



2ND ANNUAL MINERVA CONFERENCE

*Social Science Resources
for Academics and
Policymakers*

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2011 Social Science Resources for Academics and Policymakers

Minerva Research Initiative

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For academic social scientists and government social science customers alike, finding useful, current, broadly usable resources can often be difficult. As it happens, many of our Minerva research teams are building tools and databases, compiling sharable government data, and contributing to other research resource efforts. This “Social Science Resources for Academics and Policymakers” packet includes descriptions of data, sites, tools, and plans ahead for some of the Minerva projects. In addition, three Minerva-external resources of broad interest are included.

While this resource is initially small, we will continue to build it as research progresses and new resources are identified. We hope that these resources are useful for your work ahead!

Department of Defense-Generated Resources

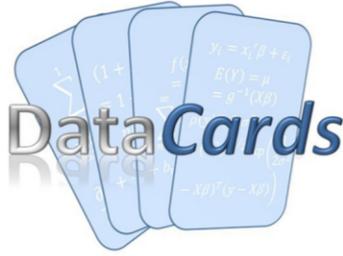
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Additional shareable resources are described in the 2011 Minerva Research Summary book; see:

- People, Power and Conflict: The Emergence of the Eurasian Migration System (Buckley)
- Deciphering Civil Conflict in the Middle East (Jenkins)
- Terrorism, Governance, and Development (Shapiro)



Collaborative Data Discovery and Information Sharing For Socio-Cultural Data

Internet Access: <http://www.datacards.org>

NIPRNet Access (CAC required): <https://datacards.osd.mil>

DataCards was created in support of a NATO Specialist Team but has since been maintained by a partnership between the National Defense University (NDU) and the Office of Cost Assessment and Program Evaluation (CAPE) in the Office of the Secretary of Defense (OSD).

The objectives of DataCards include:

- Making sources of data discoverable
- Reducing the search costs for data
- Providing a conduit for non-DOD and non-government data to the operator

The DataCards tool has been developed as a structured wiki that indexes data sources that can be used for analysis of all aspects of irregular warfare (IW) as well as socio-cultural analysis and modeling. Data cards have been, and are being, developed for every data source that we can identify to provide summary descriptions of the content, quality, intended purpose, and potentially appropriate uses.

While the DataCards tool was initially focused on Afghanistan, it has since been expanded to include every region of the world. Since the tool was developed largely by the Department of Defense, we have chosen to geographically divide the world according to the demarcations defined by the area of operations (AO) for every geographic Combatant Command (COCOM).

Our objective in the creation of DataCards was to develop a capability that could become self-sustaining. In order to succeed, a community of interested parties, data owners, analysts concerned with data, and anyone with knowledge of data sources would have to share information. Each data card (like an index card in a card catalog, or a baseball card) displays metadata about the data source, each metadata record has multiple hyperlinked fields, and each field corresponds to a semantic property.

You do not need to be able to complete an entire Data Card to contribute. You can create a new Data Card and fill it out partially or add to an existing Data Card. The tool includes a search function that will allow you to find out if a data source has already been entered.

To Access DataCards:

For access to the internet version of DataCards, you will need a username and password. To receive a username and password, please email brian.efird@ndu.edu with a request that includes your name, organization, phone number, and a brief reason for why you would like access. Requests are unlikely to be refused, but this helps track the user base more effectively. To access the NIPRNet version of DataCards, you will need a DOD Common Access Card (CAC) for user authentication.

There is also a monthly email update that is provided to all interested parties that describes progress, plans, and next steps. This update also includes the latest version of the DataCards content in an Excel spreadsheet. To be added to this list, again email brian.efird@ndu.edu with a request.

Please let anyone potentially interested know about this capability, and we encourage you to obtain an account and add a card for any data source you know about. This project will only succeed with broad community support.

Cultural Knowledge Consortium (CKC)

a Joint Interagency Multinational effort



Executive Summary: The Cultural Knowledge Consortium (CKC) provides a Socio-cultural Knowledge Infrastructure (SKI) to operationalize access to multi-disciplinary, worldwide, social science expertise and support collaborative engagement efforts in support of Combatant Command (COCOM) socio-cultural analysis requirements. CKC supports and complements the alignment and synchronization of DoD analytical efforts, operational information requirements, and training programs.

Background: The Army initiated the CKC in response to a Director of National Intelligence (DNI) directive to support the availability, analysis, and storage of socio-cultural data to satisfy information requirements of the COCOMs and the defense intelligence enterprise. The intent is to support the alignment and synchronization of DoD efforts, enable collaboration with the breadth of non-US government socio-cultural communities, and provide a single point of access and application of advanced analytics to socio-cultural information.

Concept of Operations: Two interrelated efforts— operationalize expertise network enabled by an information technology portal infrastructure.

