Motivation

- Due to the increasing pace of scientific and technological progress, government workers, researchers, and companies are drowning in data.
- If people need information, they ask experts to prepare a special report.
- Limited resources require the setting of strategic priorities. But it is hard to objectively identify (interdisciplinary) research with high socio-economic benefit.

New data analysis and visualization techniques can't replace human knowledge gathering & decision making, but they can support and complement it.

Advanced Data Processing and Visualization Techniques

- Can be utilized to mine publication and grant data related to aging research. The resulting interactive maps show:
  - Major research areas, experts, institutions, grants, publications, journals.
  - Insularity of areas and main connections for each area.
  - Time sequences, which reveal the evolution and relative speed of areas.

Interactive Visualizations can be used to:

- Identify promising areas and research opportunities.
- Facilitate (cross-disciplinary) collaborations.
- Present findings to others.

Given agreed upon data selection criteria, data mining and visualization techniques, modern domain maps are objective and scalable, and provide many different views of data.

Data Acquisition

- NIA Grants
- NIA Accomplishment Reports
- Medline Publication Data
- ISI Publication Data

Data Processing

- Automatic Term Extraction & Assignment
- Co-Term Analysis
- Co-Citation Analysis
- Co-Author Analysis
- Latent Semantic Analysis

Data Visualization & Interaction Design

VxInsight is a general-purpose knowledge visualization software package developed at Sandia National Laboratories that enables researchers, analysts, and decision-makers to accelerate their understanding of large databases. It was developed to create navigable technology maps from the Science Citation Index to show subfields and trends in science at both global and detailed levels. VxInsight has found application with patent and genomic expression data in addition to the literature data for which it was developed.

VxInsight transforms documents into a landscape where similar documents are close together, and dissimilar documents are far apart. Groups of documents create peaks in the landscape. Labels are automatically generated for landscape features from the underlying documents. Users can navigate the landscape by zooming in and out, querying titles, abstracts, keywords, authors, etc., or by time-slicing. Relationships among the data may be displayed and understood at many levels of detail. Detail about any document is also available upon demand. VxInsight allows users to interactively browse, explore, and retrieve information from a database in an intuitive way.

The visualization above shows DBASSE-related grants and publications from 1995-2000. Document groups were formed using relationships between words in the titles of grants and publications. Documents related to the topics of "retirement", "cognition", and "nursing homes/care" are shown by the green, blue, and yellow markers, respectively. "Cognition" documents are found in many areas - primarily in peaks labeled as behavioral, memory, and Alzheimer's disease. Grants funded by Richard Suzman are shown as white markers.