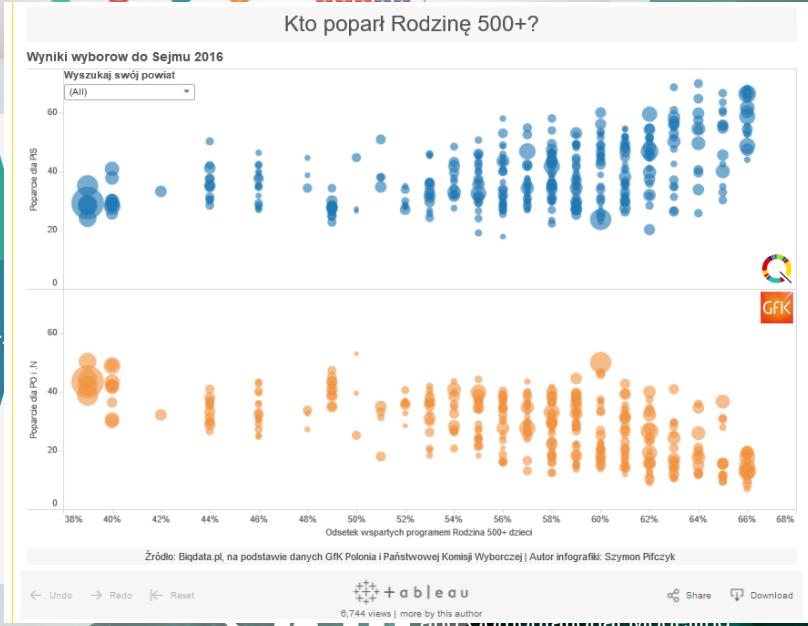
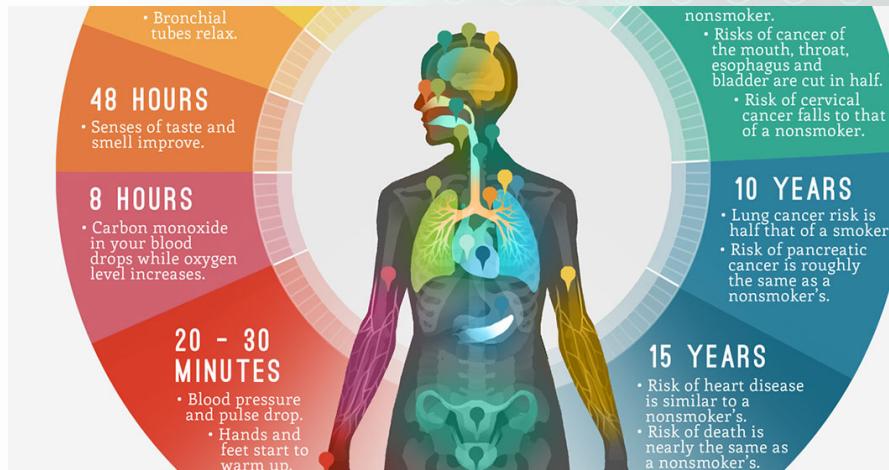
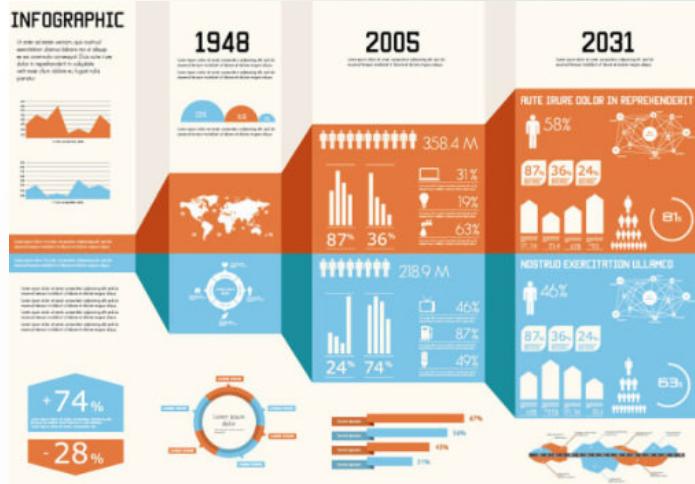


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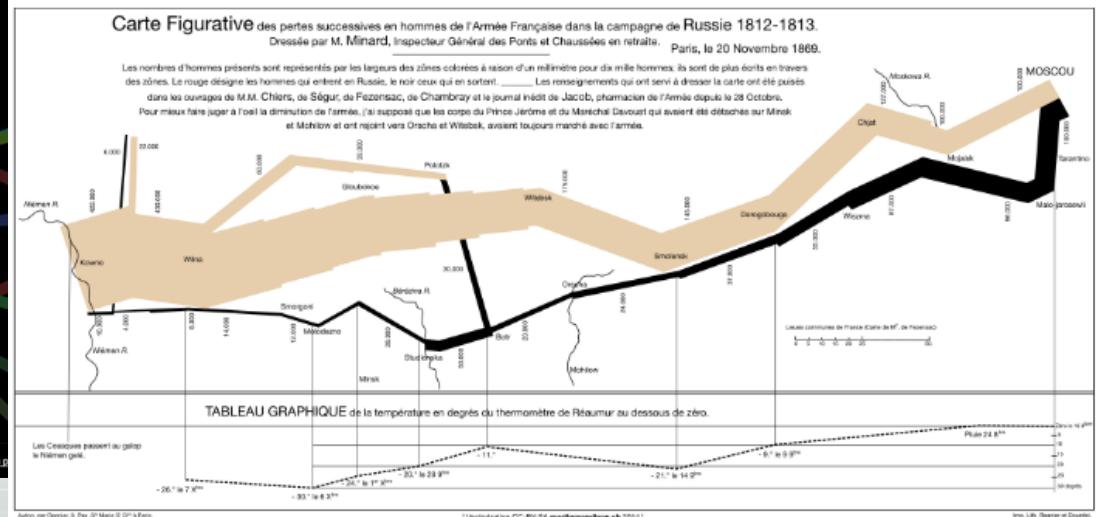
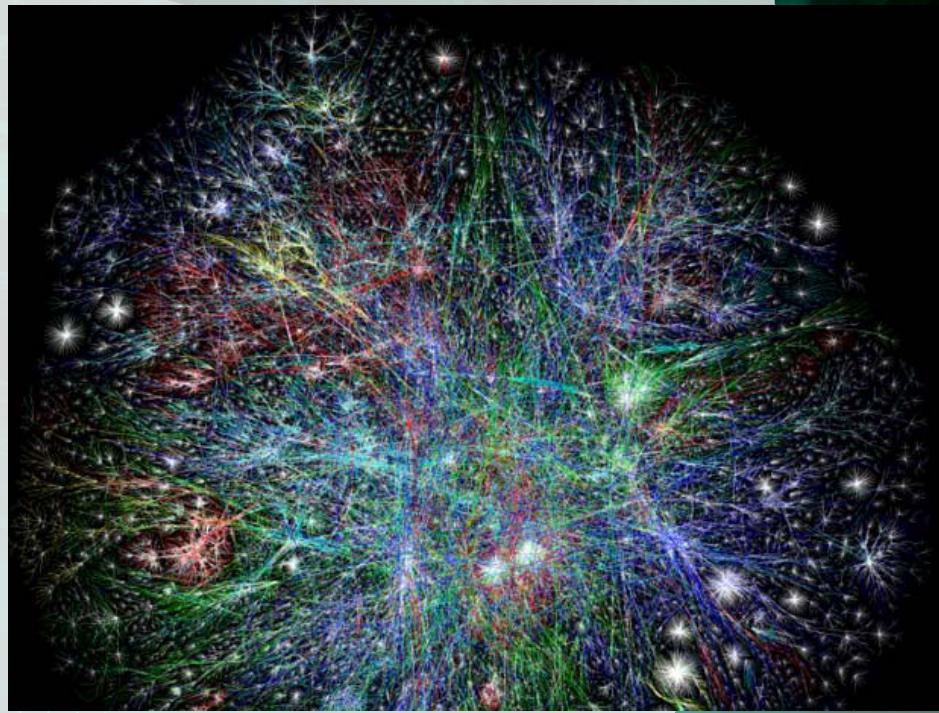
Illustrations