1. Operationalize access to expertise

An operationalized expertise network is a coordinated body of regional or functionally-aligned communities of interest, leveraged and enhanced by the CKC Regional and Functional Scholars for access by all participants. This creates a deep, diverse pool of expertise to support COCOM and whole-of-government information requirements. The CKC Scholars will:

- Develop, maintain, and facilitate inter-personal and inter-organizational relationships among a range of participants, including USG/military, non-USG/military, inter-governmental organizations (IGO), non-governmental organizations (NGO), academic institutions, and private industry.
- Drive interaction and collaboration among social science communities of interests through liaison and assistance visits, electronic collaboration means, and supporting regional and functional working groups.
- Develop, guide and mentor a body of Subject Matter Experts (volunteer and compensated) that will multiply efforts and fill capability gaps in a responsive, consistent and cost-effective manner.
- Initiate and participate in regionally and topically-focused interactive events, such as symposia, seminars, working groups, webinars, and tele-conferences in order to deepen working relationships and bring special attention to specified subjects.
- Facilitate and maintain awareness of new knowledge development efforts (e.g. field research and data gathering) to increase community awareness and avoid redundancy, gain from the efforts of others and contribute to or participate in these efforts in which they share an interest.

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- Advise and facilitate acquisition and access to specialized or premium socio-cultural knowledge resources: reduces duplicative efforts and capitalizes on economies of scale.

2. CKC Portal

- The CKC portal serves as a single point of access for socio-cultural information and analytical capabilities. The primary effort is on the commercial Internet and unclassified domain, with complementary efforts on the classified domains. This will allow streamlined access to data and leverage the capabilities of the DCGS-A Standard Cloud (DSC) and the Army's LANDISRNET telecommunications architecture.
- CKC data ingestion, indexing, and brokering will support enhanced analysis, collaboration, and dissemination. This includes acquiring or providing access to data sources and materials to increase synergies and cost savings.

CKC support to the Army Culture and Foreign Language (ACFL) Enterprise:

- The CKC Regional and Functional Scholars support and complement ACFL Advisors by managing and providing access to a diverse consortium of expertise and resources. This includes both the operationalized expertise roundtables and the larger communities of interest. CKC also coordinates and collaborates with the ACFLs to participate in and sometimes host collaborative knowledge exchange events.
- The CKC portal (and associated technical capabilities) serves as a backbone for providing access the resources, collaborative capabilities, and situational awareness for the ACFL Enterprise. ACFL Advisors may use CKC technical capabilities to support their efforts and provide continuity across the ACFL Enterprise. These capabilities are not intended to replace or duplicate existing communities or capabilities, but rather complement them by providing framework for knowledge sharing and collaboration, as well as an enhanced data brokering and advanced analytical tool capability.

Status and Way Ahead:

- The Army has provided initial funding for the basics of this effort through September 2012. Portal and DSC servers are being connected to the Internet, NIPRNET, and SIPRNET at the Network Enterprise Center (NEC) at Ft Eustis, VA. Initial portal deployment is expected to be completed in August 2011. The development of the Regional and Functional Scholar activity is on-going. There are currently 2 Department of the Army Civilians (DAC) and 6 contractors.
- Future manning will expand and reflect maturation of program activities, anticipated to be a minimum of 5 contractors, and 6 full-time military reservists serving as Regional and Functional Scholars and an IT development and support team. This will allow the CKC to conduct thorough community interactive outreach in support of all COCOMs' socio-cultural analysis activities, and increase socio-cultural knowledge product acquisitions and knowledge development projects.

Conflict Records Research Center

National Defense University

Lorry Fenner, Director

David Pallki, Deputy Director

The Conflict Records Research Center (CRRC) was established to fulfill the Secretary of Defense's intent to enable research into captured records with "complete openness and rigid adherence to academic freedom and integrity." The CRRC's mission is to facilitate the use of captured records to support research, both within and outside the government.

Electronic copies reside in a restricted U.S. Government database. The CRRC's primary purpose is to make copies of a significant portion of these records available to scholars in the CRRC's researcher database. We seek to make these copies, along with full English translations, available as quickly and responsibly as possible, while taking into account legitimate national security concerns, the integrity of the academic process, and risks to innocent individuals. Established at the direction of the Office of the Under Secretary of Defense (Policy) (OUSD(P)), the center operates under the National Defense University's Institute for National Strategic Studies (INSS).

The CRRC researcher database currently consists of two distinct collections: 1) Saddam Hussein's Iraq; and 2) al Qaeda and Associated Movements (overwhelmingly from Afghanistan). It contains over 1,200 records, constituting over 34,000 pages, with new records added weekly. All records in the CRRC include a file information sheet containing basic background information, a digital copy or audio file of the original record in Arabic, and a full English translation. The CRRC researcher database includes software that can search the full breadth of the English-language information sheets and translations.

Saddam Hussein Regime Collection

The records from Saddam Hussein's regime consist of a wide range of government files—audio recordings of high-level meetings, speeches by Saddam and senior officials, correspondence between ministries, records of the Presidential Diwan, and others—that bear mainly on issues related to national security, defense policy, and diplomacy. These records are categorized by their originating agency or office (for instance, Iraqi Intelligence Service or General Military Intelligence Directorate), and will eventually constitute the vast majority of CRRC holdings. The CRRC currently houses copies of over 800 Iraqi state records (over 27,000 pages). The archive only includes documents dated prior to 9 April 2003.

