Visualization Highlights

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http://www.cs.ubc.ca/~tmm/talks.html#amore17

Visualization highlights

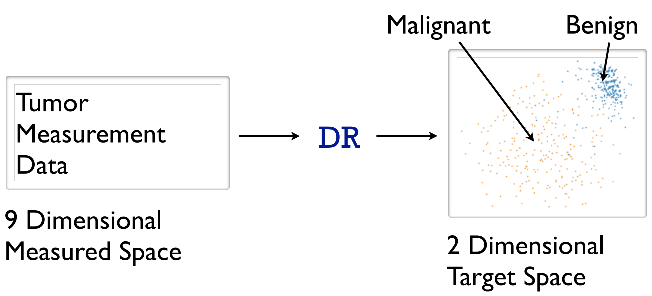
- terrain of visualization venues
  - names, scopes, relative strengths
- a few recent interesting papers
  - dimensionality reduction for visual data analysis
    - Probing Projections *https://uclab.fh-potsdam.de/projects/probing-projections/*
  - visualization to understand deep learning
    - Towards Better Analysis of Deep Convolutional Neural Networks *http://www.shixialiu.com/publications/cnnvis/paper.pdf*
    - Visualizing the Hidden Activity of Artificial Neural Networks *http://www.cs.rug.nl/~alext/PAPERS/VAST16/paper.pdf*
  - visualization incorporating ideas from ML
    - Surprise! Bayesian Weighting for De-Biasing Thematic Maps *https://idl.cs.washington.edu/papers/surprise-maps/*
  - scalable algorithms
    - Nanocubes *http://www.nanocubes.net/*
    - Hashedcubes *https://cscheid.net/static/papers/infovis_hashed_cubes_2016.pdf*

Dimensionality reduction: Background, our past work

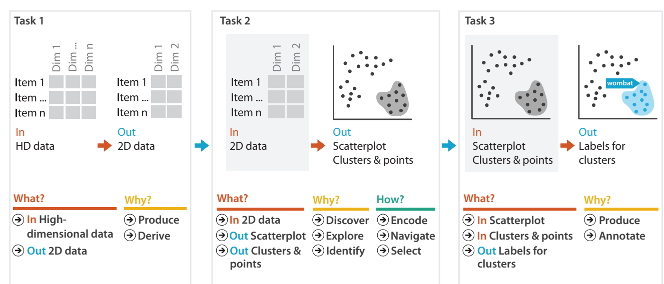
Dimensionality Reduction

- what is it?
  - map data from high-dimensional measured space into low-dimensional target space
- when to use it?
  - when you can't directly measure what you care about
    - true dimensionality of dataset conjectured to be smaller than dimensionality of measurements
    - latent factors, hidden variables

DR Example: Tumor Malignancy



DR Example: Large Document Collections



Dimensionality Reduction

- why do people do DR?
  - improve performance of downstream algorithm
    - avoid curse of dimensionality
  - data analysis
    - if look at the output: visual data analysis

Visualizing Dimensionally-Reduced Data:

Interviews with Analysts and a Characterization of Task Sequences

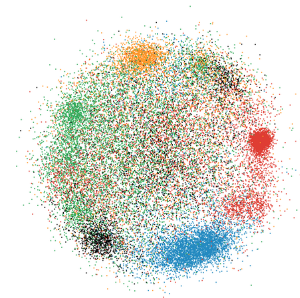
joint work with:
Michael Sedlmair, Matthew Brehmer, Stephen Ingram

http://www.cs.ubc.ca/labs/imager/tr/2014/DRVisTasks/

Visualizing Dimensionally-Reduced Data: Interviews with Analysts and a Characterization of Task Sequences
Brehmer, Sedlmair, Ingram, and Munzner. Proc. Beyond Time & Errors: Novel Evaluation Methods For Information Visualization (BELIV) 2014, p.1-8.

Two-Year Cross-Domain Qualitative Study

- interviewed two dozen high-dim data analysts
  - how are they using DR?
    - does it match up with assumptions?
  - in the wild: HCI term for field work with real users
- five abstract tasks
  - naming synthesized dimensions
  - mapping synthesized dimension to original dimensions
  - verifying clusters
  - naming clusters
  - matching clusters and classes



Glimmer

Multilevel MDS on the GPU

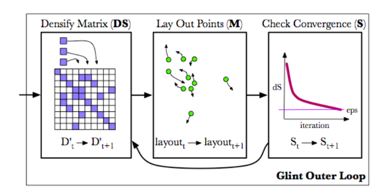
joint work with:
Stephen Ingram, Marc Olano

http://www.cs.ubc.ca/labs/imager/tr/2008/glimmer/

Glimmer: Multilevel MDS on the GPU.
Ingram, Munzner, Olano. IEEE TVCG 15(2):249-261, 2009.

MDS: Multidimensional Scaling

- entire family of methods, linear and nonlinear
- classical scaling: minimize strain
  - Nystrom/spectral methods: O(N)
    - Landmark MDS [de Silva 2004], PivotMDS [Brandes & Pich 2006]
  - limitations: quality for very high dimensional sparse data
- distance scaling: minimize stress
  - nonlinear optimization: O(N^2)
    - SMACOF [de Leeuw 1977]
  - force-directed placement: O(N^2)
    - Stochastic Force [Chalmers 1996]
    - limitations: quality problems from local minima
- Glimmer goal: O(N) speed and high quality



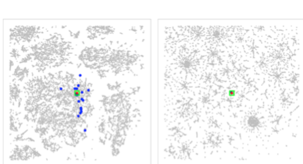
Glint

An MDS Framework for Costly Distance Functions

joint work with:
Stephen Ingram

http://www.cs.ubc.ca/labs/imager/tr/2012/Glint/

Glint: An MDS Framework for Costly Distance Functions.
Ingram, Munzner. Proc. SIGRAD 2012.



Dimensionality Reduction for Documents with

Nearest Neighbour Queries

joint work with:
Stephen Ingram

http://www.cs.ubc.ca/labs/imager/tr/2014/QSNE

Dimensionality Reduction for Documents with Nearest Neighbor Queries. *Ingram, Munzner. Neurocomputing (Special Issue for Workshop on Visual Analytics using Multidimensional Projections (VAMP) held at EuroVis 2013), Volume 150 Part B, p 557-569, 2015.*