Homeland Security

Annual University Network Summit on Research and Education

Speaker Abstracts

L'Enfant Plaza Hotel
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Gary Ackerman - University of Maryland, CBRN Terrorism: Motives and Malefactors.

Garry Adams - Texas A&M University, Development of Modern Detection and Diagnostic Capabilities for Rift Valley Fever (RVF) and Foot and Mouth Disease (FMD).

Victor Asal - University At Albany, Organizations and the Turn to Terrorism.

Hamilton Bean - University of Colorado at Boulder, A Student Perspective on the COEs.

Lori Mann Bruce - Mississippi State University, Hyperspectral Imaging for Detecting the Application of Biochemical Agents to Food Crops.

Francis F. Busta - University of Minnesota, National Center for Food Protection and Defense (NCFPD).

Deborah A. Cai - University of Maryland, Coding Messages from al-Qa'ida Leaders for Reference, Target, and Persuasive Approaches.

Elizabeth Casman & Baruch Fischhoff, Carnegie Mellon University, Risk Communication Planning for Dynamic Situations: The Aftermath of Plague Bioattack.

Moses Charikar - Princeton University, Content-based Similarity Search of Large Feature-rich Datasets.

Christopher Y. Choi - University of Arizona, Prediction of Contaminants in Water Distribution Systems.

Matthew Clark - Director, University Programs, U.S. Department of Homeland Security,
DHS University Centers Panel.

Neville P. Clarke - The National Center for Foreign Animal and Zoonotic Disease Defense, Chemical/Biological Panel.

Bill Cooke, PI: David Shaw - Mississippi State University, Capturing Hurricane Katrina Data for Analysis and Lessons-Learned Research.

Susan L. Cutter - University of South Carolina, The Social Vulnerability Index:A County-Level Assessment of Communities and Implications for Preparedness Planning.

David S. Ebert - Purdue University, Visual Analytics for Command and Control: Creating Actionable, Relevant Information from Multisource, Evolving Data.

David Forsyth - University of Illinois at Urbana /Champaign, Words and Pictures.

Peter Gordon - University of Southern California, (CREATE team Yunkyunk Kim, James E. Moore, JiYoung Park and Harry W. Richardson), The Regional Economic Impacts of Hurricanes Katrina and Rita on Oil and Gas Refinery Operations in the Gulf of Mexico and the Rest of the U.S.: Applying a Flexible Multi-regional Input-Output Model.

Sheldon Greenberg - Johns Hopkins University, First Responder Capacity Building

Mansel Griffiths - University of Guelph, "Extraction, Concentration and Detection of Toxins".

Charles N. Haas - Drexel University, Use of Classical Environmental Risk Paradigms in the Context of Assessing Risk from Bio-Agents.

Susan F. Hallowell - Transportation Security Laboratory Science & Technology Directorate, U.S. Department of Homeland Security, The Top Ten Reasons that Working for the U.S. Government is a Great Career.

Daniel Hamilton - Johns Hopkins University, Jihadist Networks in Europe: Implications for the United States.

David M. Hartley - University of Maryland School of Medicine, Modeling as a Tool for Preparing for Agro- and Bio-terrorism: Rift Valley Fever.

Syed A. Hashsham - Michigan State University, Nucleic Acids-Based Methods with Enhanced Sensitivity and High Sample Throughput.

David Hernandez - U.S. Department of Homeland Security, What do I do?

James G. Hodge, Jr., - Johns Hopkins Bloomberg School of Public Health, The Pandemic and All-Hazards Preparedness Act: Addressing Public Health Emergency Responses.

John Hoffman and **Shaun Kennedy -** National Center for Food Protection and Defense, Systems-Based Vulnerability and Risk Assessment.

Eduard Hovy - University of Southern California, Extracting and Combining Information from Text Sources.

Raphael D. Isokpehi - Jackson State University and **Rob Hochberg,** East Carolina University **-** A COE Network Approach to Workforce Development.

Andy Jaine, Consequence Management System (CMS), BTSafety, LLC.

Richard John and **Heather Rosoff** - University of Southern California; Estimating Likelihood of Terrorist Attacks by Modeling Terrorist Beliefs and Motivations.

Eric A. Johnson - University of Wisconsin, Botulinum Neurotoxin Sensing in Complex Matrices.

Rachael Jones - University of California, Berkeley, A Markov Chain Model for Supermicron Particle Fate and Transport in Indoor Air.

Jean Kinsey - University of Minnesota, Risk Perception and Communication, "Consumer Perception of Food Defense Spending and Priorities."

Donald J. Klingborg - The National Center for Foreign Animal & Zoonotic Disease Defense Risk, Effective Risk Communication for the Nation's Food System.

Gary LaFree - University of Maryland, Developing a Global Terrorism Data Base.

Alan M. MacEachren – Pennsylvania State University, Geo-temporal Information Discovery.

Lou Marciani, Stacey Hall and Walter Cooper - University of Southern Mississippi, Development of an Effective Infrastructure for Sport Venue Security.

Bruce A. McCarl and **Levan Elbakidze** - Texas A&M University, Economic Evaluation of Preparedness, Response, and Recovery Strategies.

Melissa L. McCarthy - Johns Hopkins University, Defining Medical Surge, Surge Capacity and Surge Response Capability for Catastrophic Events.

Clark McCauley - Bryn Mawr College, Mechanisms of Political Radicalization.

Dennis S. Mileti - University of Colorado at Boulder, Public Warnings for Protective Action.

Michael D. Orosz - University of Southern California, The Risk Analysis Workbench (RAW): A Tool for Risk Assessment.

William Ribarsky - University of North Carolina at Charlotte, Visual Analysis of Multimedia Data.

Fred S. Roberts - Rutgers University, Homeland Security: What Can Discrete Science Do?

Adam Rose - University of Southern California, Promoting Resilience to Terrorism.

Heather Rosoff and **Richard John** - University of Southern California, What Do We Know About Public Perception of Terrorism Risks?

Dan Roth - University of Illinois at Urbana-Champaign, "Semantic Abstraction and Integration Across Text Documents and Data Bases."

Richard Rothman - Johns Hopkins Medical Institutions, Biothreat Detection: Designing ovel Methods and Assessing Current Systems for Detection and Surveillance.

Monica Schoch-Spana - University of Pittsburgh Medical Center, Engaging Community Partners in Preparedness Planning.

Gordon Skelton - Jackson State University, All Hazards Emergency Operations Management System (ALLHAZ)/DRIS.

Gordon Skelton - Jackson State University, Linking Education to Operations.

Thomas Stinson - University of Minnesota, Macro-economic Impacts of Terrorist Attacks.

Moises Sudit - University at Buffalo, Situational Detection is more than just Sensor Detection.

Jim Thomas - U.S. Department of Homeland Security, National Visualization and Analytics Center, Regional Visualization and Analytics Centers, Developing the Next Generation of Science and Scientists in Visual Analytics.

Jim Thomas - U.S. Department of Homeland Security, National Visualization and Analytics Center, Visual Analytics: The Agenda in Response to DHS Mission Needs.

Kathleen Tierney - University of Colorado, Preparedness Networks: Crossing Sectors, Joining Jurisdictions.

Detlof von Winterfeldt - University of Southern California, Should We Protect Commercial Airplanes Against Surface-to-Air Missile Attacks by Terrorists?

Steve Weber - University of Maryland, Terrorism and Institutional Legitimacy:
When do ordinary Citizens Support Extraordinary Violence?

Janyce Wiebe - University of Pittsburgh, Extracting and Summarizing Events and Opinions in Text.

Henry H. Willis - RAND Corporation, **Don Kleinmuntz, Detlof von Winterfeldt,** University of Southern California and **Harry Bowman**, Applying Optimal Capital Allocation Methods to Homeland Security Resources: A Case Study of California's Allocation of the Buffer Zone Protection Program Grants.

CBRN Terrorism: Motives and Malefactors

Gary Ackerman
University of Maryland

Abstract

With regards to the risk of CBRN terrorism, one cannot adequately address vulnerabilities or consequence mitigation in the absence of a thorough comprehension of the threat, specifically the identity of perpetrators and their respective motives, capabilities and preferred tactics. A variety of factors converge to make such an analysis an extremely difficult and complex endeavor, although substantial progress has been made in understanding the nature of our potential CBRN terrorist opponents. This progress has come about largely as a result of analysis of historical cases of the pursuit or use of CBRN materials by non-state actors, as well as close study of statements and treatises emerging from the terrorists themselves. Consequently, recent research allows for a preliminary profile of CBRN terrorists that can be used to inform other legs of risk assessment and reduction. The presentation will discuss the strategic, organizational and expressive motives for terrorists to use CBRN weapons, present a historical picture of CBRN terrorism and introduce recent findings and work on this topic. It will also identify basic gaps in our knowledge and understanding of the threat and provide recommendations for future research.

