

Visualization II

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& others

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Lecture 1 – Introduction

What to expect?

- Successor of PV251 – Visualization course
 - We are expecting that you know the basic principles of visualizations 😊
- **Visualization II** more focused on research in visualizations

What to expect?

- Lectures about diverse research fields and topics in visualization
 - Medical visualization, molecular visualization, visual data science, web-based scalable visualization, visualization & machine learning, ...
- Many invited speakers
 - TU Wien
 - Institute of Scientific Instruments of the Czech Academy of Sciences
 - MU

What is expected from you?

- To attend and enjoy 😊
- Attend **seminars**
 - Select a topic of interest (from the given list) and work on your project for the whole semester
 - You can work individually or in groups
 - Each seminar, there will be a task for you and homework
 - Each task will be “awarded” by points. Based on these, you will get the final grade for the course.

Motivation

- TED talk of David McCandless: Introduction to Data Visualization

<https://libguides.lib.fit.edu/c.php?g=863116&p=6188479>

- Hans Rosling: GapMinder

<https://www.youtube.com/watch?v=jbkSRLYSojo&list=PLXLYorBS4uI9-1C6SValv-10710nrOvN9>

Three main fields in visualization

- Scientific visualization (SciVis)
- Information visualization (InfoVis)
- Visual analytics (VAST = Visual Analytics Science and Technology)

