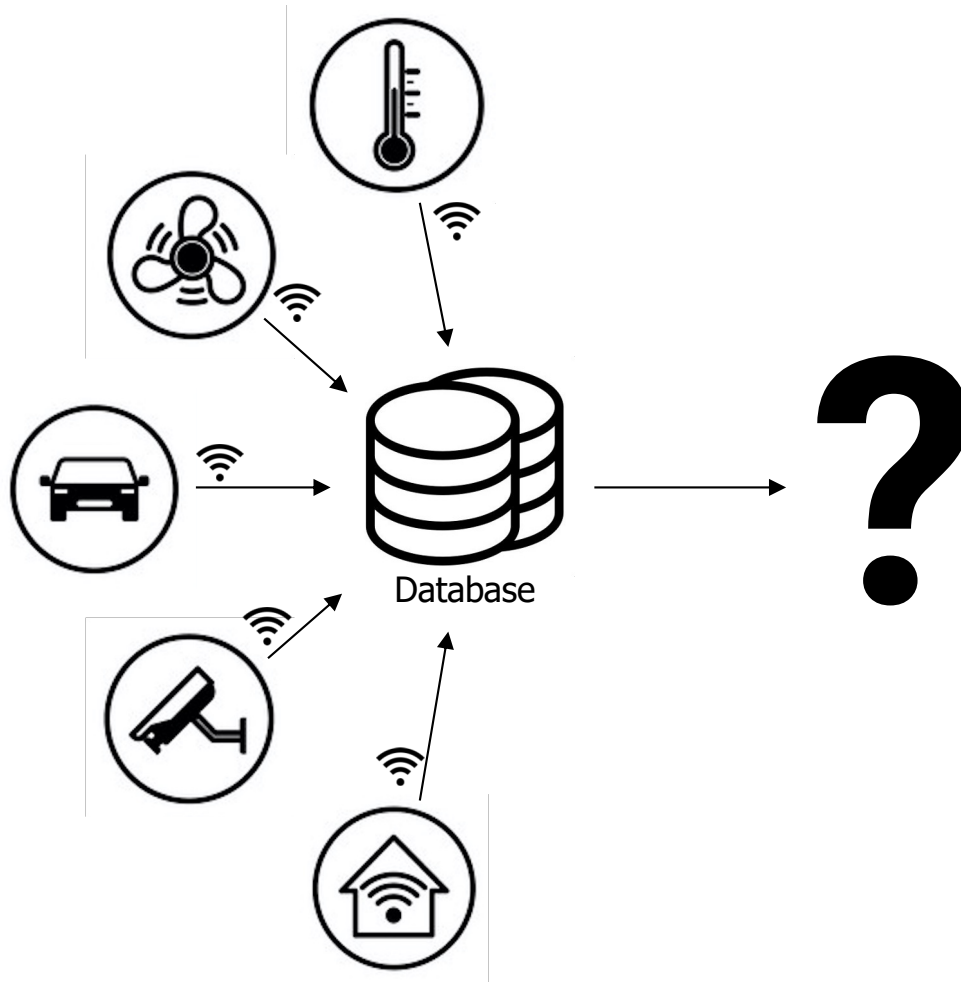# Showcases of Visualization Research for Data Analytics and Explainable AI

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Head of Information Visualization (iVis)
Media and Information Technology (MIT)

i.Vis INFORMATION VISUALIZATION @LiU

Li.u LINKÖPING UNIVERSITY

Motivation

Database

?

- **Big Data**
  - Overwhelming size and complexity of the data
  - Data is often simply stored

→ Time and money are wasted

- **Questions**
  - What to do with the data?
 - How can we derive insights from it?
 - What is relevant, what not?

Motivation

- A purely automatic analysis is *not* or *only partly* possible, and in many cases *not useful*

Anscombe's Quartet: Raw Data

|	I		II		III		IV	
	x	y	x	y	x	y	x	y
	10.0	8.04	10.0	9.14	10.0	7.46	8.0	6.58
	8.0	6.95	8.0	8.14	8.0	6.77	8.0	5.76
	13.0	7.58	13.0	8.74	13.0	12.74	8.0	7.71
	9.0	8.81	9.0	8.77	9.0	7.11	8.0	8.84
	11.0	8.33	11.0	9.26	11.0	7.81	8.0	8.47
	14.0	9.96	14.0	8.10	14.0	8.84	8.0	7.04
	6.0	7.24	6.0	6.13	6.0	6.08	8.0	5.25
	4.0	4.26	4.0	3.10	4.0	5.39	19.0	12.50
	12.0	10.84	12.0	9.13	12.0	8.15	8.0	5.56
	7.0	4.82	7.0	7.26	7.0	6.42	8.0	7.91
	5.0	5.68	5.0	4.74	5.0	5.73	8.0	6.89
mean	9.0	7.5	9.0	7.5	9.0	7.5	9.0	7.5
var.	10.0	3.75	10.0	3.75	10.0	3.75	10.0	3.75
corr.		0.816		0.816		0.816		0.816