Development of Modern Detection and Diagnostic Capabilities for Rift Valley Fever (RVF) and Foot and Mouth Disease (FMD)

Garry Adams
Texas A&M University

Abstract

Rift Valley Fever (RVF) is one of the most rapidly emerging zoonotic diseases, because of (1) the presence of competent wide spread mosquito vectors in the U.S., (2) high mobility of human populations in endemic areas of Africa and the Arabian Peninsula where the disease exists (note the current outbreak in Kenya), and (3) expected economic and public health impacts should the disease be intentionally or accidentally introduced in the U.S. Foot-and-mouth disease (FMD) is a highly contagious disease that affects all economically important US livestock. FMD has not occurred in the US since 1929, but it could be readily introduced, and it would spread rapidly. Introduction of FMD into the US would result in drastic restrictions on animal trade and a loss of faith in the animal agriculture of the country, producing economic hardship and chaos. For these reasons, lack of rapid, accurate, and user friendly diagnostic tests are seriously recognized gaps emerging from recent DHS-ARS-APHIS-CDC workshops. In response, the FAZD Center has drawn upon molecular expertise to derive novel recombinant antigens and associated antibodies to develop a spectrum of diagnostic assays that will now be further tested and developed in collaboration with PIADC, and field tested in Africa and South America.

Organizations and the Turn to Terrorism

Victor Asal
University At Albany

Abstract

Why do some organizations turn to terrorism? What factors determine the intensity of the terrorism that organizations use? This presentation draws from two projects to provide some insights into these critical questions. Using data from the Minorities at Risk Organizational Behavior database of ethnic organizations in the Middle East we examine those organizational factors that predict an increased likelihood that an organization will use terrorism as one of its political repertories. Using Data from the National Memorial Institute for the Prevention of Terrorism database to examine those factors that predict the lethality and tactical choices of terrorist organizations worldwide from 1998-2005.

A Student Perspective on the COEs

Hamilton Bean
University of Colorado
Boulder

Abstract

The START Fellowship program has helped me to achieve several educational and professional goals. As a START Fellow, I have been given a unique level of entrée to organizations to study communication and emergency management practice. I have used fellowship funds to arrange travel to conferences where I have served as both a presenter and participant. Attendance at these conferences has improved my research and provided valuable contacts. Additionally, START contacts within DHS have sponsored my attendance at government conferences and helped secure participants for research project activities. START's financial and professional support has enabled me to conduct specialized research that will, ideally, contribute to emergency management knowledge and practice in ways that support START's and DHS's goals.

Hyperspectral Imaging for Detecting the Application of Biochemical Agents to Food Crops

Lori Mann Bruce
Mississippi State University

Abstract

Damage to our nation's food crops, either through a willful act of terrorism or as a result of a natural disaster, would clearly result in a threat to our homeland security. A breach in the nation's biosecurity, either real or perceived, could cause widespread panic as well as irreparable economic damage to the U.S., where one in eight jobs depends on food production.

Remote sensing technologies, such as hyperspectral imagers (HSI) hold great potential for being an early detection tool. Researchers at Mississippi State University are designing, implementing, and validating the use of an HSI-based automated target recognition (ATR) system for detecting when airborne bio-chemical agents have been applied to agricultural crops. Likewise, the system could be used to detect false alarms, such as hoaxes aimed at causing disruptions in our nation's food supply.

The HSI technology can be mounted on handheld instruments or airborne/satellite platforms. Thus, the proposed ATR system could be put directly into the hands of first responders or could be used to remotely detect events on a much larger scale via available airborne and/or satellite imagery. In the current project, the ATR system being designed is for use with handheld instruments. Field-level experiments are being conducted to validate the ATR system's capability to detect both chemical (such as toxic industrial chemicals) and biological agents (such as fungal-based diseases like soybean rust) present in food crops.

National Center for Food Protection and Defense (NCFPD)

Francis F. Busta
University of Minnesota

Abstract

NCFPD addresses the real and potentially catastrophic threat of deliberate contamination in the food and agriculture system. The Nation's food supply chain is vulnerable to being used maliciously as a vehicle to deliver pathogenic organisms, toxins, or chemical agents directly to vulnerable populations or simultaneously to large numbers of people, with cascading effects on public health, society, and the economy. Through a targeted agenda of fundamental research in food defense and integrative research to rapidly advance available technologies, NCFPD's initiatives contribute to the development of (1) specific countermeasures to minimize or virtually eliminate vulnerabilities identified within the food/agriculture system, (2) practical solutions that enhance the Nation's capability to rapidly identify, contain, respond, and recover from intentional contamination, both real and threatened, and (3) programs of study designed to develop future expertise in food defense.

As a nationwide consortium of interdisciplinary and multi-institutional teams, NCFPD currently encompasses 30 universities across 24 states, Canada and the United Kingdom and private sector research organizations. NCFPD also partners extensively across DHS, FDA, USDA, CDC, state/local agencies, national laboratories and the private sector. The research agenda is aimed at *systems* (supply chain resiliency, economic analysis, and public health response), *agents* (agent-food matrix interaction studies for detection, inactivation, and decontamination), and *training* (risk communication and programs of study). NCFPD strives to deliver real improvements in food defense through a portfolio of 39 current projects, ranging from food system event models to new public health response strategies to novel approaches for risk communication as a prevention/intervention/mitigation tool.

Coding Messages from al-Qa'ida Leaders for Reference, Target, and Persuasive Approaches

Deborah A. Cai
University of Maryland

Abstract

We are currently content analyzing fifty-two transcribed print and video messages from al Qa'ida leaders for various features, including the changing references throughout the message, the intensity of the language, and the persuasive tactics. This talk will focus on the process and challenges of coding these messages for quantitative analysis, which often are lengthy, frequently shift in focus, and use excessive hyperbole to deliver messages that are directed at accomplishing multiple goals. The goal of the project is to understand patterns and shifts that emerge over time in the type of language and tactics used in these messages.

Risk Communication Planning for Dynamic Situations: The Aftermath of Plague Bioattack

Elizabeth Casman & Baruch Fischhoff
Carnegie Mellon University

Abstract

Developing and testing communications for the multiplicity of contingencies, ecosystems, and audiences that could be affected by bioterrorism is simply not possible. However, not preparing could result in giving inaccurate or incomplete risk-reduction instructions, squandering opportunities to limit health impacts, and undermining the public's confidence in the communicator. We demonstrate a risk communication planning technique for systematically exploring complex and information-rich bioterrorism scenarios, identifying risk management situations requiring risk communication, and identifying the relevant subject matter. This gives risk communicators time to develop and test prototypical communications for the classes of exposures identified, in advance. The method relies on the construction and annotation of an influence diagram of the bioterrorism scenario. When composing advice for the affected subpopulations, the influence diagram provides a quick visual check that the necessary causal factors are covered, while the annotation provides a summary of both academic and secular knowledge useful for mitigating the specific risks. An example, for the case of the aftermath of an urban, aerosolized plague attack, is presented

Content-based Similarity Search of Large Feature-rich Datasets

Moses Charikar
Princeton University

Abstract

Digital data has been increasing at a phenomenal rate. Most of this data is not in text form, e.g. images, sounds and video. The utility of this data would be vastly increased by good tools to search and organize it.

However, currently available search tools are inherently text based and depend on text annotations for such feature-rich datasets. Performing content-based similarity search on such high dimensional data is a challenging problem. We have developed efficient general-purpose methods to search and index such datasets, building on recent theoretical work on constructing sketches - compact representations for data.

These methods have been implemented in a toolkit designed to help system builders quickly construct content-based similarity search systems for a wide variety of such datasets. In this talk, I will describe this toolkit, some of the search and indexing technology it incorporates, and our experiences in using it to build similarity search systems for four different data types: images, audio recordings, 3D shape models and genomic micro array data.

Prediction of Contaminants in Water Distribution Systems

Christopher Y. Choi
University of Arizona

Abstract

As water utilities move from a single mission of supplying water to consumers to also ensuring water security, modeling and prediction tools used for water distribution network analyses will need to evolve to better simulate the transport of chemicals, biological, and radiological agents. The movement of contaminants in a water distribution system is examined and a series of computational simulations using selected network geometries are carried out at various Reynolds numbers. The present study focuses particularly on pipe intersections to characterize complex mixing phenomena in pressurized water distribution pipe networks. Computational results are compared with experimental data. The water quality model integrated with an existing computer program was re-evaluated based on the computational and experimental data. Initial computational fluid dynamics simulations consistently underestimated mixing, and experimental data are utilized to reexamine turbulent mixing by adjusting the turbulent Schmidt number. Corrections based on computational results are incorporated into the existing code. The improvement of the existing model may be important not only to predict concentrations of chemical species such as chlorine in water distribution systems, but also to prepare for potential intentional and accidental contamination events. In particular, developed models, tools and verified data sets will be used for quantitative risk assessment in an effort to reduce or eliminate health impacts from deliberate intrusion of biological agents of concern.

DHS University Centers Panel

Matthew Clark
Director, University Programs
U.S. Department of Homeland Security

Abstract

DHS Center Directors will provide ten minute presentations in the form of an overview of their Centers. They will make reference to the presentations to be made by representatives of each Center in the concurrent sessions scheduled later in the day.