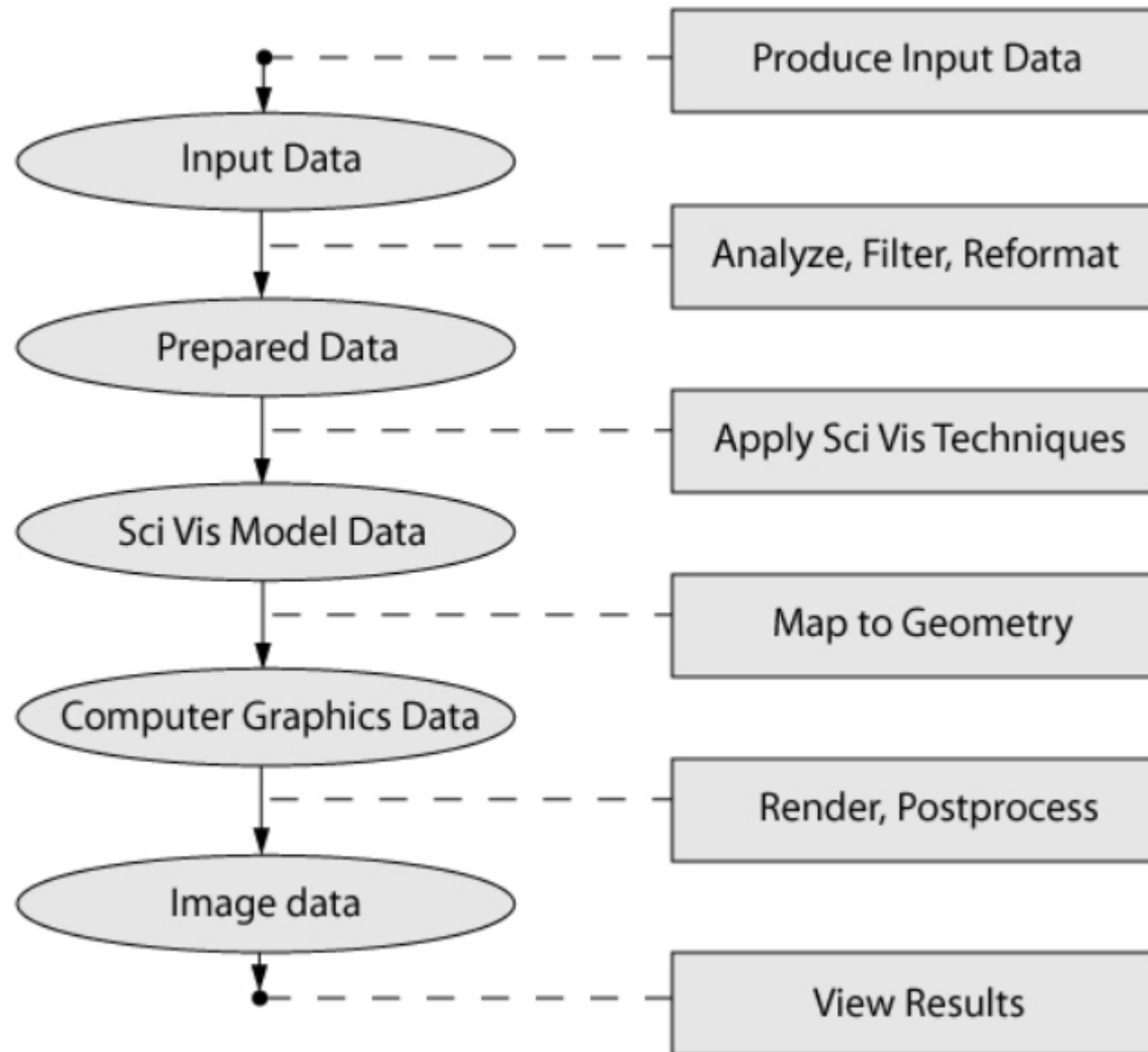
Scientific Visualization

- Producing graphics representations of scientific phenomena
- Graphic representation is used for understanding, interpretation. It may guide the direction of the research in the corresponding field.

Scientific Visualization – Areas

- Many fields:
 - Medical visualization
 - Molecular visualization
 - Flow visualization
 - Volumetric visualization
 - ...

Scientific Visualization Pipeline



What is the core topic ...

