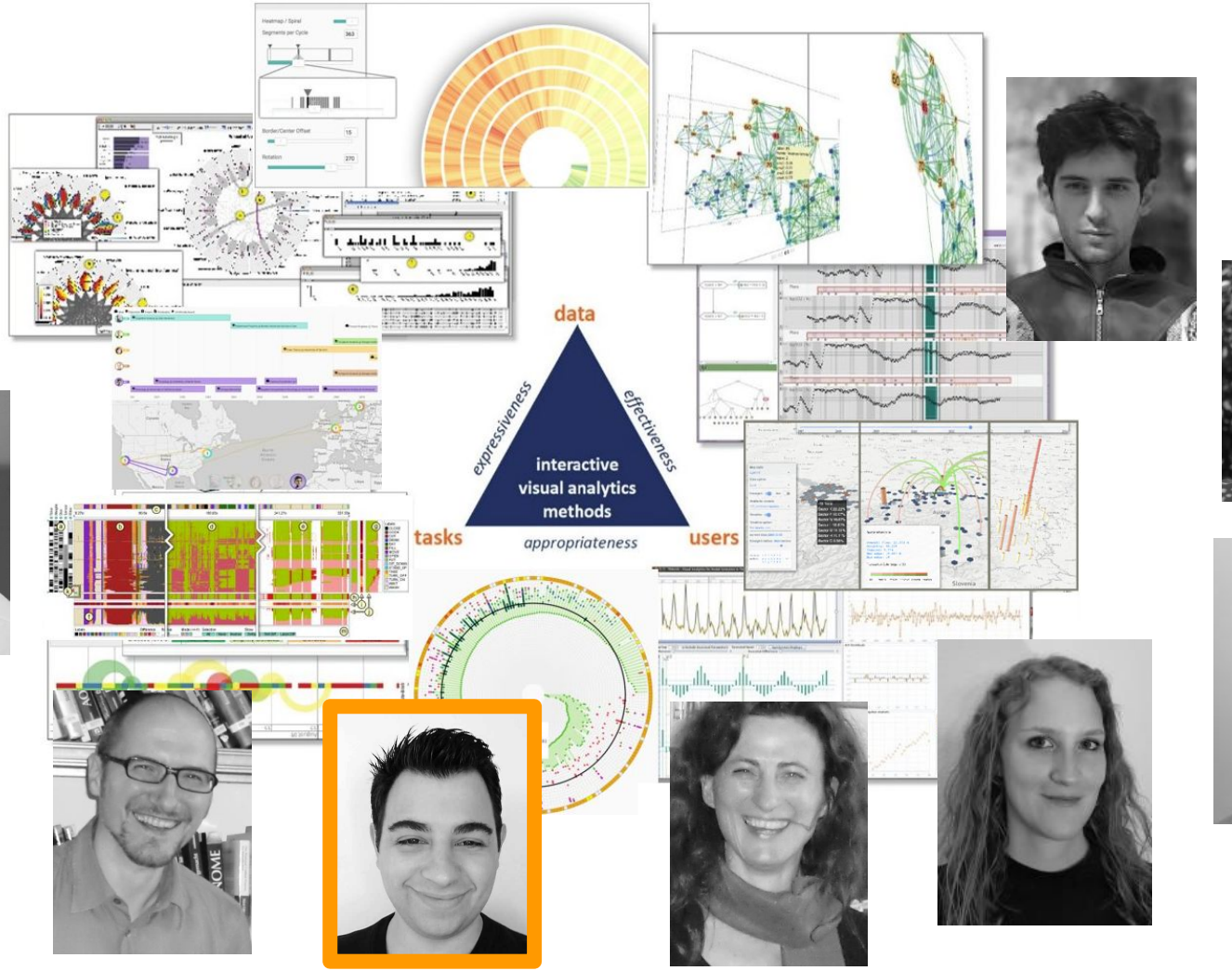
# Dynamic Perspectives:
## Visualizing Time and Networks for Analytical Insights