Chemical/Biological Panel

Neville P. Clarke
The National Center for Foreign Animal and
Zoonotic Disease Defense

Abstract

The National Center for Foreign Animal and Zoonotic Disease Defense (FAZD Center) was established September 4, 2004 as a critical component of the national response to Homeland Security Presidential Directive 9: Defense of United States Agriculture and Food. The purpose of the FAZD Center, as that of the Directive, is to "defend the agriculture and food system against terrorist attacks, major disasters, and other emergencies." The research and education mission of the Center is uniquely challenging in that it addresses not only the potential movement of pathogens and diseases in the complex infrastructure of the American agriculture and food systems, but it simultaneously addresses the potential impacts of animal diseases on public health. The Center creates means and mechanisms to produce products to protect America from biological weapons of mass effect that could devastate the agricultural and national economy. The Center's products protect Americans from biological attacks that use diseases that can be transmitted directly to humans or to humans through contact with animal populations. The Center is unique in its focus on the interface between animal and human diseases, recognizing that it will be impossible to prevent or successfully respond to catastrophic and pandemic diseases without a comprehensive understanding of the movement of diseases within animal populations and the environment, and their interactions with human populations. To address these interrelated challenges, the Center has established a portfolio of research and education projects using model diseases and cutting-edge computer modeling technologies that build from basic discovery research through the development of homeland security products for use by the nation's first responders. The FAZD Center is organized under three interactive and integrated themes that form a framework for interdisciplinary and inter-institutional research and education: Biological Systems, Information Analysis Systems, and Education and Outreach Systems. Texas A&M University is the lead institution with core partners that include the University of California Davis, University of Texas Medical Branch, University of Southern California, University of Maryland, and Huston Tillotson University. There are active collaborations with multiple DOE National Laboratories and Federal Laboratories.

Capturing Hurricane Katrina Data for Analysis and Lessons-Learned Research

Bill Cooke
PI: David Shaw
Mississippi State University

Abstract

The Southeast Region Research Initiative (SERRI) has been established to develop and demonstrate the Homeland Security benefits of leveraging Homeland Security-related research, operational and economic development capabilities within a region of the United States. Because of its diverse and representative infrastructure makeup, the state of Mississippi was chosen as the location for initial implementation of the SERRI.

MSU is sought to create a national resource for conducting "lessons-learned" research associated with the application of geospatial information technologies to disaster management in the aftermath of Hurricane Katrina. This resource will be used by MSU scientists and will also be available for other researchers nationally, to access data, geospatial analysis procedures and the social context under which the technologies were employed during the weeks following landfall of Hurricane Katrina. Knowledge gained through this project will assist the Department of Homeland Security in understanding the intricacies of the deployment of geospatial information technologies at local, state and federal levels during natural and terrorist-induced disasters, and in enhancing preparedness for future natural and willful disasters. The use of geospatial information is not part of the strategy-oriented DHS National Incident Management System or the underlying procedure-oriented Incident Command System. No geospatial standards for emergency management have been defined within the geospatial community despite the importance of location-based information to every emergency support function. This resource will provide a forum for the geospatial community and the emergency management community to define best-practices and the role of geospatial information in disaster preparation, response, and recovery.

Research initiatives on the applications of geospatial information technologies for disaster management can be facilitated through the development of a national repository of data, procedures and products developed or generated during the search, rescue and recovery stages following Hurricane Katrina. The virtual research center would also maintain ancillary resources (e.g., discussion forum, relevant bibliographic citations) to assist research efforts. The tasks below outline this effort.

Research Team
Budhendra Bhaduri, Ph.D., GIST, ORNL
Mark A. Tuttle, GIST, ORNL
Craig Harvey, NVision Solutions, Inc.
David Shaw, Ph.D., Director GRI, MSU
Scott Samson, Ph.D., GRI, MSU
Bill Cooke, Ph.D., GRI, MSU
David R. Parrish M.S., MSU
Dallas Breen, RA 1, SSRC, MSU

The Social Vulnerability Index: A County-Level Assessment of Communities and Implications for Preparedness Planning

Susan L. Cutter
University of South Carolina

Abstract

What makes people and places vulnerable to environmental hazards and extreme events and how can we develop comparative metrics that permit us to compare vulnerability over time and across space? Vulnerability science involves the intersection of natural systems, social systems, and the built environment. The spatial social sciences play a critical role in advancing vulnerability science through improvements in geospatial data, basic science, and application. While considerable research has focused on threat awareness and assessment from both natural hazards and terrorist attacks, there is less awareness of the differential susceptibility of populations to hazards. This paper describes the social vulnerability index (SoVI)—a tool that enables comparative assessments of social vulnerability and illustrates its application to preparedness planning and disaster recovery.

Visual Analytics for Command and Control: Creating Actionable, Relevant Information from Multisource, Evolving Data

David S. Ebert
Purdue University

Abstract

Increasing the effectiveness of command and control operations in real-world environments requires a new generation of technology that can support planning, detection, management, response, and recovery.

These tools must provide comprehensive analytic capabilities that enable the entire process from receiving massive amounts of real-time raw data, to the integration and extraction of relevant data, to the integrated visual presentation and analysis environment. Effective visual analytic tools must transform this data into actionable information that is easily understood by a variety of personnel using a variety of platforms, ranging from an emergency operation center's large displays to the cell phones of first responders. We are developing these techniques that also increase the effectiveness and timeliness of decision-making and response, thereby increasing the effectiveness of the entire response team. Effective visual analytic solutions must address the rate of information update; usability and interaction mechanisms; the user, task, and environment; and security and privacy.

Integrating all these components into a comprehensive visual analytic environment is a challenging, but necessary, effort to enable time-critical decision-making and response that will lead to saving lives and property.

Words and Pictures

David Forsyth
University of Illinois
Urbana – Champaign

Abstract

It is now possible to obtain huge collections of images which carry annotations of one form or another. These annotations can take many forms. Examples include the keywords that occur in the Corel and Hemera collections; various forms of metadata – who made the artifact depicted, when it was made, etc. – that are common in museum collections; the narrative annotations that are sometimes found in museum collections; and the captions that one can collect with news images.

Such collections are interesting for two reasons: First, because visual and text information tend to be complementary, a relatively simple analysis of both the image and the text can reveal a great deal about the data item. This means that, for example, one can cluster such collections well enough to enable naive users to browse a museum's collection or browse the news in a natural way. Second, such collections can be thought of as huge but poorly supervised datasets, containing both information about the appearance of objects and various forms of world knowledge. I will demonstrate a variety of methods whereby one can build probability models linking images or image regions to their annotations. With such models, one can organize a collection in a way that makes browsing easy and quite natural. One can search for pictures using words. And, what is more important, one can attach words to pictures or even to regions. Finally, one can attach names to faces.

I will argue that there is a quite general principle here – useful supervisory information can often be extracted from quite unexpected places. I will show some of the consequences of this principle for motion tracking, face recognition and activity recognition.

The Regional Economic Impacts of Hurricanes Katrina and Rita on Oil and Gas Refinery Operations in the Gulf of Mexico and the Rest of the U.S.: Applying a Flexible Multi-regional Input-Output Model

Peter Gordon
University of Southern California
(CREATE team Yunkyunk Kim, James E. Moore, JiYoung Park
and Harry W. Richardson)

Abstract

U.S. economic growth seems to be on its long run growth path of over 3% annual GDP growth -- in spite of the 2001 attacks, the 2002 recession, the war, the tech bust, the housing bust, the oil price shock. The economy is seemingly quite resilient.

Our economic impact modeling has emphasized the importance of spatial detail. We have studied economic impacts applying a 50-state (and DC) multii-regional input-output model. Can an aproach like this help us to study economic resilience? An experiment with a new model, FlexNIEMO, and data from the Gulf Coast oil and gas refinery disruptions from Hurricanes Katrina and Rita suggests that it can.

First Responder Capacity Building

Sheldon Greenberg
Johns Hopkins University

Abstract

Building the capacity of first responders to engage more fully in preventing and interdicting the delivery of terror is neither complex nor costly. It requires commitment and candor that, to date, have not materialized. The prevention and interdiction of the delivery of terror has not been built into the culture of the nation's state and local law enforcement agencies. Greed, competition for grant funds, pursuing "show and tell" equipment, catering to politicians have taken precedence over mastery of foundation skills, belief in information exchange as paramount to success, and changing the culture of agencies and communities. This presentation focuses on the primary inhibitors to building homeland security into the culture of public safety and ways to overcome them. Mastery of basic skills, timely feedback to first responders who provide information, improved education and training, careful selection of personnel who interact with community organizations, effective allocation of resources to the front line, and better understanding of those who seek to deliver terror are among them.