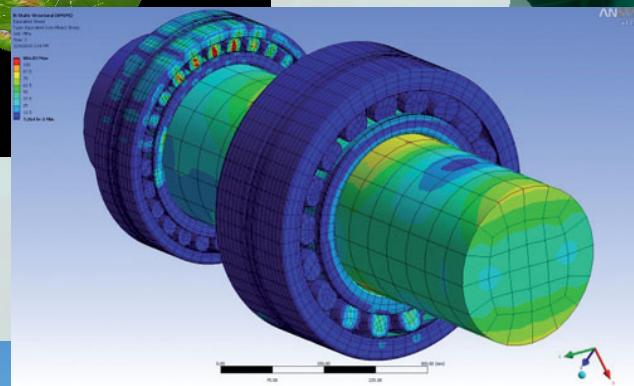
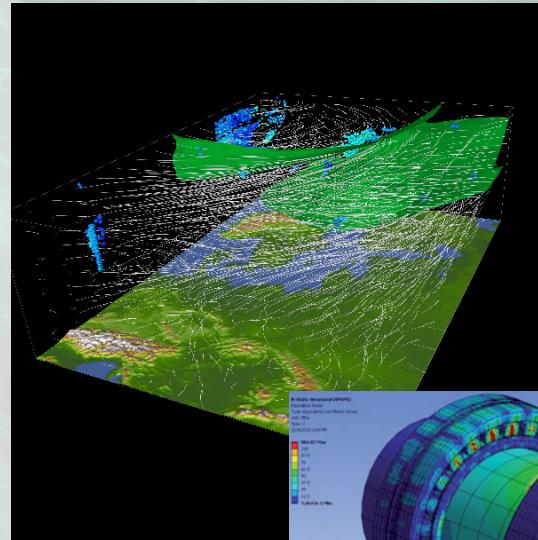
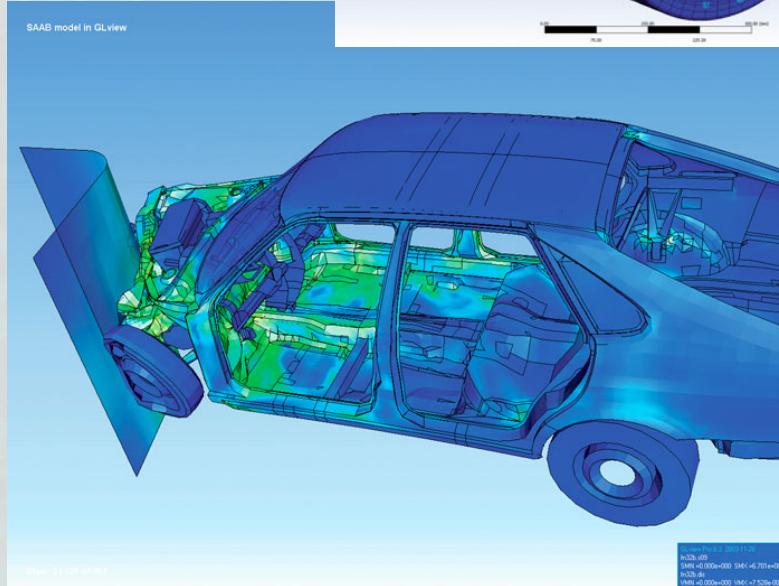
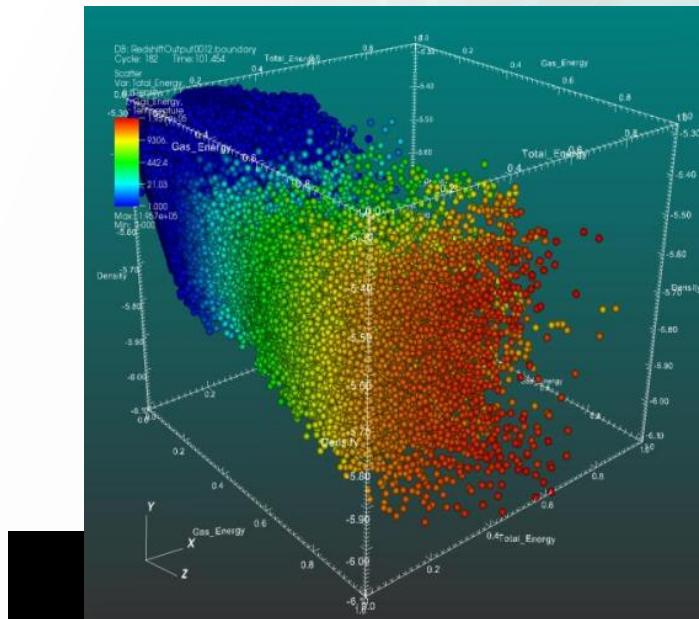
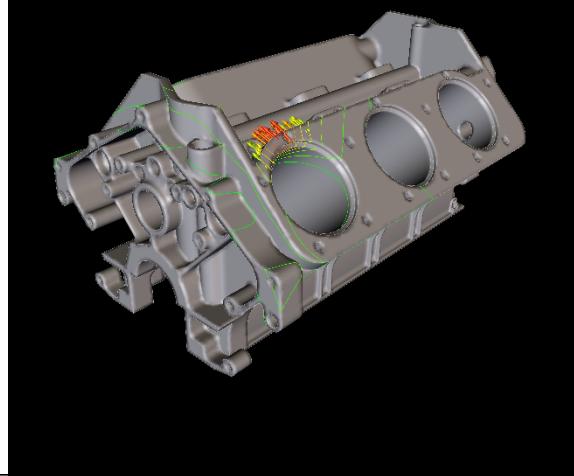
Infographics



InfoVis



SciVis



SAW
for Mathematical
Modelling

Divide and conquer

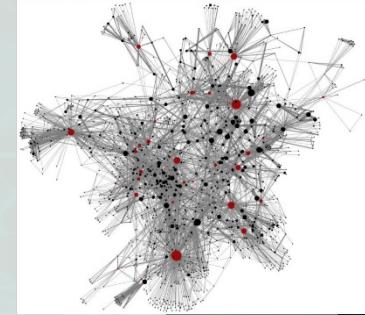
• Information Visualization

- Design and creation of visual representations and interactions where the spatial representation depends on creator
- Abstract data or set in abstract space



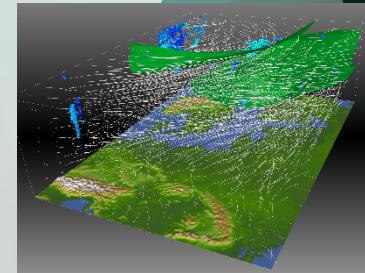
• Scientific Visualization

- Data from measurements or simulations
- Set usually in real space
- E.g. flow visualization, medical visualization



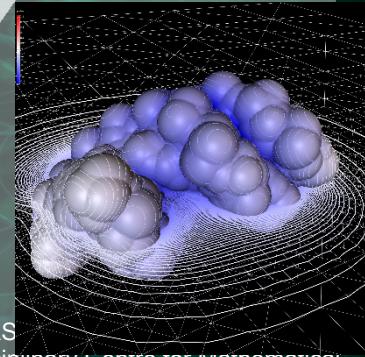
• Visual Analytics

- Reasoning by interactive visual techniques
- Focused in the interaction between user and visualization
- **Shows expected and reveals unexpected**



• Visual Modelling

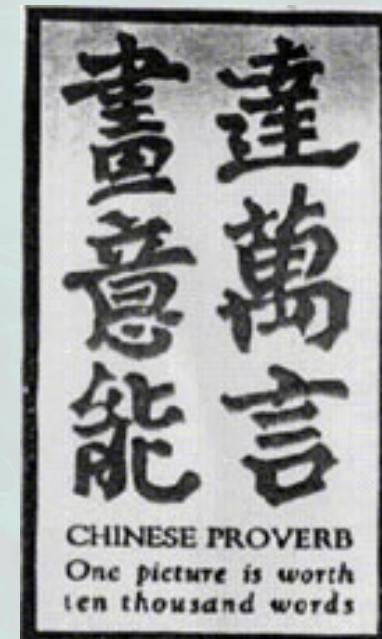
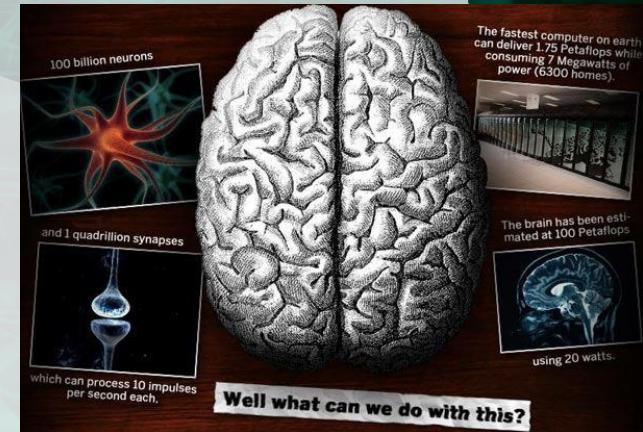
- Model creation based on visual techniques



