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AUSTRIAN MARSHALL PLAN FOUNDATION

Altmetrics-based Visualizations Depicting the Evolution of a Knowledge Domain

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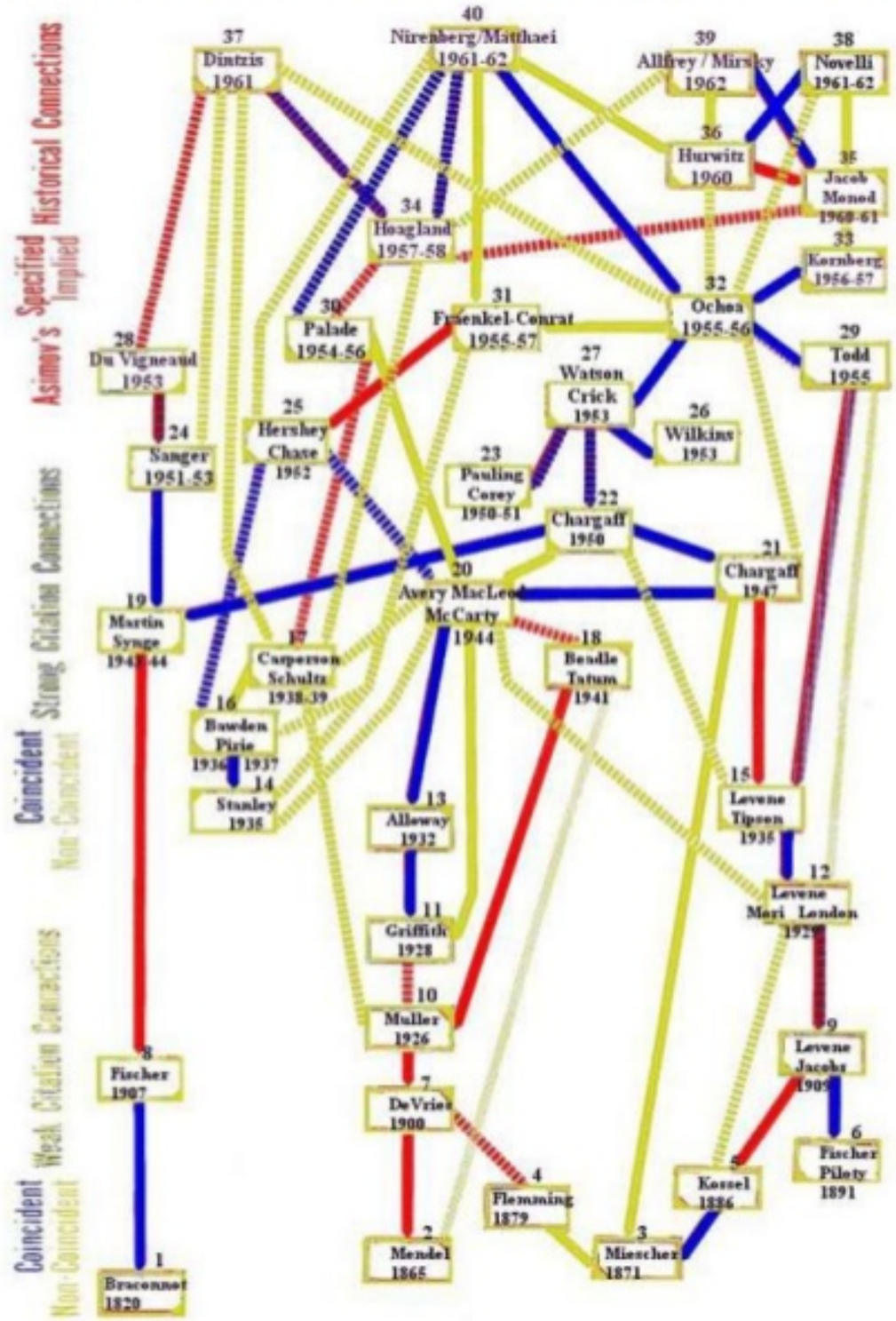
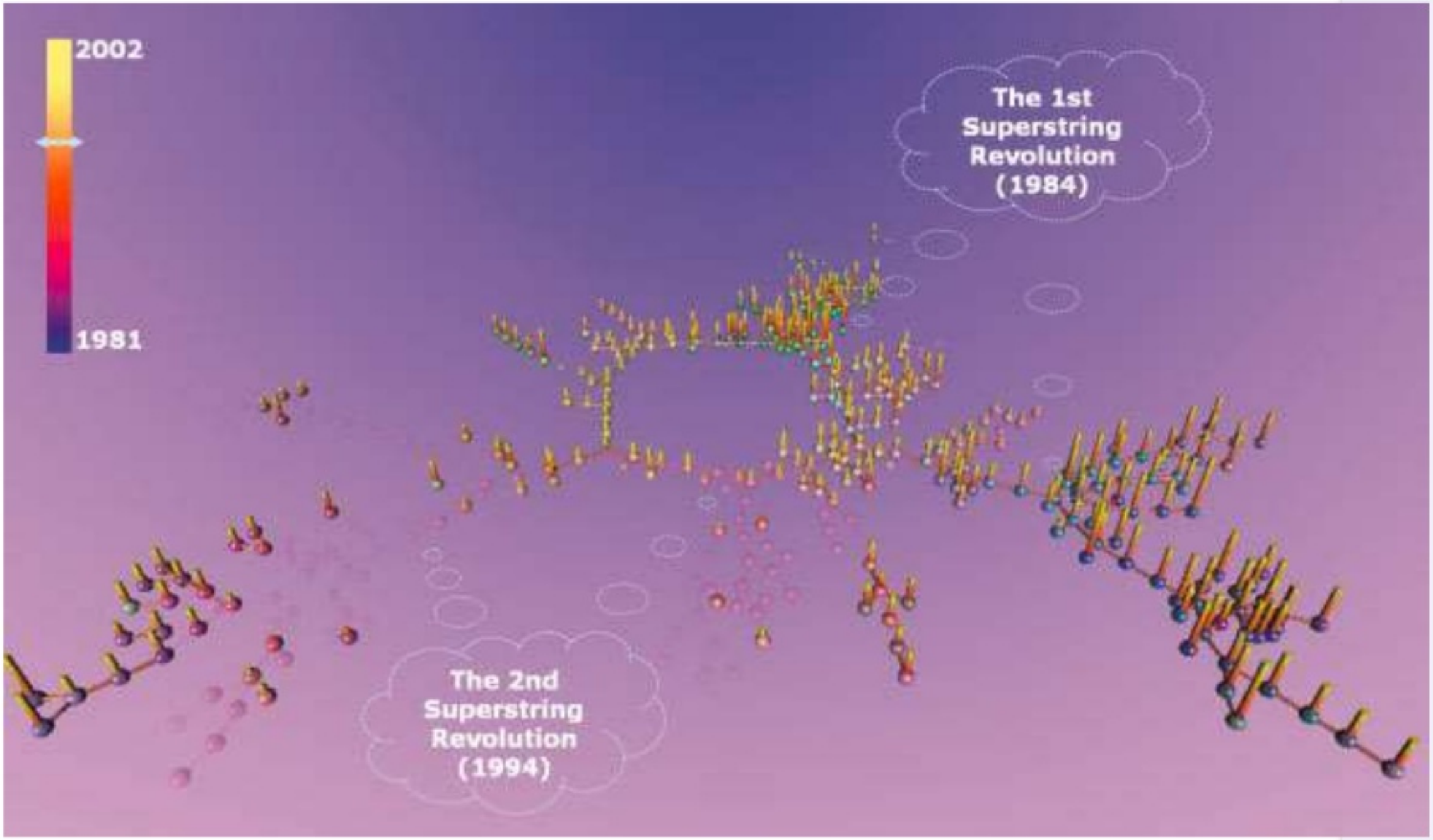
Competence Centers for Excellent Technologies

