

# InfoVis Lab Research in 15 mins



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**Knowledge Domain Analysis, Visualization & Modeling**

- Examining the Evolution and Distribution of Patent Classifications.** *Daniel O. Kutz*
- Visualization of Weblog Topic Spaces.** *Elijah Wright*
- Visual Interface to SRS.** *Ketan K. Mane*
- Visualizing the Work of the Supreme Court: 59 Years of Data.** *Peter A. Hook*
- Mapping Medline Papers, Genes, and Proteins Related to Melanoma Research.** *Kevin W. Boyack, Ketan K. Mane and Katy Börner*
- Visualizing the Blogosphere.** *Ning Yu, Susan Herring, Inna Kouper, John Paolillo, Lois Ann Scheidt, Mike Tyworth, and Elijah Wright*
- PNAS Mapping Knowledge Domains**
- Unstructured Peer-to-Peer Networks: Topological Properties and Search Performance.** *George Fletcher, Hardik Sheth and Katy Börner*
- Analysis and Visualization of the IV 2004 Contest Dataset.** *Weimao Ke, Katy Börner and Lalitha Viswanath*

**Analysis and Visualization of Diffusion Patterns**

- The ActiveWorlds Toolkit.** *Shashikant Penumarthy*
- The Spatial-Semantic Impact of a Collaborative Information Virtual Environment on Group Dynamics.** *Chaomei Chen and Katy Börner*
- Mapping Virtual Worlds and Their Inhabitants**

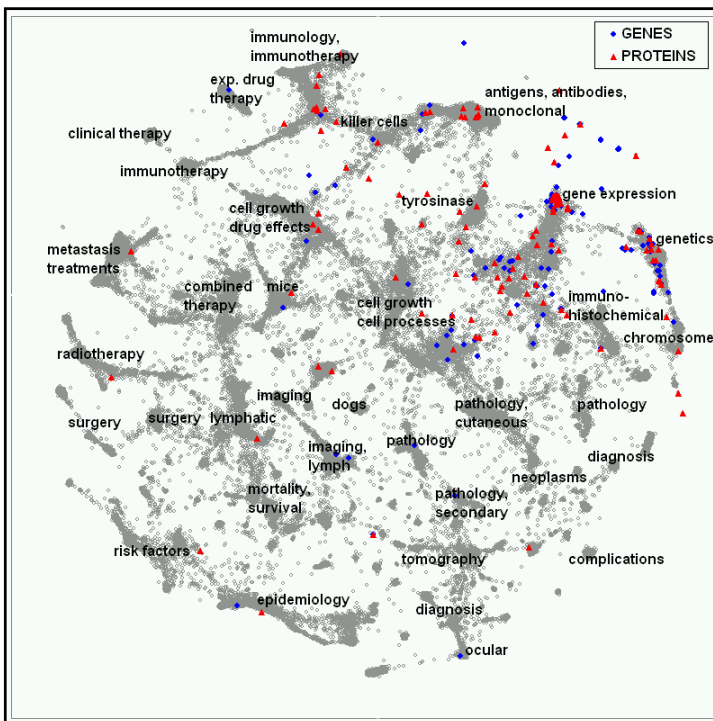
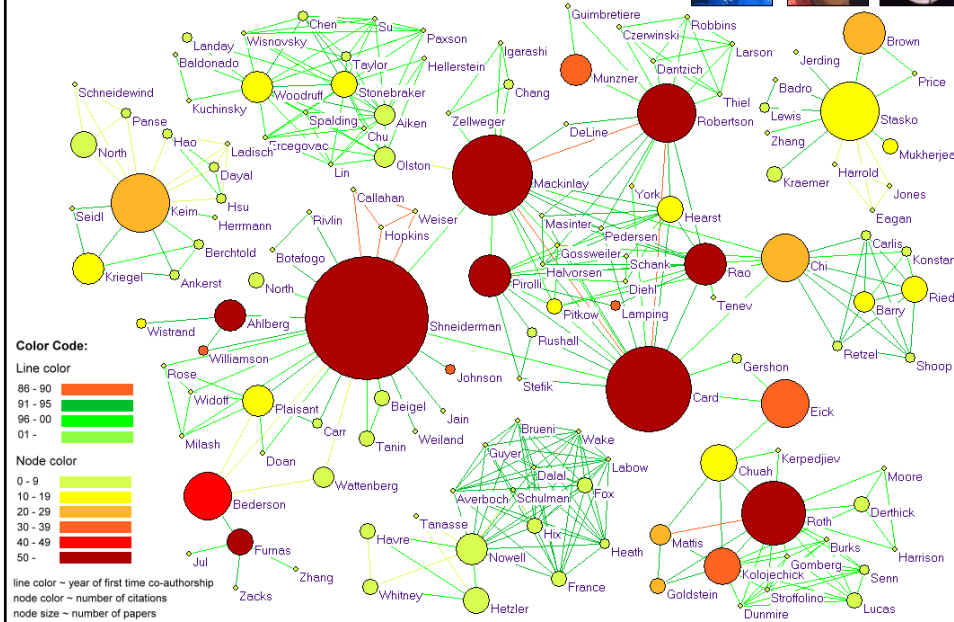
**InfoVis Cyberinfrastructure**