Visual analytics in practice

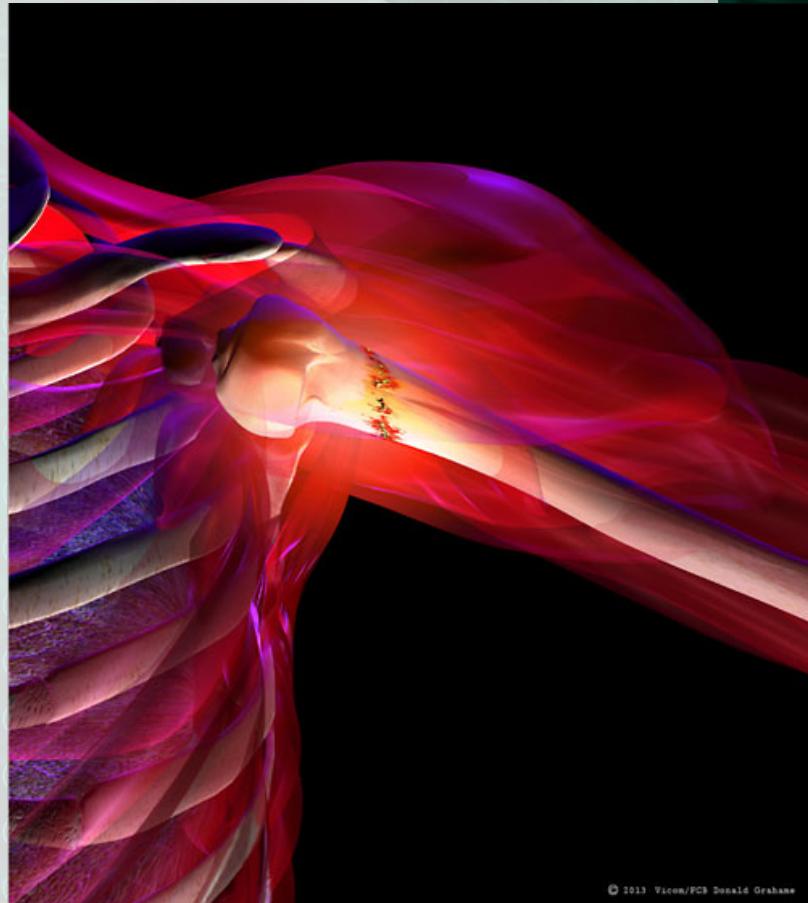
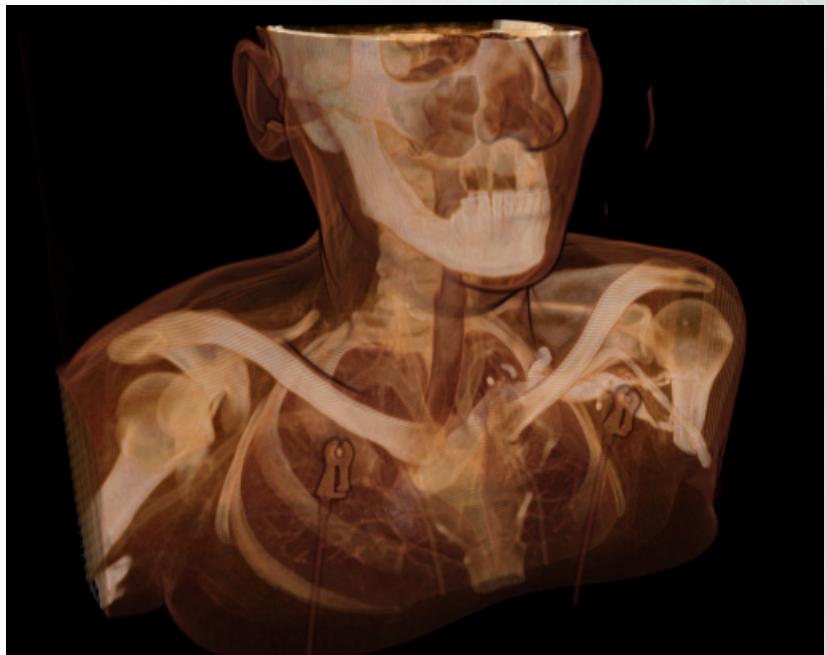
- Techniques for translating data to visual information
 - Algorithms and visualization tools
- Techniques for visual information presentation
 - Screens, VR/AR headsets, posters, etc.
- Human perception
 - High data transfer parallelism
- Visual information interpretation
 - Fast and „automatic” understanding of the whole image at once

„One image is worth a thousand words”



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Visualization vs. graphical design

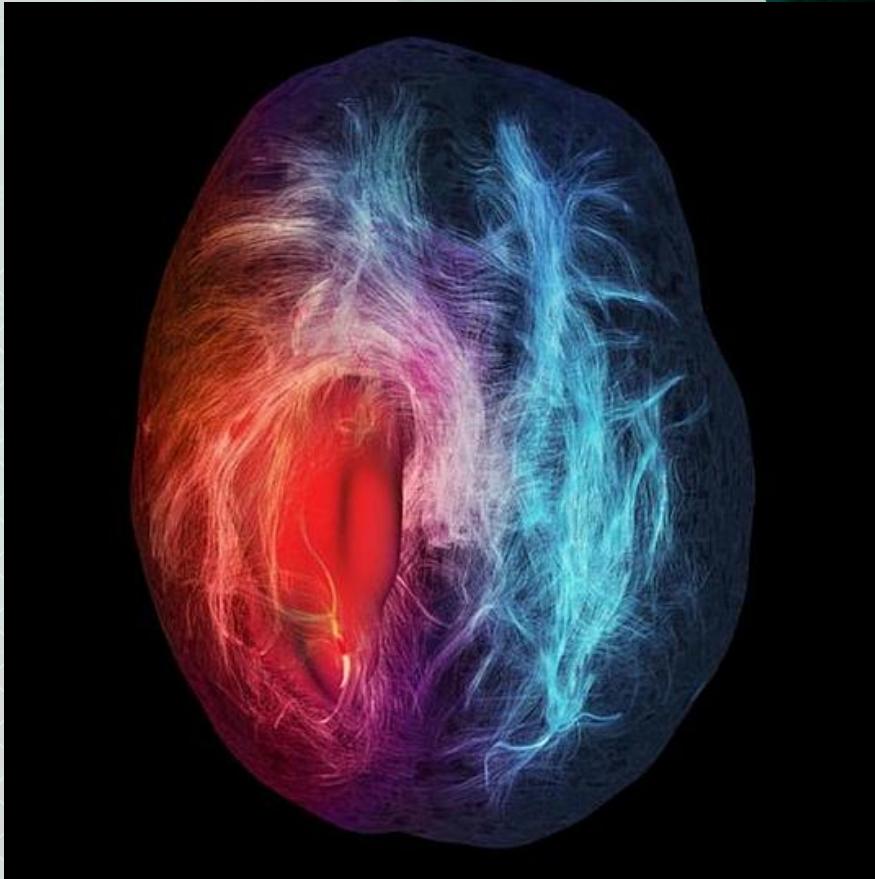
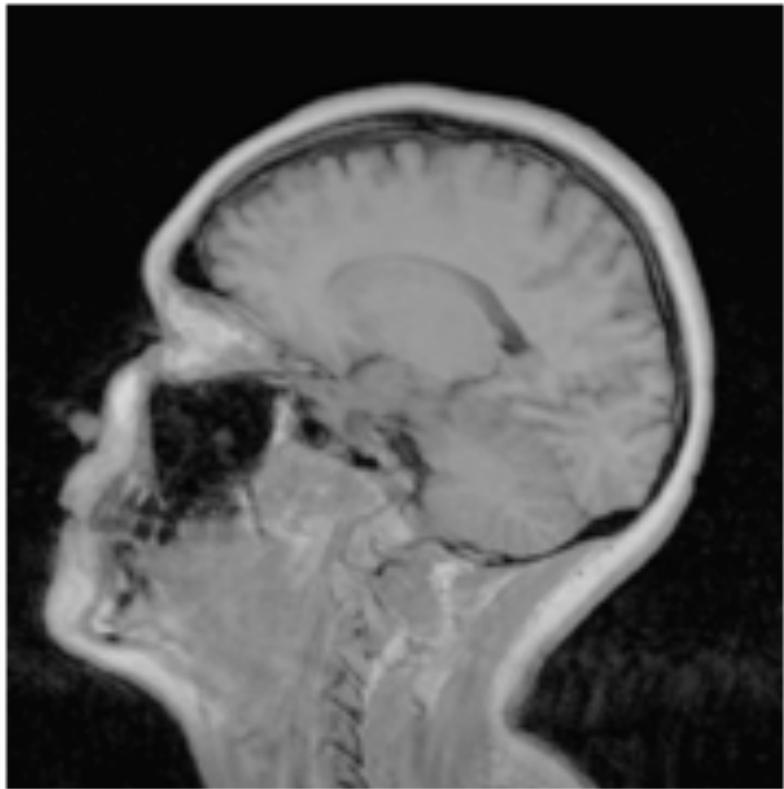