Introduction
Evolution of a Knowledge Domain



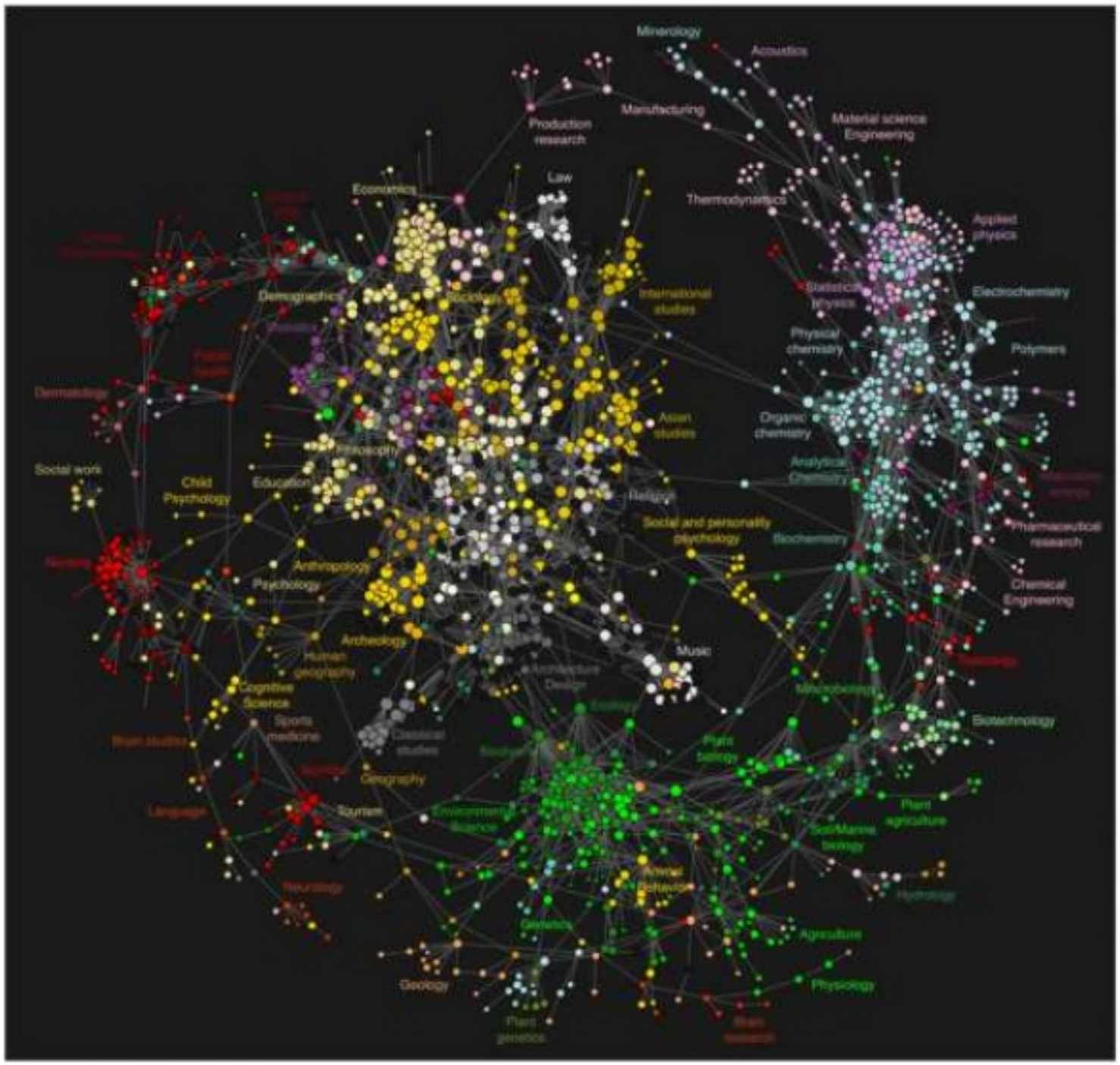
Garfield et al. (1964)

