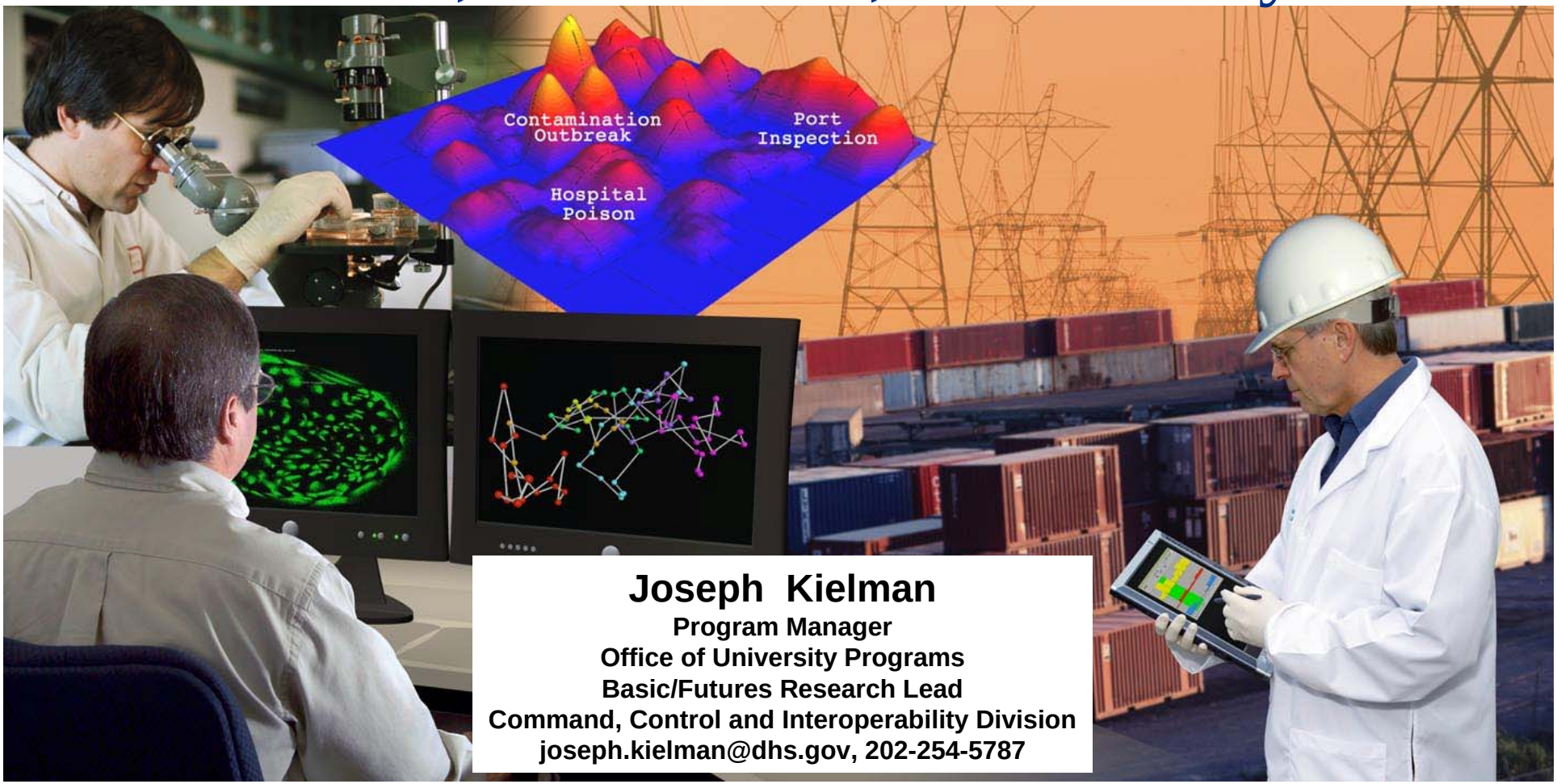
The Visual Analytics Complex: A Collaboration Among National Laboratories, Universities, and Industry



Joseph Kielman
Program Manager
Office of University Programs
Basic/Futures Research Lead
Command, Control and Interoperability Division
joseph.kielman@dhs.gov, 202-254-5787

Homeland Security

National Visualization And Analytics Center

Basic/Futures Research – The Mission

Division Mission: Through a practitioner-driven approach, CCI creates and deploys information resources to enable seamless and secure interactions among homeland security stakeholders

- A practitioner-driven approach is defined as a process where the needs of end-users drive the creation of information resources
- Information resources include standards, frameworks, tools, and technologies
- Enabling seamless and secure interactions means enhancing the ability to communicate, share, visualize, analyze, and protect information
- Stakeholders include all local, tribal, state, Federal, international and private entities engaged in homeland security

DHS Drivers: OI&A, OIP, FEMA, ICE, CBP, USCG, S&T; federal, state, and local public safety, health, law enforcement, and emergency response organizations; NSF, ODNI, CIA, and NSA; DRDC, BMBF

End-Users: OI&A, OIP, FEMA, ICE, CBP, USCG, S&T; federal, state, and local public safety, health, law enforcement, and emergency response organizations