"Extraction, Concentration and Detection of Toxins"

Mansel Griffiths
University of Guelph

Abstract

Toxins naturally present in foods can be from a variety of sources including bacteria, fungi and dinoflagellates. They are most commonly proteins that cause disease by interacting with biological macromolecules such as enzymes or cellular receptors in the target organism. Toxins vary greatly in their severity, producing symptoms ranging from mild (e.g. *Bacillus* enterotoxin) to potentially fatal (e.g. botulinum toxin). In order to respond rapidly to events involving the presence of toxicants in food, methods must be developed that are able to detect physiologically relevant concentrations of the toxin in as short a time as possible. To this end, researchers at the Universities of Guelph and Surrey are developing techniques for the rapid capture and concentration of toxins from foods using hydrogel imprinted polymers and *Staphylococcus aureus* enterotoxin B as a model system. These techniques will be coupled with methods for detection based on impedimetric immuno-sensors or cell-based biosensors.

Use of Classical Environmental Risk Paradigms in The Context of Assessing Risk from Bio-Agents

Charles N. Haas
Drexel University

Abstract

The human health risk from primary exposure to deliberately released infectious bioagents can be assessed using the classical environmental risk paradigm, as first elucidated in 1983, with more recent modifications made for microbial risk. The key analysis elements are:

- Exposure assessment – quantitatively determining the frequency, spatial and temporal distribution, and concentration of microbial agents. The principles of making such estimates have been well established.
- Dose response assessment – relating the exposure of an agent to an individual (organisms inhaled, ingested, etc.) to the likelihood of experiencing an adverse effect. Concepts of microbial dose-response have been developed over several decades.

In this talk, the general paradigm for risk assessment will be reviewed. We will discuss several dose response relationships that we have developed (from literature data) for bio-agents (amongst those may include *Bacillus anthracis*, Lassavirus, Variola, and Yersina pestis). Issues of animal to human extrapolation and information needed for validation will also be covered, as will directions for future dose response modeling and data needs.

The Top Ten Reasons that Working for the U.S. Government is a Great Career

Susan F. Hallowell
Transportation Security Laboratory
Science & Technology Directorate
U.S. Department of Homeland Security

The U.S. Government needs to attract the best and brightest people to civil service in order to be successful in the homeland security mission. Conversely, career seekers should be greatly compelled to consider civil service as a career. It can be richly rewarding. As a civil servant with 33 years of service to the U.S. Government as a scientist, serving through the cold war in the area of chemical warfare agent detection/protection, and after the cold war, in the area of counter terrorism, explosives detection, it has been a great life. I would like to share "Hallowell's Top ten reasons for considering civil service as a career for a scientist or engineer."

Jihadist Networks in Europe: Implications for the United States

Daniel Hamilton
Johns Hopkins University

Abstract

Islamist extremism has emerged as one of the central threats to Europe's security and social cohesion. Europe is home to the world's largest Muslim diaspora and is a central arena in the global battle over Muslim identity. This struggle has also become central to Europe's own crisis of identity. Although the vast majority of Muslims in Europe are not involved in radical activities, Islamist extremists and vocal fringe communities advocate terrorism openly, are active recruiters and funders for terrorist activities, and have provided cover for terrorist cells. Germany and Spain, for instance, were key logistical and planning bases for the September 11, 2001 attacks on the United States. The rise of Islamic extremism in Europe poses important security considerations for the U.S. in the fight against international terrorism. How European governments and societies deal with the challenge will be an important determinant of the sort of partner Europe will be f or the U.S. in coming years.

Modeling as a Tool for Preparing for Agro- and Bio-terrorism: Rift Valley Fever

David M. Hartley
University of Maryland

Abstract

Mathematical models have been applied to public health issues for more than a century, but recently the specters of agroterrorism, bioterrorism, and accidental introduction of exotic agents have opened a new chapter in their application. Models are important tools for assessing the impact of such diseases should they be introduced into the United States. Rift Valley fever (RVF, a viral disease of livestock (including cattle, sheep, and goats) and humans, is prevalent throughout Africa and the Arabian Peninsula. Should it be introduced into the US or the Americas, it is unclear how and where RVF might spread. No complete model of RVF exists in the literature. We describe the development and initial validation of a mathematical model of RVF. Application to Africa, where the disease is endemic, is shown. Ongoing work involves applying the model to identify areas of the US that are ecologically vulnerable to RVF. Next steps for this research include investigation of public health control and intervention strategies.

Nucleic Acids-Based Methods with Enhanced Sensitivity and High Sample Throughput

Syed A. Hashsham
Michigan State University

Abstract

Molecular methods for identifying biological agents of concern are of interest in many areas including biodefense, water and food industries, and in clinical diagnostics. Nucleic acids-based methods are receiving special attention because they are sensitive, specific, rugged, quantitative, rapid, and cost-effective. Development of such methods requires integration and optimization of several steps including gene sequence mining and analyses, probe/primer design, validation, target enrichment and amplification, quantification of abundance, data and statistical analyses. Both microfluidic in situ microarrays and nanoliter volume quantitative PCR chips are being used to develop such tests. In one such study using a 10,000 probe microarrays targeting over 500 virulence and marker genes (VMGs), we have observed that i) using multiple signatures per VMG increases confidence in positive calls and the variation in signal intensity between targeted probes can be neglected, ii) thermodynamic parameters are key in finding 18-mer olignucleotide probes with high selectivity and sensitivity, and iii) modeled association kinetics with the microarray is comparable to experimental results. In another related work using a commercially available on-chip real time PCR equipment, we evaluated the ability to amplify more than 200 VMGs from 30 pathogenic microorganisms in dozens of samples simultaneously. Under the conditions used in this study, the environmental backgrounds used (DNA extracted from river water, tap-water, and tertiary effluent) had a negligible influence on PCR specificity and efficiency. A high correlation existed between predicted and experimental threshold cycle based on primers and genomic characteristics of targeted organisms. In addition, by targeting multiple VMGs per pathogen, only minimal validation was necessary for new primers. Thus by combining the power of real time PCR with arrays to analyze multiple samples for multiple targets, the cost of environmental screening can be substantially reduced. Translating the power of these methods to point-of-use hand-held devices may further enhance the application of such tools.

What do I do?

David Hernandez
U.S. Department of Homeland Security

Abstract

The increase in use of Improvised Explosive Devices (IED), Improvised or Homemade Explosives (HME) requires a novel approach to research. In the past, the development of commercially made or military explosives was optimized in laboratories that legitimately provided this service. Stolen, black market trade, or illegally recovered explosives were the common sources for terrorists to acquire such material. The sobering emergence of explosives that may be manufactured in bathrooms or garages brought to the forefront the need for detection technologies and systems to counter this threat. The goal of my presentation will bring together my experience in the complementary fields of intelligence, research, and practical application: think like a terrorist.

The Pandemic and All-Hazards Preparedness Act: Addressing Public Health Emergency Responses

James G. Hodge, Jr.
Johns Hopkins Bloomberg School of Public Health

Abstract

Preparing for public health emergencies continues to be a vital objective for federal, state, tribal, and local officials in the United States. Deficiencies in emergency response efforts during Hurricane Katrina coupled with ongoing national security threats of bioterrorism, pandemic flu, and other emerging infectious diseases justify ongoing public health preparedness efforts by public and private sectors. Still, many perceive that the United States is not prepared for a catastrophic public health emergency. Public health authorities and private sector health care entities lack national surveillance data to monitor threats, may not be able to fully meet surge capacity during emergencies, and do not know how to fairly allocate scarce resources (such as vaccines). Most importantly, national prioritization and responsibility for public health emergency responses are murky.

On December 19, 2006, President Bush signed the "Pandemic and All-Hazards Preparedness Act," or "PAHPA." PAHPA substantially reorganizes federal, state, and local efforts to address these (and other) issues with multiple implications for health care practitioners in public and private sectors. The Act (1) further centralizes preparedness response efforts within the federal Department of Health and Human Services (DHHS), (2) requires new evidence-based objectives for state and local public health partners; (3) assigns DHHS responsibility for national distribution of scarce resources, such as available vaccine supplies, during emergencies; (4) urges improvement to meet medical surge capacities; and (5) provides initiatives to integrate medical innovations, research developments; and countermeasure procurement with infectious disease requirements and biodefense. Collectively these and other objectives of the Act have the potential to reform existing preparedness efforts that have lacked organization, direction, and utility. Subject to Congressional appropriations, the Act offers renewed guidance tied to measurable outcomes on key priorities.

Systems-Based Vulnerability and Risk Assessment

John Hoffman
Shaun Kennedy
National Center for Food Protection and Defense

Abstract

Identifying potentially high consequence components within critical infrastructure systems, assessing their vulnerabilities and the consequences of attacks on those components, is crucial to their defense from terrorist attacks. For relatively well defined infrastructures that are either primarily fixed and physical (chemical/petroleum plants or nuclear power stations) or distributed but with a limited number of focused nodal assets (water systems or the electrical grid), approaches based on asset centric risk assessment work relatively well. Such approaches are less effective, however, for systems that have numerous redundant pathways within a vast, extended, highly integrated process that operates incessantly throughout the nation and the world. In cases where the infrastructure itself can be used as a vehicle to deliver weapons, e.g., infective agents and toxins, the needs are even more complex. The postal & shipping system, transportation, production agriculture and the food supply chain are primary examples of broad, systems-based infrastructures where elements or components of the systems are of greater concern than a small number of physical assets. This talk will address research efforts to develop scalable approaches that can be employed for systems-based consequence, vulnerability and risk assessment, utilizing examples from food and animal production agriculture models.