Introduction
Evolution of a Knowledge Domain



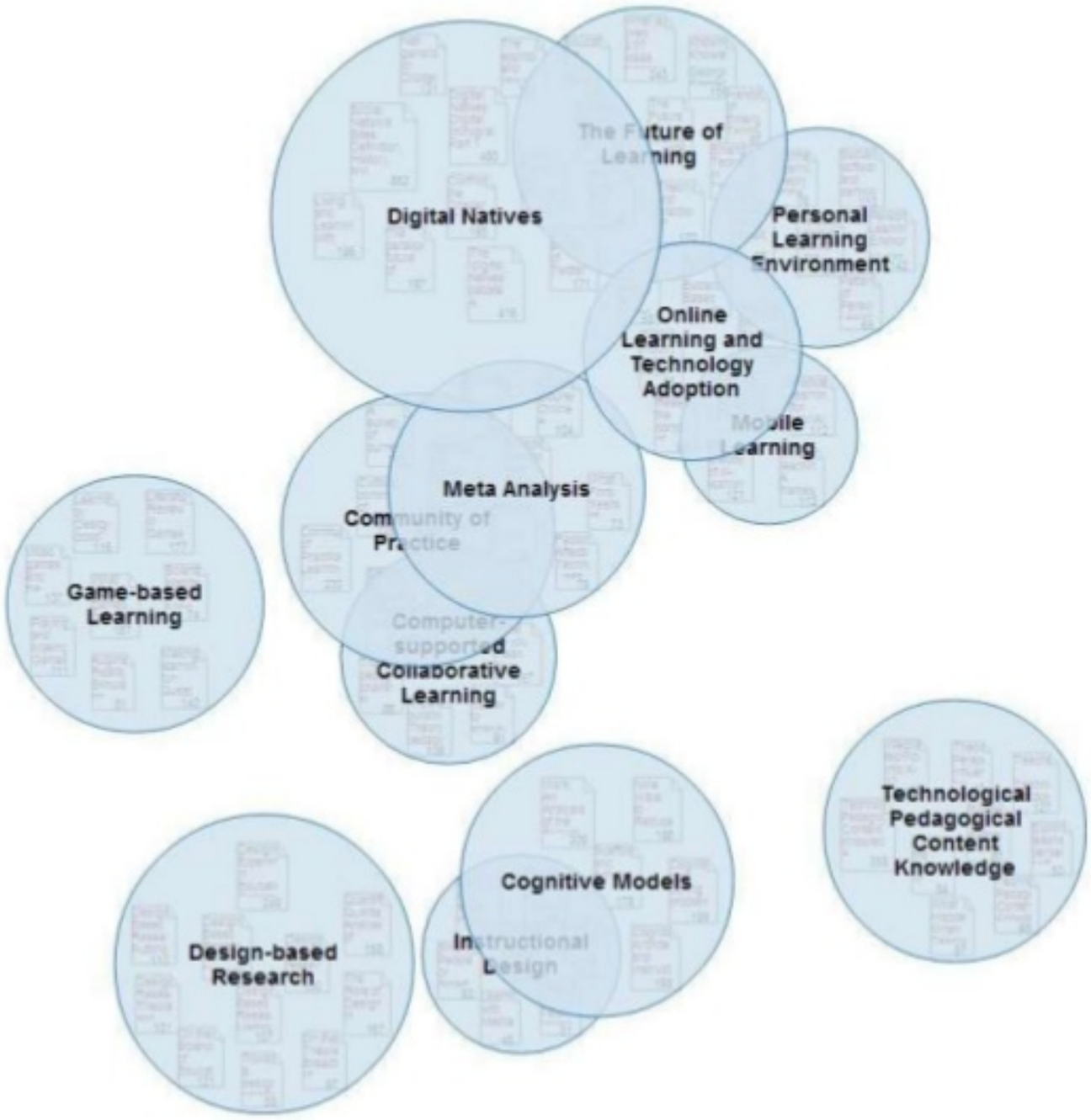
Chen and Kuljis (2003)