Velitchko Filipov

TU WIEN CVAST


data
expressiveness
effectiveness
interactive
visual analytics
methods
tasks
appropriateness
users



# ArtVis: Dynamic Network Perspectives on Digital Art History

Transdisciplinary collaboration with University of Vienna

Visual Analytics methods to understand
interactions between components of the art system

Identifying patterns and temporal developments

Artists' social networks and exhibiting behaviors

https://www.cvast.tuwien.ac.at/projects/artvis

ArtViz
FWF
Der Wissenschaftsfonds.
TU WIEN
universität wien

# SANE: VA for Event-based Diffusion on Networks

Collaboration with University of Cologne & Newcastle University

Visual Analytics for studying information diffusion processes over networks

Tackling the dynamic and stochastic nature of diffusion processes in real-world scenarios


FWF
Der Wissenschaftsfonds.

weave
Research funding without borders

https://www.cvast.tuwien.ac.at/projects/sane

TU WIEN

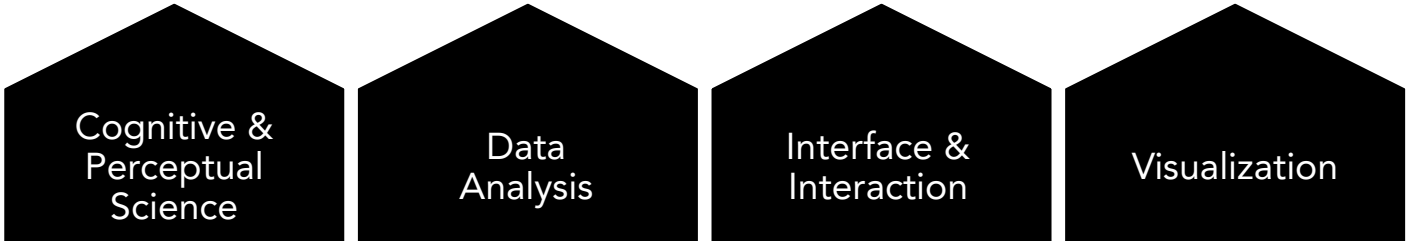
UNIVERSITY OF COLOGNE

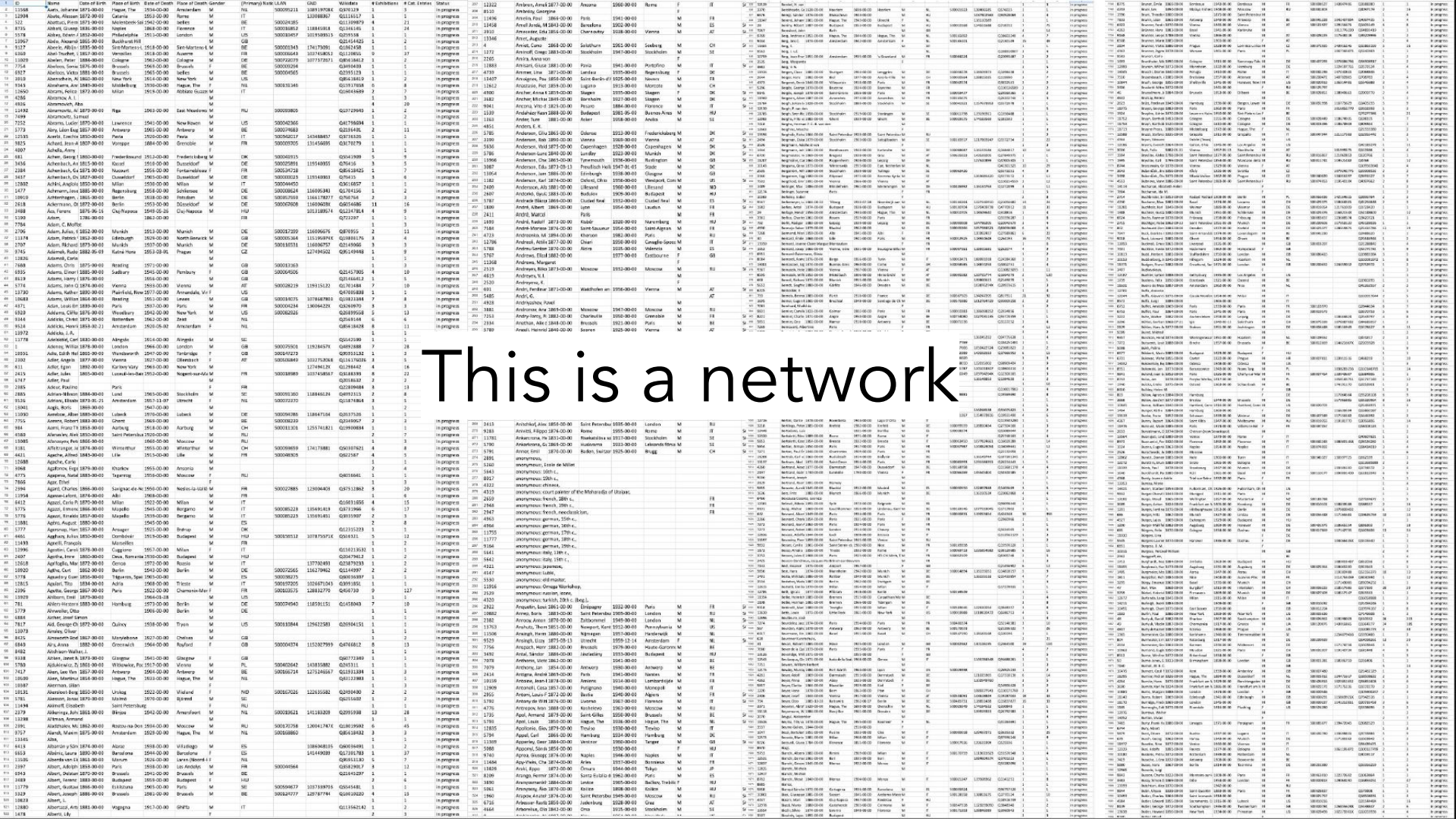
Newcastle University

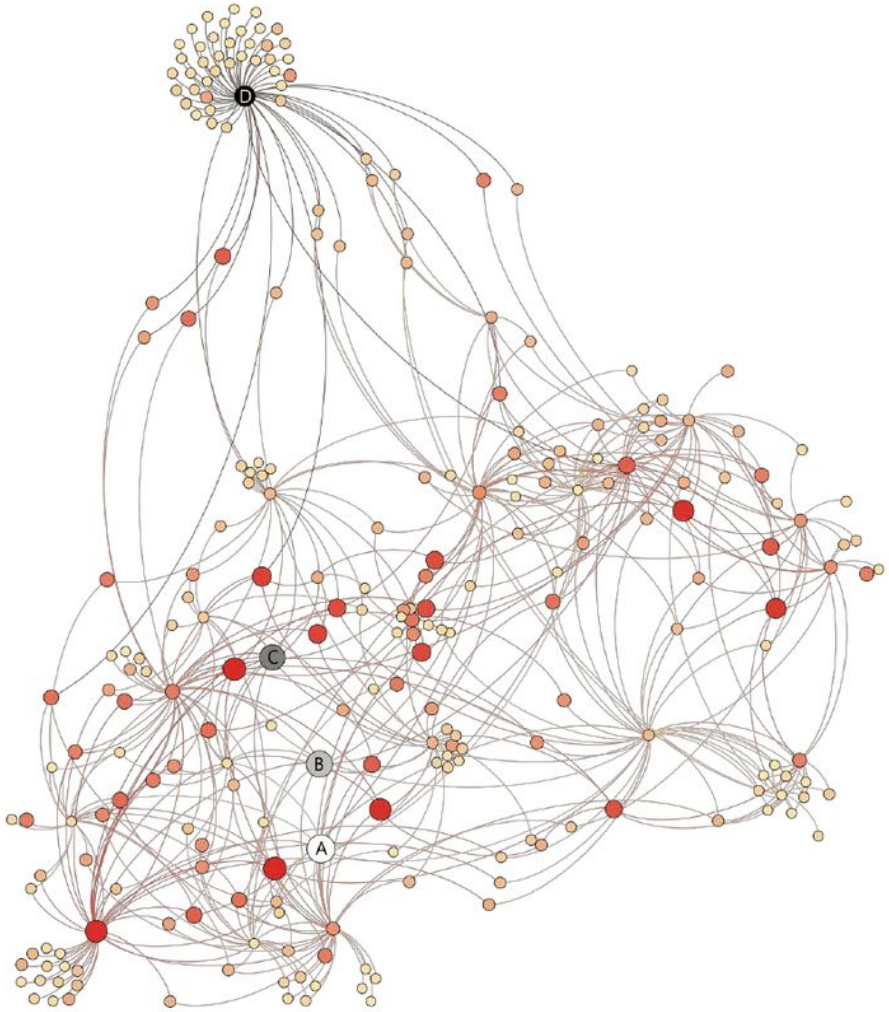
# Visual Analytics

*"…the science of analytical reasoning facilitated by interactive visual interfaces."*

Illuminating the path
*J. J. Thomas and K. A. Cook [2005]*



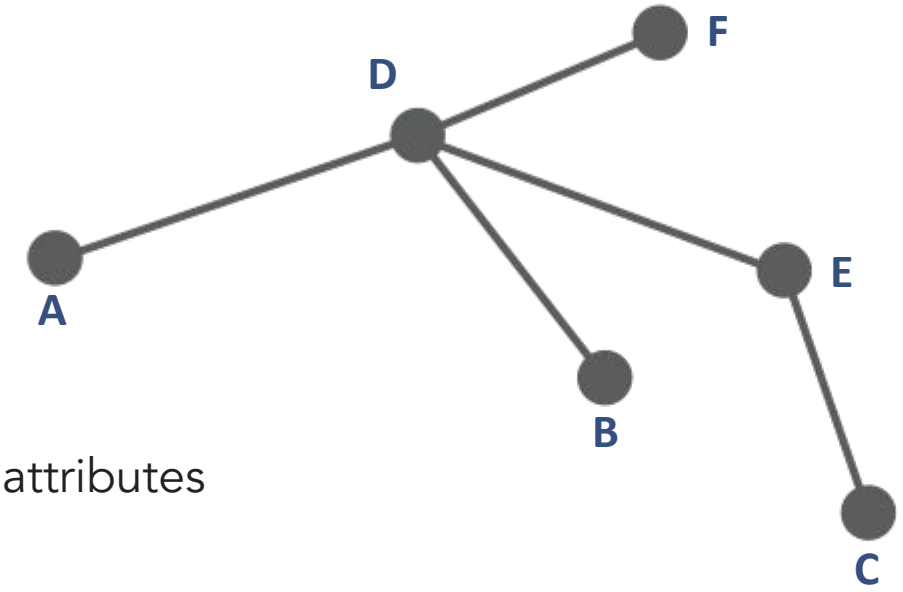

This is a network


D
C
B
A

# Networks (*Graphs*)

G = (V,E)