Basic/Futures Research - Description

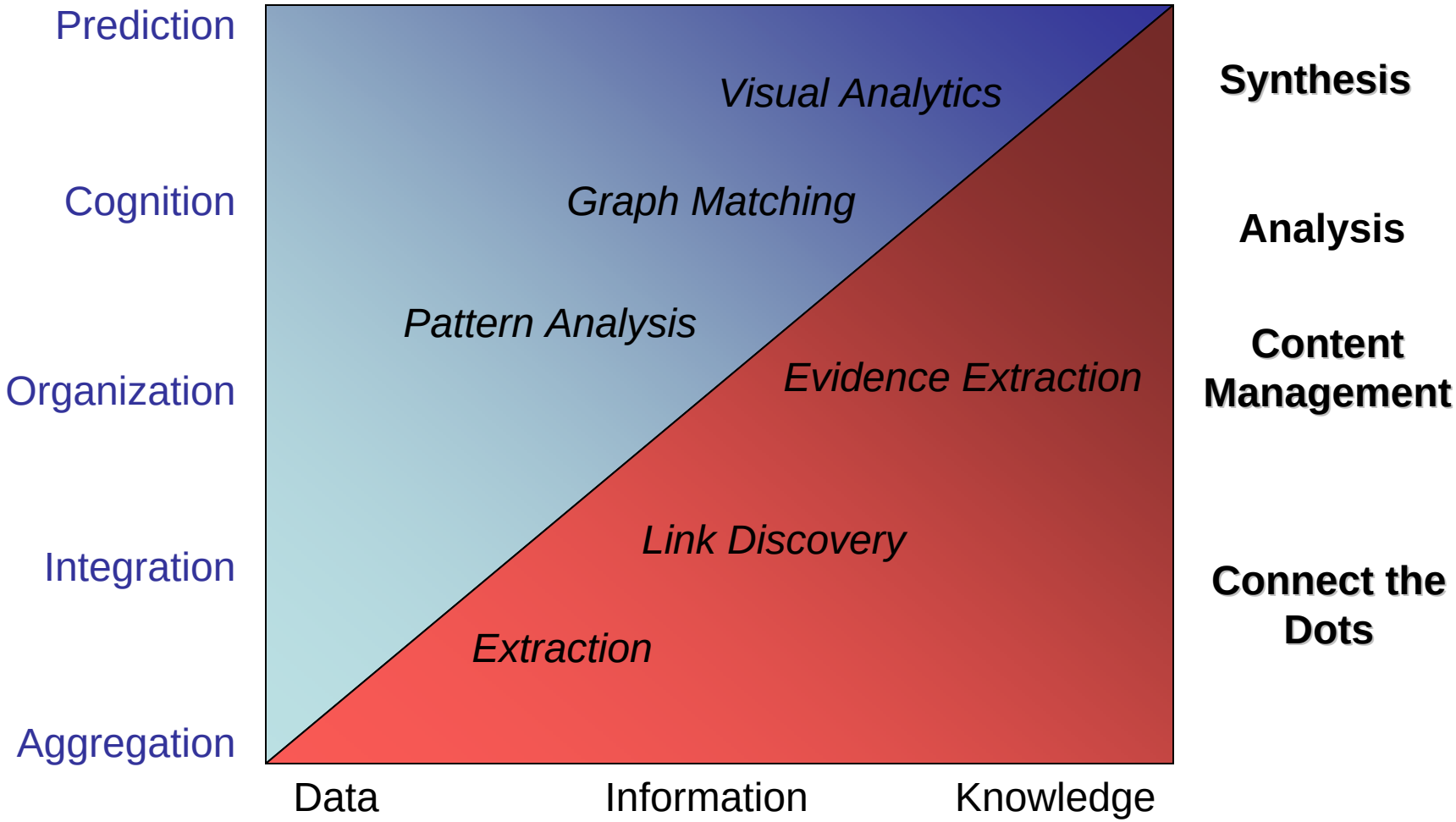
Basic/Futures Research Application

- The capability supports CID efforts in threat assessment, data communications and sharing, interoperability, knowledge management and analysis, surveillance and investigative support, cyber security, and disaster management

Basic/Futures Research Metrics

- Search for novel algorithms, computing architectures, and methods that will fundamentally advance the theory and practice of transforming data into new, scalable representations suitable for computer visualization, visualizations that faithfully represent the content of the underlying data, and physically realistic and accurate simulations
- Creation of a single, common analytical framework for all data types, namely, structured and unstructured text, video, imagery, audio, and sensor and other data, and all computer and network architectures
- Development of a truly scalable knowledge discovery, understanding, and dissemination capability, which maintains its real-time nature as the amount, variety, and diffusion of the data increase
- Development of application-specific interfaces and combined analytical-synthesis capabilities for systems ranging from handheld, mobile devices to single analyst stations to command center installations suitable for wide-area, multi-threat, and inter-agency operations