Source: <http://www.vectordiary.com/inspirations/30-inspiring-medical-illustrations/>



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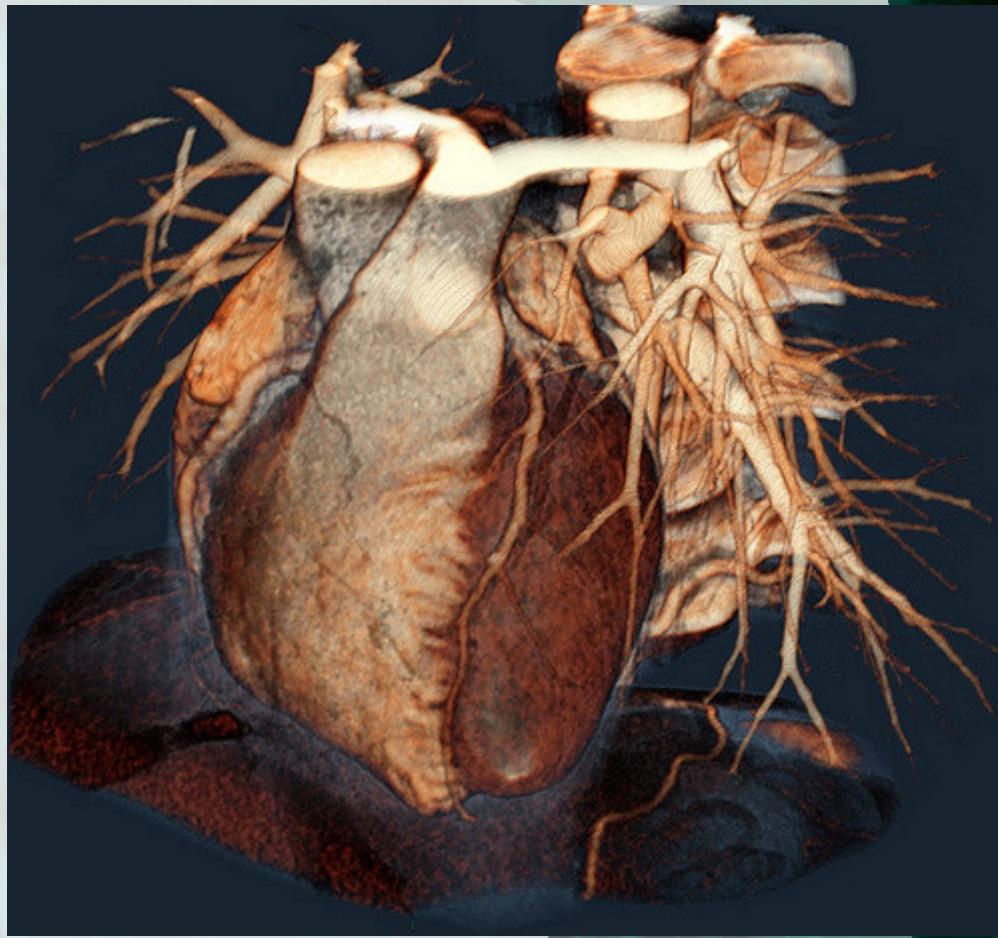
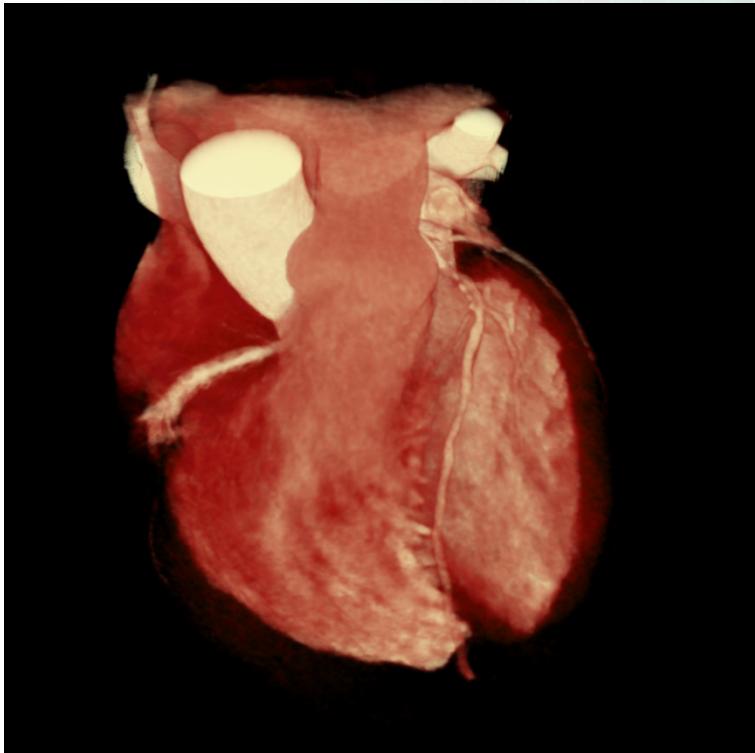
Source: <http://www.penccil.com/museum.php>



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Visualization vs. graphical design