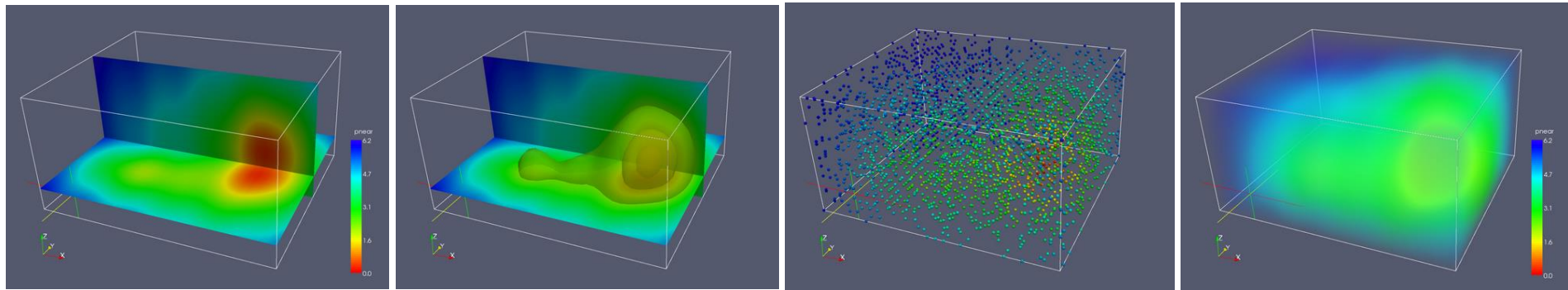
- The focus of the pipeline is the application of SciVis techniques to create a renderable geometric model of the data

Data Representation in SciVis

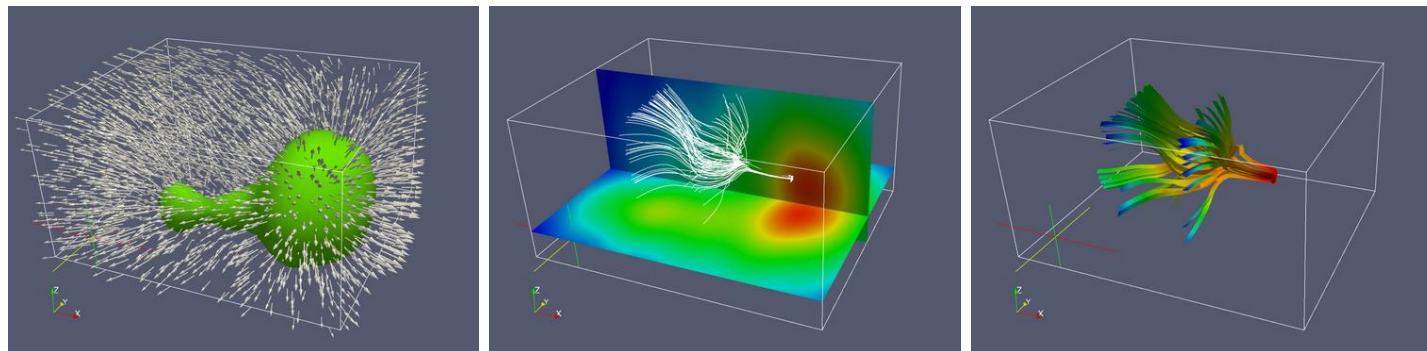
- The studied phenomenon is usually modelled by measurements at a discrete set of points in space
 - Representational samples of the underlying mathematical function governing that phenomenon
 - Mesh or topology associated with the data
 - Explicit or implicit definition of points