Extracting and Combining Information from Text Sources

Eduard Hovy
University of Southern California

Abstract

The availability of massive amounts of information on the web means that a lot of the information is repeated, allowing automated systems to learn how to identify and extract information of interest to the analyst. By combining information in various ways, interesting complex concepts and patterns can be identified. I will outline projects underway at our USC center that build biographies, identify psychological states, extract biomedical information, and determine the social relationship between people, and I will discuss both the actions required of the system user (as teacher) and the shortcomings of modern information extraction techniques.

A COE Network Approach to Workforce Development

Raphael D. Isokpehi
Jackson State University
and
Rob Hochberg
East Carolina University

Abstract

The Workforce Development Initiative led by Jackson State University in partnership with Rutgers University and East Carolina University as part of the South East Region Research Initiative consists of two components. The first addresses expanding the capacity of educators of the current workforce to rapidly deploy STEM materials developed by DHS University Centers of Excellence (COE). The second component addresses the building of capacity of educators of the future workforce to rapidly deploy developmentally appropriate STEM modules at the frontier of Science and Technology. The pilot activity is on Avian Influenza. The participating Mississippi Educational Institutions are Jackson State University and Alcorn State University while the participating COE are Foreign Animals & Zoonotic Diseases (FAZD) at University of California, Davis (UC) and DIMACS at Rutgers University. The UC Davis FAZD will upgrade the Flu School course and conduct the course in Mississippi. Faculty at Jackson State and Alcorn State will identify courses at their institutions that can incorporate the Flu School elements; incorporate these into courses and deliver them to the current workforce. DIMACS and ECU will develop and conduct biological- and mathematics-based problem solving and critical thinking programs at JSU that will have a significant Avian Influenza component, designed to be replicable throughout the 80 DHS Centers of Excellence.

Consequence Management System (CMS)

Andy Jaine
BTSafety, LLC

Abstract

This presentation will describe and demonstrate the progress of the evolution Consequence Management System (CMS). The CMS is a predictive model that is designed to assist government and industry to rapidly and effectively respond to intentional and unintentional contaminations of the food supply. The model depicts the evolution in time and space of the pathway of a food outbreak involving a selected combination of food product and contaminating agent. The pathway starts with the movement of the food product from the farm through outlet channels to the various points of consumption. It then continues by showing the health effects of the contamination including the rate at which illness would occur, and the way that the patient would seek medical care; and continues to model the pathway through to the health outcomes.

The outputs of the system include estimates of consumer exposure, morbidity and mortality, the impact of the event on public health infrastructure, and estimates of the economic impact of an event on individual consumers, the food industry, and the public health system. Since the public health system is one of the first lines of defense in a food contamination event, the model allows the exploration of various public health detection processes and timelines as well as the impact of various intervention strategies on the economic and human health outcomes of the event.

Estimating Likelihood of Terrorist Attacks by Modeling Terrorist Beliefs and Motivations

Richard John
and
Heather Rosoff
University of Southern California

Abstract

Terrorism risk analysis requires estimation of both the likelihood of attack and the magnitude of the consequences of an attack. Current methods focus on target vulnerability, terrorist capability, and attack consequence. These methods ignore the motivational aspect, a key component to any analysis of terrorism risk. Analogous to PRA methods applied to estimate both natural and technological hazard probabilities, we extend PRA methods to estimate the likelihood of terrorist attack by modeling the attractiveness of competing attack alternatives from the view of a terrorist organization. We focus on both the beliefs and motivations of leaders of terrorist organizations who must choose among alternative attack possibilities, including decisions about location, timing, and mode of attack. We propose psychological models of terrorist objectives and values that substitute for more traditional physical, chemical, and biological models common in PRA of natural disasters (e.g., earthquakes) and technological hazards (e.g., nuclear power plants). We illustrate methods to construct terrorist value structures, including an objectives hierarchy and a multi-attribute utility model of terrorist values. These value models include terrorist uncertainties about the outcome of the attack, and uncertainties in our knowledge of the terrorist value functions, including parameters representing terrorists' attitude toward risk and trade-offs among conflicting objectives. Relative likelihood of terrorist attacks are functionally related to the terrorists' utility of attack. We suggest practical applications of this methodology for setting counter-terrorism policy, including allocation of funds for counter-terrorism. A number of challenges to modeling terrorist beliefs and values are discussed, including: (1) Difficulty in identifying geographically distributed terrorist group leadership, (2) evolving terrorist group leadership with short tenure, (3) changing terrorist beliefs about the likelihood of attack success in rapidly changing environment of counter-measures, (4) shifting terrorist motivations and values due to changing political events shaped by a worldwide media, and (5) growing attack option set growth due to growing terrorist capabilities.

Botulinum Neurotoxin Sensing in Complex Matrices

Eric A. Johnson
University of Wisconsin

Abstract

Botulinum neurotoxin (BoNT) is the most poisonous substance known. Recently, it has been considered as serious bioterrorism threat in foods. Rapid, specific, and sensitive detection of BoNT is a prominent strategy for deterrent of bioterrorist activity. Studies in our laboratory have emphasized the fundamental properties of BoNT, and a prominent focus has been the detection of the toxin in complex food and clinical matrices. Methods for concentration of BoNT are described, particularly by utilizing monoclonal antibodies attached to magnetic beads. Certain detection platforms are presented based on the biological properties of BoNT and engineering principles. Systems employing various detection and sensing strategies including microfluidics, liquid crystals, mass spectroscopy, and remote sensing are described. The development of these systems has provided methods for rapid and sensitive detection of BoNT that does not involve traditional animal testing.

A Markov Chain Model for Supermicron Particle Fate and Transport in Indoor Air

Rachael Jones
University of California
Berkeley

Abstract

A Markov chain can be applied to predict supermicron particle fate and transport in indoor air. The model construct considers particle movement via advective air flow, turbulent diffusion, and gravitational settling; and considers particle removal from room air via deposition onto room surfaces and exhaust air flow. The first-order rates by which a particle would exit a state in the Markov chain (a state is a small volume in the room, or a surface) in a small time step due to these mechanisms are used to specify the probability with which a particle remains in a given state or moves to one of six adjacent states along three orthogonal axes. The Markov chain model will be illustrated in a hypothetical room, and evaluated with experimental data for floor deposition of cobalt oxide particles released in a building lobby. The Markov chain model provides spatially and temporally refined estimates of airborne and surface particle concentrations in indoor environments with computational ease.

Risk Perception and Communication
"Consumer Perception of Food Defense Spending and Priorities"

Jean Kinsey
University of Minnesota

Abstract

Based on an Internet survey of more than 4000 U.S. consumers in August 2005, fifty-five percent were not confident the food supply is secure. Consumers indicated a preference for spending thirteen percent more resources to protect food supply systems than to protecting the airlines and more for food than other potential terrorist targets (public transportation, public spaces from biological/chemical attack, electric grids, and national monuments). Using "Predictive Segmentation" consumers were grouped into archetypes, based on attitudes and values. Segments that have a high fear level as well as those who are risk averse allocated the most to defending food. Those with more education and income or young adults were less concerned about food security. Each of six segments differs with respect to their information preferences, should an attack happen, and with respect to their preferred source of news. Based on their information needs and media behavior, guidance is offered with respect to the development of communication strategies for each segment. Food companies, risk communicators, and public policy makers will need to assure consumers that terrorism mitigation steps are being taken to protect them and their food.

Effective Risk Communication for the Nation's Food System

Donald J. Klingborg
Foreign Animal & Zoonotic Disease Defense

Abstract

The National Center for Food Protection and Defense catalyzed a larger collaborative effort to create effective risk and crisis communication as it applies to the food system. The food system spans multiple players with critical control points starting with the environment in which food is raised and ending with the individual consumer's actual ingestion of a product. The National Center for Foreign Animal and Zoonotic Disease Defense partnered in this effort and assumed leadership for the curriculum as it applies to the pre-harvest safety of foods originating from animals.

The presentation will summarize key differences between effective risk communication and those that incorporate common mistakes. Methods to overcome mystery and fear, calm public outrage and to be seen as a credible and trustworthy resource will be covered in a review of the *Ten Best Practices*.

Developing a Global Terrorism Data Base

Gary LaFree
University of Maryland

Abstract

Although the research literature on terrorism has expanded dramatically since the 1970s, the number of studies based on systematic empirical analysis is surprisingly limited. One of the main reasons for this lack of cutting-edge empirical analysis on terrorism is the low quality of available statistical data. In response, there has been growing interest in open source terrorist event data bases. One of the major problems with these data bases in the past is that they have been limited to international events—those involving a national or group of nationals from one country attacking targets physically located in another country. Past research shows that domestic incidents greatly outnumber international incidents. In response, the National Consortium for the Study of Terrorism and Responses to Terrorism (START) has been collecting an open source event data base that includes both domestic and international terrorist events. The GTD currently includes about 70,000 events, making it about seven times larger than any of the other existing event data bases. In this presentation, I briefly describe our data collection efforts, the strengths and weaknesses of open source data in general and the GTD in particular, and provide some examples of the analytic utility of this new resource.