+ identical linear regression
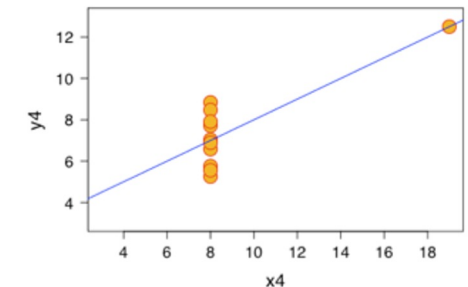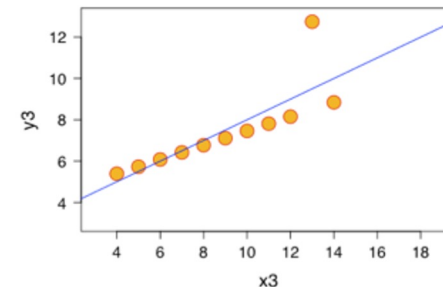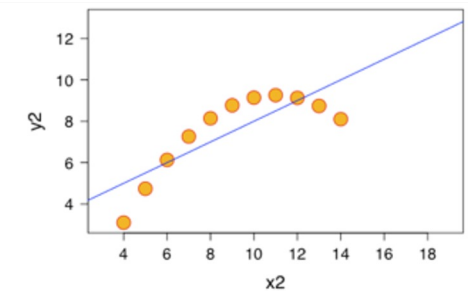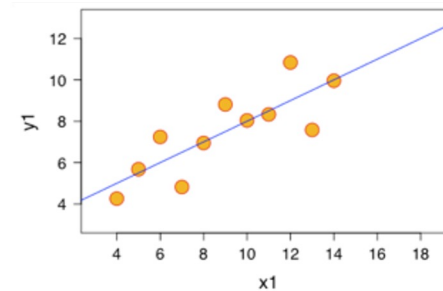
Visualization

- ## What is a **visualization**?

    - It is NOT a static graphics, diagram, or image

    - It IS a *cognitive process* that

        - produces a mental model of the data in our brains

        - supports a better understanding/insight

    - „The purpose of visualization is *insight*, not pictures" Ben Shneiderman (1999)

        - Aims: discovery, decision making, explanation, …

    - → **Interactive, exploratory data analysis**
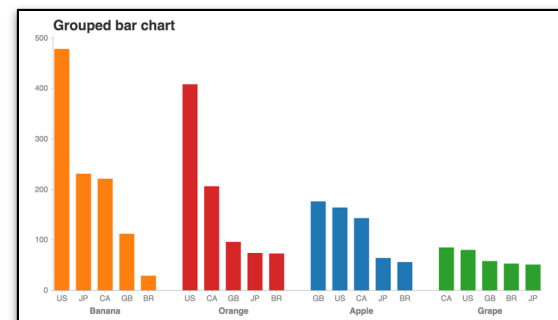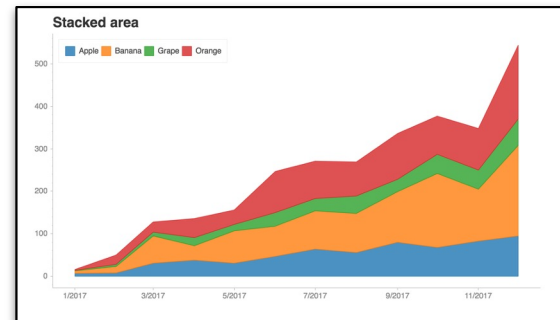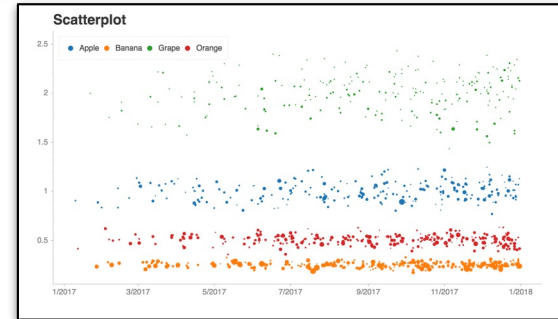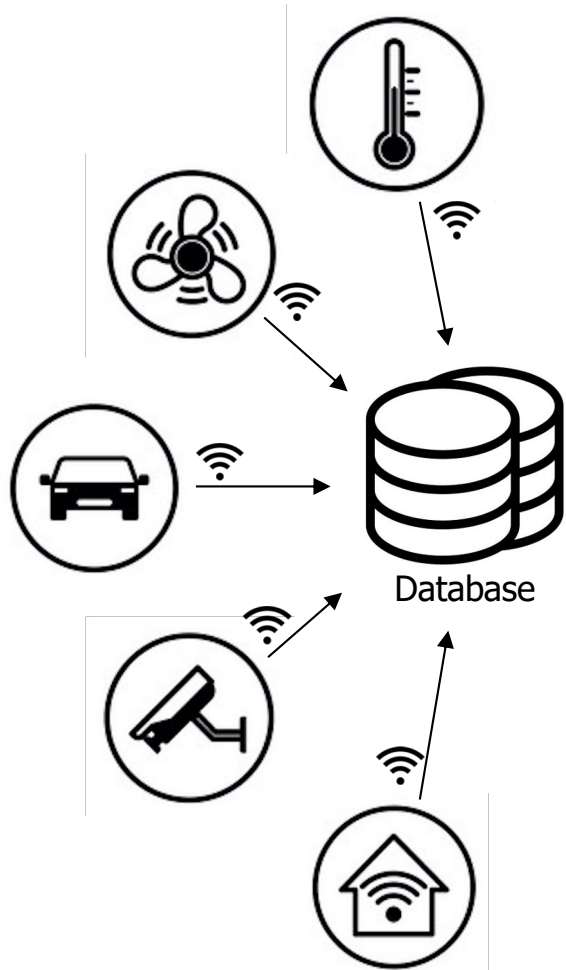
Visualization