- InfoVis Cyber-Infrastructure Database.** *Todd Holloway et al.*
- InfoVis Learning Modules.** *Katy Börner*
- InfoVis Cyberinfrastructure Software Framework.** *Shashikant Penumarthy, Bruce Herr and Katy Börner*
- Information Visualization Cyberinfrastructure**

<http://ella.slis.indiana.edu/~katy/gallery/04-openhouse/>

## Mapping InfoVis Co-Authorships ([Interactive Map](#))

IV Contest Submission (Ke. Viswanath & Börner, 2004)



## Mapping Medline Papers, Genes, and Proteins Related to Melanoma Research

(Boyack, Mane & Börner, 2004)



# Examining the Evolution and Distribution of Patent Classifications

### 1 Patents Granted Over the Last 20 Years

Year	Number of Patents
1983	100,000
1984	105,000
1985	110,000
1986	115,000
1987	120,000
1988	125,000
1989	130,000
1990	135,000
1991	140,000
1992	145,000
1993	150,000
1994	155,000
1995	160,000
1996	165,000
1997	170,000
1998	175,000
1999	180,000
2000	185,000
2001	190,000
2002	195,000

### Top Classes 1978 - 1982

Class	Number of Patents
2600	10,000
2700	8,000
2800	7,000
2900	6,000
3000	5,000
3100	4,000
3200	3,000
3300	2,000
3400	1,500
3500	1,000
3600	800
3700	600
3800	400
3900	200
4000	100
4100	50
4200	20
4300	10
4400	5
4500	2
4600	1
4700	1
4800	1
4900	1
5000	1

### Top Classes 1983 - 2002

Class	Number of Patents
2600	15,000
2700	12,000
2800	10,000
2900	8,000
3000	6,000
3100	5,000
3200	4,000
3300	3,000
3400	2,000
3500	1,500
3600	1,000
3700	800
3800	600
3900	400
4000	300
4100	200
4200	150
4300	100
4400	50
4500	20
4600	10
4700	5
4800	2
4900	1
5000	1

In the United States, each patent gets assigned to one out of more than 450 classes covering broad application domains. An examination of the size and growth of patent classes provides insight about patenting trends.

Termmaps, a space-filling method developed in the HCI Lab at the University of Maryland, are used to communicate major results. Termmaps represent a tree structure as nested rectangles with each rectangle representing a node. A rectangular area is first allocated to hold the representation of the tree, and this area is then subdivided into a set of rectangles that represent the next level of the tree. This process continues recursively on the resulting rectangles to represent each lower level of the tree. The parent-child relationship is indicated by enclosing the child rectangle by its parent rectangle. Typically the size of each rectangle corresponds to the size of the node. Additional information about a node, e.g., its age or value, can be represented by the color of the innermost rectangle.

### 2 Fast Growth Domains 1983 - 1987 / 1998 - 2002

### Slow Growth Domains 1983 - 1987 / 1998 - 2002

### 3 Apple Computers

Depicted above is how Apple Computers' portfolio has changed in yearly increments from 1980 to 2002.