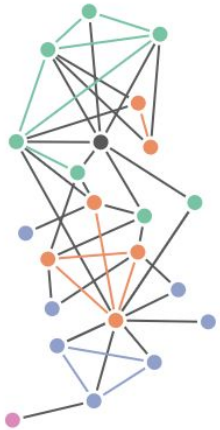
Very abstract and widely applicable

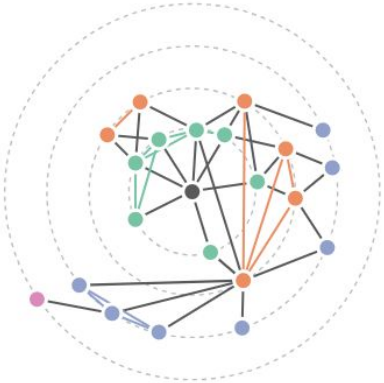


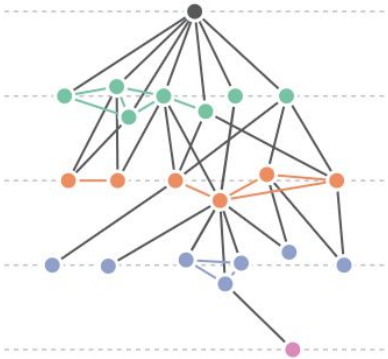

Gets complex with dynamics, multiple attributes

… and scale

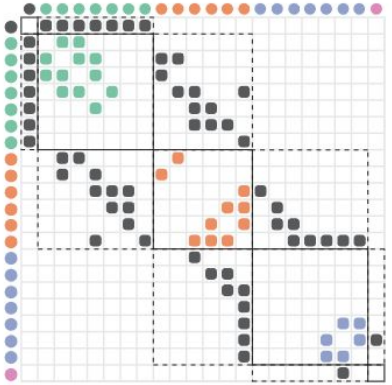
# Visualizing Networks







node-link approaches



adjacency matrix

# Dynamic Networks

## Time-Varying Networks

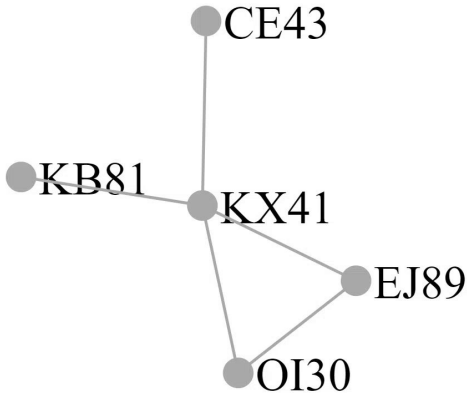
nodes (entities) and edges (connections) change over discrete or continuous time intervals