Multiple Techniques Contribute to Threat Assessment

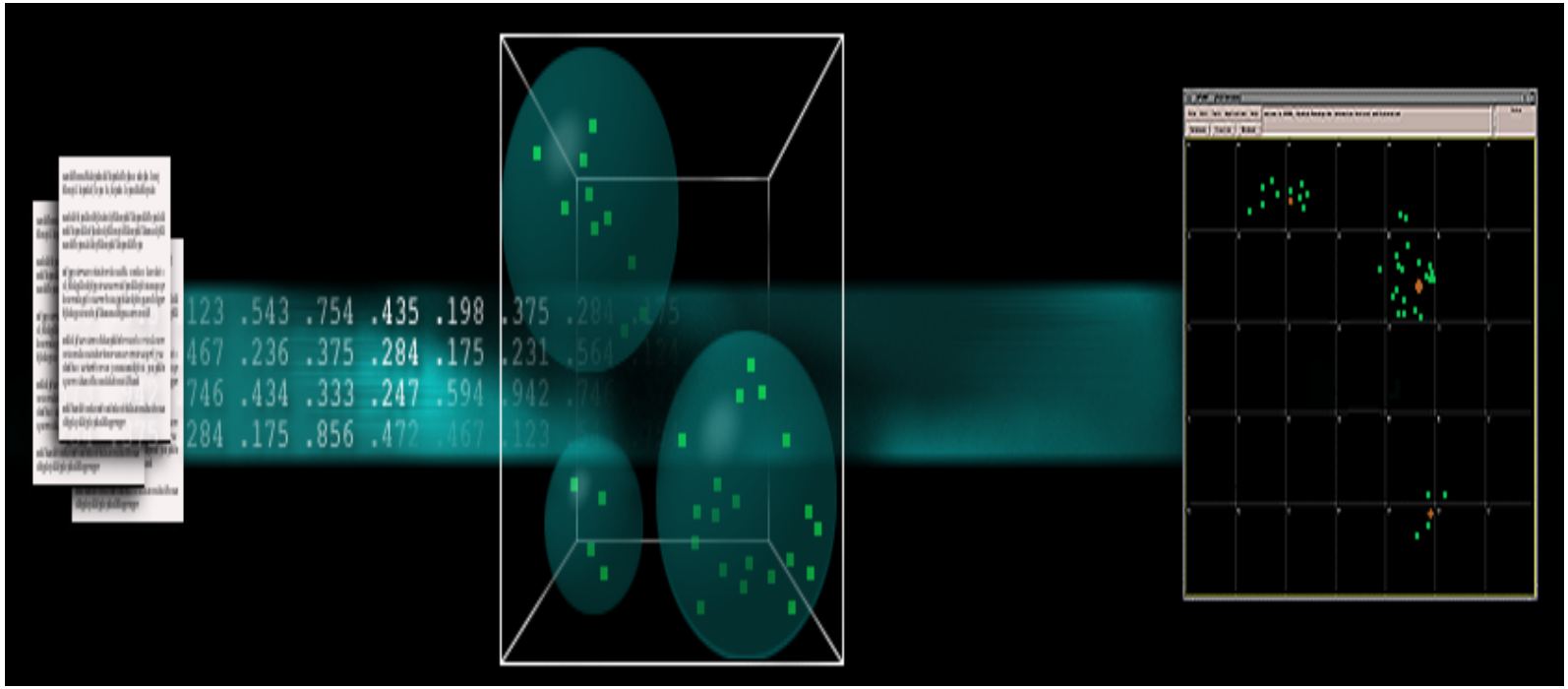


One Core Concept

Create
data signature

Synthesize into
high-dimensional
discovery space

Visual discourse
for discovery



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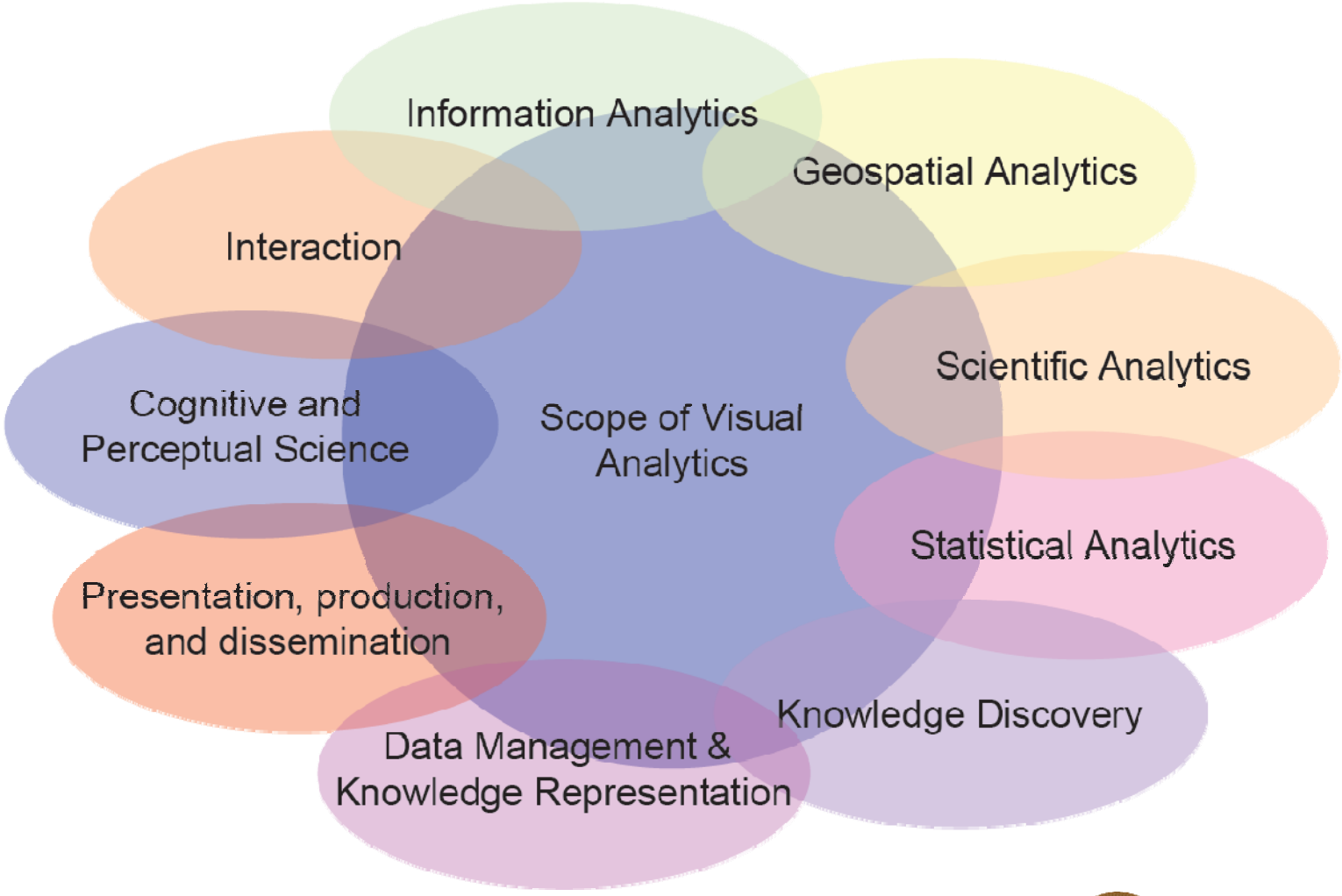
Scope of Visual Analytics



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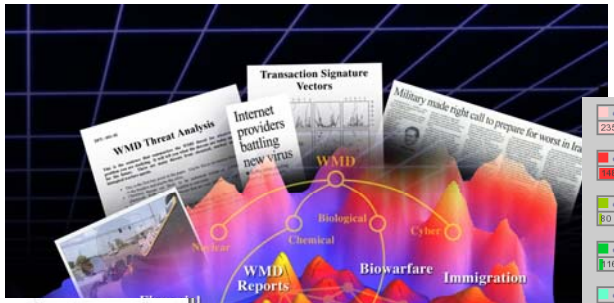
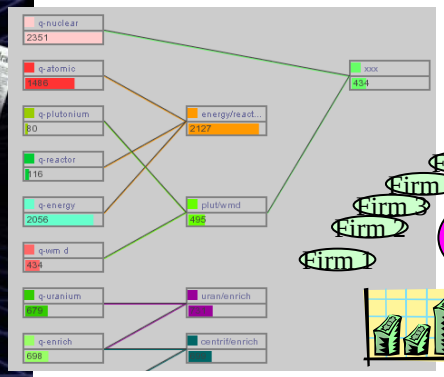
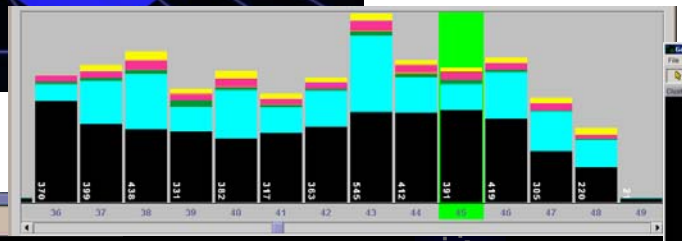
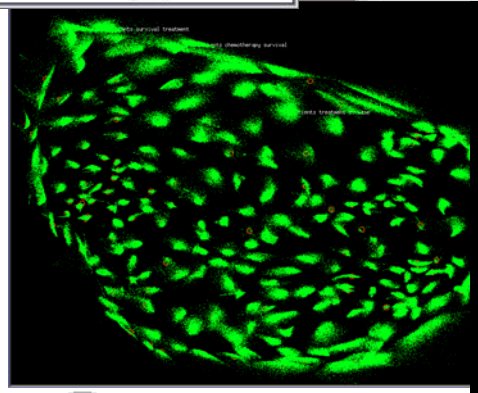
Visual Analytics Capabilities