SciVis Techniques

- Spatial phenomena
 - Scalar data – slice planes, isosurfaces, glyphs, volumes



- Vector data – hedgehog, streaklines, ribbons



SciVis Software Packages

Tool	Produce Input Data	Analyze, Filter, Reformat	Apply Sci Vis Techniques	Map to Geometry	Render	Postprocess	View Results
Experiments, Simulations	Y						
Custom code	x	x	x	x	x	x	x
MATLAB	x	Y	x	x	x		x
IDL	x	Y	x	x	x		x
VTK		x	Y	x	x		x
Paraview		x	Y	x	x		x
OpenGL					Y		x
Open Scene Graph					Y		x
Maya					Y		x
Photoshop						Y	x
Gimp						Y	x
Imagemagick						Y	x
Premier						Y	x
Journals, web browsers, Projectors							Y

<http://www.bu.edu/tech/support/research/training-consulting/online-tutorials/introduction-to-scientific-visualization-tutorial/software-packages/>

Other Resources

- Anders Ynnerman: OpenSpace – Visualizing the Universe
 - <https://vimeo.com/169967499>
- Anders Ynnerman et al.: Interactive visualization of 3D scanned mummies at public venues
 - <https://dl.acm.org/doi/10.1145/2950040>

Information Visualization

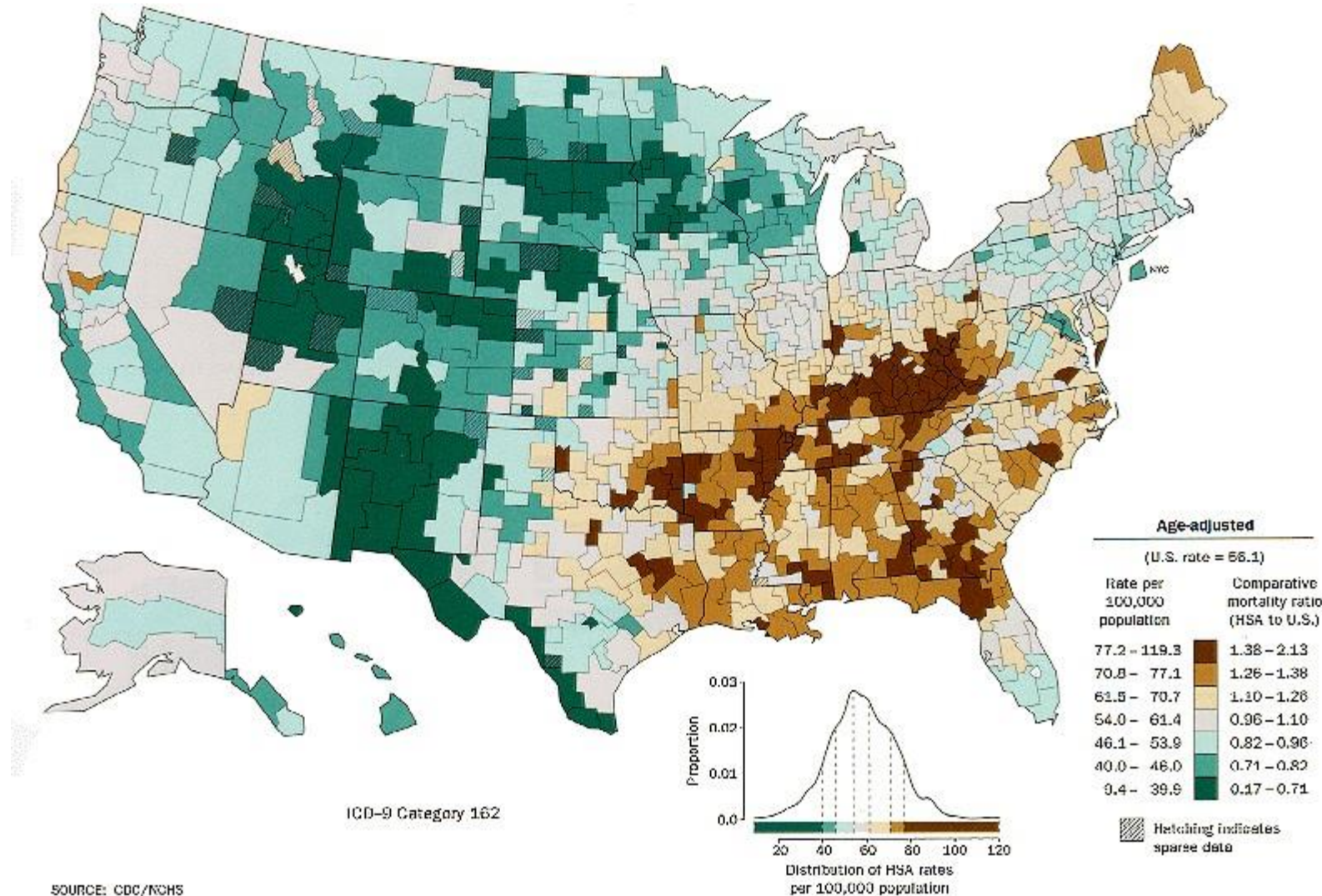
- Main focus on representing data in an easily understandable way, supported by intuitive interaction
- The most common uses of InfoVis are:
 - Presentation
 - Explorative analysis
 - Confirmation analysis