Introduction
Altmetrics-based Visualizations



Bollen et al.[4] (2009)

Introduction
Altmetrics-based Visualizations



Kraker (2014)

Introduction
Approach

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Knowledge domain: scientific conferences

Research Questions

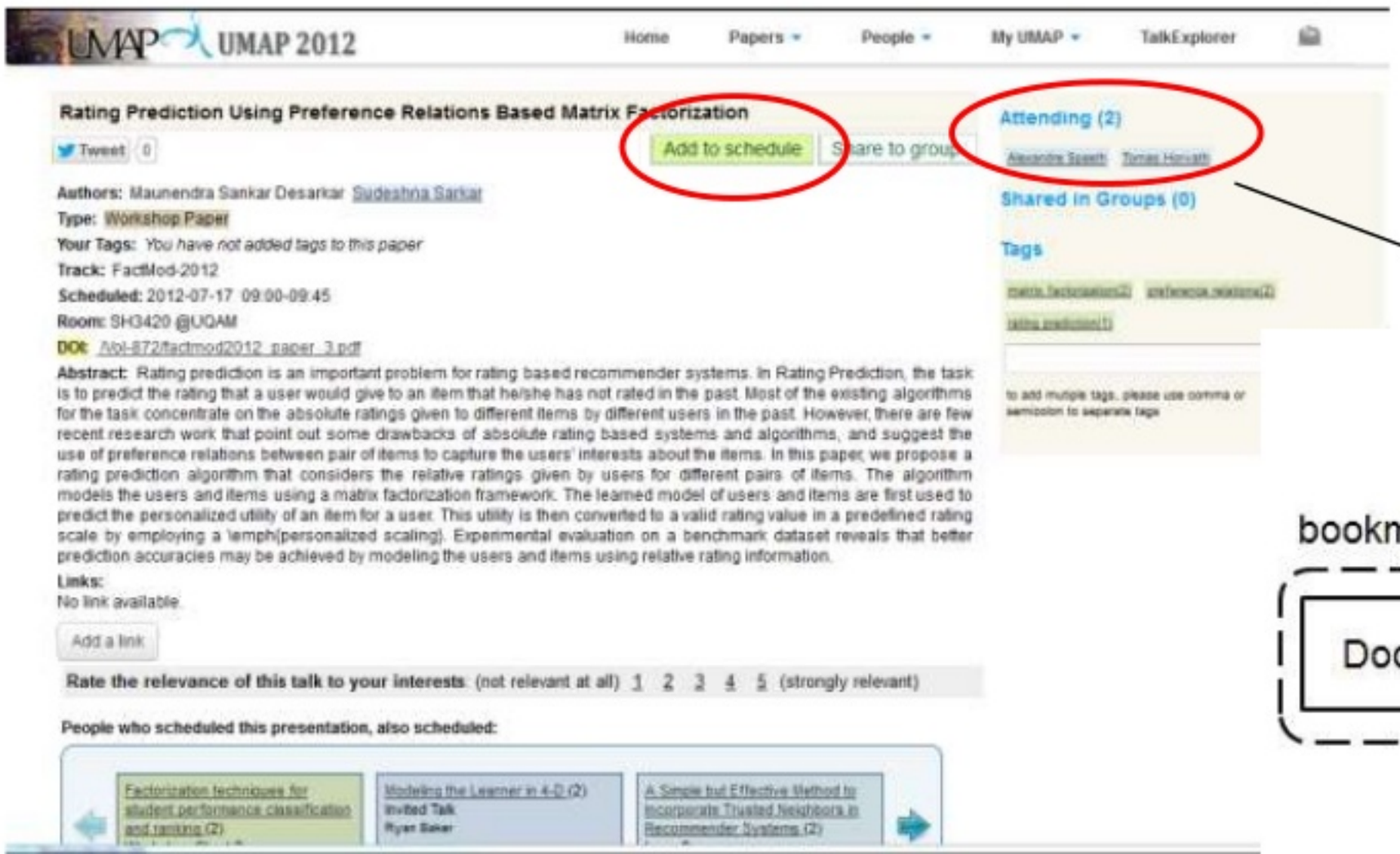
- How to automatically determine the intellectual structure of a scientific conference?
- How to visualize the evolution of this intellectual structure?
- How to design the visualization so that it facilitates unsupervised exploration?