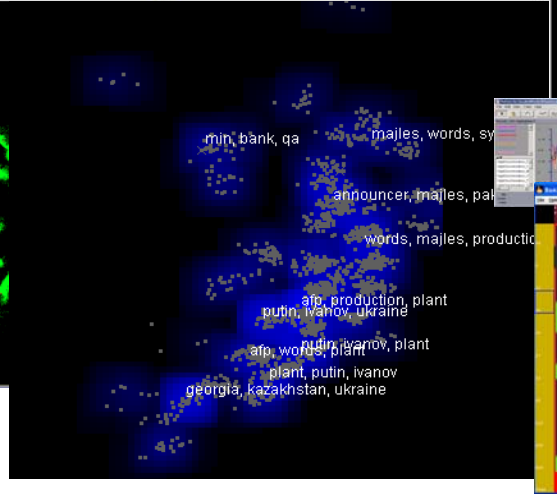


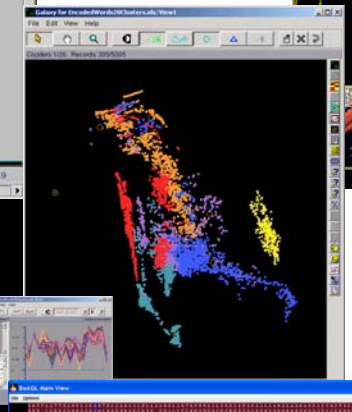


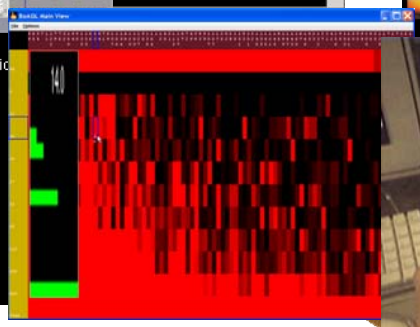
A Bank

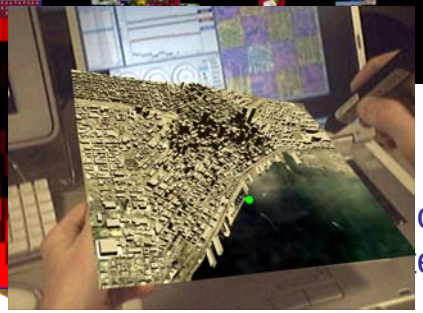


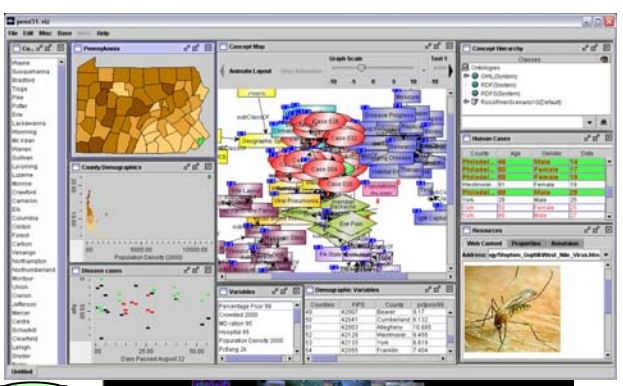


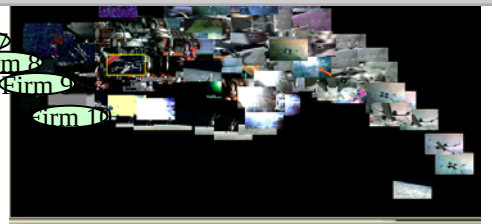












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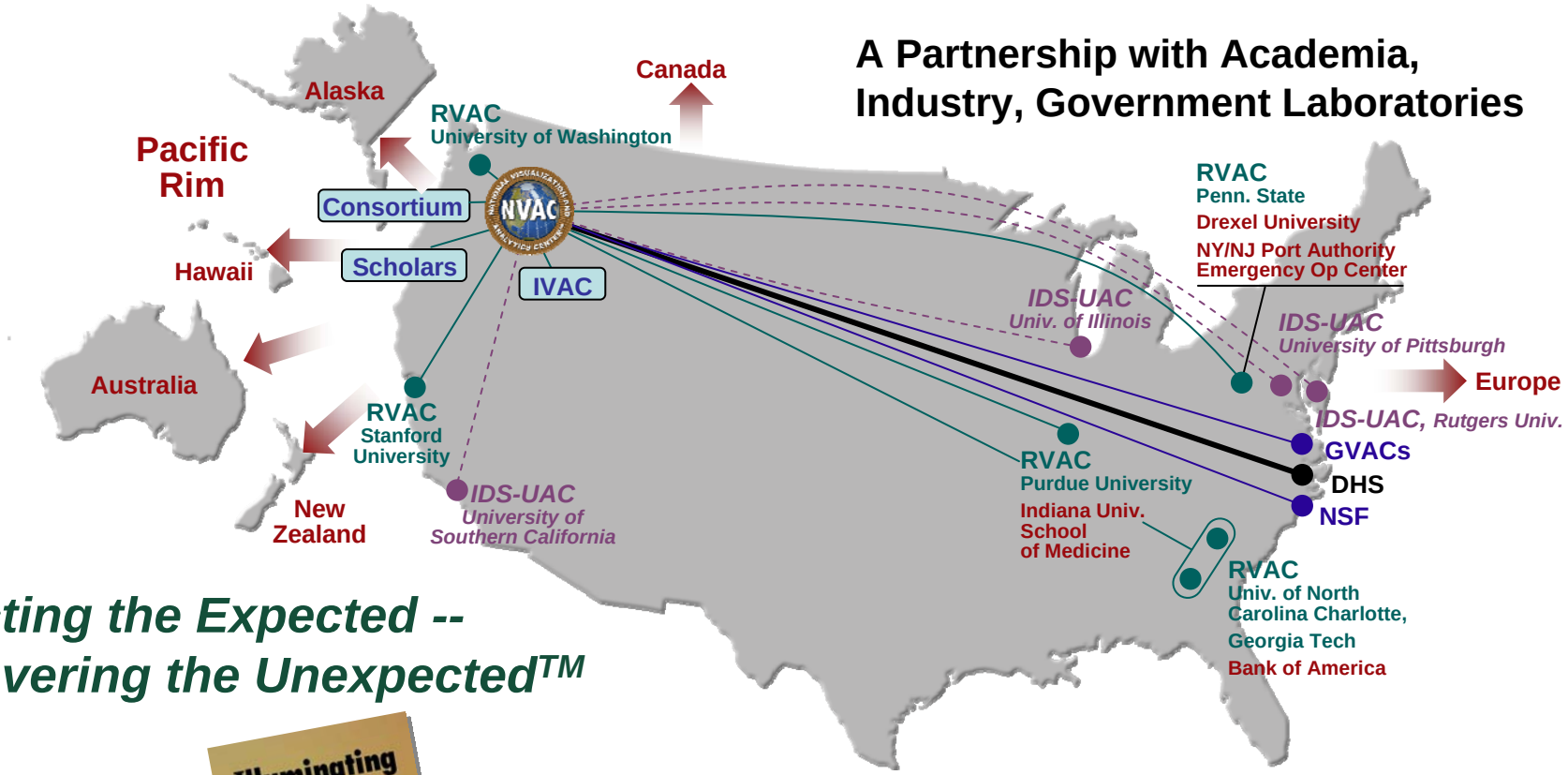
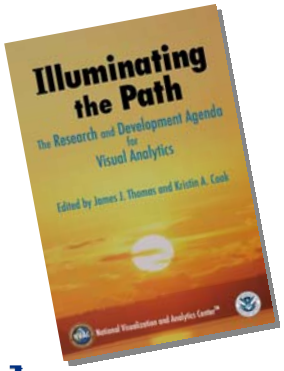
Visualization and Analytics Centers