Visualization vs. Visual Analytics

- ## Visualization (Vis)

  – Pure interactive visualization methods do not work for billions of data records

  – Not enough pixels, too much clutter, …

- ## Visual Analytics (VA)

  – Science of analytical reasoning facilitated by interactive visual interfaces

  – Combines the strengths of humans (Vis) and computers (DM, ML)

INFORMATION VISUALIZATION @ LiU

Group Web Site
https://liu.se/en/research/ivis
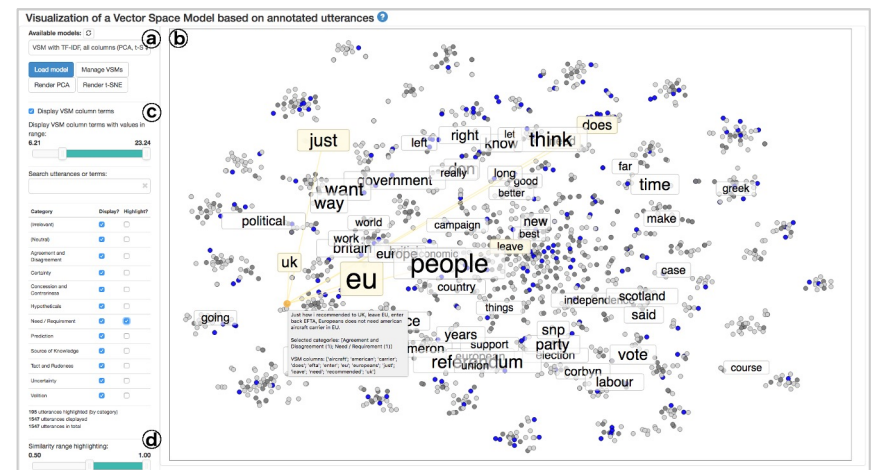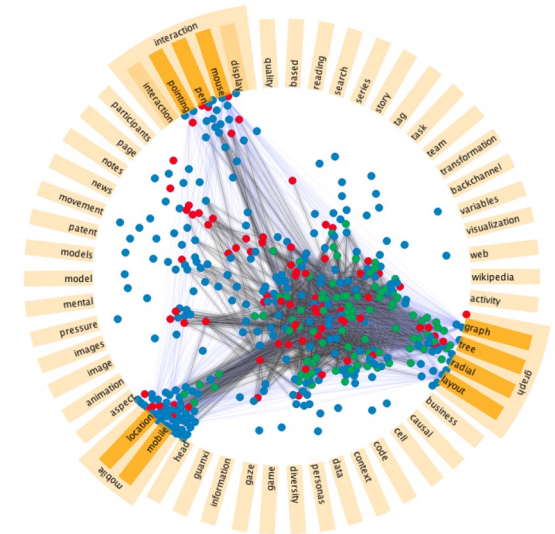
Showcases

Current Research Areas @ iVis

Text Visualization and Visual Text Analytics

Interactive representations and analytical tools for raw textual data and the results of text mining algorithms.

Explainable and Interpretable AI/ML

Providing insights from AI/ML models to make better predictions and improve the trustworthiness of the results.