Base: scheduling data in Conference Navigator (Parra et al. 2012)

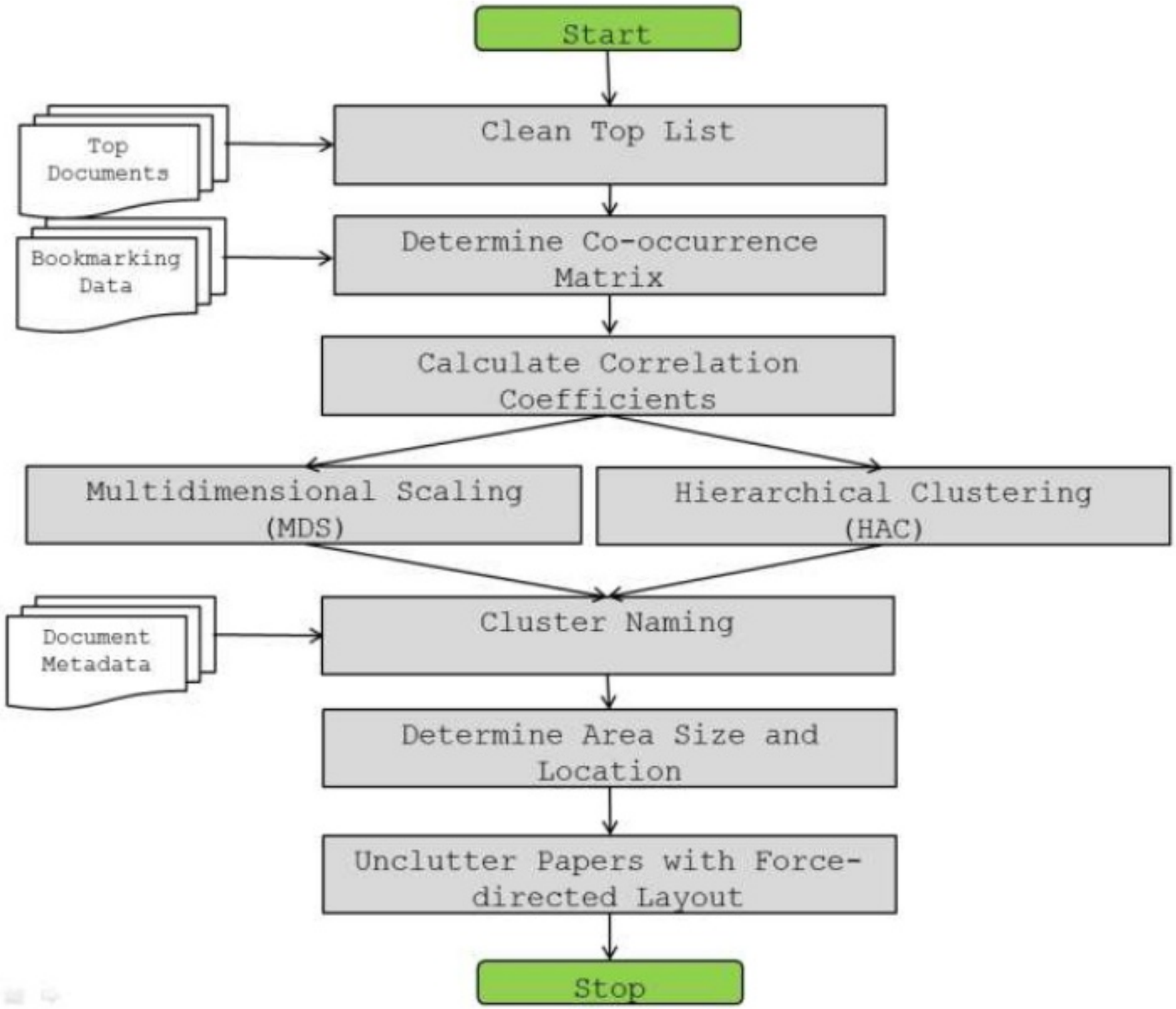
Data

Use Case: 19th and 20th Conference on User Modelling, Adaptation and Personalization