Geo-temporal Information Discovery

Alan M. MacEachren
Pennsylvania State University

Abstract

This presentation will focus on the challenges of exploiting complex, heterogeneous information that contain both implicit and explicit geospatial and temporal references. The approaches and applications presented are part of a larger effort to develop, implement, test, and deploy a suite of geovisual analytics methods and tools directed to supporting an iterative process of information foraging, analysis, sensemaking, and decision-making. The particular focus in this presentation is on a set of approaches and tools developed to support the analysis of fragmentary, heterogeneous information. Geospatial references in heterogeneous information sources are used to both explore the geo-temporal components of the information and to stitch together otherwise independent data sources. One set of tools discussed focuses on integration of methods for place-time-concept extraction from text, ontology mapping, and geolocation from imprecise information with web map services to create applications that support geographical contextualization and application of extracted information. A second set of tools focuses on the complementary process of exploration and analysis of complex sets of fragmentary information. Examples will be presented of tools targeting the following problems: identifying patterns of behavior from sparse data containing place, time, and attribute components, identifying group behavior from movement data, understanding the spatial-temporal-concept characteristics of news stories, developing possible explanations of fragmentary evidence from field reports, and relating geographic and social diffusion of scientific knowledge to real world events.

Development of an Effective Infrastructure for Sport Venue Security

Lou Marciani, Stacey Hall
and
Walter Cooper
University of Southern Mississippi

Abstract

High profile sporting events in the United States have been identified by the Department of Homeland Security (DHS) as potential terrorist targets (Lipton, 2005). Since 9/11 the American sports industry has increased security at major sporting venues and high profile events such as the Super Bowl, World Series, and Olympics. Large scale sports stadiums provide a perfect target for mass casualties and catastrophic economic impact. Besides terrorism, other potential threats include drug/alcohol usage, fan violence, patron injuries, weather concerns, power failure, and sabotage (Fried, 2005). It is therefore imperative that sport venue managers employ an all-hazards approach to emergency planning.

The University of Southern Mississippi (USM) Center for Spectator Sports Security Management has emerged a leader in the quest to prevent, prepare for, respond to, and recover from incidents at sporting venues. The Center focuses on building capabilities among those responsible for sports event security management. In May 2005, the Mississippi Department of Homeland Security and the Mississippi Emergency Management Agency awarded USM a $568,000 grant to create a research based model for effective security management of university sport venues. Vulnerability assessments were conducted at seven state-supported university stadiums in Mississippi with an average capacity of 70,000+. The vulnerability assessment process identified security weaknesses (industry gaps), highlighted "best practices", and provided consequence reduction proposals at each institution.

Furthermore, the *Sport Event Security Aware (SESA)* system was developed through the Center's research efforts as a means to improve capabilities of those involved in sport event security operations. The system involves a 4 step process of *assessment, training, practice*, and *audit*. These 4 key components assure the sport facility has conducted the appropriate security assessments, such as threat/risk and vulnerability assessments. Training is emphasized to ensure staff is adequately prepared and aware of their roles and responsibilities during game day and in the event of an incident. Sport organizations also need to have written and practiced emergency/evacuation plans in coordination with local emergency agencies. Finally, an unannounced game day audit is critical to the overall assessment of the venue and operations to guarantee plans and policies in place are carried out during game day.

The presentation will address the potential threats to sports events, discuss the DHS grant awarded to USM, and review the SESA system developed to be utilized by all agencies involved in protecting America's sporting public.

References:

Fried, G. (2005). *Managing sports facilities*. Champaign, IL: Human Kinetics.

Lipton, E. (2005, March 16). U.S. Report Lists Possibilities for Terrorist Attacks and Likely Toll. *New York Times*, Section A, Page 1, Column 2.

Economic Evaluation of Preparedness, Response and Recovery Strategies

Bruce A. McCarl
And
Levan Elbakidze
Texas A&M University

Abstract

The presentation addresses some of the economic issues related to allocation of resources across pre event preparedness strategies and post event response/recovery strategies in enhancing homeland security. The allocation problem is discussed as a balance problem between pre and post event actions. It is discussed from the standpoint of the effects of event severity and probability, costs, co-products and effectiveness of mitigation strategies on optimal allocation of moneys to preparedness and response strategies. Examples of framework application are drawn from animal disease and hurricane evaluations. Specifically, early disease detection and animal tracking are evaluated as options that could be carried out as part of pre event preparedness strategies. We find the benefits of investing in pre event preparedness activities increase with the increase in the probability of event, increase in spread rate of the disease, increase in expected damages brought by the disease, increase in the effectiveness of and decrease in the costs of pre event options, decrease in the effectiveness of and increase in the costs of response options. In the hurricane case we show results on the desirability of permanent, preventative crop mix shifts as a management strategy that increases resilience to hurricane damages.

Defining Medical Surge, Surge Capacity and Surge Response Capability for Catastrophic Events

Melissa L. McCarthy
Johns Hopkins University

Abstract

A critical component of medical response to a catastrophic event is our surge response capability. Surge response capability is the ability of surge capacity to meet a surge in demand for medical services. Surge is defined as a sizable increase in demand for services compared to a baseline demand. Dimensions of surge include: (1) influx (volume rate); (2) event (type, scale and duration); and (3) resource demand (consumption and degradation). Medical surge capacity consists of four components: (1) structure (facilities); (2) staff; (3) supplies and equipment; and (4) systems (i.e. policies and procedures). While there is general agreement on the major components of medical surge capacity, the essential elements within each of these components has not been comprehensively detailed, especially for all hazard types. Our medical surge response capability will be influenced by surge and surge capacity as well as assets and systems that are external to the health care system but are important to medical surge capacity such as power, transportation, and security. This talk will provide a conceptual framework of medical surge response capacity for all hazards that details the internal components and elements of surge and surge capacity as well as identifies the external factors that will influence our medical surge response capability for a catastrophic event.

Mechanisms of Political Radicalization

Clark McCauley
Bryn Mawr College

Abstract

Radicalization refers to changes in beliefs, feelings, and behaviors toward increased support for intergroup conflict and intergroup violence. Twelve mechanisms supporting participation in political violence are advanced. At the individual level, motivation to engage in political violence can be based on personal grievance, intergroup grievance, "slippery slope" participation in radical activism, and love for radicalized friends and relatives. At the group level, participation in political violence can emerge from extremity shift of likeminded group members, social reality value of encapsulated groups, intragroup competition (fission), intergroup competition to represent the same cause, and escalation in response to state repression. At the level of mass opinion, support for political violence is increased by perceived threat, dehumanization of the outgroup, and the construction of political martyrs.

Public Warnings for Protective Action
Presented to the Session on
Risk Perception and Communication

Dennis S. Mileti
University of Colorado
Boulder

Abstract

This presentation synthesizes the conclusions from the published research record of over 500 research publications that span over 50 years of research in the social and behavioral sciences regarding public response to warnings of the pending impact of natural, technological, human made, and terrorism hazards and disasters including evacuation of the World Trade Center Towers prior to their collapse on September 11th. This research record includes the range of public protective actions, e.g., evacuation, shelter in-place, and others as well as for public response in the context of communities and occupant response in high rise buildings. The findings of this research base are synthesized in terms of the basic social and social psychological processes that underlie human warning response across all hazard types. The finding are presented in terms of how to use these principles of human response in a warning context to maximize the probability of the public (in communities as well as in high rise buildings) taking timely and appropriate protective actions prior to impact. Topics covered include, among others, public notification, warning content, warning communication channels, and how to effectively manage public mis-information in an actual warning event.

The Risk Analysis Workbench (RAW): A Tool for Risk Assessment

Michael D. Orosz
University of Southern California

Abstract

The Risk Analysis Workbench (RAW) is a collaborative software system for risk analysts and decision/policy-makers to assess terrorism threats (e.g., FMD infection and spread), to evaluate strategies for countering these terrorist threats, and to undertake comparative analysis for risk-based funding allocation. Its coverage spans risk assessments and models, decision support tools, scenario and threat definitions, supporting data, and presentation and review tools. Based on a semantic network, the workbench is being developed to also enable composition of different risk and consequence models in a common user and data set management interface. The current user interface allows for the creation and specification of new scenarios and models for analysis, management of existing scenarios, and sharing of scenarios and other resources among multiple analysts. The ultimate target is an environment in which questions can flow from decision/policy makers to analysts, triggering both composition of software and formation of teams to gain insights. Meanwhile, conversely, analysts can develop synergies with each other which produce new findings that need to be brought to the attention of those decision-/policy-makers. RAW is currently populated with resources from the Texas A&M National Center for Foreign Animal and Zoonotic Diseases (FAZD), the University of Southern California's Center for Risk and Economic Analysis of Terrorism Events (CREATE), and the University of Maryland's National Consortium for the Study of Terrorism and Responses to Terrorism (START).

