

AW1 - Visual Analytics

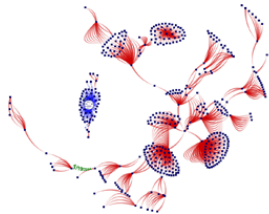
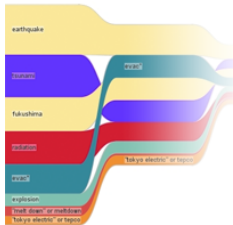


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7. November 2013





- ① Einführung
 - Motivation
 - Roadmap
 - Visual Analytics
- ② Anwendungsbereich
 - Beispiele
- ③ Umfeld
- ④ Ausblick
- ⑤ Referenzen





- Datenmenge

- unstrukturiert, widersprüchlich
- dynamische Informationen → heterogene Quellen / Streams
- immer mehr Daten → information overload

- Methoden

- fragliche Resultate → 'analysing our analyses' [2]
- Vermittlung der Resultate?
- Zeitdruck

⇒ Visual Analytics liefert Einblick in Daten.



Pacific Northwest NATIONAL LABORATORY

*Proudly Operated by **Battelle** Since 1965*

- Fokus: Grenzschutz, Katastrophenschutz
- Buch: Illuminating the Path
- National Visualization and Analytics Center
- 2004 bis 2005
- Finanzierung: DHS
- Resultat: Überblick, Vorschläge, Ansätze



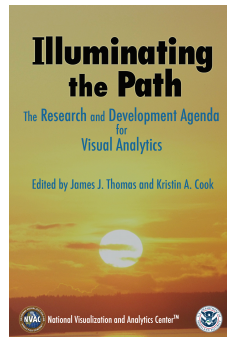
- Fokus: Research Roadmap
- 2008 bis 2010
- Buch: Mastering the Information Age
- Finanzierung: EU
- Resultat: Überblick, Herausforderungen, Möglichkeiten, Richtung

Definition

"Visual analytics is the science of analytical reasoning facilitated by interactive visual interfaces." [1]

→ multidisziplinäres Forschungsfeld:

- Analytical reasoning
- Darstellung und Interaktion
- Repräsentation und Transformation der Daten
- Kommunikation der Ergebnisse zu den Interessenten



- Techniken[3]:

① line graphs

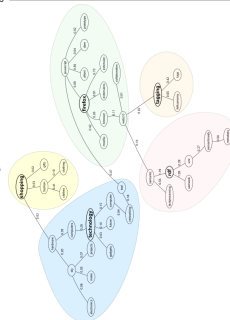
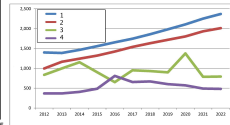
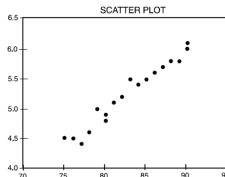
② scatter plot

③ bar charts

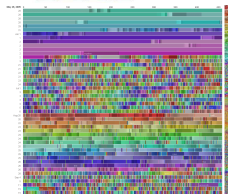
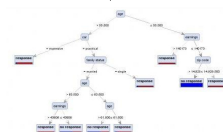
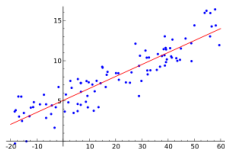
④ glyphs (Chernoff faces)