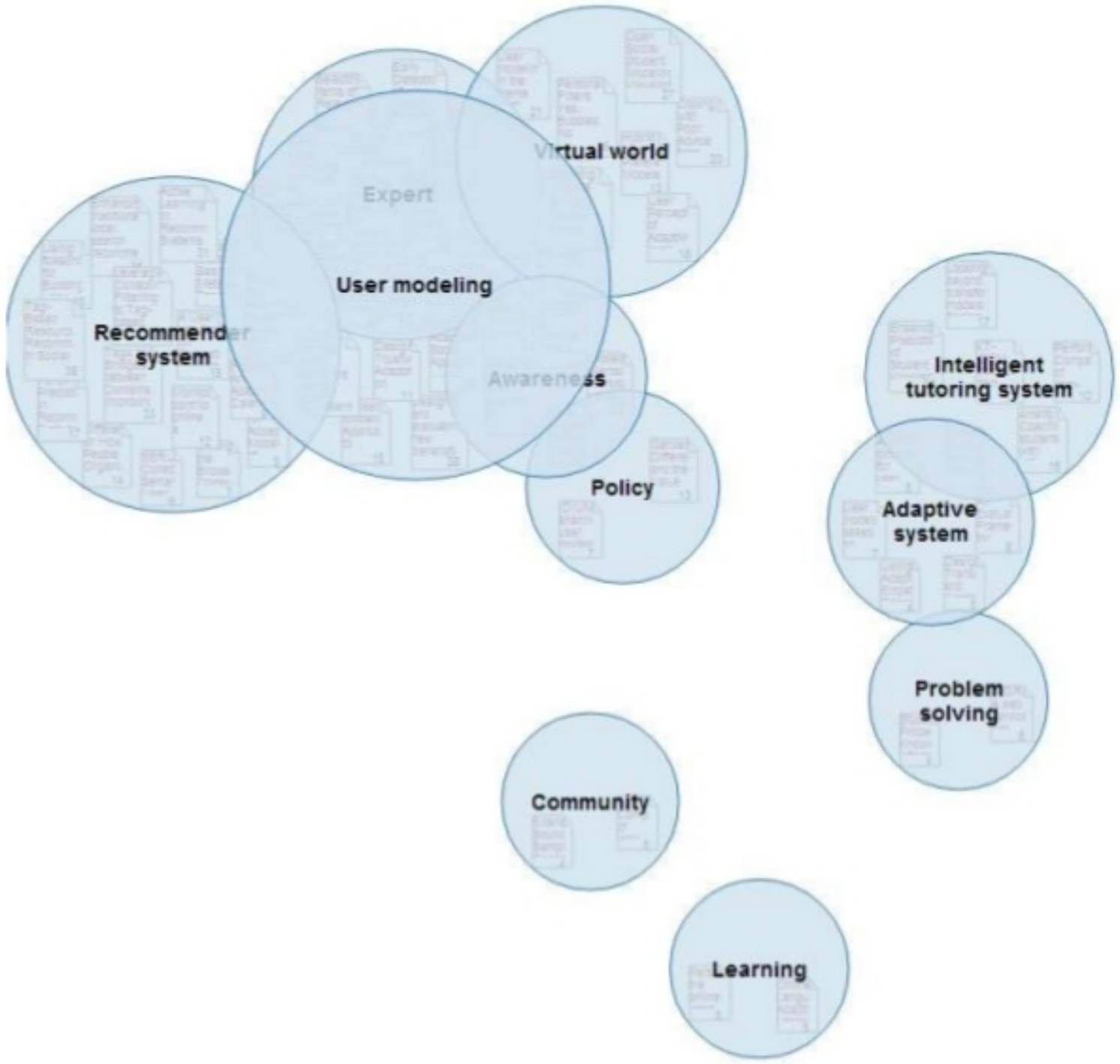
Article metadata and co-bookmarking data



Method


Start
Top Documents
Clean Top List
Bookmarking Data
Determine Co-occurrence Matrix
Calculate Correlation Coefficients
Multidimensional Scaling (MDS)
Hierarchical Clustering (HAC)
Document Metadata
Cluster Naming
Determine Area Size and Location
Unclutter Papers with Force-directed Layout
Stop