Network Visualization and Visual Network Analytics

Developing novel network layouts and interactive visual analysis tools for large and complex networks.
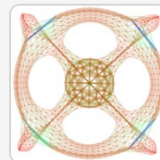
Foundations of Visualization

General research on the foundations of visualization and visual analytics.
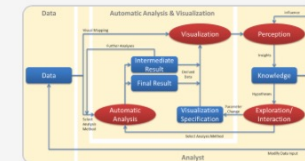
User-centered Evaluation

User-centered evaluation in visualization and visual analytics.
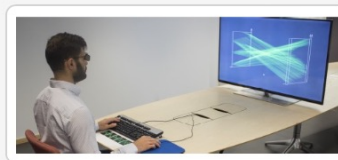
Visual Analytics of Temporal Event Data

Innovative research at the intersection of temporal data mining and interactive visualization.
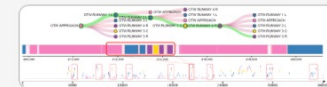

Human-AI/Automation Joint Control

Basic and applied research on Human-AI/Automation Joint Control for mission-critical processes. Research on visual analysis tools, on concepts for visualization of processes.
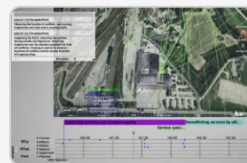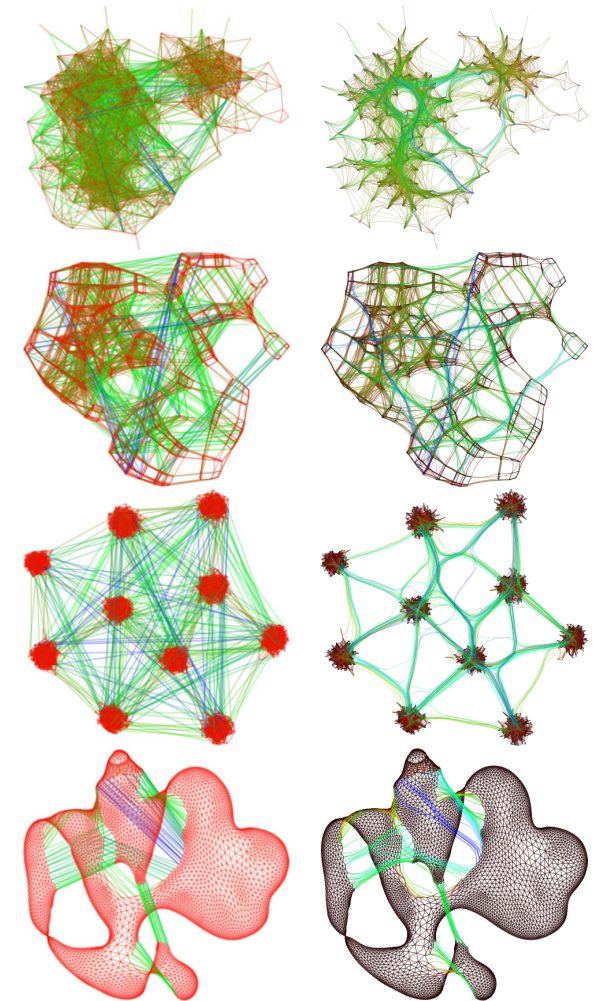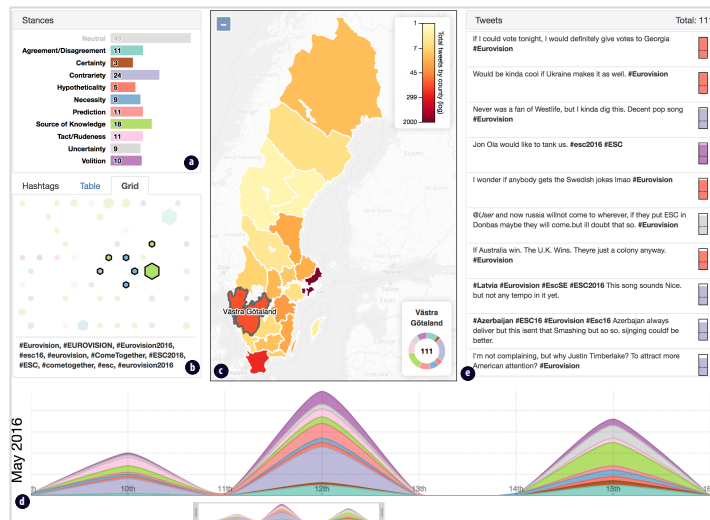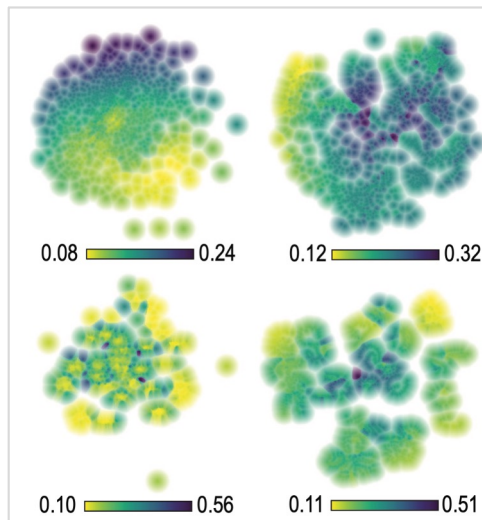

