

Science.  
Technology.  
Innovation.

Visual analytics can be applied in:

- Technology Scanning
- Intellectual Property Management
- Information Assurance
- Scientific Research
- Legal and Regulatory Analysis
- Acquisition Analysis
- National Security and Law Enforcement
- Medical and Pharmaceutical Research
- Cyber Security
- Web Space Analysis

# Interactive Visual Analytics

## A Look at Innovative Solutions at PNNL

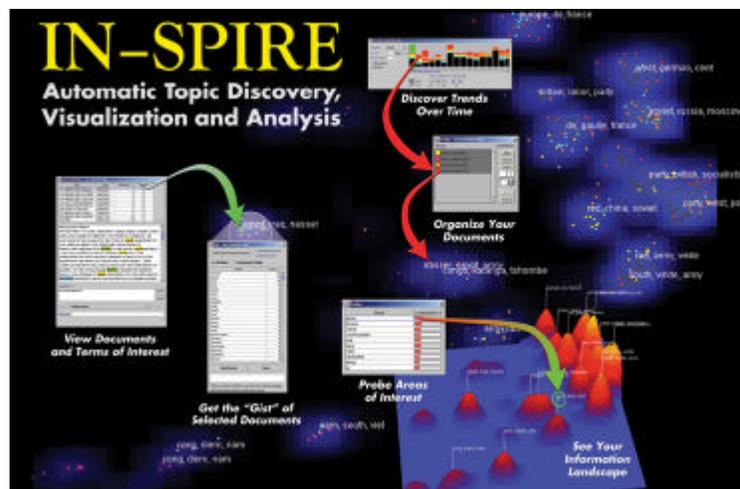
So much data, so little meaningful information. Industry and government face this challenge as they try to stay ahead of the competition or understand national security risks. Whether gathering market research, assessing terrorist threats, or determining how to treat a medical condition, the ability to uncover relationships, trends, and themes hidden within data can lead to new knowledge. Pacific Northwest National Laboratory's visual analytics research and technologies give people insight—the ability to see something in data they already have.

### More than just a pretty picture

People have the natural ability to rapidly comprehend visual images. To make the most of this skill, our researchers have developed creative and powerful approaches to present diverse data types in compelling visual displays. Statistics and complex mathematical algorithms behind the scenes transform abstract information into meaningful, insight-triggering images. Furthermore, our tools allow people to interact with the visualizations and explore the information they reveal—without having to understand the sophisticated underlying mathematics.

### Working Solutions

With broad experience in research, engineering, and product development, PNNL's efforts in visual information analysis range from basic research to the development of innovative tools and technologies. Our interdisciplinary teams apply their diverse capabilities in software engineering, computer science research, cognitive psychology, statistics and mathematics, and human-computer interactions to solve problems for industry and government clients. We look forward to further developing, enhancing, and customizing these tools, as well as exploring new approaches, to meet your specific analytical needs.



The IN-SPIRE discovery tool integrates information visualization with interaction and query capabilities. In the Galaxy visualization, dots represent documents and cluster around center points that represent central topics or themes, like constellations in the sky. An additional visualization tool provides an even faster way to get a visual overview of a collection of data. Users see a relief map where the highest peaks represent the most prevalent topics

Pacific Northwest  
National Laboratory  
Operated by Battelle for the  
U.S. Department of Energy





*Pacific Northwest National Laboratory's interactive visual analytics provide new ways to ask questions and get answers*

### **Discovering the Unexpected**

Our research helps people identify trends, temporal and cognitive relationships and key themes within large collections of data, which might include a large collection of documents, individual large documents, information on the web, images, video, or audio data.

For example, IN-SPIRE quickly and automatically conveys the gist of large sets of unformatted text documents such as technical and patent literature, marketing and business documents, web data, accident and safety reports, newswire feeds and message traffic. By clustering similar documents together, this Windows-based software unveils common themes and reveals hidden relationships within the collection. Building upon nearly a decade of PNNL's research for the U.S. Government, IN-SPIRE allows analysts to spend more time exploring the information they find most relevant and less time sifting through masses of irrelevant documents.

### **Starlight Sheds Light on Data**

Starlight software analyzes large databases and displays information so users can recognize subtle relationships. It could identify correlations in records about chemical spills by giving users the ability to sort by cause, then again by company responsible, age of equipment, or geographic location.

Maps and photographs can be integrated into the display to assist in recognizing connections among multiple variables. Potential applications include law enforcement, patent analysis, and medical and legal research.

### **Mining for data** - PNNL

researchers have developed tools that combine data mining with visualization to allow users to simultaneously study patterns, associations, and other complex relationships in large collections of data. These tools not only uncover hidden and unpredicted relationships among documents, people, or concepts, they also identify the absence of relationships where they were expected. The visualization shows statistical patterns identified by the data mining engine, making associations easier to grasp and explore.

### **Giving users more control** -

In addition to automatically revealing similarities among the data and presenting images for investigation, some of our tools allow users to define relationships and theories they would like to explore or test. With these technologies, people can manipulate the analysis without having to be familiar with the details behind the scenes.

**Seeing it your way** - Dynamic analysis gives users the opportunity to define which images in a collection should be considered similar. The tool reorganizes and displays the images based on the user's guidance. This approach could be used to analyze image databases including photos, images captured by research or medical instruments, or satellite imagery, as well as applied to text or other kinds of data.

### **About PNNL**

From the scientific research and development of cutting-edge concepts to engineering those concepts into visual analytic tools, PNNL is ready to meet your information analysis needs. PNNL delivers breakthrough science and technology in the areas of environment, energy, health, fundamental sciences, and national security. Battelle, based in Columbus, Ohio, has operated the Laboratory for the U.S. Department of Energy since 1965.

#### **For technical information contact:**

Dennis McQuerry  
*Email:* mcq@pnl.gov  
*Phone:* (509) 375-2953

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<http://www.pnl.gov/infoviz/>