Source: <https://www.flickr.com/photos/voxel123>

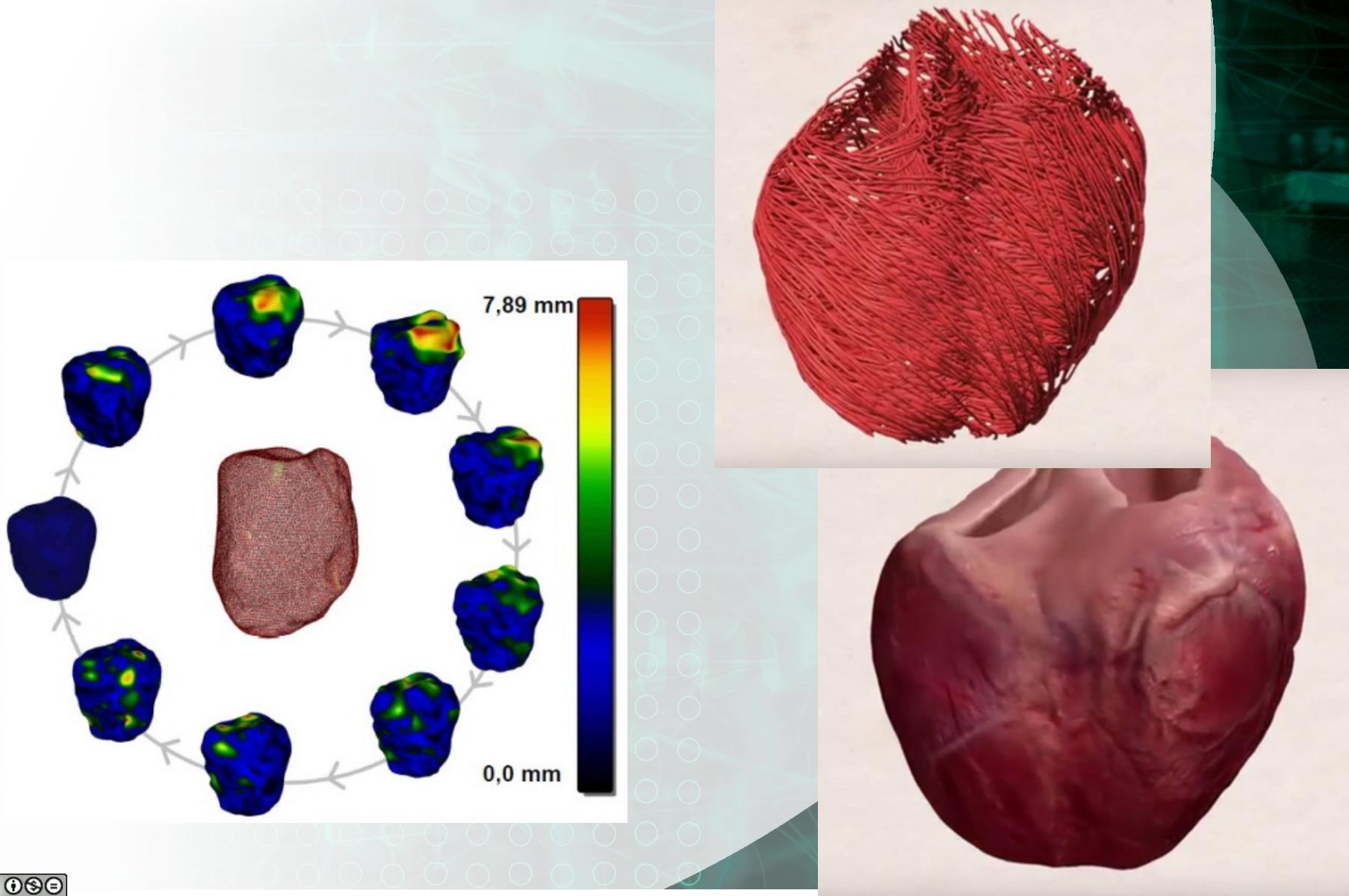


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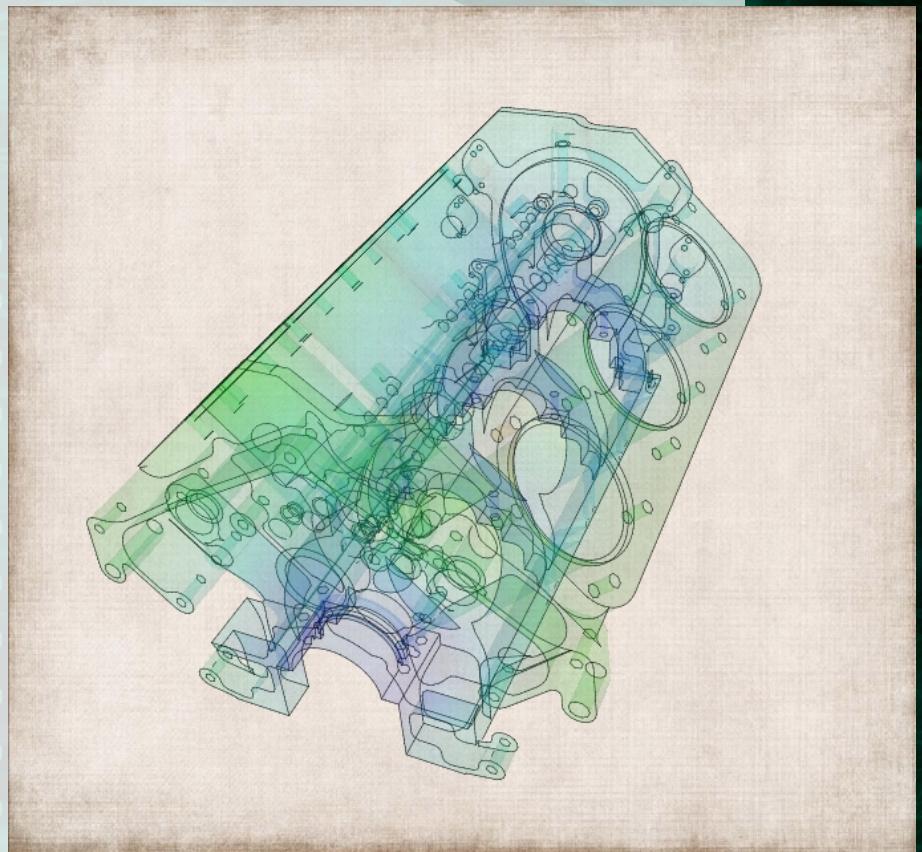
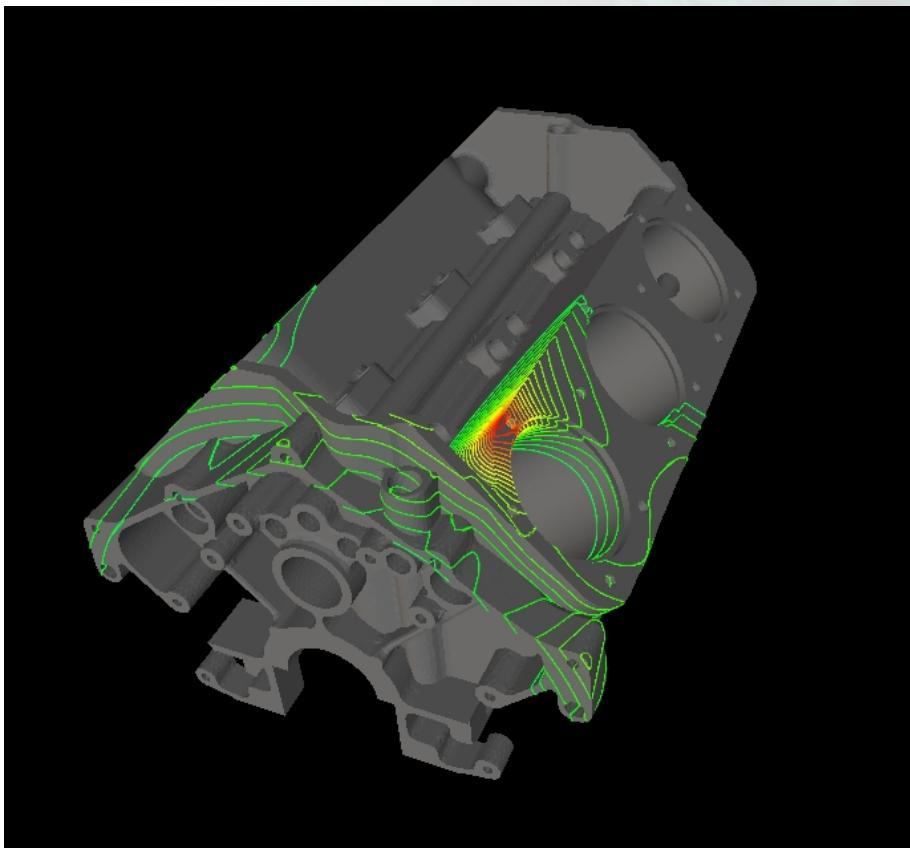


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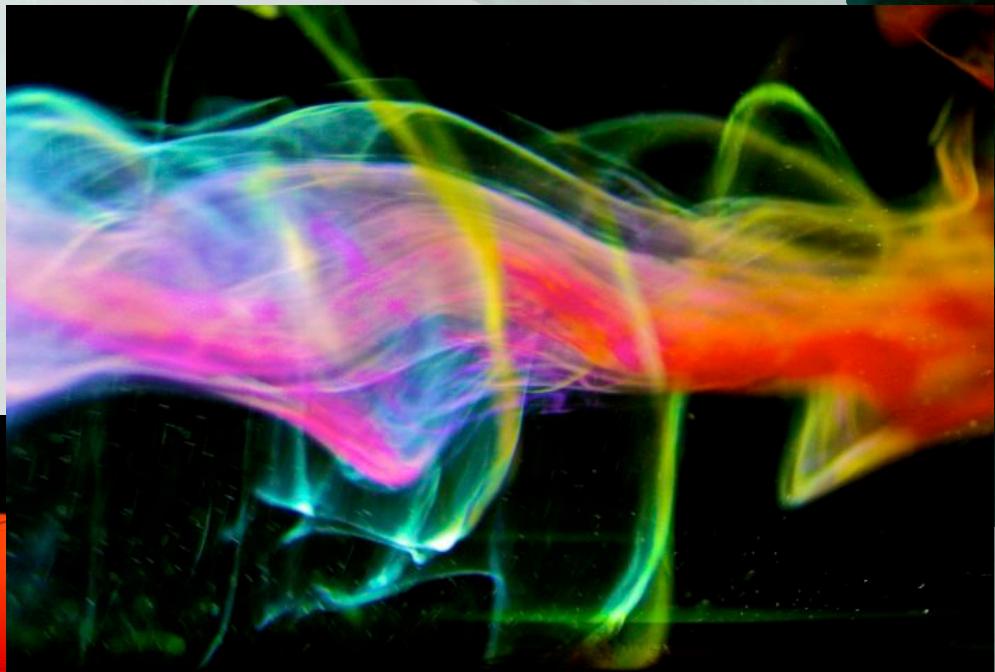
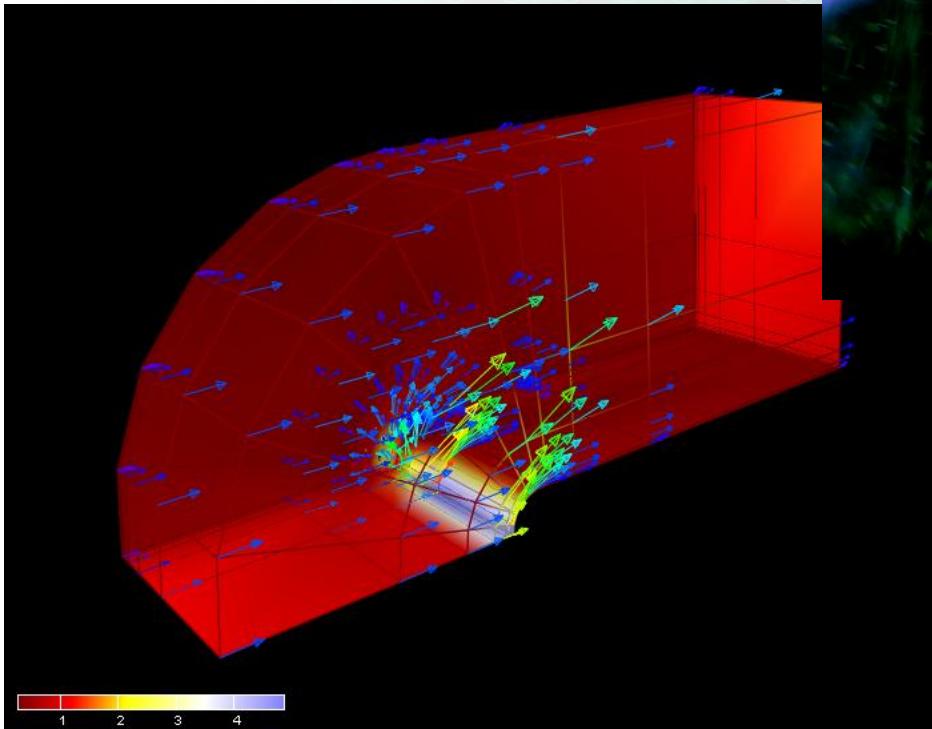
Source: <https://www.bsc.es/computer-applications/alya-red-ccm>