Presentation

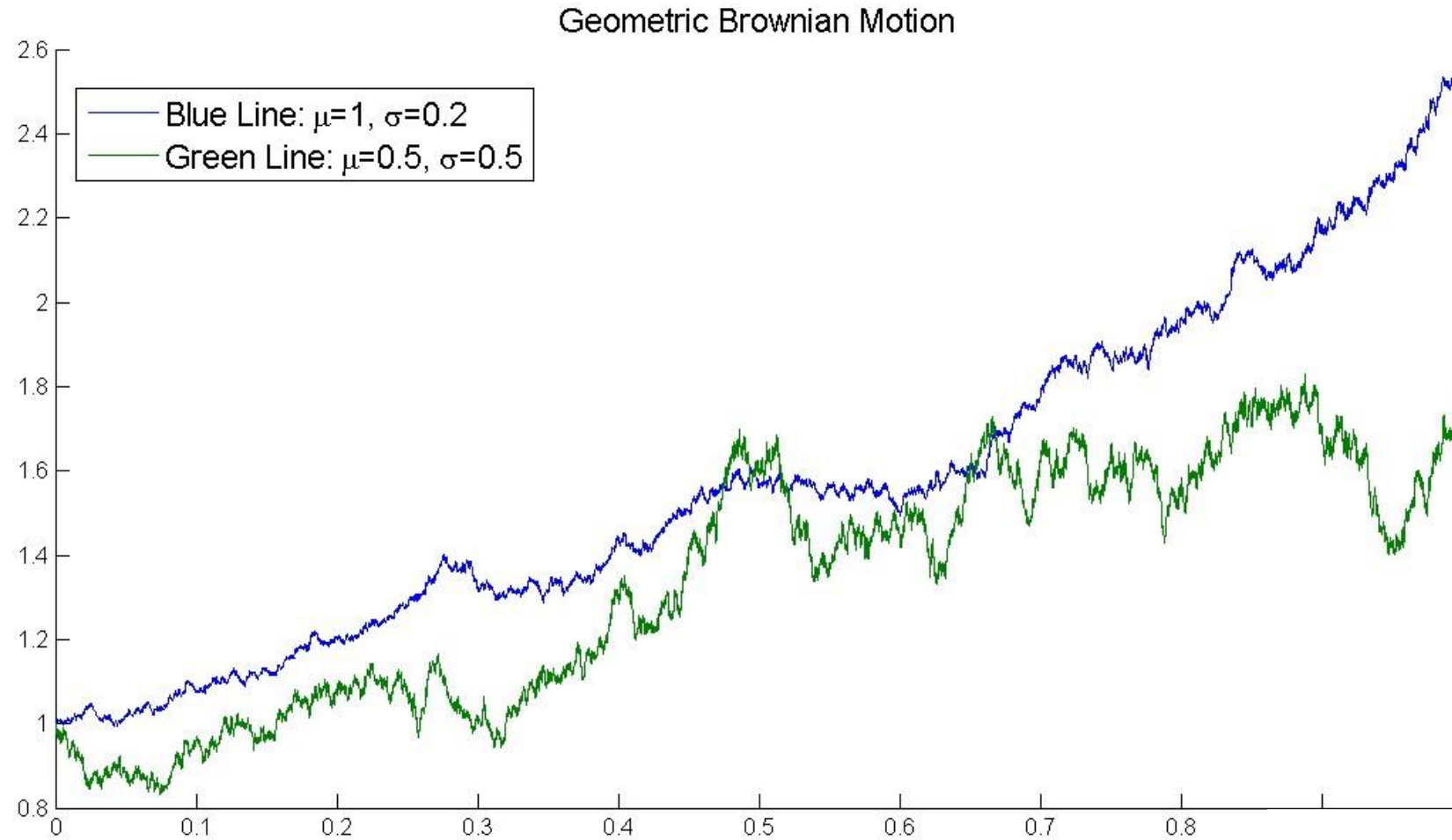
- For understanding



Explorative Analysis



Confirmation Analysis

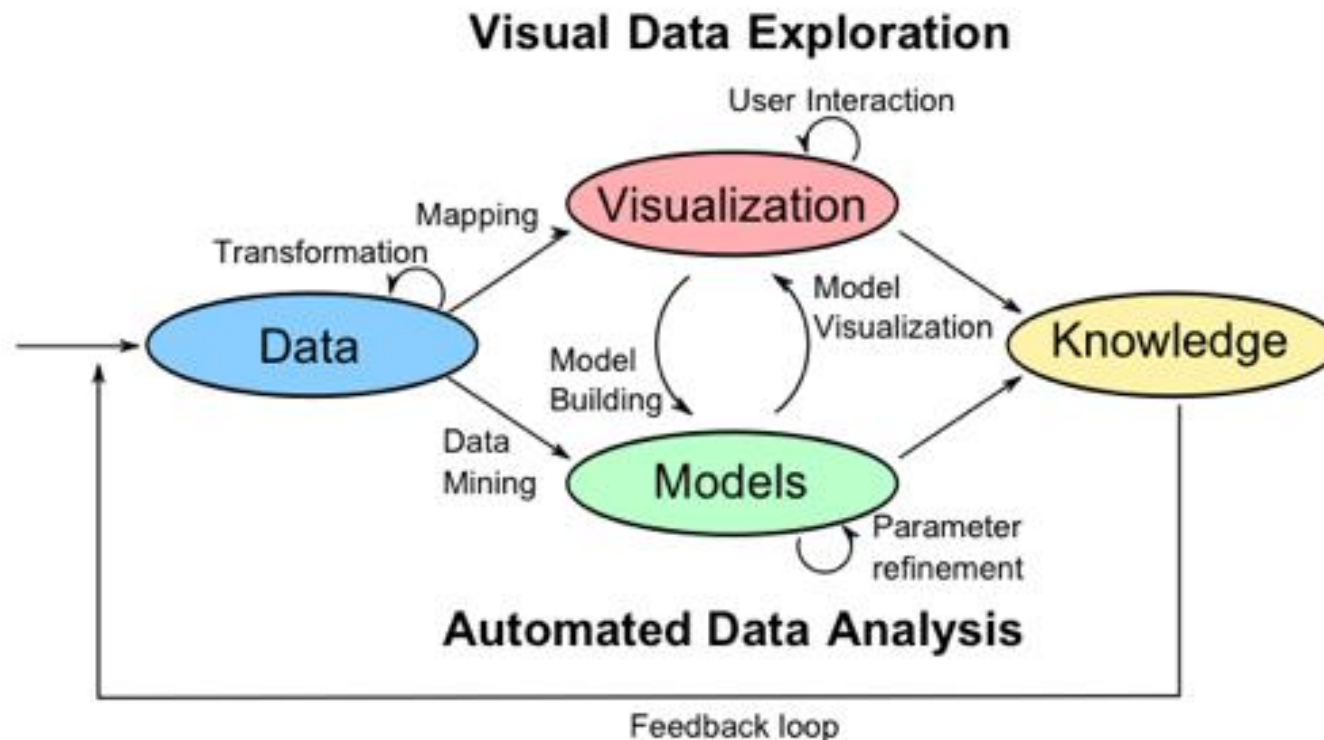


Other Resources

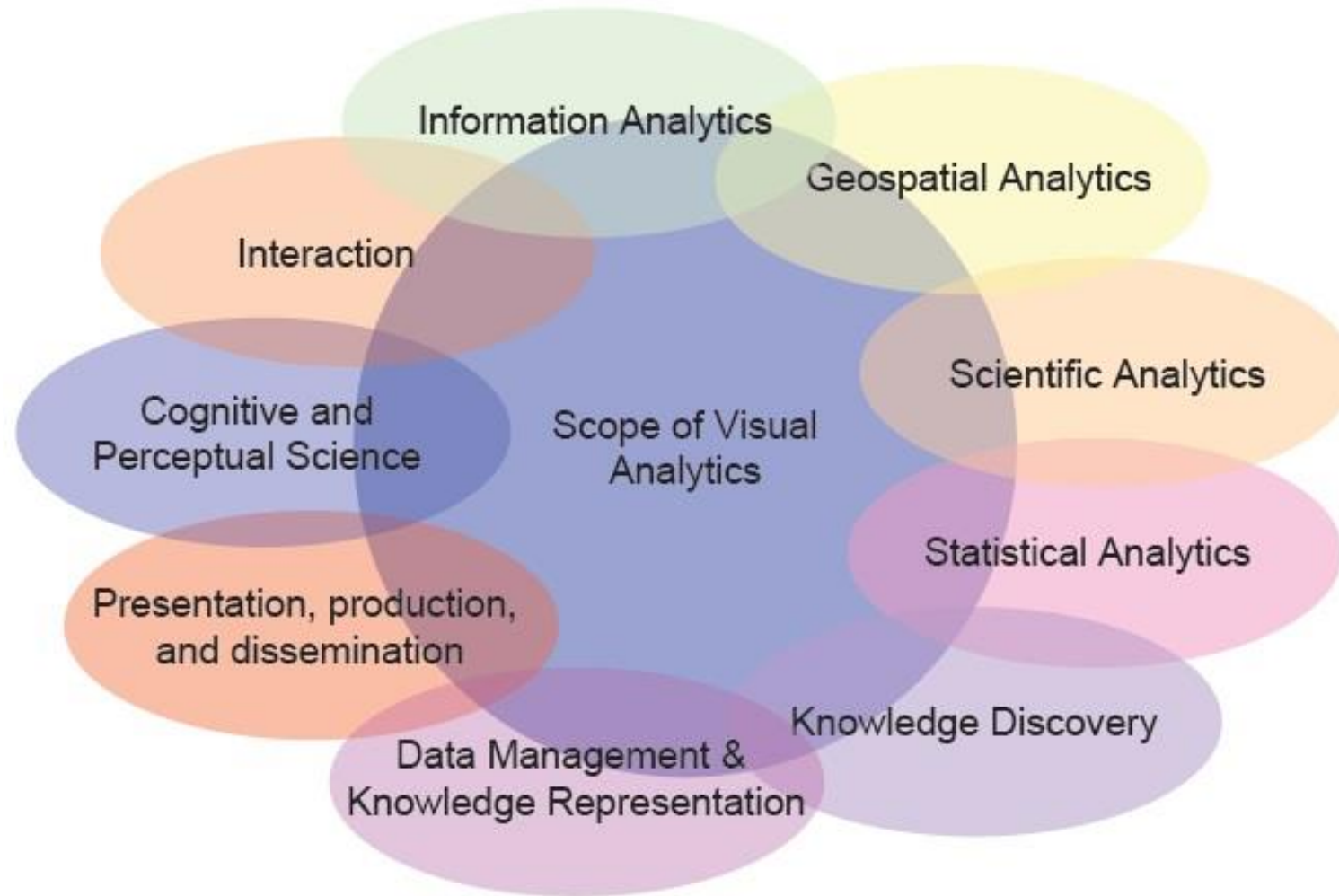
- <https://informationisbeautiful.net/>
- <https://informationisbeautiful.net/visualizations/what-makes-a-good-data-visualization/>
- Jeffrey Heer: <https://www.youtube.com/watch?v=hsfWtPH2kDg>
- Ben Shneiderman: <https://www.youtube.com/watch?v=X1EPxT9EP5c>

VAST

- Analytical reasoning supported by interactive visual interfaces
- Designing advanced visual interfaces