Al-Qaeda and Associated Movements (AQAM) Collection

The AQAM records consist of a wide range of files, including financial records, theological and ideological documents, strategic plans, operational guidebooks, and histories of individual operations from the Afghan war in the 1980s through the early 2000s. These documents are grouped thematically. There are also a small number of documents generated by the Taliban

government in Afghanistan. The CRRC currently includes over 200 AQAM records (3,800 pages). The archive only contains records dated prior to 1 January 2003.

Visiting the CRRC

The CRRC welcomes scholars to use its holdings. Because of the nature of the materials, however, potential researchers must complete several important steps prior to visiting the CRRC. This process includes determining whether the CRRC possesses files that may be helpful to one's research, obtaining Institutional Review Board (IRB) approval of one's research plan, and scheduling a time to use our research facilities. Accordingly, the first step in using CRRC holdings is to e-mail a two-paragraph summary of your research interests to crrc@ndu.edu so we can guide you through this process and help you obtain access to CRRC records in the most expeditious manner possible.

The CRRC requires all visiting researchers to adhere to US government standards regarding the protection of Personally Identifiable Information (PII). Certain documents in the CRRC database may contain PII that was collected on individuals without their knowledge and that, if made public, could subject them to harm or discomfort greater in and of themselves than those ordinarily encountered in daily life. PII includes information that could be used to distinguish or trace an individual's identity, such as his or her name, address, personal e-mail address or phone number, social security number, family member names, biometric records, etc., alone, or when combined with other personal or identifying information which is linked or linkable to a specific individual, such as date and place of birth, mother's maiden name, etc. PII protections generally do not apply to the deceased or to public officials (e.g. Saddam Hussein) acting in their official capacity.

Prior to accessing the CRRC database, scholars must obtain IRB approval of a research plan containing a pledge not to publish or otherwise disseminate PII encountered in CRRC holdings. This includes publishing PII in articles, books, or scholarly papers, making PII or documents containing it available on a website or other forums that might result in public dissemination, or other such activities. If scholars take notes containing PII from the CRRC, they must agree to store them in a locked location (desk, drawer, cabinet, etc), until the completion of the research project and/or the notes are no longer needed, at which time they agree to permanently destroy them. Scholars may not use PII found in the CRRC to locate and interview research subjects without first obtaining IRB approval that explicitly authorizes such research.

CRRC rules forbid removing digital copies of records, or of parts of records, from the archive. Photography and recording devices are not allowed. If researchers violate their commitments to protect PII, they will be permanently banned from using the CRRC and may also be subject to additional penalties and sanction. While scholars must obtain IRB approval before accessing CRRC records, the CRRC imposes no prepublication review requirement of any kind.

CRRC IMPACT

CRRC Research Database:

- Created and populated a CRRC researcher database with 1,200 unclassified records from Saddam Hussein's regime and from al-Qaeda and Associated Movements (Afghanistan).
- Provided a full English translation for every record in the researcher database. The records and translations combined constitute over 34,000 pages, and include nearly 150 hours of captured audio files of high-level Iraqi meetings.
- Assisted prominent Iraq and al-Qaeda experts, civilian faculty and students, and USG researchers in using the researcher database. Civilian scholars have used CRRC records in unclassified studies, accepted for publication in prominent journals and presses, which will benefit the DOD.



CRRC Academic Outreach:

Fulfilled OSD-P directive of reaching out to civilian scholars by staffing information booths, organizing roundtables, and presenting papers at the following organizations:

- International Studies Association; American Political Science Association; American Historical Association
- Society for Historians of American Foreign Relations
- Middle East Studies Association; Association for the Study of the Middle East & Africa
- Institute on Global Conflict and Cooperation; University of Kansas's Dole Institute of Politics; University of Michigan
- Washington Institute for Near East Policy; Center for Strategic and International Studies
- OSD-Policy's Minerva Initiative; JPME schools



CRRC Publications:

- *The Saddam Tapes: The Inner Workings of a Tyrant's Regime, 1978-2001*, Cambridge University Press.
- "Saddam, Israel, and the Bomb: Nuclear Alarmism Justified?," *International Security*.
- "'Conspiring Bastards': Saddam Hussein's Strategic View of the United States," *Diplomatic History* (forthcoming, 2012).
- "Contrasting Causal Mechanisms: Iraq and Libya," in Etel Solingen, ed, *Sanctions, Statecraft, and Nuclear Proliferation* (contract with Cambridge University Press).
- "Why did Saddam want the Bomb? The Israel Factor and the Iraqi Nuclear Program," published by the Foreign Policy Research Institute.



CRRC Conferences:

Ten Years Later: Insights on al-Qaeda's Past & Future through Captured Records

- Participants will draw on captured records from al-Qaeda and Associated Movements to cast light on the terrorist threat to the United States. In conjunction with this 2-day conference, co-sponsored with Johns Hopkins University, the CRRC will release copies of roughly a dozen unclassified CRRC records, along with English translations.