Visual Analysis of Multimedia Data

William Ribarsky
University of North Carolina
Charlotte

One of the most important applications in visual analytics has been exploratory visual analysis of large collections of unstructured text documents. However, digital media, especially those on the Internet, are multimedia in content with text, images, video, and even sound together. Furthermore, there is an explosion of broadcast and other media, especially in third world countries. (In the Middle East, for example, there has been a rapid increase in the number of broadcast channels in the last five years.) Thus there is the need to extend exploratory visual analysis to large collections of multimedia. However, this requires intelligent automated analysis techniques closely integrated with interactive visualization. In the case of broadcast video, correlated image segmentation, feature identification, image flow analysis, audio analysis, and closed caption concept extraction are required. In this talk, I will discuss recent work that focuses on analyzing video news broadcasts from several channels over extended periods of time. The news segments are found automatically, and broadcasts in any language can be analyzed. The resulting multiple terabyte database can then be explored visually over time, permitting the user to follow themes as they grow or recede, compare different viewpoints on the same theme, and do many other analyses. I will discuss how this approach can be extended to other types of multimedia.

Homeland Security:
What Can Discrete Science Do?

Fred S. Roberts
Rutgers University

Abstract

Methods of discrete science have become important tools for homeland security, especially when combined with powerful, modern computer methods for analysis and simulation. We will describe the use of such methods tracing back to World War II and describe modern homeland security applications of discrete science: text analysis, disease event detection, author identification, bioterrorism sensor location, port of entry inspection, protection against invasive species, response to natural disasters, and privacy-preserving data analysis.

Promoting Resilience to Terrorism

Adam Rose
University of Southern California

Abstract

Although we have made significant gains in our ability to thwart terrorist attacks, the stark reality is that we cannot prevent them all. Our next best strategy is to minimize the losses of the attacks that do occur. One approach is to enhance *economic resilience*, or the ability of the economy to continue to function after assets have been damaged or critical resource flows have been disrupted. Ways to accomplish this include: greater reliance on own sources of critical input supply (e.g., distributed electricity generation), increases in inventories, conservation, input and import substitution, business relocation, and making up lost production at a later date. The potential for resilience is high, due to the motivation of businesses and individuals to survive. At the same time, experience is limited and opportunities are not always well understood. However, the situation is improving by the professionalization of the concept through the emergence of the "business continuity" industry and DHS efforts to disseminate information on "best-practice" methods.

This presentation will define economic resilience, show how it can be measured, and report on studies of its effectiveness. I will also discuss future research priorities and a new project on the topic that involves researchers at five DHS university centers

I will also identify ways to enhance resilience, as well as how to avoid the erosion resilience in a catastrophe. A major emphasis will be the relatively low cost and broad applicability of resilience in comparison to other strategies. Resilience is truly a worthy *second line of defense* against terrorism.

What Do We Know About Public Perception of Terrorism Risks?

Heather Rosoff
and
Richard John
University of Southern California

Abstract

The events of September 11, 2001 (9/11) confronted the American public with a reality that had previously been of peripheral concern. Since there have been a limited number of terror-related attacks on United States soil, it is relatively unclear how Americans perceive the likelihood and consequences of different attack types. It is also unclear how the American public might react and respond in the event of different attack types. We apply the psychometric model to answer the question of how terrorism risk is related to perceived likelihood and consequence of an attack. Specifically, we asked survey participants to assess the risk of various natural, manmade and terror-related disasters. Each disaster was evaluated based on the risk to themselves and society, probability of disaster occurrence in the next year and the expected number of fatalities from a given event. We further extend the analysis to compare aggregated and individual responses across disaster type and risk attributes. Understanding the terrorist threat is critical to maintaining public moral, sustaining economic activity, and limiting disruption to normal daily routines. Obtaining a deeper understanding of how Americans perceive the terrorist threat will assist the development of policies and procedures for educating and preparing the nation for the impacts of an act of terrorism if it were to occur.

"Semantic Abstraction and Integration Across Text Documents and Data Bases"

Dan Roth
University of Illinois
Urbana-Champaign

Abstract

Intelligent access to information requires semantic integration of structured databases with unstructured textual resources. We will discuss some of our research towards identifying mentions of entities in text, identifying relations that may hold between entities and concepts in texts and determining whether different mentions of real world entities, within and across documents, actually represent the same concept. We will also discuss using these capabilities to search unstructured text and to integrate information extracted from unstructured data with existing institutional knowledge bases.

Biothreat Detection: Designing Novel Methods and Assessing Current Systems for Detection and Surveillance

Richard Rothman
Johns Hopkins Medical Institutions

Abstract

In this session several laboratory platforms being developed for rapid detection of biologic and emerging infectious threats in clinical settings will be described. Specific examples leading up to our current DHS evaluation project will be described from our group, including a real time universal PCR for rapid bacterial identification, and a breath condensate method for detection of exhaled inflammatory markers. Brief examples of other innovative platforms will also be presented. Areas for ongoing study with DHS will be described in the context of existing national programs for organizing both laboratory preparedness (CDC's Laboratory Response Network) and syndromic surveillance (e.g. ESSENCE and Biosense). These studies include preparation of systematic reviews of emerging laboratory technologies, as well as surveys and planned expert conferences, designed to categorize and assess the wide range of laboratory and syndromic detection methods currently in use and under development.

Engaging Community Partners in Preparedness Planning

Monica Schoch-Spana
University of Pittsburgh Medical Center

Abstract

Disasters and epidemics are immense and shocking disturbances that necessitate the moral courage, judicious action, and practical innovations of large numbers of people, not simply those who serve in an official capacity. The civic infrastructure—comprised of the public's collective wisdom and capability to solve problems; voluntary associations (both virtual and face-to-face) that arise from shared interests or a public good; and social service organizations that look out for the well-being of various groups—is essential to managing a mass health emergency. This talk will outline the *Working Group on Community Engagement in Health Emergency Planning's* judgments and recommendations to government decision makers on why and how to catalyze the civic infrastructure for an extreme health event. Community engagement—defined here as structured dialogue, joint problem solving, and collaborative action among formal authorities, citizens at-large, and local opinion leaders around a pressing public matter—can augment officials' abilities to govern in a crisis, improve application of communally held resources in a disaster or epidemic, and mitigate against communitywide losses.

All Hazards Emergency Operations Management System (ALLHAZ)/DRIS

Gordon Skelton
Jackson State University

Abstract

The Department of Homeland Security is modifying the *National Preparedness Goal and Target Capabilities List* to reflect the impact of Hurricane Katrina. The Hurricane crystallized the importance of **all-hazards emergency operations planning** and brought to the forefront the need for changes on a number of fronts. Citizens need to know how to better prepare for disasters. A strategy for managing volunteers and donations is needed. Critical resource logistics and distribution need to be integrated with NIMS. Shelter staffing, evacuation preparedness, short term recovery and mass care strategies all need attention. Public officials must be trained in incident command and large scale event management. Mississippi Urban Search and Rescue teams need to be increased in size and number.

The All Hazards Emergency Operations Management System (ALLHAZ) is designed to implement key components of DHS' National Preparedness Goal at the local level and to provide a Common Operating Picture (COP) employing geospatial displays and models. ALLHAZ leverages current projects, existing data and resources, heterogeneous data sources and is targeted for use Responders teams. ALLHAZ is scaleable to support routine operations and large scale disasters.

Linking Education to Operations

Gordon Skelton
Jackson State University

Abstract

The nation needs the ability to rapidly deploy homeland security relevant STEM knowledge to a wide range of stakeholders; from the leadership of national, state and local organizations to first and early responders, to the general citizenry and to the future workforce. This capability is required to secure the homeland and to sustain our economy. The logical and only truly viable way to expedite this rapid deployment of homeland security relevant STEM knowledge is through our education system.

Goal: Incorporation of the University Centers of Excellence enabling technology into Homeland Security Operational units through workforce development training

Approach: Develop methodology and tools required to incorporate disparate enabling technologies into ALLHAZ. A demonstration project will be conducted focusing on an avian flu outbreak with local responders acting as Subject Matter Experts. Teaming with the State Office of Homeland Security will speed the deployment of technologies and also assist in building a much-needed workforce required to support ongoing Homeland Security efforts nationwide. The purpose of this level of integration with ALLHAZ is to consistently deliver to Homeland Security Operational Units, the technology they need in a framework suitable for day-to-day use in small- to medium-sized events, but scaleable to meet the requirements of managing a major disaster.

Building on intelligent decision-making and data fusion the Center for Defense Integrated (CDID) is developing a Disaster Response Intelligent System (DRIS) capable of data acquisition, data fusion, and intelligent decision-making in support of the Urban Search and Rescue (USAR) mission. DRIS is being integrated with the ALLHAZ system. The system, designed in a “Web Services service-oriented architecture” which can easily be enhanced with additional modules, will provide emergency response personnel with a “one- view” look for disaster planning, response and mitigation.