Lemelson's patent holdings below show a more even distribution over multiple classes. No class dominates over a majority of the years for granted patents, instead they are distributed more broadly over the intellectual space.

### Jerome Lemelson

Shown is a comparison of the patent class space for 1983 to 1987 and 1998 to 2002. There is a preponderance of growth in the 1998 to 2002 patent space, which correlates to the increase in patent grants during this period. By comparing the growth in categories, one can distinguish between domains that have been recouping a larger amount of patent grants.

Katz, Daniel O. Examining the Evolution and Distribution of Patent Classifications. Accepted for the Information Visualization Conference, London, UK, July 2004.

The material is based upon work supported by the National Science Foundation under Grant No. IIS-0238261.

For more information, contact Katy Börner at [katz@indiana.edu](mailto:katz@indiana.edu).

# Mapping Virtual Worlds and Their Inhabitants

### Addressed User Tasks

The developed visualization tools are intended to support social navigation in three dimensional virtual worlds, to help evaluate and optimize the design of virtual worlds, and to provide a means to study the communities evolving in virtual worlds.

### Design Concept

The figures show the layout and utilization of diverse virtual worlds. Information on the position, size and rotation of all three-dimensional objects as well as on interaction possibilities are used to generate a map of a world. Overlaid are user interaction data such as movements, web click, or chat activity recorded during virtual events in a particular world.

### Design Implementation

All virtual objects are rendered in transparent green to preserve the visibility of layered objects. A reference grid indicates the size of the virtual world. To show the evolution of a world, darker colors are used for older objects and lighter colors for younger ones. Web links and teleports are indicated by green square and purple plus signs respectively. Color-coding is used to denote the chronological sequence of user interactions.

Map of the 1980s in large, colorful, 3D virtual world. Overlaid is a map of movement activity that was recorded on April 19th while students could walk and interact in the virtual world. The data was collected in real-time and is overlaid on the virtual world. The data was collected in real-time and is overlaid on the virtual world. The data was collected in real-time and is overlaid on the virtual world.

A film sequence of user tracks recorded during the virtual conference on learning in Three Dimensions (Learn3D) in November 1999.

This visualization tool has been applied to map and visualize movement, social interaction, collaboration in three-dimensional virtual worlds and conferences. This map displays user tracks recorded in the 3D world during the design conference in 2000.

This visualization tool has been applied to map and visualize movement, social interaction, collaboration in three-dimensional virtual worlds and conferences. This map displays user tracks recorded in the 3D world during the design conference in 2000.

Katy Börner and Shashikant Penumarty (2003) Social Diffusion Patterns in Three-Dimensional Virtual Worlds. Information Visualization Journal, 2(3):182-198.

This material is based upon work supported by the National Science Foundation under Grant No. IRI-0411846.

For more information, contact Katy Börner at [katz@indiana.edu](mailto:katz@indiana.edu).

# Information Visualization CyberInfrastructure

The InfoVis CyberInfrastructure provides access to data, software code and learning modules as well as computing resources in support of the analysis, modeling and visualization of diverse data sets.

## DATABASES

An Oracle database provides access to publications, patents, grants and grant opportunities. The database is continuously and automatically updated. (<http://ivis.indiana.edu/db/>)



## COMPUTING RESOURCES

The InfoVis CyberInfrastructure is hosted at Indiana University's Research Database Complex comprising of two Sun X1280 servers with 12 X6000 1z processors and 96 GB of memory each. 8 TB fiber channel disks are attached to both servers. A Sun V900 system with 4 cpus and 8GB memory serves as the web front-end for the database servers. (<http://ivis.indiana.edu/>)



InfoVis Lab, School of Library and Information Science, Indiana University (2004).  
For more information, contact Katy Börner at [kborner@indiana.edu](mailto:kborner@indiana.edu)

## SOFTWARE

An open source IC framework was designed to facilitate the integration of diverse data analysis, modeling and visualization algorithms. New algorithms, data persistence methods, look and feels for the interface and entire toolkits can be easily "plugged in" or "unplugged". (<http://ivis.indiana.edu/iv/>)