The Iran-Iraq War: The View from Baghdad

- Participants will draw on captured records from Saddam Hussein's regime to cast light on Iraqi perspectives and decision-making during the Iran-Iraq War. In conjunction with this 2-day conference, co-sponsored with the Woodrow Wilson International Center for Scholars, the CRRC will release copies of dozens of unclassified CRRC records, along with English translations.

Questions?

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Agent-Based Political Simulations Visualization Tools¹

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In the course of our Minerva research (see summary document) we have developed three systems for visualizing and analyzing agent-based simulation data: SocialViz, MDSViz, and Temporal Graph Visualization. Research efforts are described in greater detail in the Minerva Research Summary book.

SocialViz: SocialViz is developed as an interactive visualization system for the analysis of a single run of an agent-based simulation. It is designed using a Coordinated Multiple View (CMV) approach in which different visualizations are linked and integrated. The different visualizations created in SocialViz include a geospatial view, a temporal view, a bubble-chart view, and a dynamic political hierarchy (DPH) view. When the political scientists interact with any of the four visualizations, the other three views will dynamically respond, showing patterns and data from other perspectives. Figures 1 and 2 show screen shots of the SocialViz system.

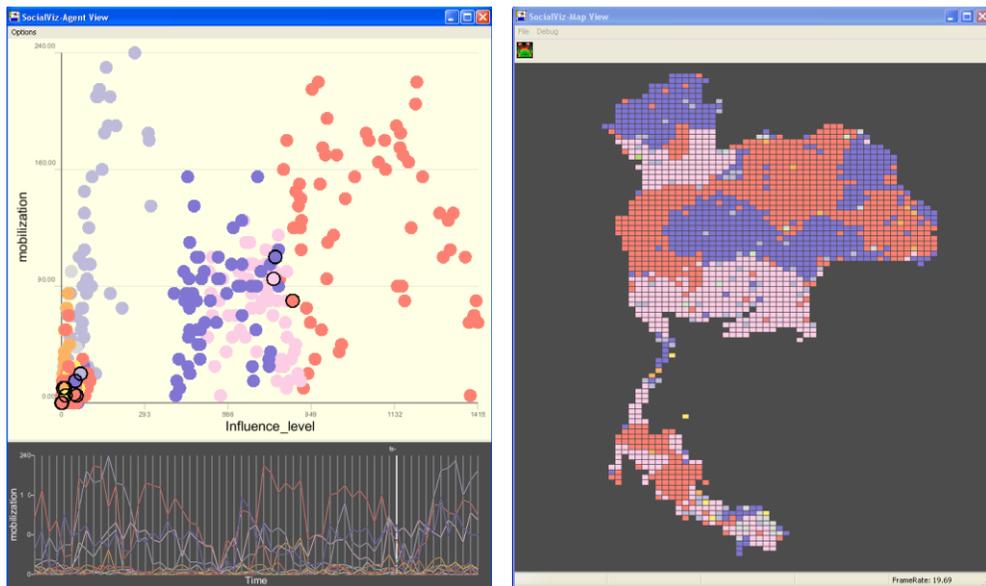
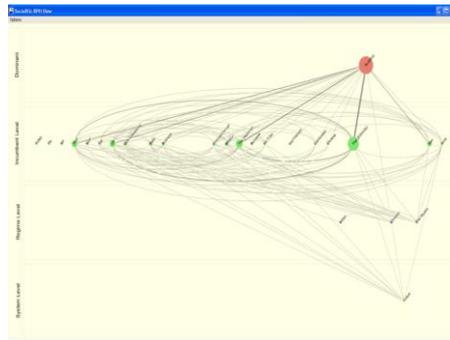


Figure 1: Three views of the SocialViz visualization system. (Upper Left) Bubble-chart view, currently shows the correlation between mobilization and influence level of each group of agents. (Lower Left) Temporal view that shows the activities of each group over time (x-axis is time). (Right) A geospatial view of the overall system including all the agents.



¹ Generated from the Minerva project “Visualizing Agent-Based Political Simulations” (Chang et al.)

Figure 2: The Dynamic Political Hierarchy (DPH) view. Each group of agents is assigned a level in the hierarchy: dominant, regime, system, and anti-system.

MDSViz: While the SocialViz system is effective in the analysis of a single agent-based simulation, it does not provide the political scientists an overview of the thousands of simulations needed to appropriately cover all potential outcomes. In order to address such needs, we have developed a second tool, MDSViz, which allows the political scientists to see all the simulations in a single image, and allow them to interactively discover trends within the simulation space.

The MDSViz system is designed with the same Coordinated Multiple View (CMV) approach as SocialViz. There are 4 visualizations in MDSViz, each of them is tightly coupled with the others. Much like SocialViz, any interactions with one of the visualizations in MDSViz will also cause the other visualizations to react. The four visualizations used in MDSViz are: a multi-dimensional scaling (MDS) view, a cluster view, a temporal view, and a parallel-coordinates view (Figure 3). Each of the views corresponds to a particular analysis requirement by the political scientists, and when used together as a system, these visualizations allow the scientists to discover common trends and patterns exhibited in all the simulations.