Detecting the Expected -- Discovering the Unexpected™



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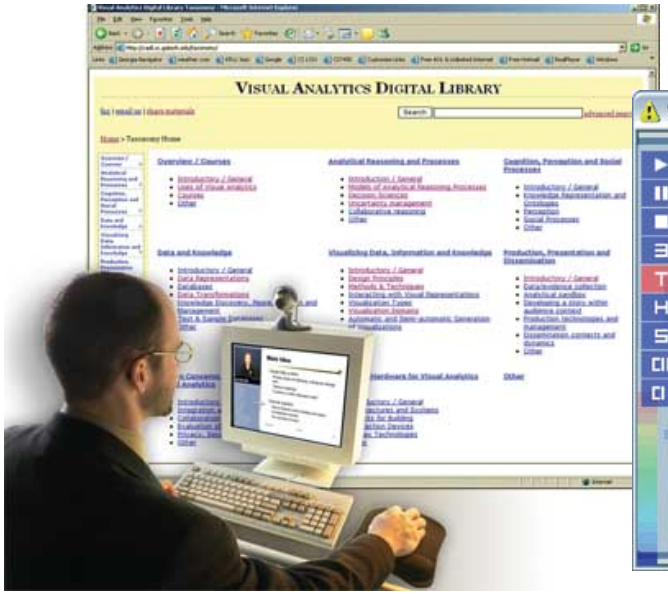
Fall 2007 VAC Consortium

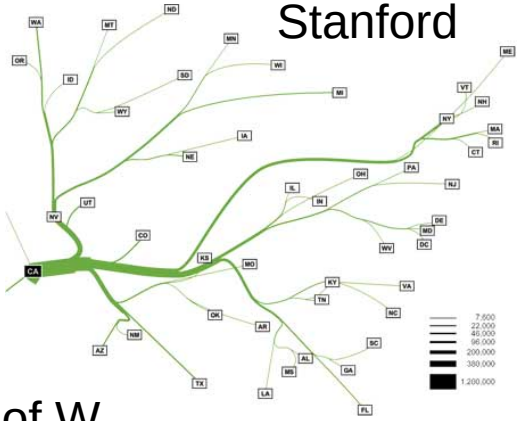
Drawing on the VAC Partners

- Regional Centers
- DHS Centers of Excellence

Georgia Tech



Stanford



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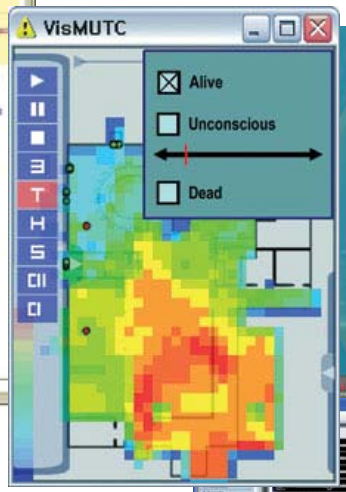
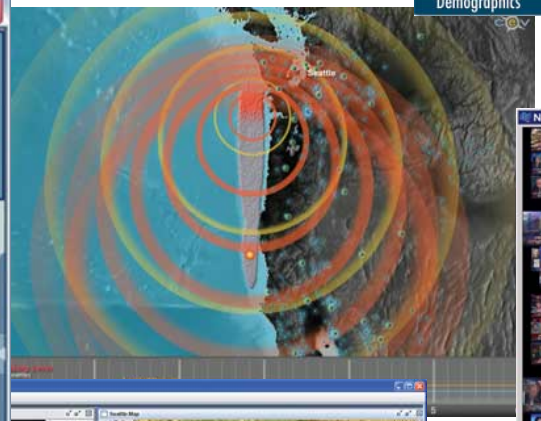
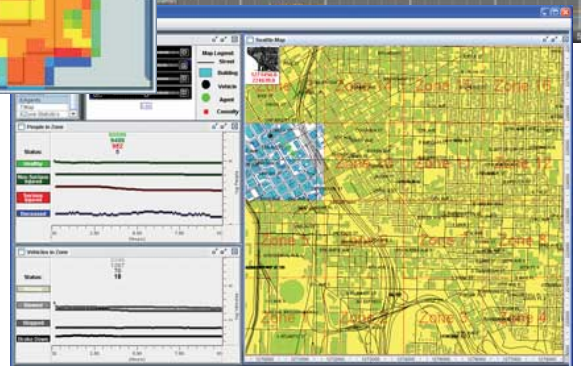
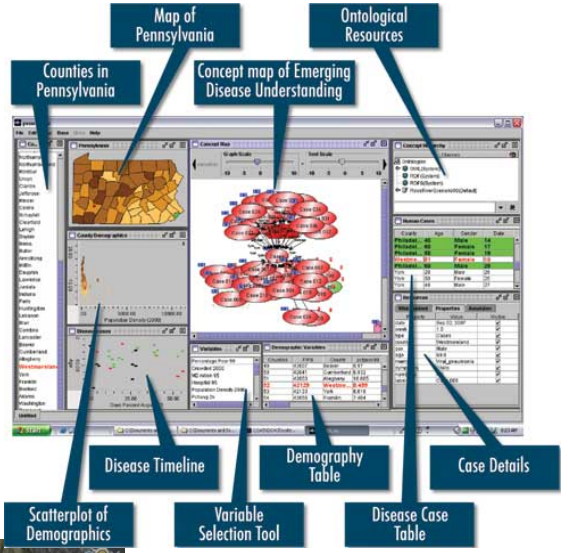






Penn State



UNCC

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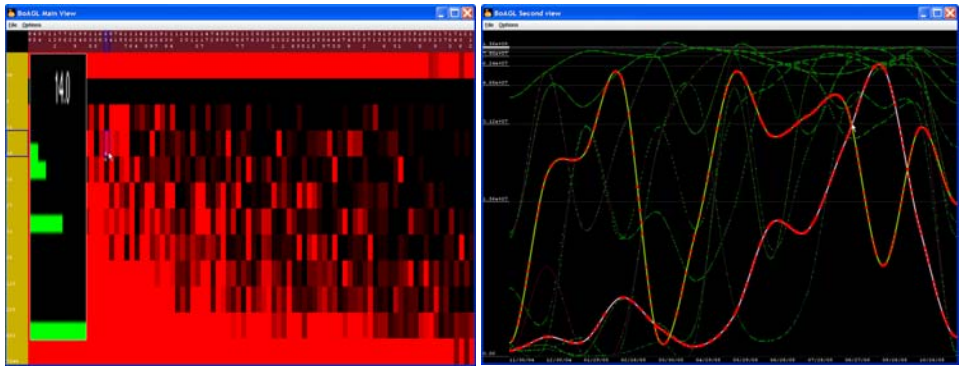
SouthEastern RVAC:UNC Charlotte

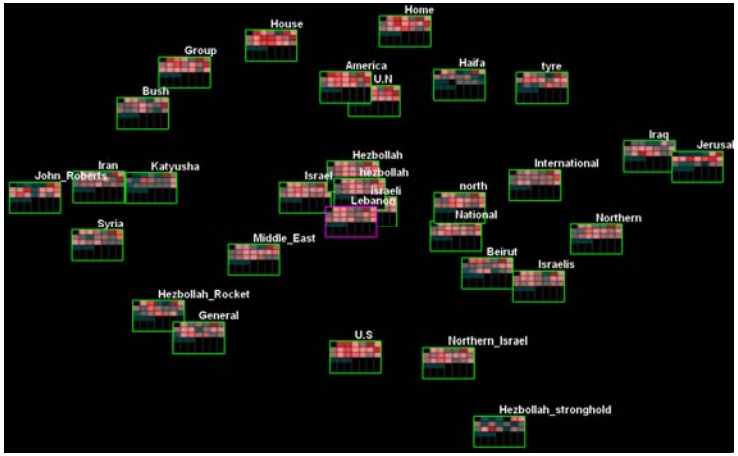
Visual Image Content Browser
Analyzes any number of images of unknown content. Provides a highly interactive visual interface for exploration. NVAC is evaluating and will use. Available to all RVACs and partners.