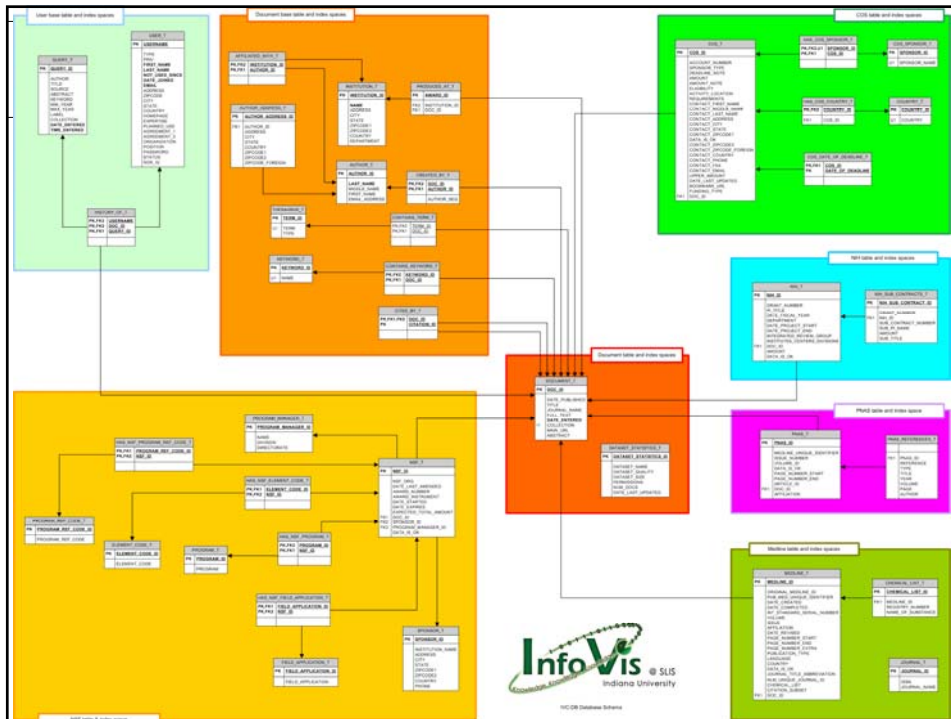


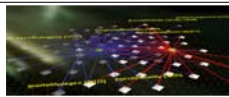
## LEARNING MODULES

A set of associated learning modules aims to equip learners with a practical skill set by providing code and advice to quickly modify and run different algorithms, test diverse interaction techniques and design features, and to quickly generate and compare information visualizations. (<http://ivis.indiana.edu/iv/>)

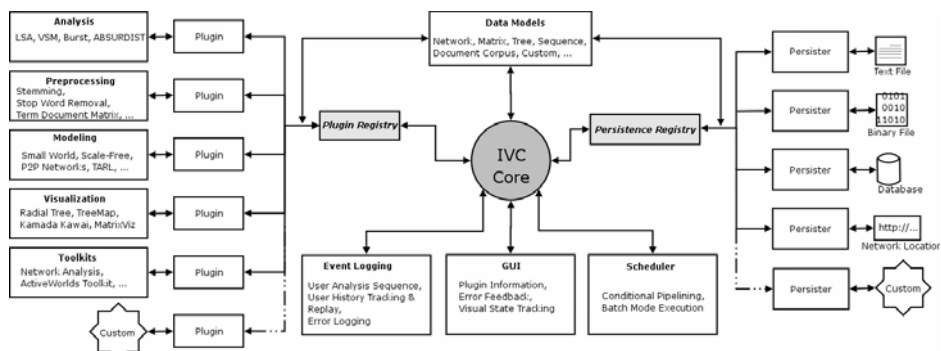
This material is based upon work supported by the National Science Foundation under Grant No. IRI-0225611 and CUE-0336212.

Katy Börner, InfoVis Lab Research in 15 mins, Oct 8<sup>th</sup>, 2004.





## IVC Software Framework



See SLIS Colloquium talk on the *InfoVis Cyberinfrastructure* on Nov 19, 2004.