Visualization vs. graphical design



Visualization vs. graphical design

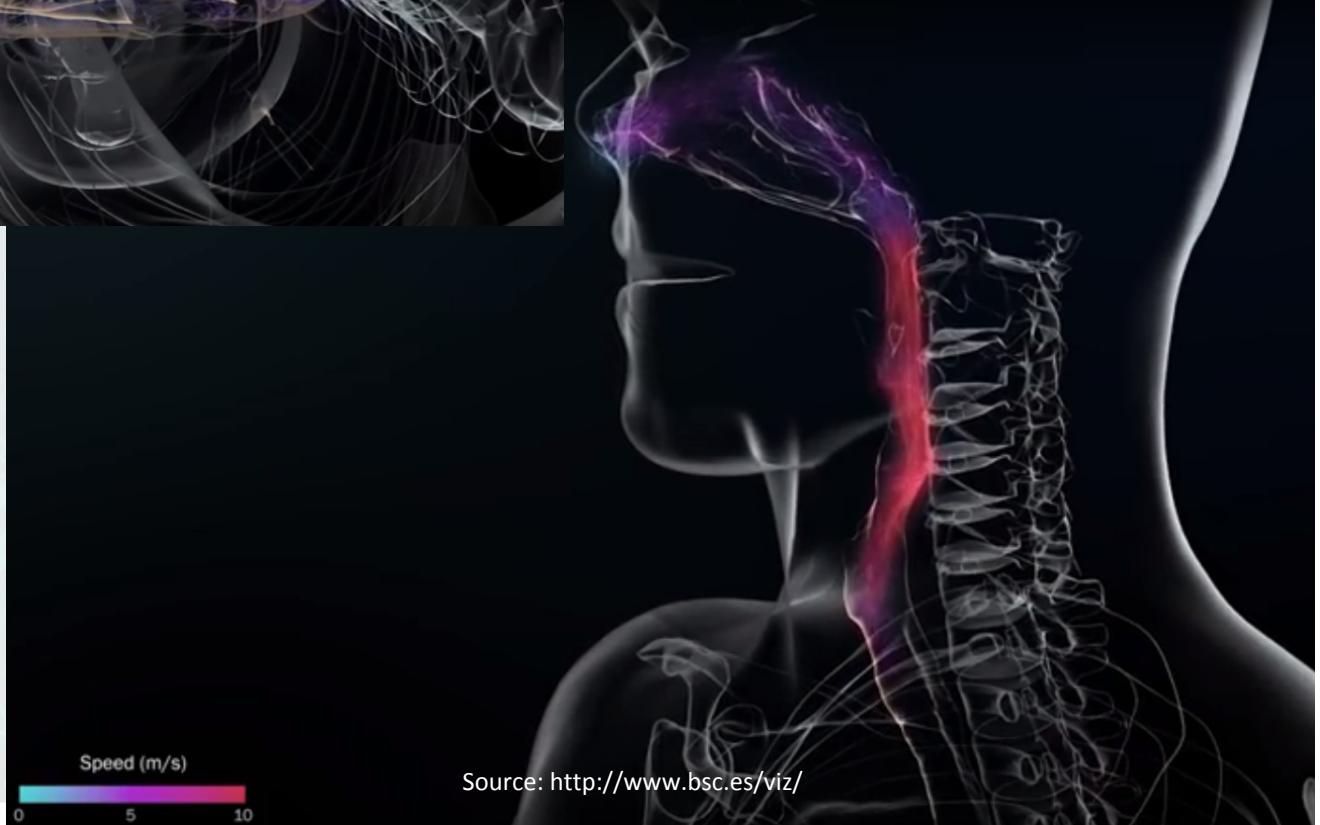


Source: <https://blog.pointwise.com>



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Visualization vs. graphical design



Source: <http://www.bsc.es/viz/>

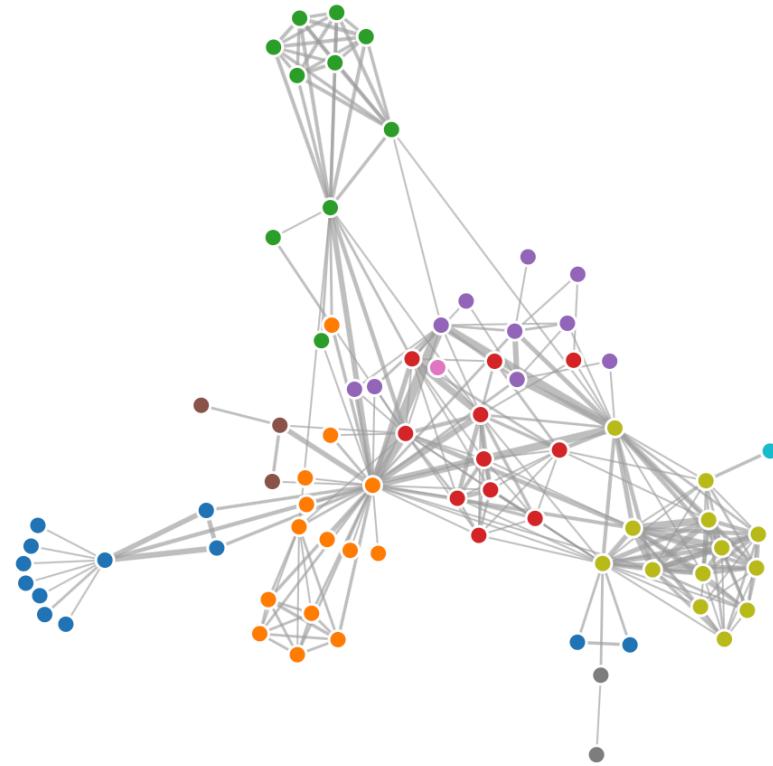
Graphs visualization

- **Graph**
 - Nodes
 - + Edges
 - = Structure
- **Problems**
 - Graph creation: What is a node? What is an edge?
 - No spatial placement (no geometry)
 - Visual representation – of nodes, of edges (colors, etc.)
- **InfoVIs + Visual analytics**
 - Abstract space
 - User creates visual form
 - Focus on interaction
 - The visual form and interaction are tools for exploration



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Graphs visualization – examples