Video Exploration Visual Interface
Explores hundreds or more broadcast channels over time to automatically analyze news.



Transaction Visual Interface

Used to explore wireless bank transactions to find money laundering. Able to do complex investigations over time. Work with Bank of America and NVAC.



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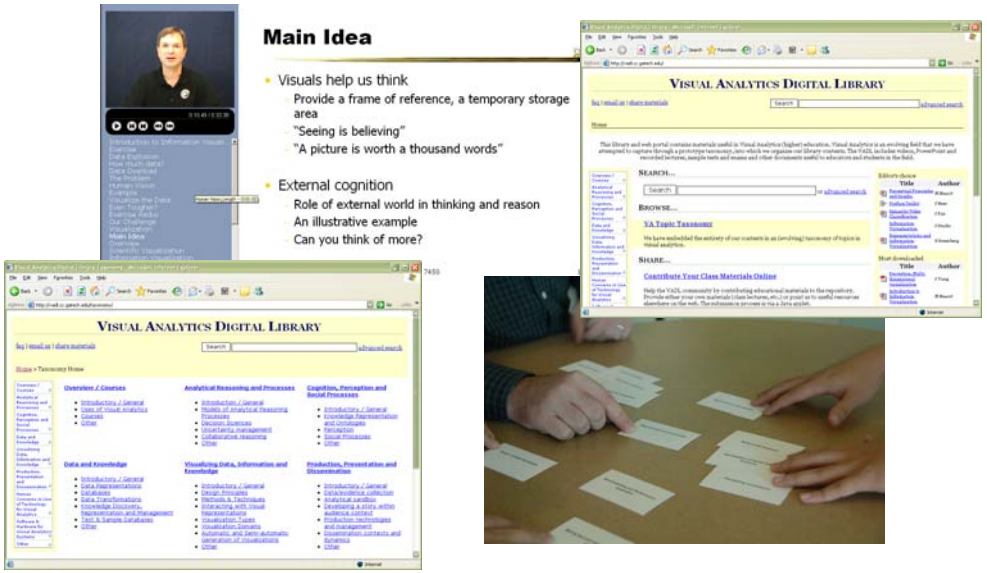
SouthEastern RVAC: Georgia Tech



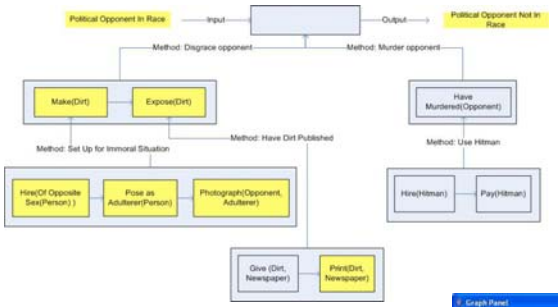
Visual Analytics Digital Library

A central repository for educational materials about visual analytics. Organized along a visual analytics taxonomy.

URL: **`http://vadl.cc.gatech.edu`**

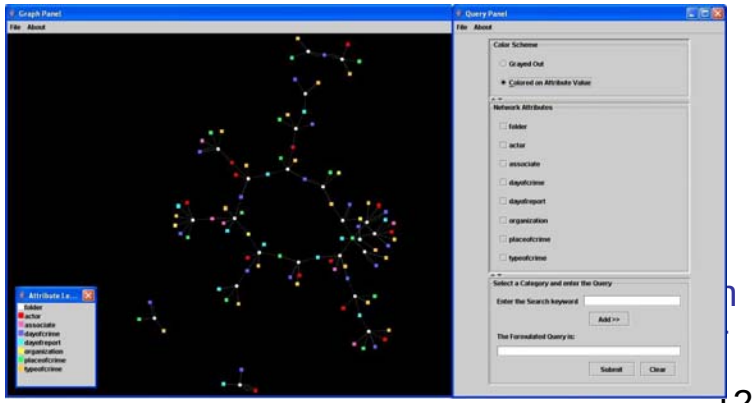
STAB System

Making predictive hypotheses about future events based on past situations.



Intelligence Report Visualizer

Visualizing intelligence reports and their important constituents in order to help analysts explore the reports more flexibly.



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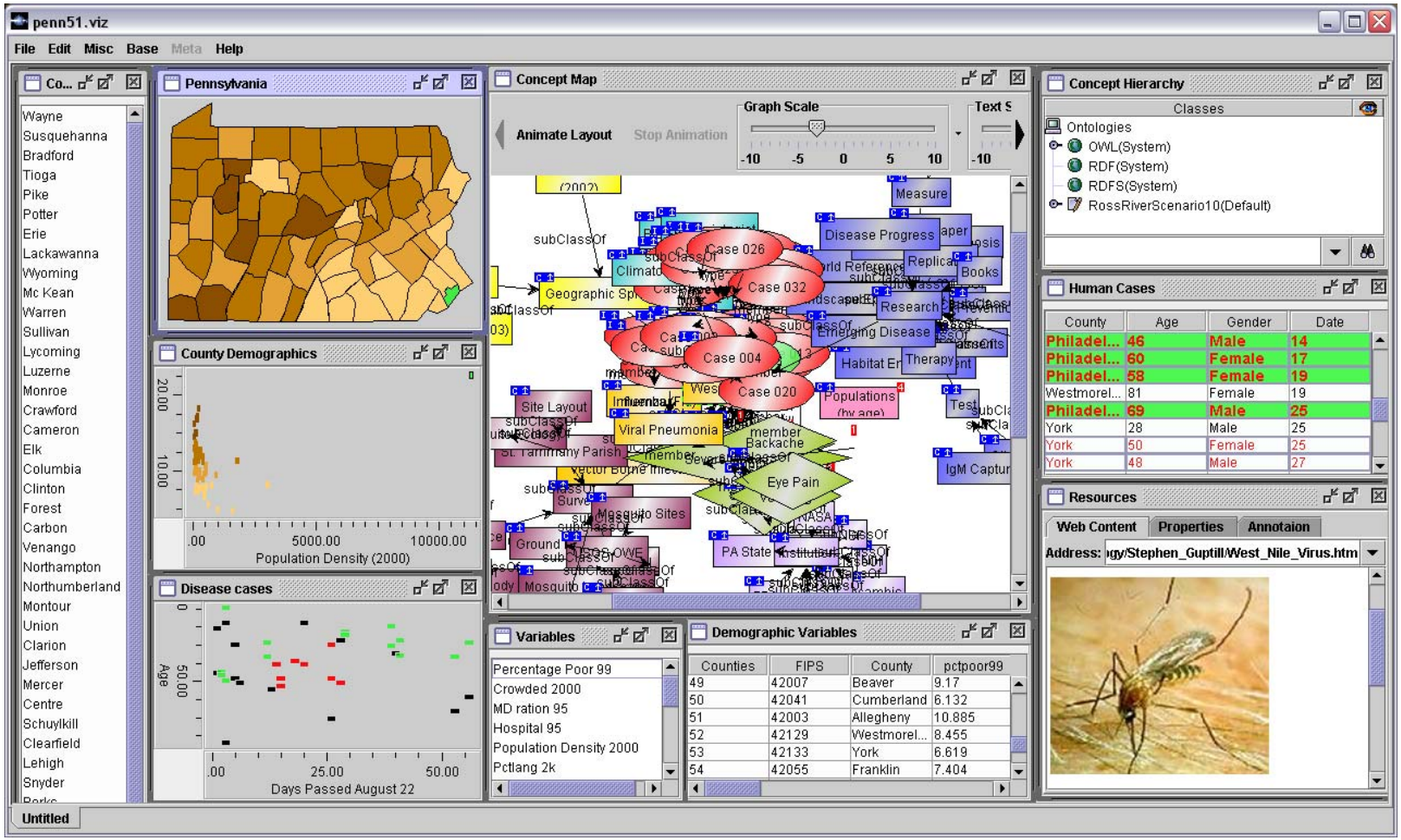
NorthEastern RVAC:

Exploring connections between conceptual knowledge, geography, and disease cases

Investigating new outbreaks of vector-borne disease (highly coordinated visual representations, existing knowledge is used to find new resources)



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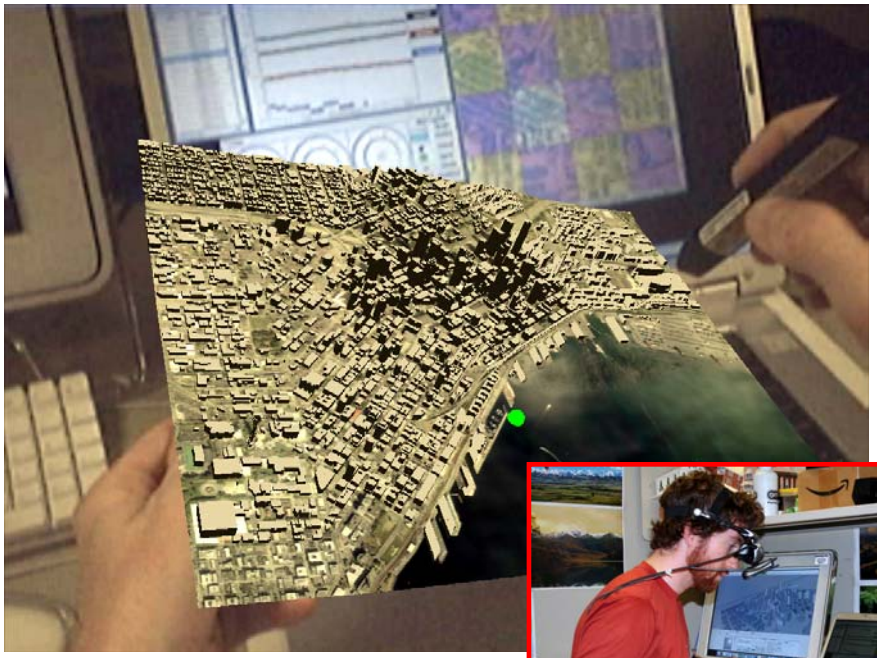
PARVAC:
Pacific Rim Visualization and Analytics Center



JITC3

(Just-In-Time C3)

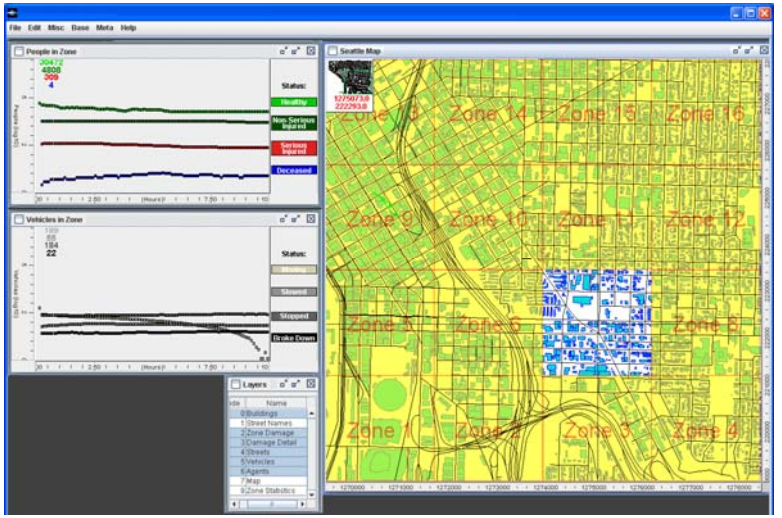
Purpose - To develop a flexible, portable command post for deployment with emergency response personnel which optimizes situational awareness and responder flow during an emerging event.
Approach - Develop a cohesive geo-spatial representation of an urban environment that can be navigated and manipulated using Augmented Reality. The ARToolkit's intuitive, tangible interface is used to create location-specific perspectives, including both exocentric and egocentric viewpoints.

An international R&D collaboration involving researchers in the Washington, Hawaii, Alaska, Canada, New Zealand and Australia, led by the University of Washington HIT Lab (Tom Furness, PI)

RimSim

Purpose - To develop a reality-based simulation game as a platform for studying distributed cognition and collaborative analysis of geospatial events typical of cities around the Pacific Rim.

Approach - In parallel to requirements gathering and game development, a focus on assessing the quality of a game session through a visual analytics support tool helps RimSim developers verify game data needs, interface needs, and game objectives. The assessment tool builds upon the Improvise platform developed by researchers at the Penn State RVAC.



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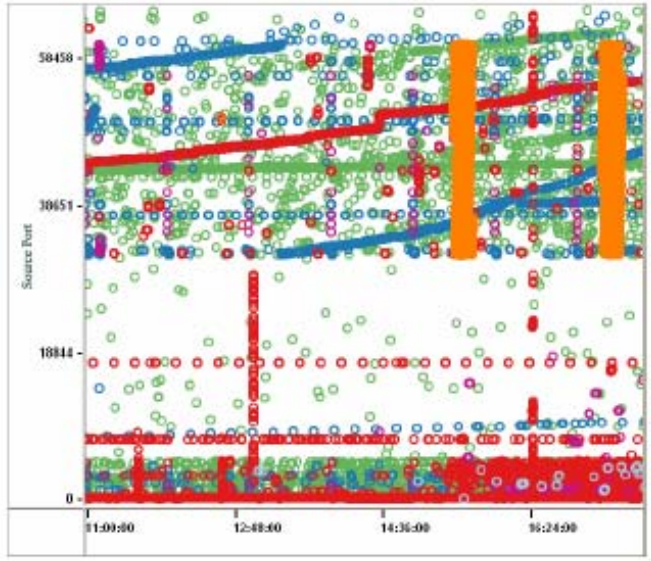
Stanford: Transactional Analytics