Katy Börner, InfoVis Lab Research in 15 mins. Oct 8<sup>th</sup>, 2004.

## Workshop on Information Visualization Software Infrastructures

Sat. Oct. 9th, 2004, 10am-6pm  
Room Hill Country A-B

Right before the [IEEE Symposium on Information Visualization \(InfoVis\) 2004](#).

### Workshop Chairs

- Jean-Daniel Fekete, INRIA Futurs, France (Author of [The InfoVis Toolkit](#)),  
[Jean-Daniel.Fekete@inria.fr](mailto:Jean-Daniel.Fekete@inria.fr), Home page: <http://www.lri.fr/~fekete/index.en.html>
- Katy Börner, Indiana University, USA (Co-Author of the [InfoVis Cyberinfrastructure](#))  
[katy@indiana.edu](mailto:katy@indiana.edu), Home page: <http://ella.slis.indiana.edu/~katy/>

### Description

Information visualization systems and toolkits are becoming available for a large range of visualization and interaction techniques and are used in diverse application domains. This workshop is aimed at gathering experts involved in building such infrastructures to share their views, understand the issues involved and trying to find ways to avoid fragmentation and improve collaborations.

To participate in the workshop, you should submit a semi-structured position paper explaining your view of what an infrastructure should provide, describe what you consider as the main challenges for such infrastructures and describe the capabilities of toolkits of systems you have already built, following a form available [here](#) by Sept 30th, 2004.

<http://vw.indiana.edu/ivsi2004/>



The Tower of Babel by Pieter Bruegel

### Fall 2004 Talk Series on

## Networks and Complex Systems

Every Monday 6-7p, LI 001 ~ Optional Dinner Afterwards

#### Description

This talk series is open to all Indiana University faculty and students interested in network analysis, modeling, visualization and complex systems research.

A major intent is to cross-fertilize between research done in the social and behavioral sciences and research in 'hard core' sciences such as biology or physics.

Links to people, projects, groups, students, courses and other resources at Indiana University are also available via the CSN web site.



The slides of all talks will be available online.



Most talks will be video taped.

#### Organizer

**Katy Börner** <[katy@indiana.edu](mailto:katy@indiana.edu)> Assistant Professor

#### Time & Place

Every Monday 6:00-7:00pm in the **Main Library LI 001**, in the **Science Colloquium Series**.

There is an optional dinner afterwards 7-9p at **Lennie's**.



<http://vw.indiana.edu/talks-fall04/>

<http://vw.indiana.edu/aag05/>

### Mapping Humanity's Knowledge and Expertise in the Digital Domain

At the **101st Annual Meeting** of the **Association of American Geographers** | Denver, CO: April 5-9, 2005.

#### Session Organizers

**Katy Börner**, **Indiana University**  
**André Skupin**, **University of New Orleans**

#### Sponsors

Cartography and GIS specialty groups

#### Description

This session will bring together leading researchers and practitioners that aim to develop techniques, tools, and infrastructures to map humanity's knowledge and expertise for the improvement of science and education.

Knowledge and expertise is typically extracted from digitally available literature, news, computer mediated communication data as well as from information about the producers and consumers of those data sets. Advanced data analysis techniques in combination with spatial metaphors, geographic principles, and cartographic methods are applied to organize, visualize, and communicate the semantic relationships inherent in the data.

The ultimate goal of this work might be an interactive cartographic map of all of science, with continents representing the major research areas such as, e.g., biology or physics, dots denoting major authors, PIs, papers or news, dynamically evolving research frontiers, blinking 'hot' papers and topics, etc. This map could be used to teach and understand the evolving structure of all of science, to identify major experts, to find and read the most relevant papers and news, to see the effects of resource allocation decisions, to study social networks, etc. Last but not least, it would provide a unique bird's eye view of major experts in specific areas and mankind's knowledge in general.

Some of the leading-edge research on this topic is found where geography intersects with information/library science, computer science, and cognitive science. We invite papers on the broad foundations, computational methods, software systems, and evaluation of such data analyses and visualizations, as they have emerged in this interdisciplinary endeavor.