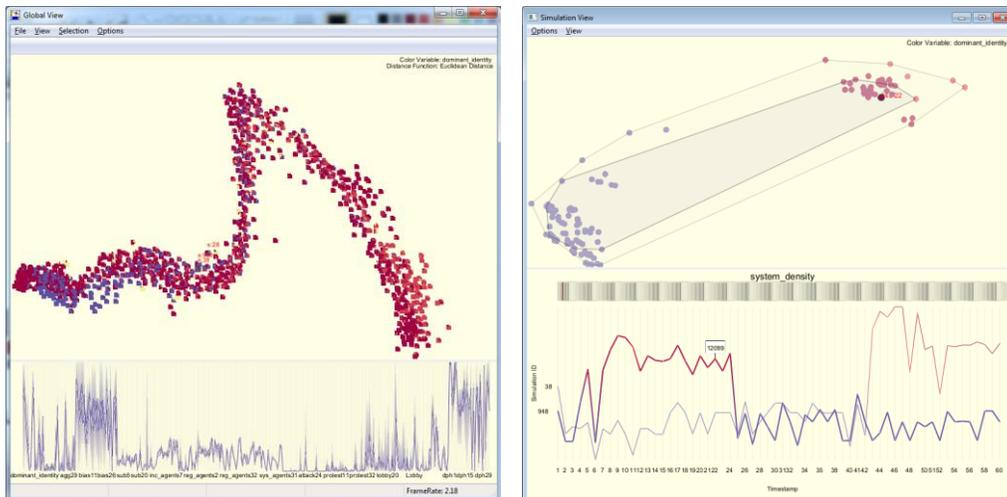


Figure 3-4: Four views of the MDSViz visualization system. (Upper Left) Multi-dimensional scaling view, currently shows the overall trend of 1000 simulations (each sim is a square). (Lower Left) Parallel-coordinates view showing all the attributes of a specific selected simulation. (Upper Right) Cluster view shows the similarities of the time steps in the selected simulations. (Lower Right) Temporal view that shows the activities of the selected simulations over time (x-axis is time).

Temporal Graph Visualization: The emphasis of this research project is to examine the thousands of simulations in a temporal structure. Specifically, we had designed the MDSViz tool such that the user can see the global trends and patterns of all the simulations, and quickly identify if there are similarities between the simulations. While the tool is useful for its intended purpose, it is still difficult for the user to understand “why” and “how” the simulations are similar. To answer such questions, we propose to formulate the simulation data as a temporal graph problem and develop graph algorithms to explore the simulation space more directly. Figure 5 shows an example output of our approach.

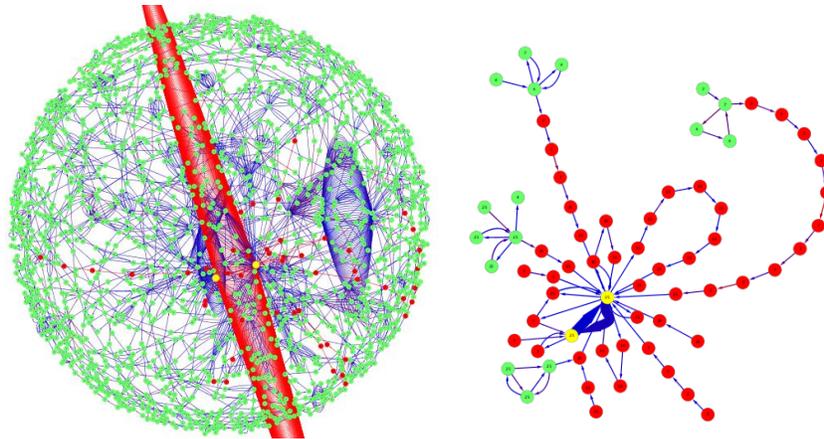


Figure 5: (Left) a colored temporal graph using a force-directed layout. This image is created using 100 simulations. (Right) a sub-graph of the temporal graph in the left. In this image, the yellow nodes denote the target states, the red nodes denote the “points of no return”, and the green nodes represent the last “decision points”

Potential Impact on DoD Capabilities and Broader Implications for National Defense:

The three visualization tools have been deployed and are being used by political scientists in a DARPA-funded project (Integrated Crisis Early Warning System (ICEWS) project (Prime Contract #FA8650-07-C-7749)). With the use of these visualization systems, the political scientists have been able to analyze large amounts of agent-based simulation data and gain insight into how the agents’ behaviors change over time. Such understanding has in turn led to the creation of better and more accurate agent-based simulation models.

Relational Database of China's Science and Technology Innovation System²

University of California Institute on Global Conflict and Cooperation

DESCRIPTION:

The University of California Institute on Global Conflict and Cooperation (IGCC) Minerva project on the Study of Innovation and Technology in China (SITC) is developing a unique relational database designed to record networks and linkages between Chinese corporations, state bodies, investment sources, individuals, and the technologies they are pursuing. Developed entirely in-house using MySQL, the database is housed in the state-of-the-art San Diego Supercomputer Center on the University of California, San Diego main campus.