Immersive Analytics

Research on the utilization of immersive human-computer interfaces to support data understanding, analytical reasoning, and collaborative decision making.
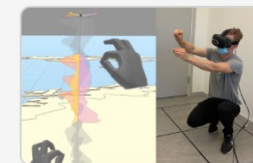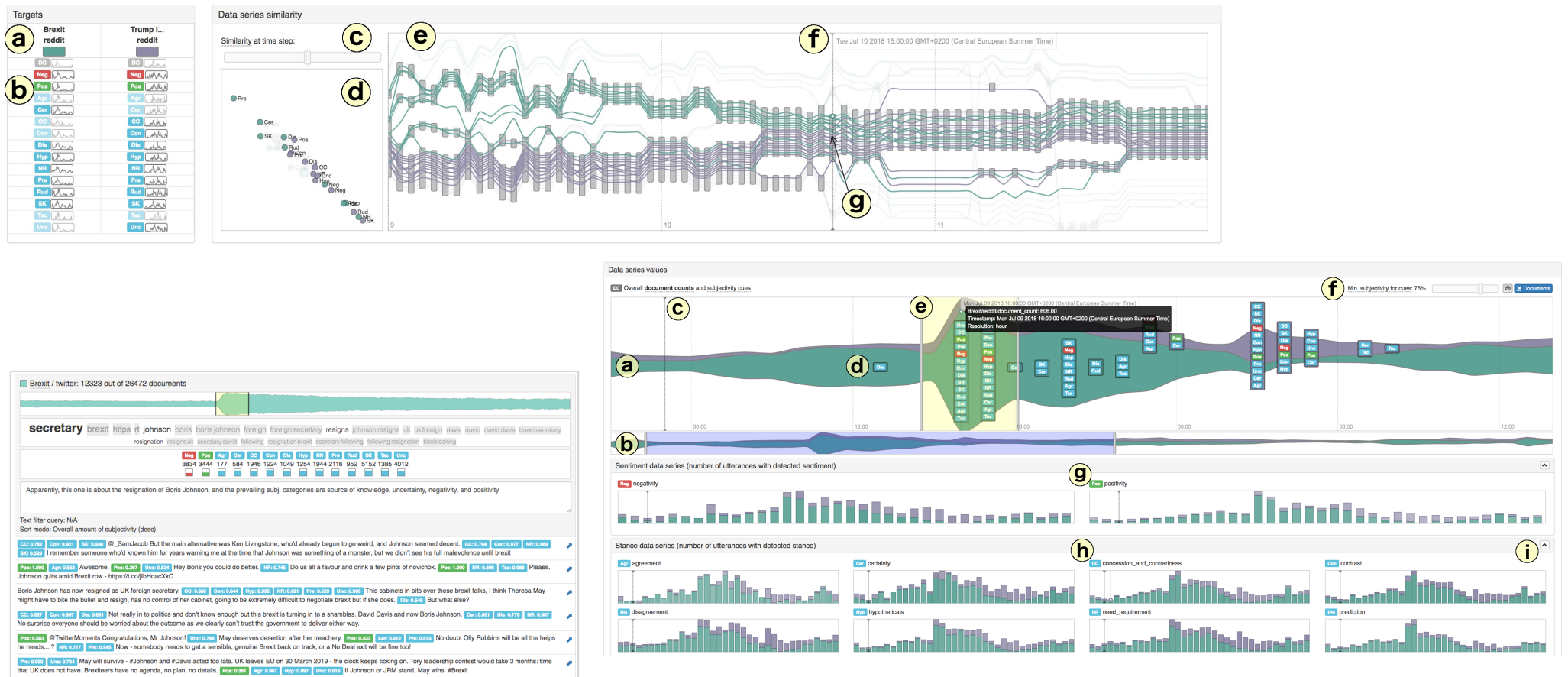
Selected Areas