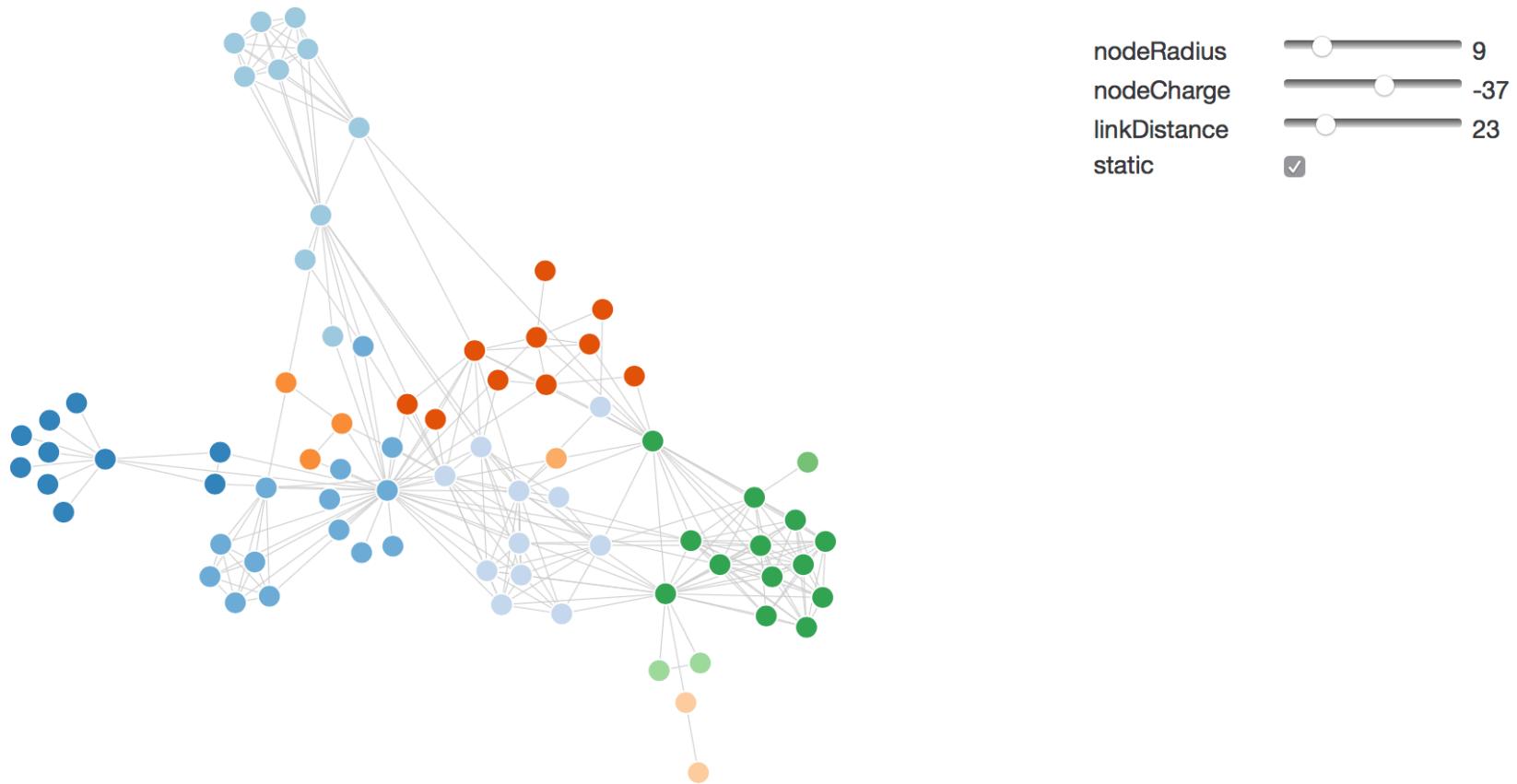


D3.js



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Graphs visualization – examples



Vega



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Graphs visualization – examples

Search Info Help ≡

Tagging Scientific Publications using Wikipedia and Natural Language Processing Tools. Comparison on the ArXiv Dataset

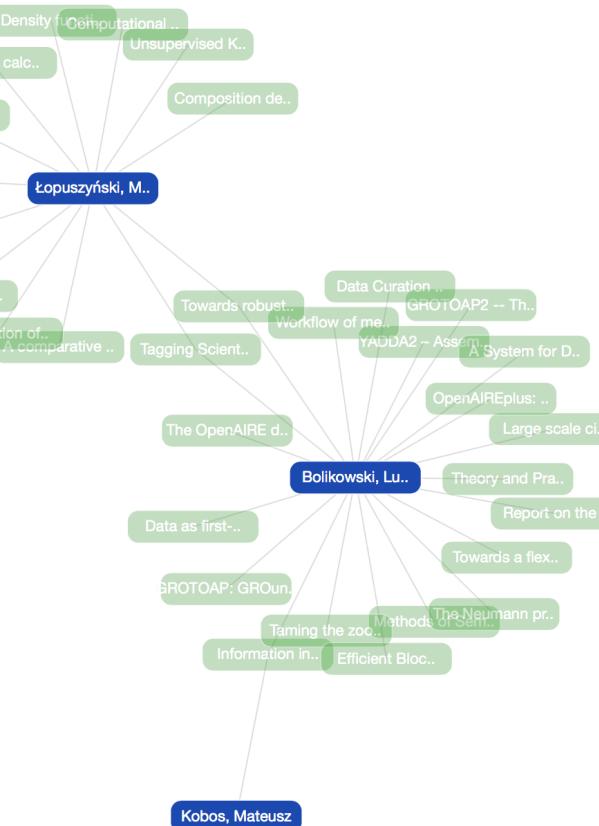
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2013-02-01T00:00:55.634Z

Subject:
COMPUTER SCIENCE - DIGITAL LIBRARIES, COMPUTER SCIENCE - COMPUTATION AND LANGUAGE

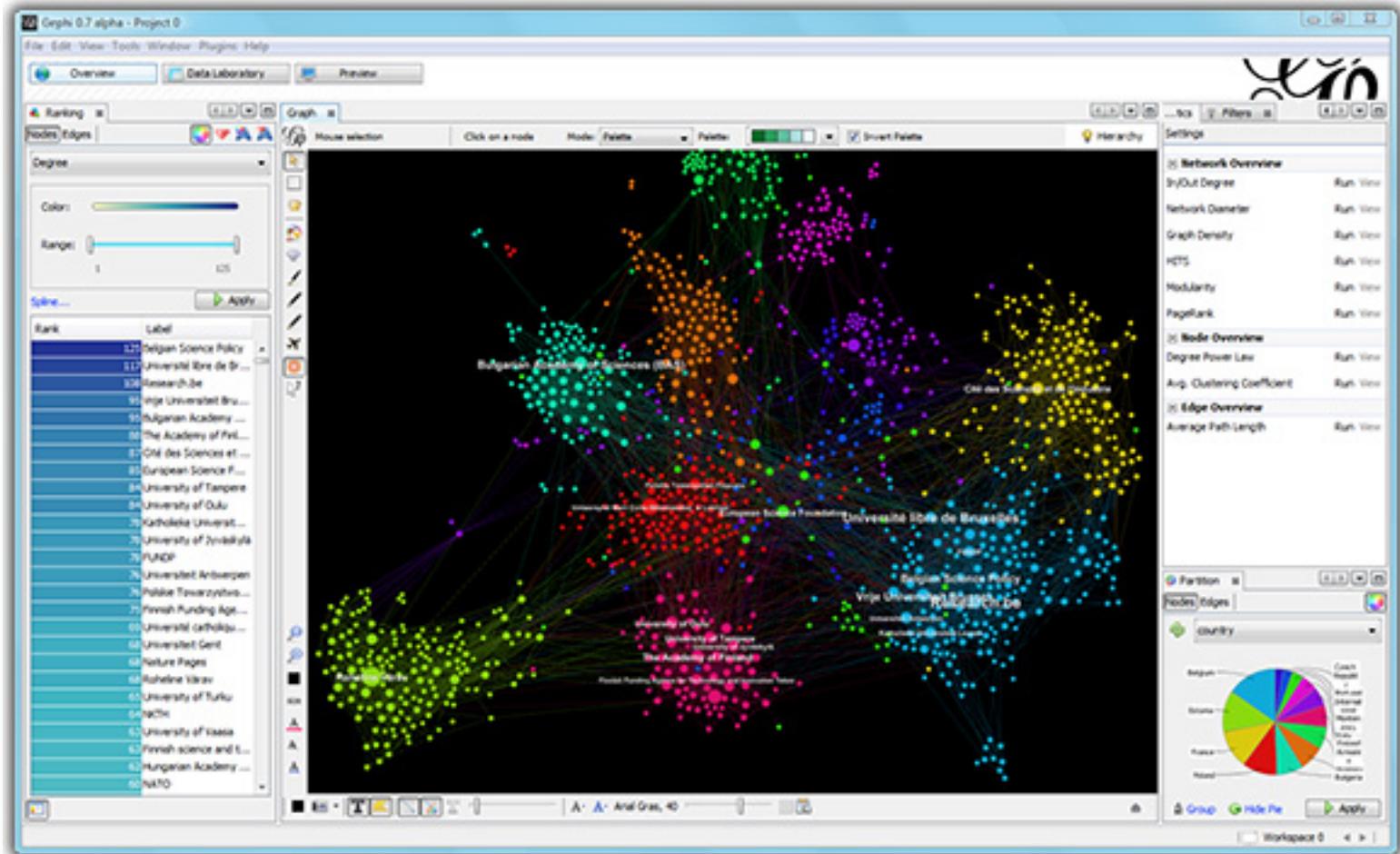
DOI:
10.1007/978-3-319-08425-1_3

Abstract:
In this work, we compare two simple methods of tagging scientific publications with labels reflecting their content. As a first source of labels Wikipedia is employed, second label set is constructed from the noun phrases occurring in the analyzed corpus. We examine the statistical properties and the effectiveness of both approaches on the dataset consisting of abstracts from 0.7 million of scientific documents deposited in the ArXiv preprint collection. We believe that obtained tags can be later on applied as useful document features in various machine learning tasks (document similarity, clustering, topic modelling, etc.).

