Automated Methods in Information Visualization

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Visualization? Information Visualization?

- Vis ... Visualization
- InfoVis (or IV) ... Information Visualization
  (SoftVis ... Software Visualization, ...)
- SciVis ... Scientific Visualization
  (VolVis ... Volume Visualization, FlowVis ... Flow Visualization, ...)
- VA (or VAST or IVA) ... Visual Analytics
- GeoVis ... Geographic Visualization
- Statistical Graphics, Statistical Visualization
- HCI ... Human-Computer Interaction
- Graph Drawing
- Information Design, Information Graphics
- ... (Architectural Visualization, ...)

Integrated Methods

- Clustering
  - k-means
  - hierarchical clustering methods
  - etc.
- Projections (embeddings), e.g., for dimension reduction
  - PCA
  - MDS
  - etc.
- Classification, regression
  - decision trees
  - SVM
  - etc.
- Etc.
Levels of Integration

- In most of Information Visualization:
  - no integration

- Then you find:
  - the visualization of ML results

- You also find:
  - approaches to make ML interactive

- Very rarely you find:
  - tight integration of ML and InfoVis to solve problems

Some Examples

- Integration of clustering

- Integration of projection/embedding

- Integration of classification/learning
Hierarchical Parallel Coordinates

[Fua, Ward, Rundensteiner; Vis 1999]

Calendar view example

[van Wijk & van Selow; InfoVis 1999]
Time-varying Multivariate Climate Data

[Sukharev, Wang, Ma, Wittenberg; PacificVis 2009]

Perfusion data IVA

visualizing “tissue at risk” (c & e)

[Oeltze, Doleisch, Hauser, Muigg, Preim; TVCG 2007]
Using SOMs

low crime rates

high crime rates

space-in-time SOM

drop in 2000

[Andrienko, Andrienko, Bremm, Schreck, von Landesberger, Bak, Keim; CGF 2009]

Web search visualization

nine search engines, MDS embedding

[Sun, Lebanon, Collins-Thompson; WWW 2010]
**BaobabViews (decision trees)**

Tumor location classification and same classification, manual sex-split.

- Misclassification
- Hard to separate
- Typical male
- Typical female

[van den Elzen, van Wijk; VAST 2011]

**Visual Human+Machine Learning**

Start focus: high temp. ML tell: density is related!

- Larger search: more results...
- Three interpretations (A, B, C)

[Fuchs, Waser, Gröller; TVCG 2009]
Problem solving with ML and InfoVis?

- Problem solving with ML and InfoVis
  - it’s not about ML, it’s not about InfoVis
  - it’s about solving problems
    (with ML & InfoVis)
- Inner vs. outer integration
- Concept of a toolbox of enabling technologies
  - integrate visualization
    - show to the user
    - let the user interact
  - integrate ML
    - give feedback quickly
    - be explained
- A form of visual analytics (or visual computing)

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- Question?

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