⑤ clustering

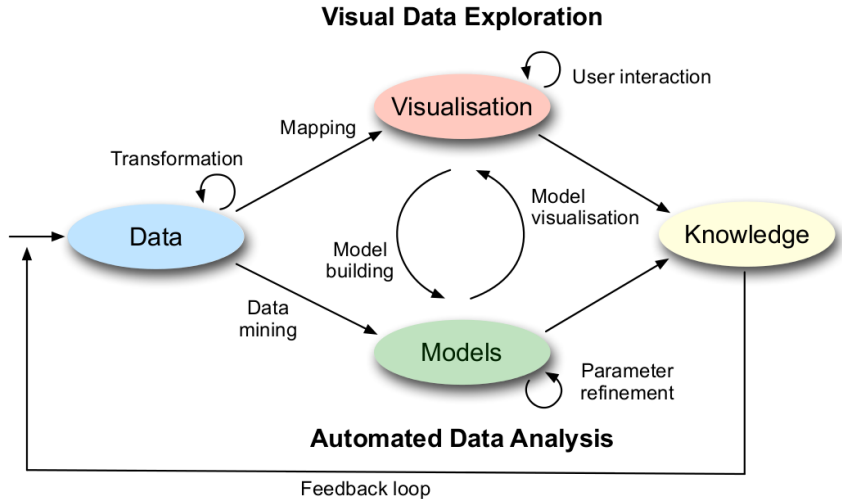
⑥ ...



Prediction	Description
① classification ② regression	① clustering ② association rule discovery ③ sequential pattern discovery ④ anomaly detection

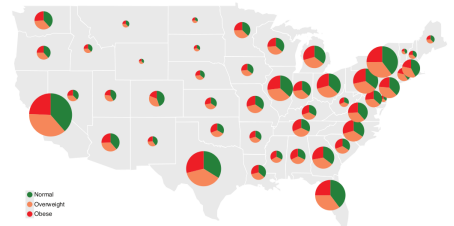
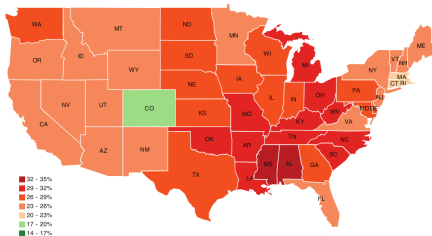
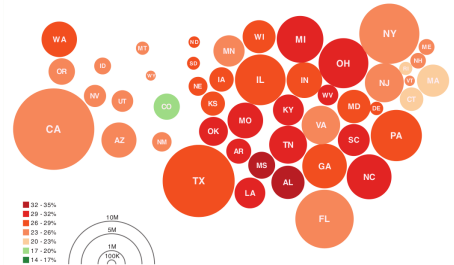


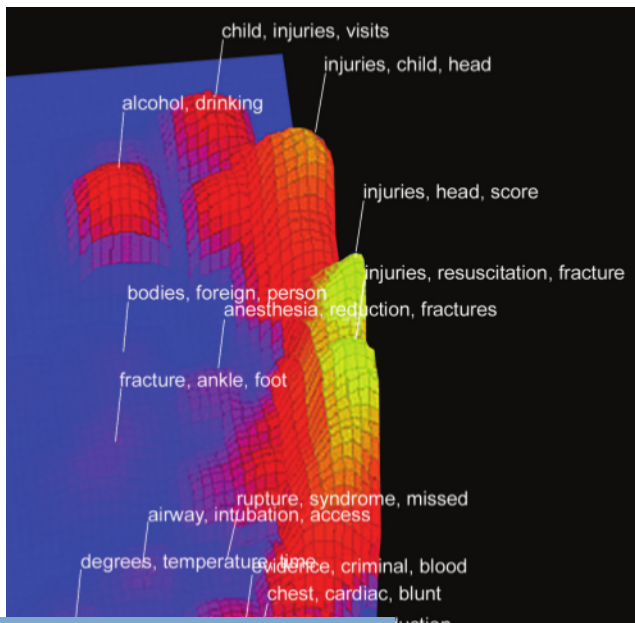
[7]



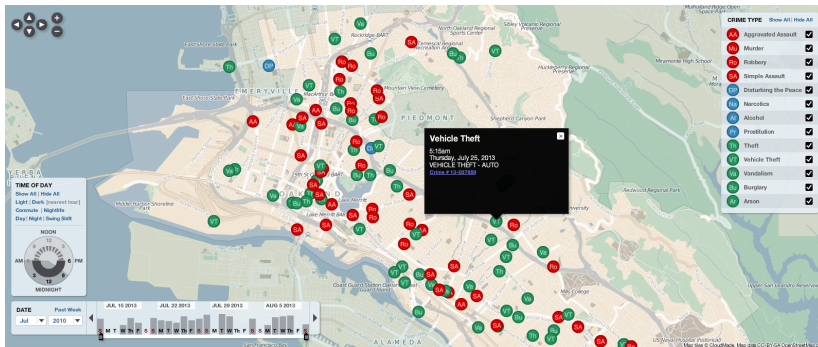
Quelle: [2]

- public health Surveillance Systems[5] → Weak Signals
- Epidemien / Pandemien [6]
- Wo leitet man Gegenmaßnahmen ein?