COMAC Navigator



Graphs visualization – examples

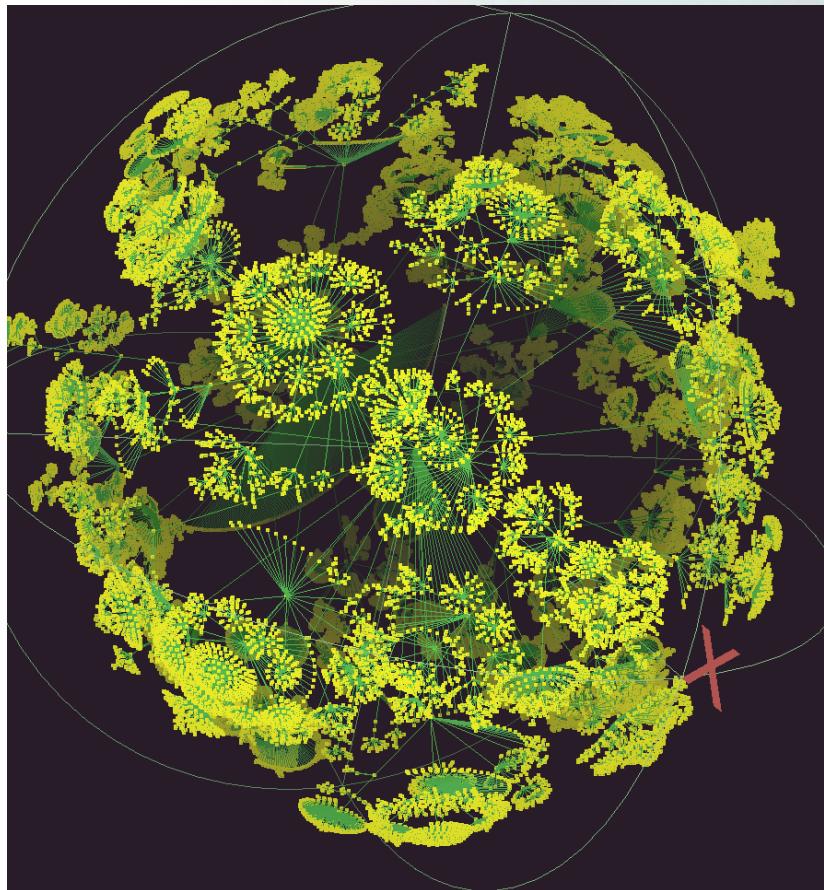


Gephi

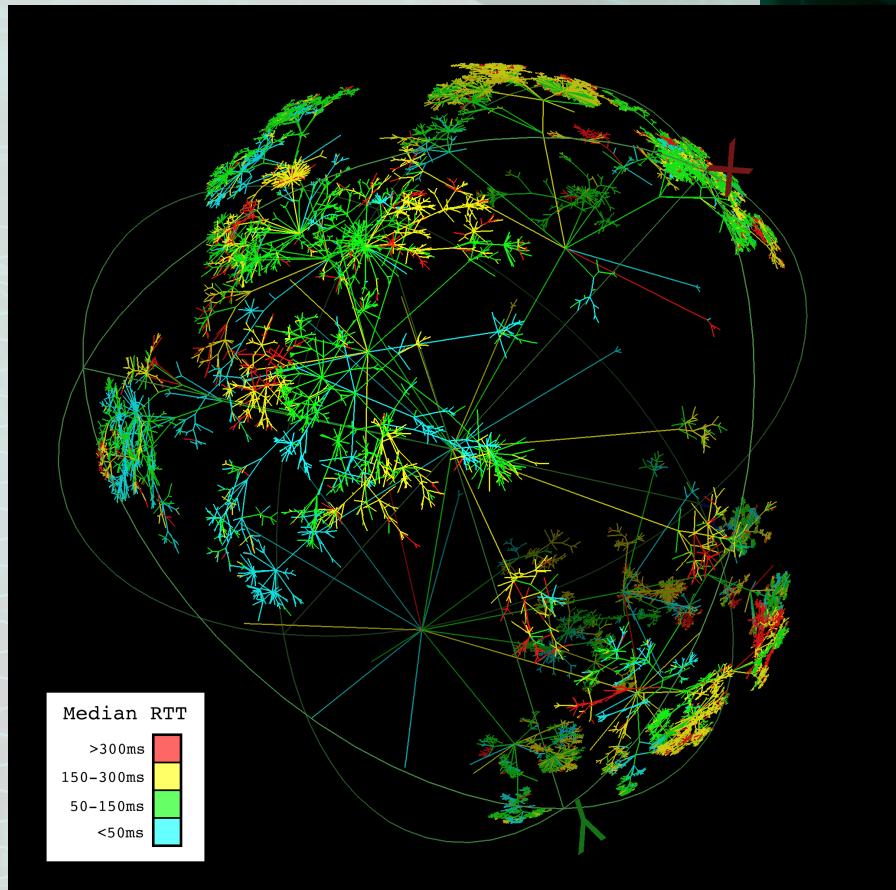


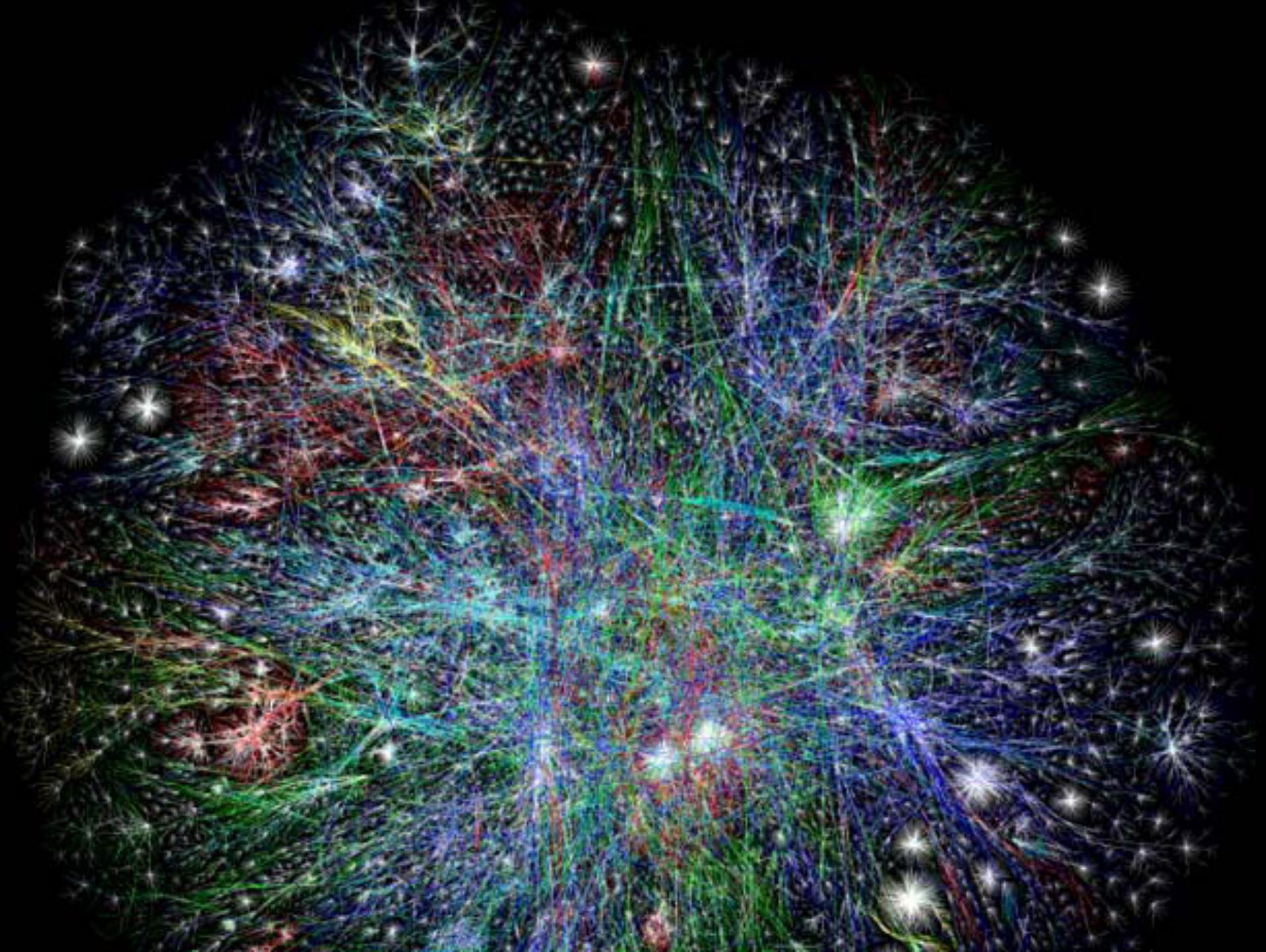
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Graphs visualization – examples



Walrus





Thank you!

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