Macro-economic Impacts of Terrorist Attacks

Thomas Stinson
University of Minnesota

Abstract

Quantifying the losses from terrorism is a sobering but important task. Such estimates aid policy makers as they allocate scare resources among competing demands. Calculating the direct economic losses—the value of the lives and income lost by those directly affected by the attack--is a sobering but relatively straight forward first measure of the cost of terrorist actions. But, those micro-level losses are likely to be small when viewed against the entirety of the U.S. economy. The collateral, or indirect economic damages created to the broader macro-economy will almost certainly be much larger, since even a small, temporary decline in the growth rate in a $13 trillion economy is likely to dwarf the direct losses from terrorism.

The national economic impacts of a terrorist attack were estimated using a large-scale econometric model of the U.S. economy. Exogenous shocks were applied to consumer sentiment, a stock market index, interest rates and the value of the dollar. The magnitudes of the shocks were based on actual changes observed following previous geo-political incidents directly affecting the United States. After four quarters the economy was allowed to grow along the same growth path as in the baseline scenario. No long-term productivity changes were assumed. Under conservative assumptions cumulative losses in real GDP over the five-year simulation period were estimated to be in excess of $190 billion.

Situational Detection is more than just Sensor Detection

Moises Sudit
University at Buffalo

Abstract

We will present a graph-based framework that spans the temporal aspects of Situational Awareness by applying fusion techniques of sensed data. For real-time decision-making we have developed a highly versatile methodology that can be used in many situations involving high volumes of incoming data that can be filtered through systematically to hypothesize about events of interest in a target environment. INFERD (INformation Fusion Engine for Real-time Decision-making), generates and evaluates (or ranks) the more relevant hypotheses of the current situation to allow a human decision-maker to act accordingly. A number of algorithmic handlers have been created to deal with abnormalities such as imperfect/wrong a-priori information, defragmentation of data sources and failure of sensors. We will demonstrate the value of INFERD in a diverse set of domains from cyber security to Chemical/Biological Sensor Applications.

Regional Visualization and Analytics Centers Developing the Next Generation of Science and Scientists in Visual Analytics

Jim Thomas
U.S. Department of Homeland Security
National Visualization and Analytics Center

Abstract

The Department of Homeland Security has established five Regional Visualization and Analytics Centers (RVACs) led by universities across the United States to develop visual analytics tools that can help analysts and emergency responders detect, prevent, and reduce the threat of terrorist attacks; identify and assess threats and vulnerabilities to our homeland; and recover from and minimize damage from national disasters. Visual analytics software tools leverage people's inherent ability to process visual information to help them interpret and analyze vast volumes of data. Visual analytics helps facilitate analytical reasoning about complex information to identify important trends, test hypotheses, and determine how best to take action.

The RVACs are affiliated with the National Visualization and Analytics Center (NVAC),which was established by DHS in 2004 and is led by Pacific Northwest National Laboratory. PNNL coordinates the efforts of the RVACs. NVAC Director Jim Thomas will present an overview of the RVACs' research and accomplishments in their mission to create the next generation of visual analytics technologies and educate the next generation of visual analytics researchers.

Visual Analytics:
The Agenda in Response to
DHS Mission Needs

Jim Thomas
U.S. Department of Homeland Security
National Visualization and Analytics Center

Abstract

The scientific field of study now called Visual Analytics was created to fill a critical gap in capability and talents for many DHS mission needs. These needs include identifying terrorist's activities, understanding vulnerability of our critical infrastructures, and preparing and responding to natural and man made disasters. A team of about 40 people including end users, multiple government agencies, went through training, workshops, and listened to end users to clearly understand these needs, articulate the current state of practice, and develop a plan forward now published as *Illuminating the Path: The Research and Development Agenda for Visual Analytics*. This agenda defines many opportunities for academia, industry, and government to work together to develop critical technologies that have applications well beyond homeland security. This agenda will be described along with the 6 Research Centers established to start the work of the agenda to develop the next generation capabilities and talents. In addition several other government agencies are now using this agenda to form related investment programs providing opportunities for faculty, students, and researchers in industry and the National Laboratories.

Preparedness Networks:
Crossing Sectors, Joining Jurisdictions

Kathleen Tierney
University of Colorado

Abstract

This presentation provides an overview of START research, with a special focus on research being conducted by members of START Working Group #3, which focuses on societal dimensions of terrorism. The presentation includes an overview of WG#3 research on local community preparedness networks. This study, which is being carried out by the University of Colorado Natural Hazards Center, involves field work and in-depth interviews in five "typical" UASI sites. This study seeks to better understand the structure and composition of local terrorism preparedness networks; the nature of interactions among organizations participating in preparedness networks; and the impacts of DHS preparedness initiatives on local efforts.

Should We Protect Commercial Airplanes Against Surface-to-Air Missile Attacks by Terrorists?

Detlof von Winterfeldt
University of Southern California

Abstract

This presentation describes two decision analyses to assess the cost-effectiveness of MANPADS (Man-Portable Air Defense Systems) countermeasures. These countermeasures are electronic devices that can be installed on commercial airplanes to detect and deflect shoulder fired heat-seeking missiles. The initial analysis considered protection only against MANPADS and it concluded that countermeasures can be cost-effective if the probability of such an attack is large (>0.5 in ten years), the losses are large (>$100 billion), and the countermeasures are relatively inexpensive (<$15 billion). Subsequently, we conducted an expanded analysis that considered alternative countermeasures and shifting terrorist tactics after installing a particular countermeasure. This expanded analysis confirmed that MANPADS countermeasures can be cost-effective, but it also suggested that perimeter control is important, because close-range attacks with RPGs are the next best choice of terrorists, once MANPADS countermeasures are installed.

Terrorism and Institutional Legitimacy: When do ordinary Citizens Support Extraordinary Violence?

Steve Weber
University of Maryland

Abstract

A growing body of criminological research suggests that attitudes toward crime are closely related to attitudes toward larger social institutions: when citizens lose trust in institutions such as justice and government they become more likely to tolerate or even support criminal behavior. Researchers interested in terrorism have made related claims about the effects of counter terrorist strategies on the popular legitimacy of regimes. Prior research suggests that terrorists frequently rely on the response of governments to mobilize the sympathies of would-be supporters. To the extent that government-based counter terrorist strategies outrage participants or energize a base of potential supporters, such strategies may increase the likelihood of further terrorist strikes. This reasoning has led some to argue that responses to terrorism can be more dangerous than terrorism itself. In fact, several commentators have argued that Osama bin Laden's decision to support the September 11 attacks was animated in part by the belief that American retaliation would inevitably kill innocents, demonstrate the extent of American hatred towards Muslims, and thereby erode the international legitimacy of the United States. Despite the general interest in the connections between legitimacy and attitudes toward terrorism, there has thus far been little research on whether citizens are more likely to support terrorist activity when they have little trust in their government. In this paper, we address this question using international survey data collected in seven countries with large Islamic populations. As the influence and power of terrorist organizations is closely related to their base of popular support, it becomes imperative for researchers to understand when and why ordinary citizens come to tolerate, condone or support terrorist behavior.

Extracting and Summarizing Events and Opinions in Text

Janyce Wiebe
University of Pittsburgh

Abstract

This talk will overview our research into text extraction of facts, entities, and relations associated with events, as well as rich information about the opinions being expressed about them. (Whose opinions are being expressed? How intense are they? Are the opinions positive or negative?) We will perform within- and cross-document coreference resolution, and combine the information extracted from one or more documents into query-able graph-based summaries. To perform these tasks, we will develop rich linguistic resources, such as semantic and sentiment lexicons, and employ bootstrapping and weakly supervised learning techniques to produce Information and Opinion Extraction systems that can be rapidly retrained for new domains without requiring large amounts of special training resources.

Applying Optimal Capital Allocation Methods to Homeland Security Resources: A Case Study of California's Allocation of the Buffer Zone Protection Program Grants

Henry H. Willis
RAND Corporation
Don Kleinmuntz
Detlof von Winterfeldt
University of Southern California
and
Harry Bowman

Abstract

Decision analysis has been used successfully in many fields to help organizations allocate resources most efficiently. The methods used build on the theory and practice of mathematical programming and multiattribute utility and value models. However, federal and state governments are only beginning to adopt these approaches to make decisions on the allocation of resources to protect and prepare communities from terrorism. The purpose of this work is to improve methods for risk-informed allocation of homeland security resources by providing sound analytical guidance to decision makers regarding the most effective way to obtain maximum impact from a given funding level. This paper presents a framework for applying the fundamentals of optimal capital resource allocation to homeland security policy. The framework was developed at the University of Southern California's Center for Risk and Economic Analysis of Terrorist Events, a U.S. Department of Homeland Security University Center of Excellence. The framework draws upon a mix of methodologies including probabilistic risk analysis, economic analysis, and qualitative assessments by experts, as appropriate. This paper also reports on a pilot study of applying the framework to help the California Office of Homeland Security allocate funding from the Department of Homeland Security's Buffer Zone Protection Program in Fiscal Year 2006. The pilot study emphasizes the strengths of the framework as well as challenges and issues involved with implementation. This work provides demonstration of an analytic process that can be replicated in other states with the challenge of deciding how to homeland security grants.