- "Overview first, zoom and filter, then details-on-demand." [4]



Quelle: www.crimespotting.org



- **ACM:** SIGKDD seit 1989, SIGGRAPH
- **IEEE:** VIS (VAST, INFOVIS, SCIVIS) seit 1999
- **weitere:** VDA (Conference on Visualization and Data Analysis) seit 1994, EuroVis seit 1999, ...





- Personen
 - Prof. Dr. Daniel A. Keim (University of Konstanz)
 - Dr. Jörn Kohlhammer (Fraunhofer IGD)
 - James .J. Thomas (†)
- Einrichtungen
 - Fraunhofer IGD / IAIS
 - Institut für Visualisierung und Interaktive Systeme (Universität Stuttgart)
 - National Visualization and Analytics Center (im PNNL)
- Projekte
 - Scalable Visual Analytics: Interactive Visual Analysis Systems of Complex Information Spaces (von DFG)
<http://www.visualanalytics.de>
 - Visual Analytics for Security Applications (VASA) (vom BMBF)



Aufgaben:

- Weak Signals $\rightleftharpoons$ Visual Analytics
- passende Visualisierungsarten finden
- Integration von Daten, Visualisierung und der Analyse



- Epidemien vorhersagen / Verlauf darstellen
- Kriminalität → Prävention



- [1] Thomas, James J., and Kristin A. Cook, eds. *Illuminating the path: The research and development agenda for visual analytics*. IEEE Computer Society Press, 2005.
- [2] Keim, Daniel A., et al., eds. *Mastering The Information Age-Solving Problems with Visual Analytics*. Florian Mansmann, 2010.
- [3] Card, S. K., Mackinlay, J. D. & Schneidermann, B. *Readings in information visualization, Using Vision to Think*. Academic Press Inc. 686 p., 1999
- [4] Shneiderman, B. 1996. *The eyes have it: a task by data type taxonomy for information visualizations*. Proceedings of the IEEE Symposium on Visual Languages
- [5] Maciejewski, Ross, et al. "A visual analytics approach to understanding spatiotemporal hotspots." *Visualization and Computer Graphics*, IEEE Transactions on 16.2 (2010): 205-220.
- [6] Keith R. Bisset, Stephen Eubank, and Madhav V. Marathe. 2012. High performance informatics for pandemic preparedness. In *Proceedings of the Winter Simulation Conference (WSC '12)*. Winter Simulation Conference , Article 72 , 12 pages.
- [7] Järvinen, Paula, et al. "Visual analytics. Final report." (2009).
- [8] Wijk, J.J., "Evaluation: A Challenge for Visual Analytics," *Computer* , vol.46, no.7, pp.56,60, July 2013



Bilder:

- Seite 1: Graph und Flow Bilder von <http://vis.pnnl.gov/>
- Seite 2: Kompass von <https://office.microsoft.com/en-001/images/>
- Seite 6 Chernoff Faces von http://blogs.iq.harvard.edu/ss/archives/2006/11/chernoff_faces_1.shtml
- Seite 6: Clustering http://tagging.pui.ch/automated_tag_clustering/
- Seite 7: Sequential Pattern wikipedia.org
- Seite 7: Anomalies <http://www.r-bloggers.com/data-mining-for-network-security-and-intrusion-detection/>
- Seite 9: Fettleibigkeit in Amerika (2008) <http://hci.stanford.edu/jheer/>
- Seite 10: IN-SPIRE Software <http://in-spire.pnnl.gov/>
- Seite 12: GeoTime Software <http://www.geotime.com/>