- Visual text analytics
- Visual analytics for XAI
- Network visualization

Visual Text Analytics: StanceVis

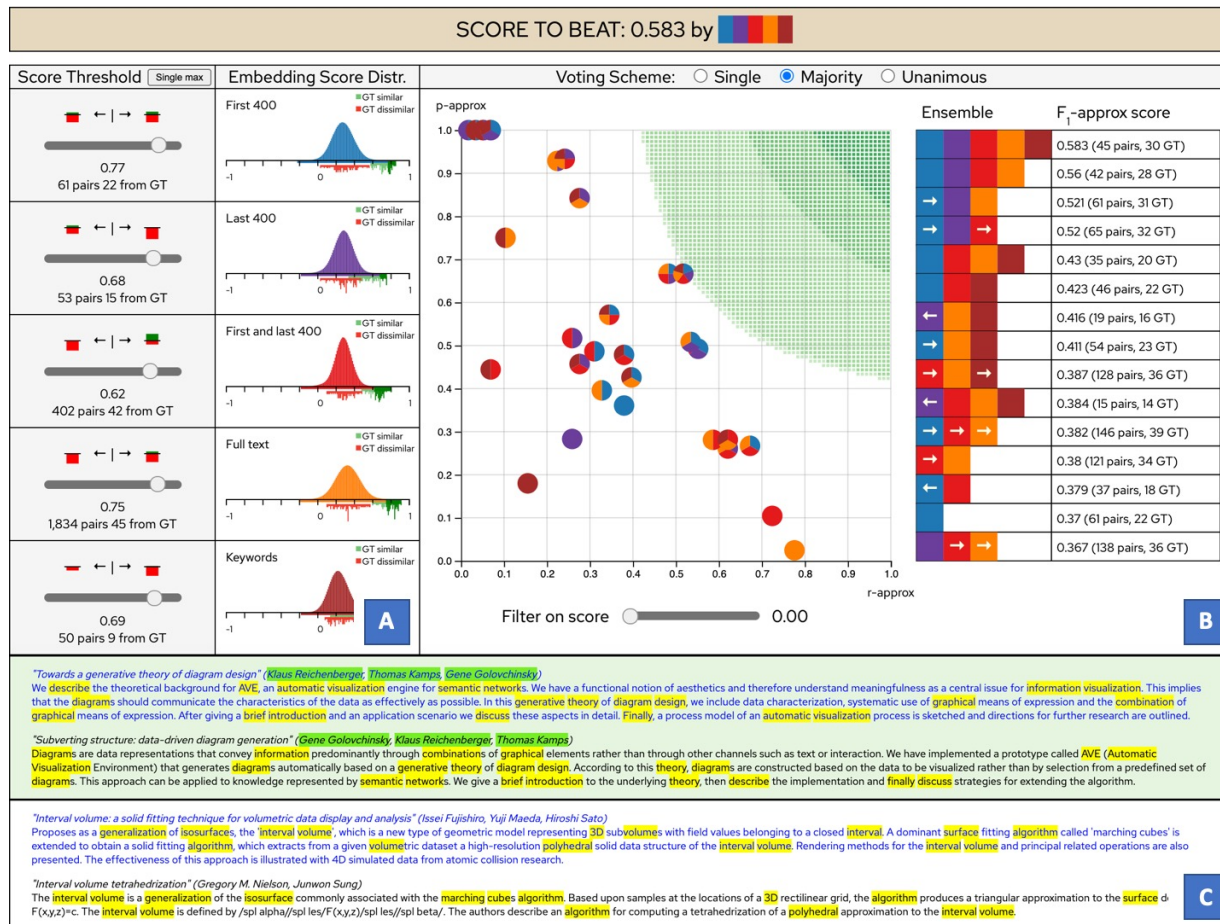## Visual Analysis of Sentiment and Stance in Social Media Texts

https://link.springer.com/article/10.1007/s12650-020-00684-5 - Sec21

[Journal of Visualization, 23(6):1015-1034, 2020]

Interactive optimization of embedding-based text similarity calculations
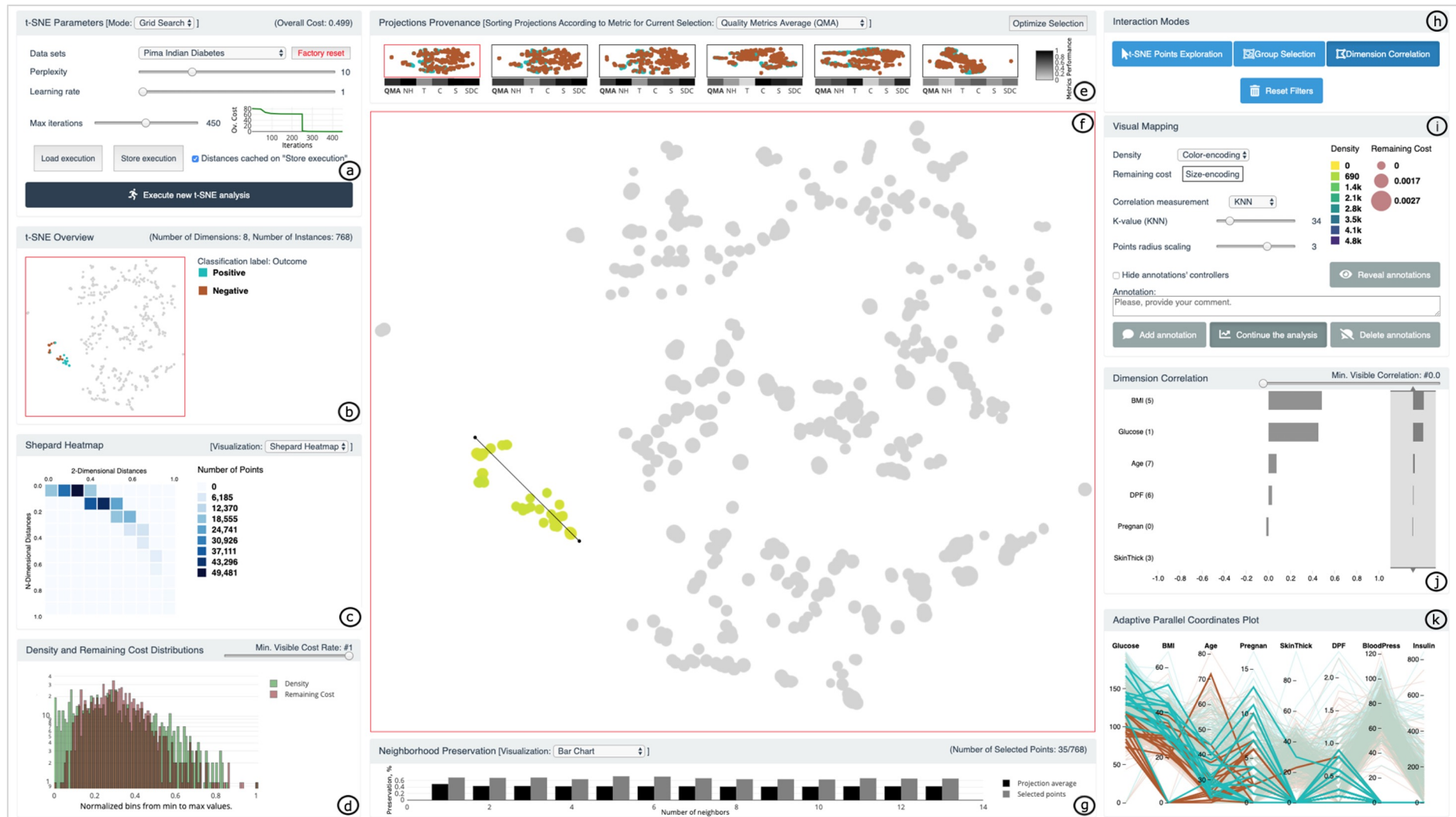
VA for XAI: t-viSNE