Initial efforts to populate the database have focused broadly on data collection in three main subject areas:

1. Organizations and research institutes in China that contribute to defense S&T development projects
2. Corporate actors in the state and non-state sectors
3. Political actors in the realm of S&T policymaking

Relevant actors and institutions are recorded as entities in the database. Purpose-built tables are used to record biographical information for people, including information on birth dates, home-towns and provinces, education, etc. A jobs table records military service as well as positions held in government and the private sector so that a clear picture can emerge about a given person's career trajectory. For institutions, a separate set of unique tables store budget information, geographical data, personnel size, and other specifics.

The core value of this database is the relational nature of its structure. Once an entity is created, a relationship can be constructed between that entity and just about any other entity, or entities, in the database: A person, a research institution, a job title, and a time period constitute an employment relation, while a company can be related to a university in that it was born out of an idea created by a member of its faculty, to give a couple of examples.

As increasing quantities of data are collected and recorded, formal and informal linkages will begin to emerge, providing analysts and researchers an always incomplete, but highly structured and dynamic, picture of the Chinese S&T innovation system.

PROGRESS:

To date, we have populated the relational database with information from the following areas:

1. China's ten major defense conglomerates and their subsidiaries
2. Academicians from the Chinese Academy of Engineering (CAE)
3. Academicians from the Chinese Academy of Sciences (CAS) IT and technology departments
4. Academicians within CAS and CAE with concurrent officer commissions in the Chinese military
5. Significant actors in China's aviation industry (chief designers, noteworthy scientists, executives, etc.)

² Generated from the Minerva project "The Study of Innovation and Technology in China" (Cheung et al).

6. Top-tier corporations owned by China's State-owned Assets Supervision and Administration Commission (SASAC)
7. National initiatives such as the S&T mega-projects, NSF projects, and 863 and 973 technology development projects
8. Biographic and career path information on past and current Central Committee members of the Chinese Communist Party

HOW TO ACCESS THIS RESOURCE:

Currently, information in this database is not available to outside researchers as we have not yet built a convenient interface to spare users from needing to know SQL syntax. We expect to have a limited interface constructed by May 2012, whence the database will become available for academic use (with approval). We will continue to improve the interface, and collect additional data, for the duration of the Minerva project. For more information contact Heidi Serochi, Project Manager (hserochi@ucsd.edu; 858-534-8602).

Mapping Militants: The Organizational Dynamics of Violent Extremist Organizations³

Martha Crenshaw, Stanford University, crenshaw@stanford.edu

<http://mappingmilitants.stanford.edu>

The project (see research summary) focuses on the interactive genealogies of militant non-state organizations in specified conflict zones. The project identifies common patterns of organizational evolution, as terrorist and other violent groups form, split, merge, collaborate, compete, shift ideological direction, adopt or renounce terrorism, grow, shrink, and eventually decline over time. **We are producing a series of dynamic maps of the architecture of violent and non-violent opposition groups existing in the same conflict system.**

The project creates dynamic visual representations of relationships among militant organizations. The maps are not geographical but combine aspects of networks and timelines. They are simultaneously interactive, accessible, clear, and informative. They feature both organizational diagrams that permit visualization of interactions and carefully-researched profiles of individual groups. Each profile follows a standard template with assigned fields and provides citations to the sources used. The map shows umbrella organizations that unite different groups. Thus far, leadership changes and major attacks can also be displayed. The user can select an individual group to trace (which displays that group and all others with which it has or has had relationships) or see the entire universe of groups over a selected time period. The map is also searchable (e.g., for all profiles that contain a reference to Hamas). There is also a feedback field for comments (which are most welcome since this is work in progress).

Currently the Iraq map is accessible to the public at <http://mappingmilitants.stanford.edu>. (See screenshot appended.) Other maps will be posted as soon as they are completed. **Conflict arenas currently being mapped include: contemporary Iraq, Afghanistan-Pakistan, the Maghreb, Somalia, Yemen, Israel-Palestine, Turkey, Colombia, Northern Ireland, and Italy in the 1970s and 1980s.** For example, in the Pakistan, Afghanistan and India region, we are working on profiles for Harkat ul Jihadi Islami (HuJI), Harkat ul Ansar (HuA), Tehreek e Nifaz Shariat e Muhammadi, Harkat ul Mujahedeen, Jaish e Muhammad, Sipah Sahaba Pakistan (SSP), Sipah Muammad Pakistan (SMP), Lashkar e Jhangvi (LeJ), Lashkar e Taiba (LeT), Tehreek e Jafria Pakistan (TJP), Sunni Tehreek (ST), Tehreek e Taliban Pakistan, Asian Tigers, Islami Jamiat Taliba, Lashkar e Islam (LeI), Lashkar e Jhangvi Al Almi, Al Akhtar Trust, Al Rashid Trust, Lashkar e Zil, 313 Brigade, Ummah Tamir e Nau, and the Abdullah Azzam Brigade. In Somalia, we include Al-Shabab, Hizbul Islam, and Ahlu Sunna. In the Maghreb, profiles include Al-Qaeda in the Islamic Maghreb (AQIM), the Islamic Armed Movement (MIA), the Armed Islamic Group of Algeria (GIA), and the Salafist Group for Preaching and Combat (GSPC). We also have a profile of Al Qaeda in the Arabian Peninsula (AQAP). We aim to extend this list to other conflicts (e.g., Spain) and will include a global map of Al Qaeda and its affiliated organizations. We will be happy to provide draft profiles on request.