Results



http://stellar.know-center.tugraz.at/umap/

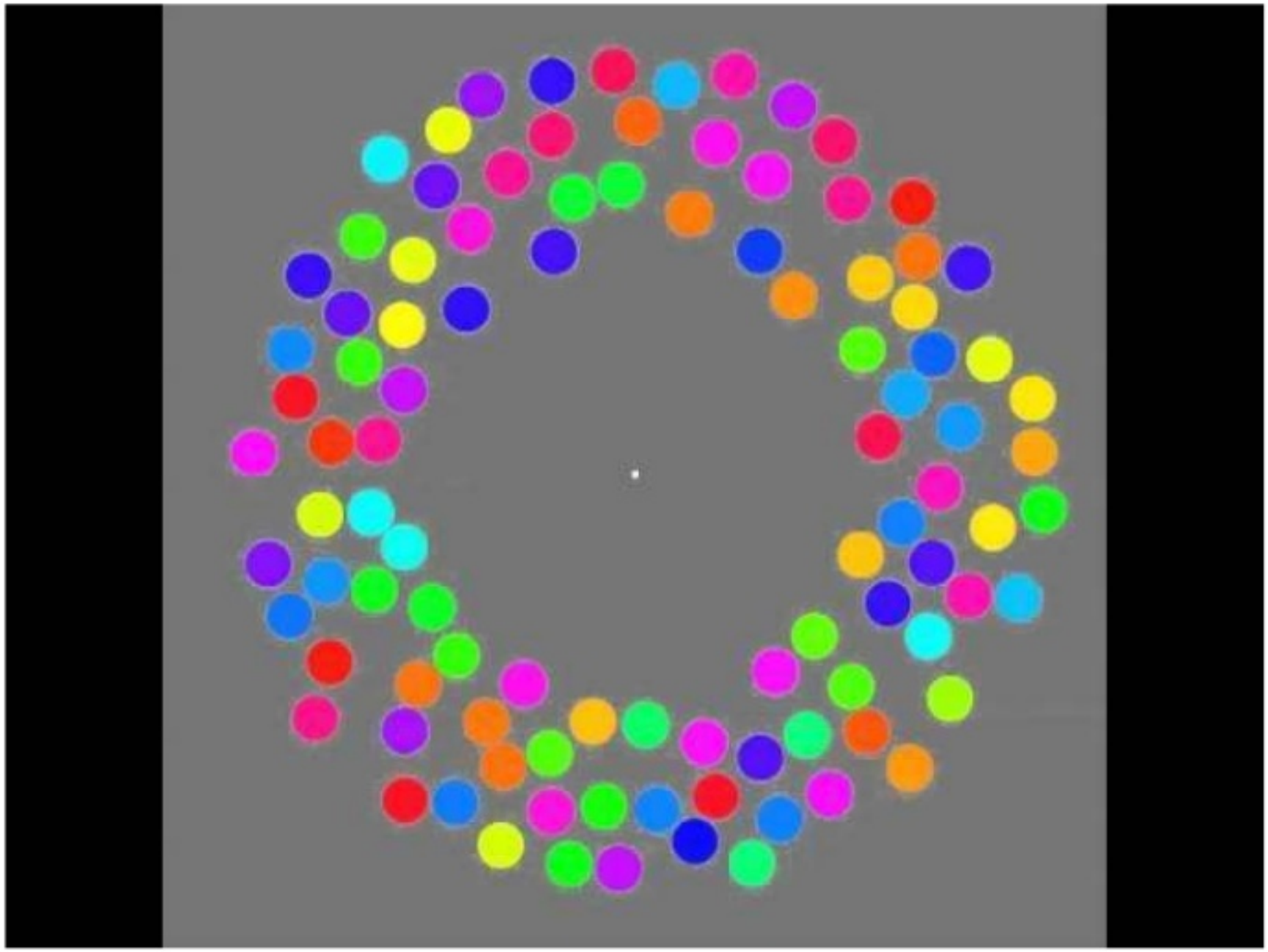
Visualization of Time-Series Data

Simple visualizations are not able to convey all necessary dimensions of the data

Animation

- Change blindness: people have difficulties recognizing change in an object or a scene (Simons and Rensink, 2005)
- The effect can also be observed in animation

Visualization of Time-Series Data



Suchow & Alvarez (2011)