## Temporal Analysis

Evolution, Change, Patterns/Trends, Anomalies

## Visualization

Animations, Dynamic Layouts, Interactions



# Visualizing Dynamic Networks

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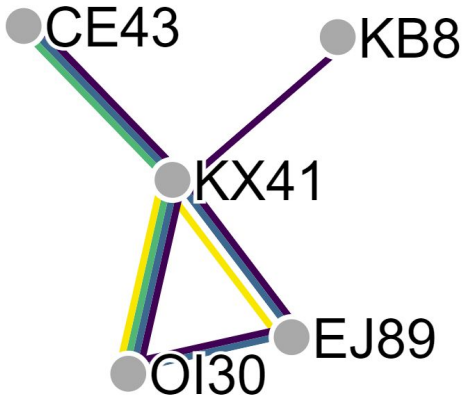
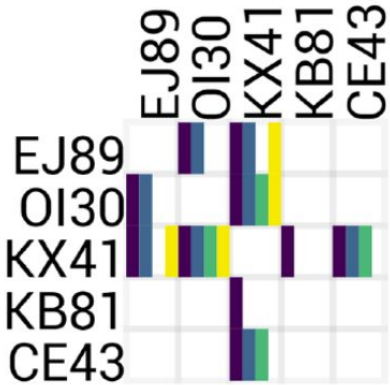
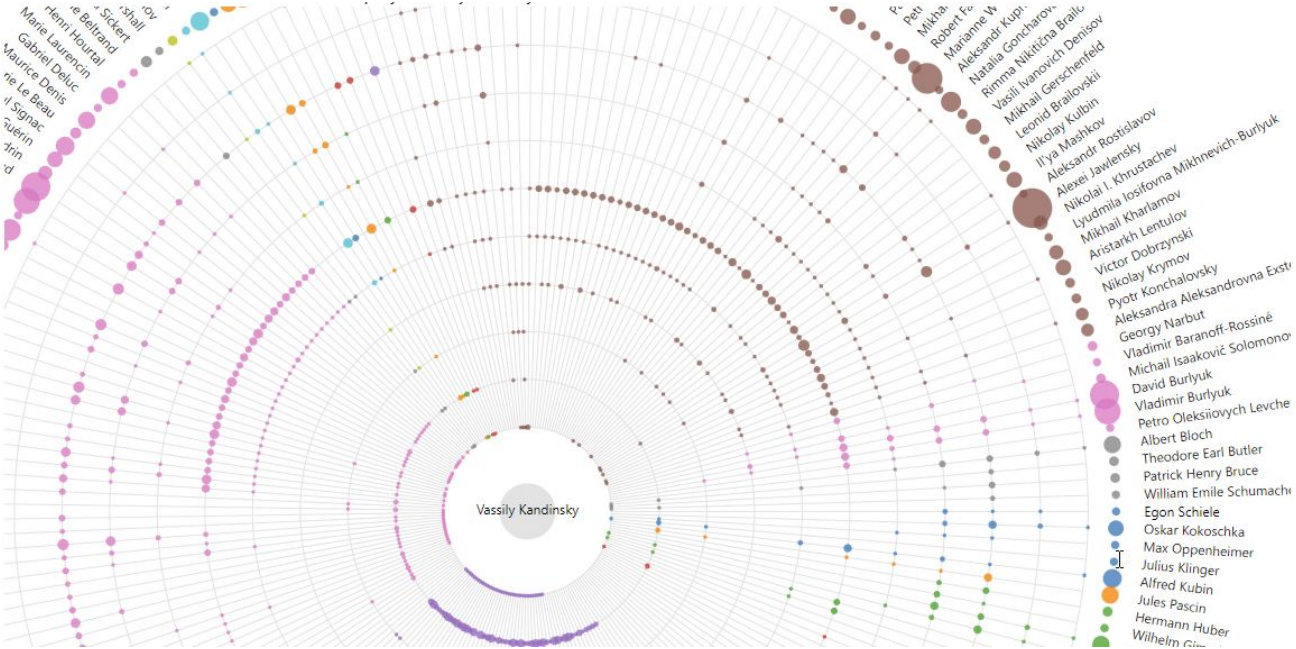
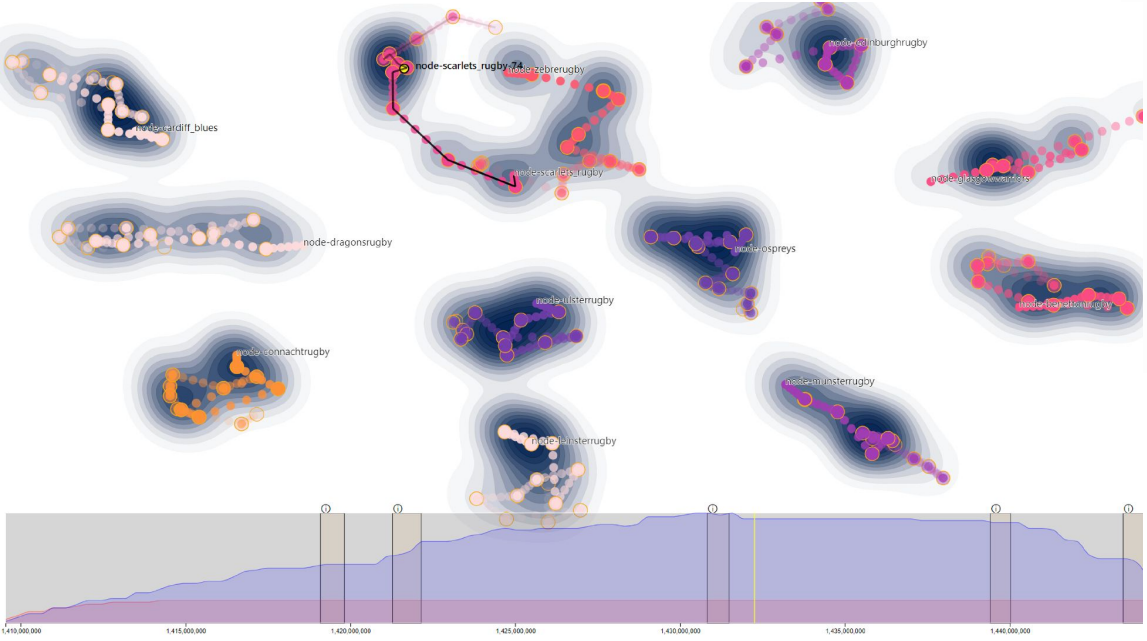
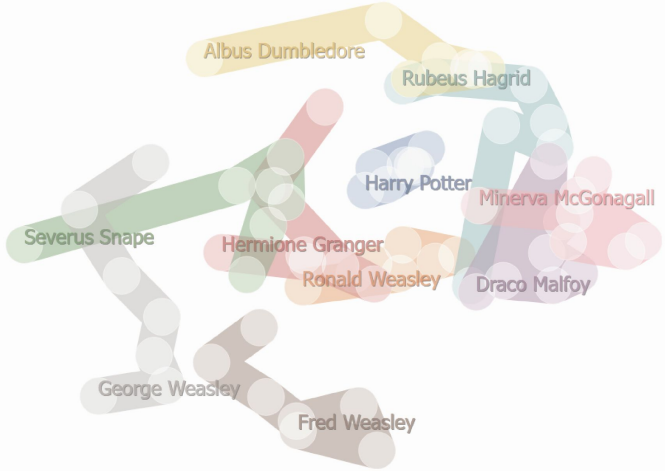