VA for XAI: StackGenVis
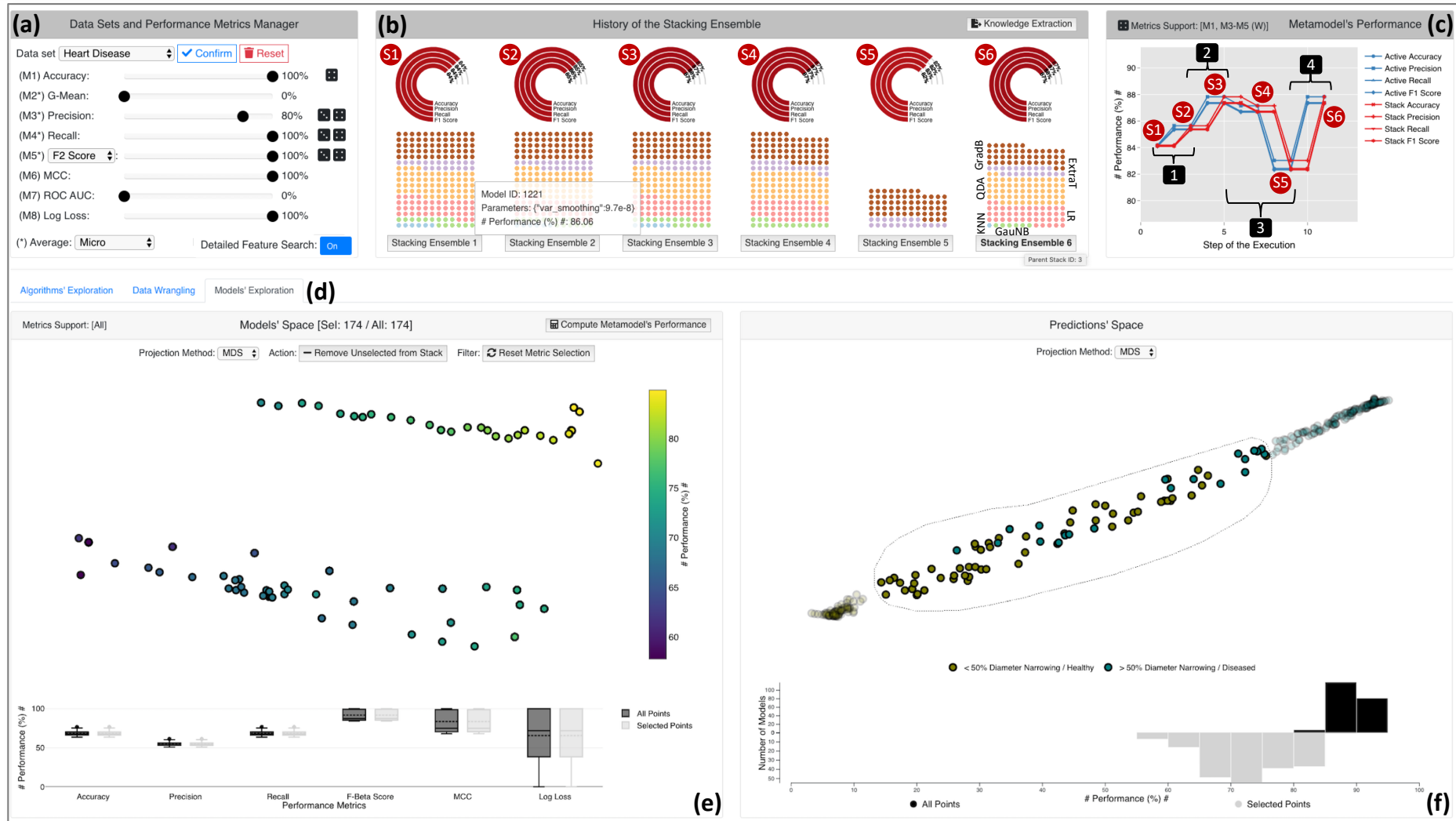
Network Visualization: OnGraX