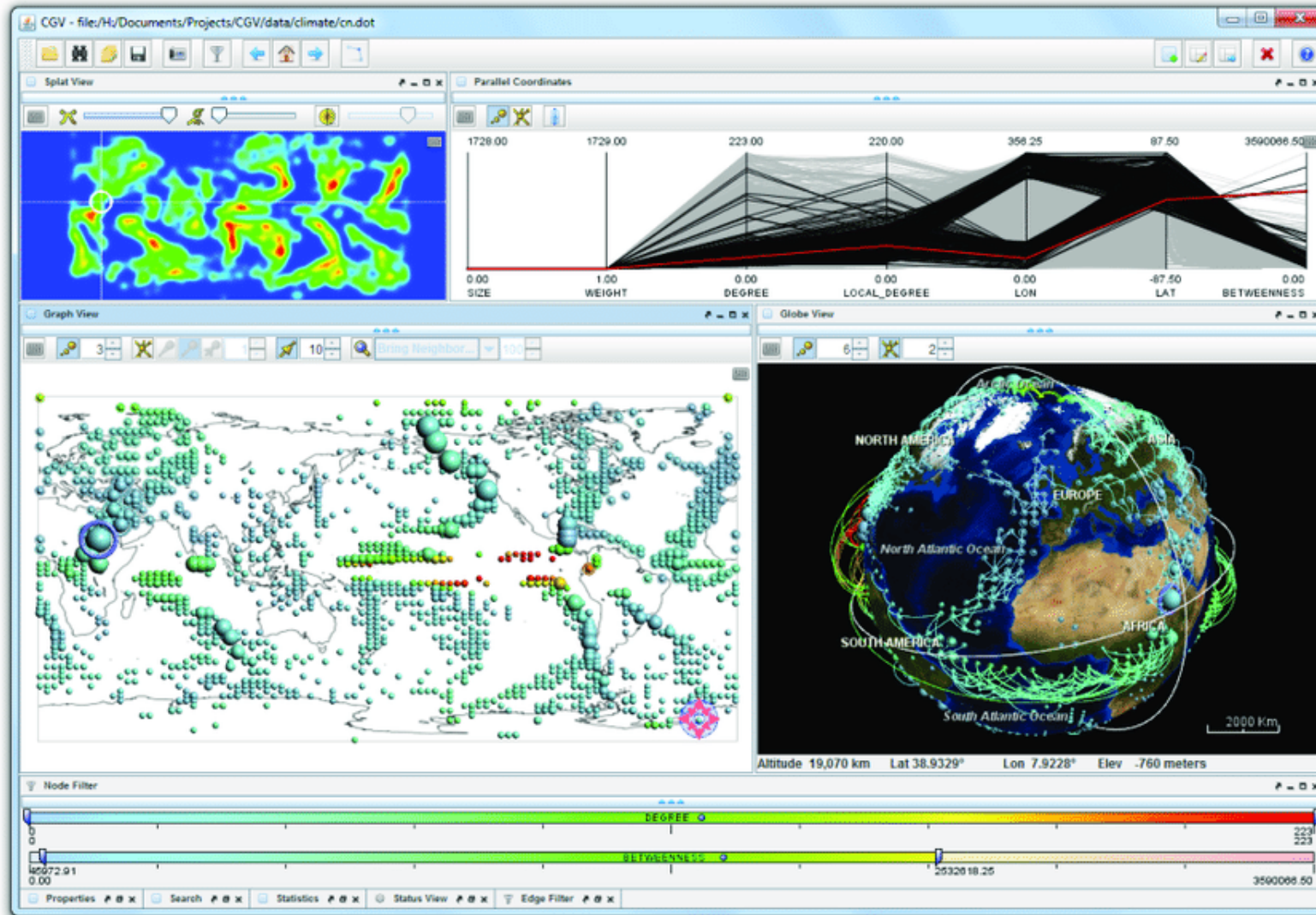


VAST Scope



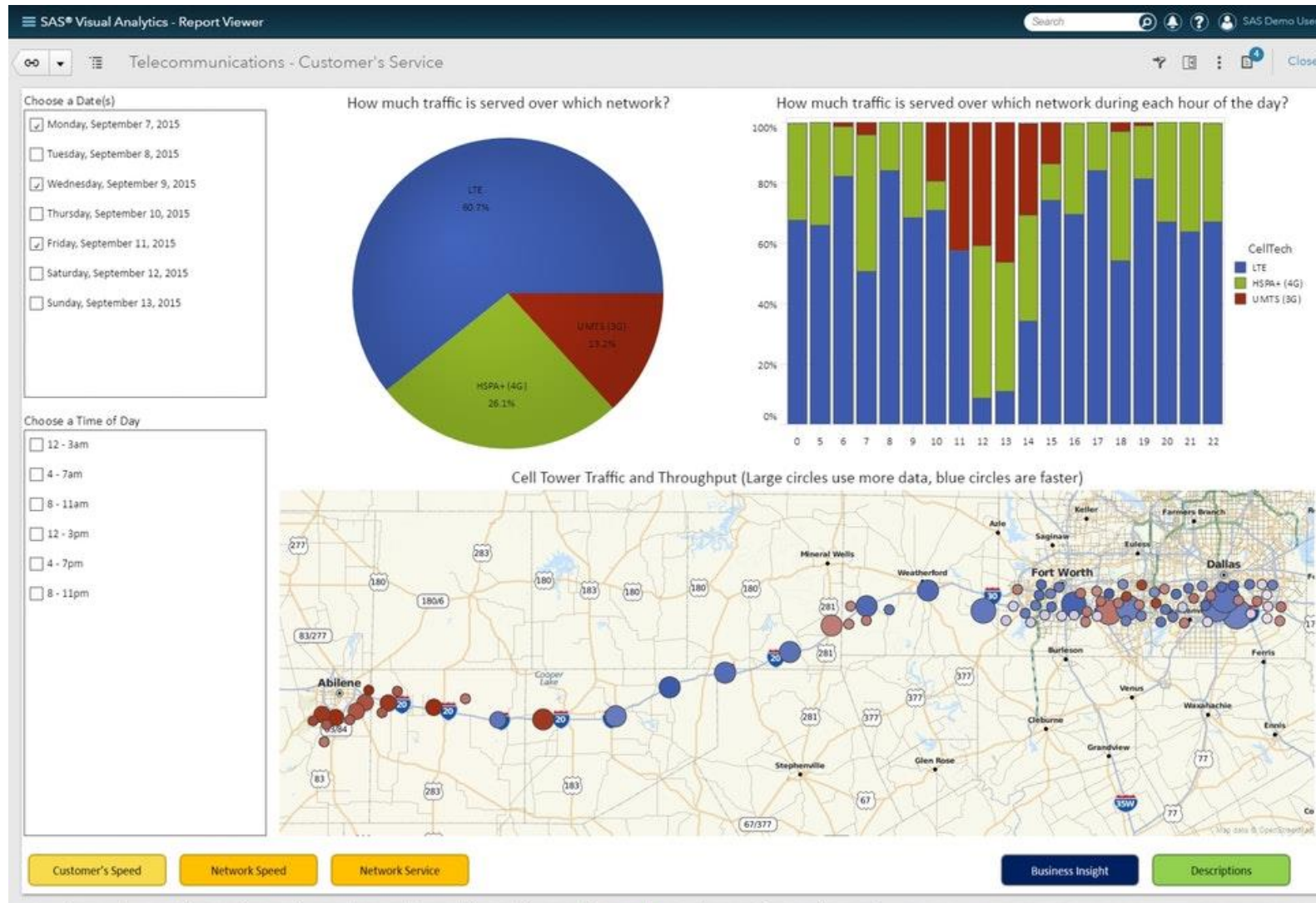
<https://visual-analytics.eu/2009/12/visual-analytics-scope-and-challenges/>

Examples



https://www.researchgate.net/figure/Visual-analytics-in-action-Visual-support-for-the-simulation-of-climate-models_fig1_277007765

Examples



<https://www.softwareadvice.com/bi/sas-visual-analytics-profile/>



Other Resources

- Tamara Munzner: <https://www.youtube.com/watch?v=xUbhRu2f8e4>

Where to publish the visualization research outcomes ...

- International conferences: IEEE VIS, EG EuroVis, IEEE PacificVis, ...
 - Smaller specialized venues: EG VCBM
- Journals: IEEE TVCG, Computer Graphics Forum, ...

What are the possible paper types ...

- <http://ieevis.org/>

Technique & Algorithm, System, Application & Design Study, Empirical Study, Theory & Model

- SciVis

- <http://ieevis.org/year/2020/info/call-participation/scivis-paper-types>

- InfoVis

- <http://ieevis.org/year/2020/info/call-participation/infovis-paper-types>

- VAST

- <http://ieevis.org/year/2020/info/call-participation/vast-paper-types>

We hope you'll like the course ...

- Questions and requests:

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