# Visualizing Dynamic Networks



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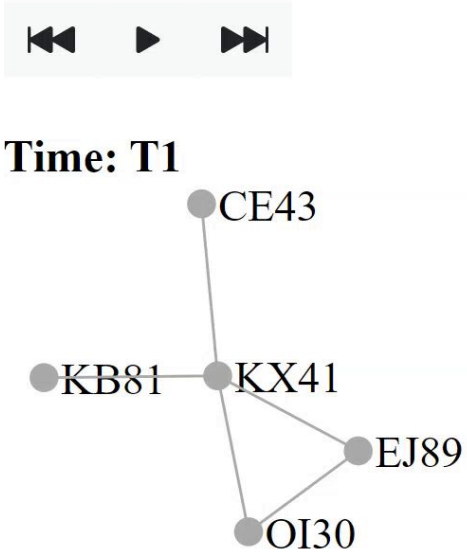
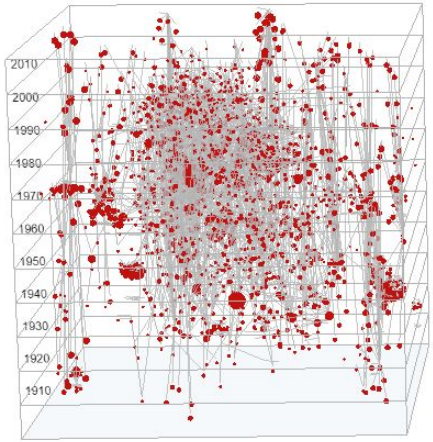