http://vimeo.com/18074674

Visualization of Time-Series Data

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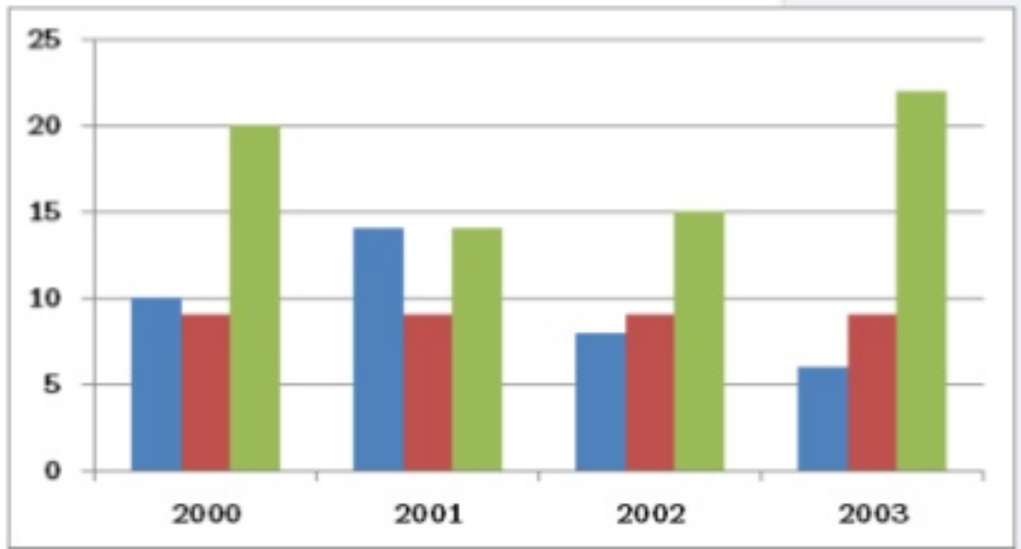
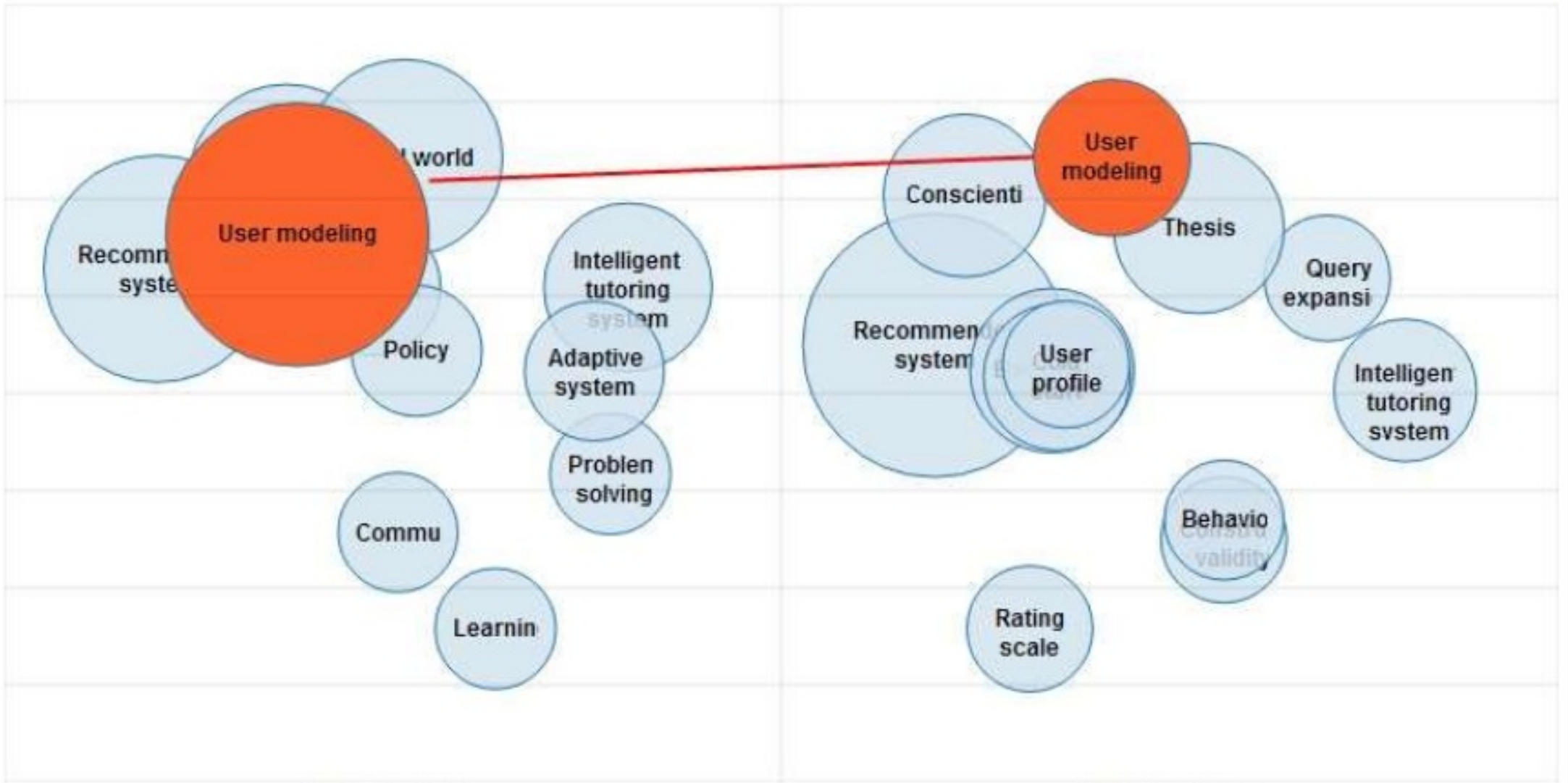


→ Solution: Small Multiples (Tufte, 1990)

Results



UMAP 2011 UMAP 2012

http://stellar.know-center.tugraz.at/umap/

Discussion and Outlook

First results are encouraging…

…but there are certain problems:

- Topology → force-directed layout
- Method depends on usage of the system
- Continuity → moving time windows of two years

Outlook

- Further use cases and longer timeframes
- Evaluation: Comparison to other measures, expert interviews

References

Chen, C., & Kuljis, J. (2003). The rising landscape: A visual exploration of superstring revolutions in physics. Journal of the American Society for Information Science and Technology, 54(5), 435–446.

Garfield, E., Sher, I., & Torpie, R. (1964). The use of citation data in writing the history of science (p. 75).

Kraker, P. (2013). Visualizing Research Fields based on Scholarly Communication on the Web. University of Graz.

Parra, D., Jeng, W., Brusilovsky, P., López, C., & Sahebi, S. (2012). Conference Navigator 3: An online social conference support system. In UMAP Workshops (pp. 1–4).

Simons, D. J., & Rensink, R. A. (2005). Change blindness: past, present, and future. Trends in Cognitive Sciences, 9(1), 16–20. doi:10.1016/j.tics.2004.11.006

Suchow, J.W., & Alvarez, G.A. (2011). Motion silences awareness of visual change. Current Biology. doi:10.1016/j.cub.2010.12.019

Tufte, E. R. (1990). Envisioning Information (p. 127). Graphics Press.

Dank u voor uw aandacht!

Comments? Questions?

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Code:
http://github.com/pkraker/Headstart

Demo:
http://stellar.know-center.tugraz.at/umap