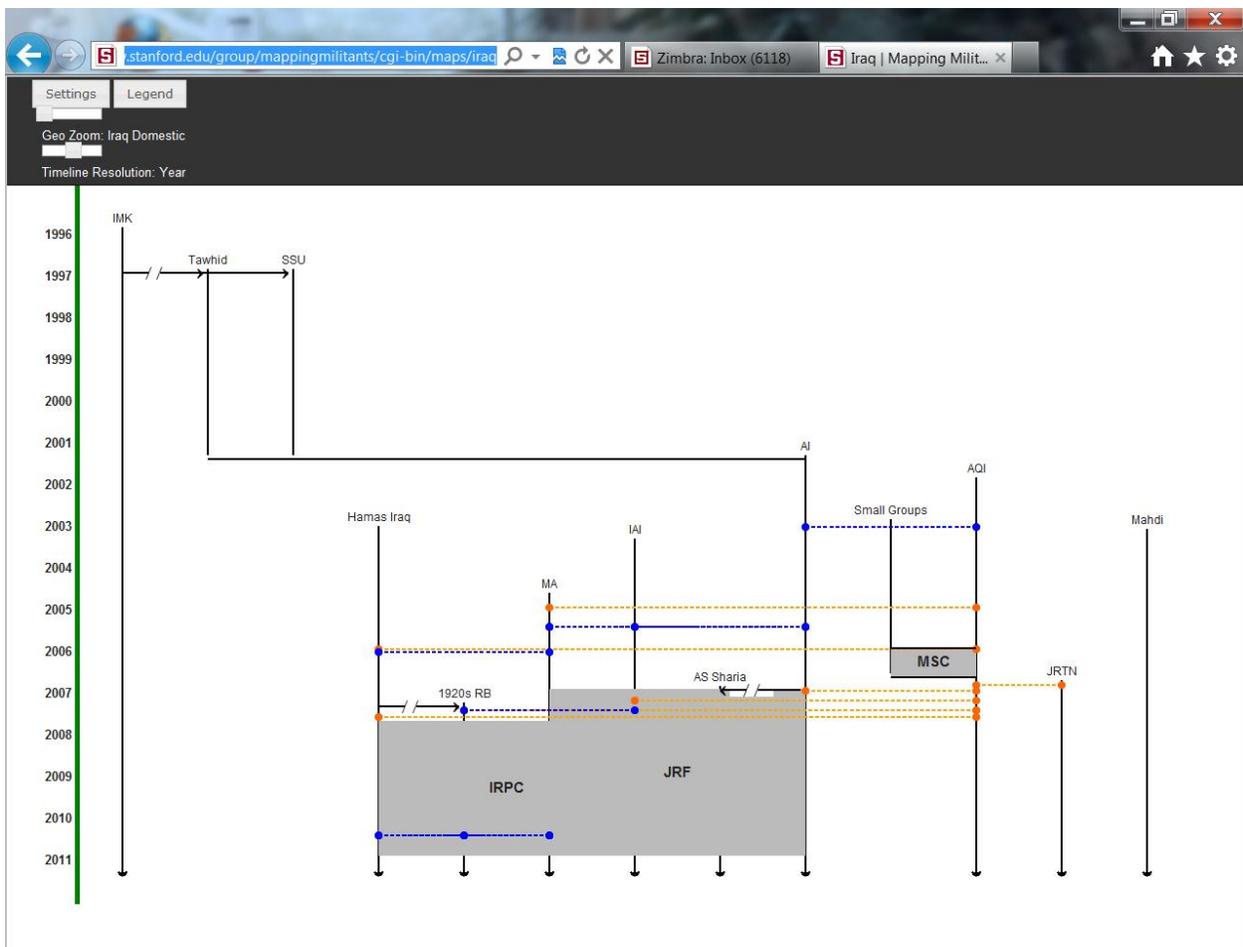
The project uses standard web technologies. During the past year the maps have developed from a simple visual demonstration – into a full-fledged, database-driven web application powered by MySQL, thanks

³ Generated from the Minerva project “Organizational Dynamics of Violent Extremist Organizations” (Crenshaw)

to student research assistant Daniel Cassman (Stanford Law School). Research assistants write organizational profiles using a wiki program, the text of which is parsed and data abstracted to construct the maps. The abstracted data is copied to a separate database and then converted into the interactive diagram. Javascript Object Notation is used to pass information from the database to the front-end website. The webpage then uses Javascript, HTML, and CSS to create the diagram. The code is licensed open source under LICENSE and can be reviewed at GitHub Repository.