Linköping University

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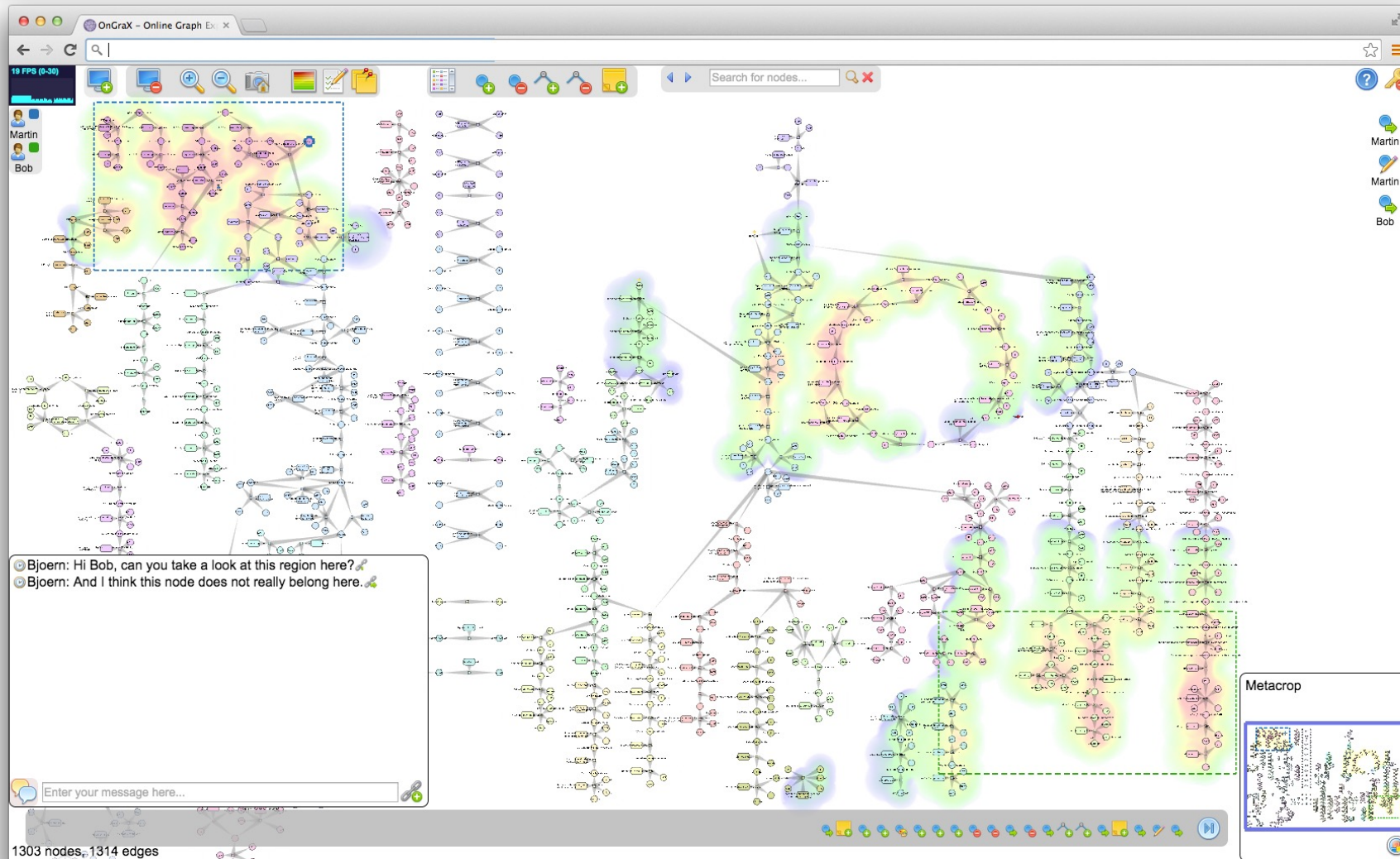
Network Visualization: MLN-Vis

Multilayer Network Visualization

Thank you!

Questions ?