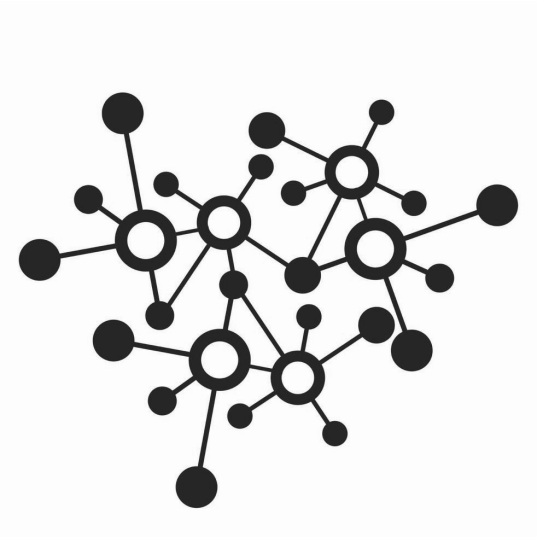

# Connection to Materials Sciences

*Networks* of atoms, molecules, and defects within materials

Similar (same) (sub-)structure *detection*

*Diffusion* of atoms within a material

Materials design and *simulation*



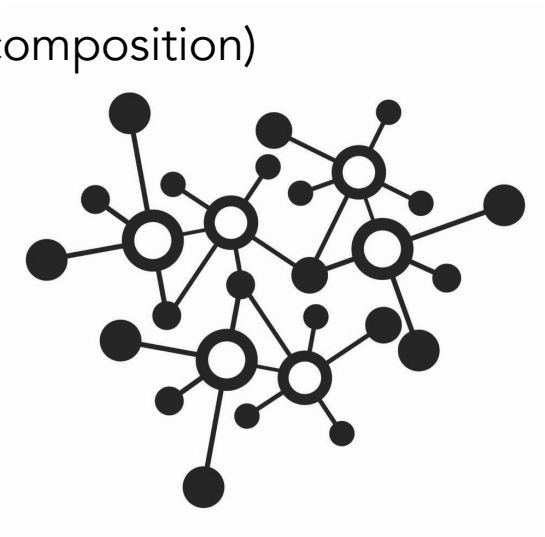
# Connection to Materials Sciences

Analyze and visualize the *structural evolution*

*Formation* and *dissolution* of defects in materials

Visualize *dynamic* processes (temperature, pressure, composition)

*Structural changes* under stress over time

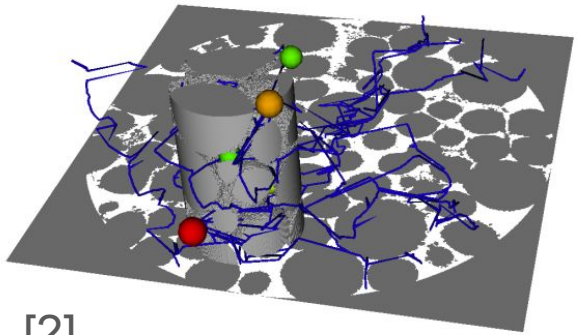


# (*Dynamic?*) Networks in Materials Sciences

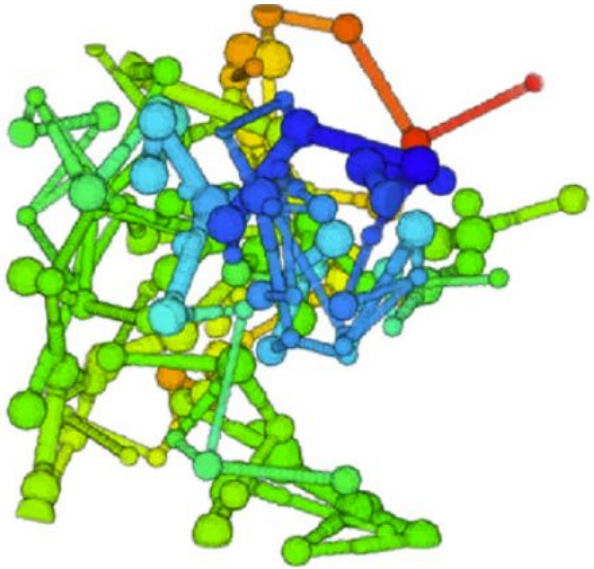
Pore Networks & Structures

Simulation & Modeling

Decision-making



[2]



[1]

[1] S. Grau et al. “Exploration of porous structures with illustrative visualizations”, Computers & Graphics (2010)
[2] Ushizima et al. “Augmented Topological Descriptors of Pore Networks”, IEEE TVCG (2012)

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Thank you

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