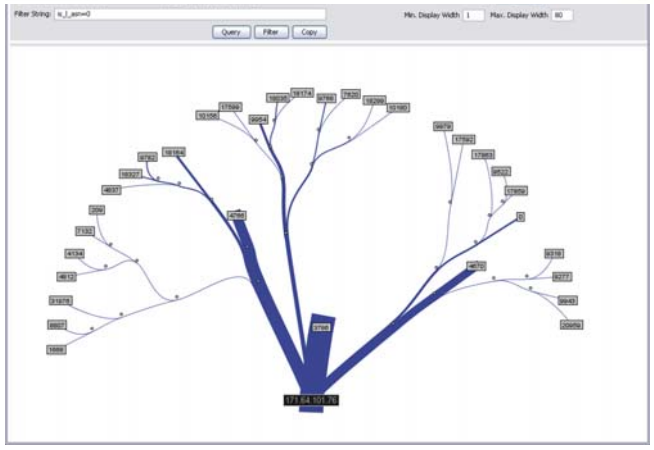
Goals:

- *Transforming* events into transactions
- *Linking* transactions into behaviors
- *Modeling* participant behavior patterns
- *Identifying* unusual patterns
- *Searching* for their agents

Challenges:

- Massive amounts of streaming data
- Couple classification and visualization





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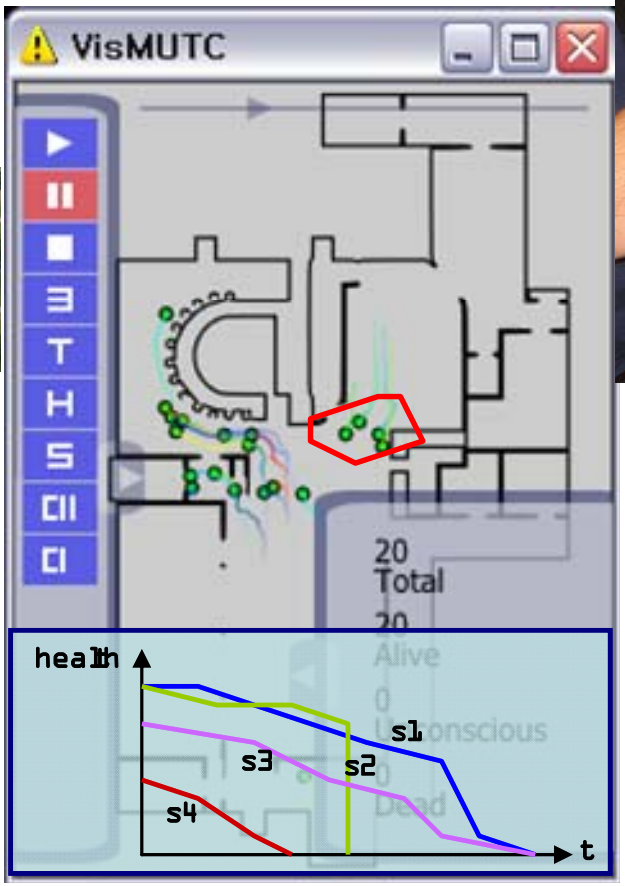
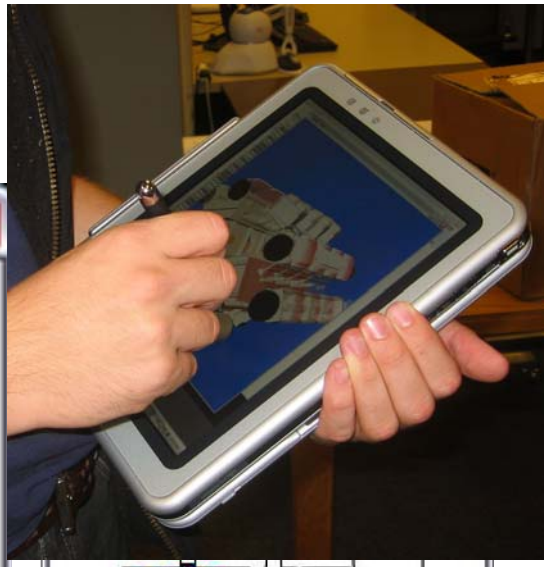
PurVAC: First Responder Command and Control

Muscatatuck Urban Training Center
Mobile and EOC Visual Analytics





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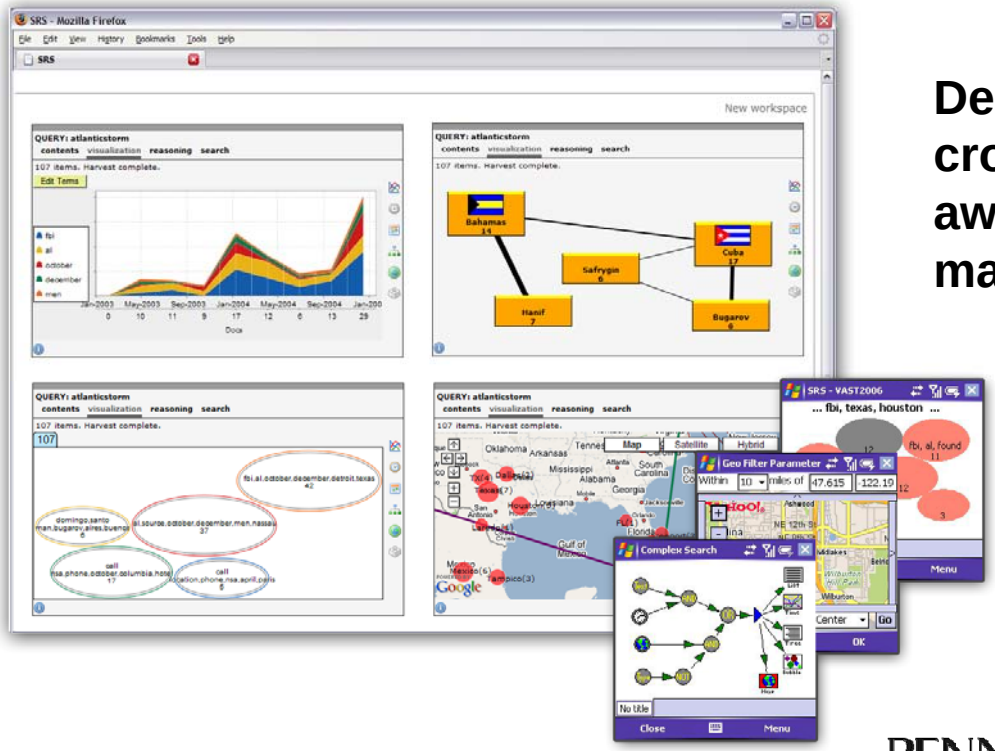
Law Enforcement and Counter-Terrorism



Desktop to Handheld: Enabling cross-jurisdictional situational awareness for rapid decision making and resource deployment

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