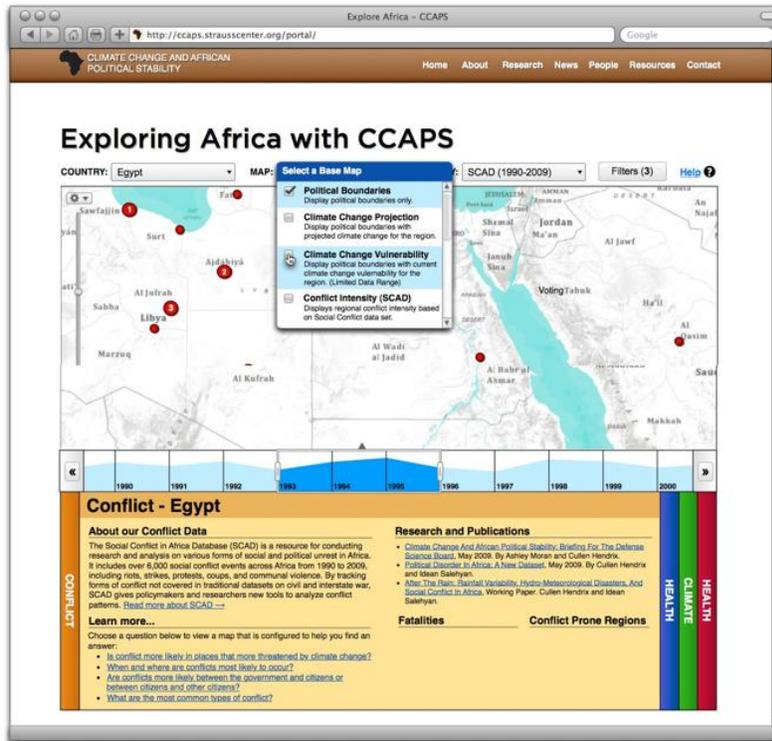
Screenshot: The Iraq Map

Settings can be adjusted to show regional affiliates, change the timeline, display only a selected group and its relationships rather than all groups, and display leadership changes and major attacks. Clicking on the acronym for a group brings up a short summary, which can then bring up the full profile.



Climate Change and African Political Stability (CCAPS) Resources ⁴

<http://ccaps.strausscenter.org/>

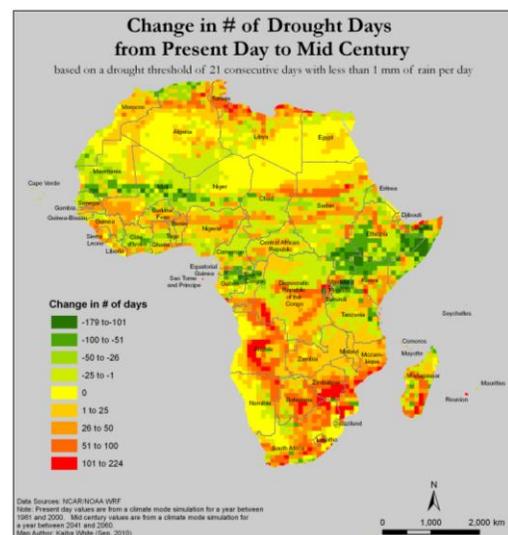


Climate and Security Data Dashboard

CCAPS is developing an online data portal that will allow policymakers and the public to access and map all of the program's data on climate change vulnerability, conflict, governance, and aid in Africa. The prototype will be released in December 2011, with the complete dashboard available on the CCAPS website in 2012-13.

Climate Projection Model for Africa

CCAPS developed a new climate projection model for Africa. This climate model is unique in that it is a regional model focused on Africa, which allows researchers to optimize the model to be more accurate for the African continent than current global models. Also in contrast to global models that project climate in the late 21st century, the CCAPS model produces mid-century projections to better align with policy planning horizons. The model produces projections on a range of variables, including growing season, daily temperature change, precipitation change, heat index, extreme weather events, surface winds, and dust. Data from the model will be available on the CCAPS website in 2012-13.



⁴ Generated from the Minerva project "Climate Change and African Political Stability" (Gavin et al)

Social Conflict in Africa Database

CCAPS produced the new Social Conflict in Africa Database (SCAD) as a new resource for research and analysis on social and political unrest in Africa. SCAD includes protests, riots, strikes, inter-communal conflict, and other forms of social conflict not tracked systematically in other conflict datasets. SCAD includes information on the location, timing, and magnitude of social conflict events, as well as the actors, targets, issues of contention, and government response. SCAD currently includes over 7,300 social conflict events across Africa from 1990 to 2010, and it will be updated each year. SCAD data and analyses are available to the public at www.scaddata.org.

| EventID | Country | Location | Start Date | End Date | Event Type | Actor | Target | Participants | Deaths | Repression | Issue |
|---------|---------|------------|------------|------------|----------------|---------------------------|-------------|----------------------|--------|-----------------------|--------------------------------------|
| 6150028 | Algeria | El hajar | 05-20-1992 | 05-23-1992 | Limited Strike | Steel workers | Government | Unknown | 0 | Non-lethal repression | Economy/jobs, Food/water/subsistence |
| 6150051 | Algeria | Nationwide | 02-10-1995 | 02-13-1995 | Limited Strike | Dock workers | Government | Unknown | 0 | No repression | Economy/jobs, Food/water/subsistence |
| 6150060 | Algeria | Nationwide | 02-10-1996 | 02-28-1996 | Limited Strike | Factory workers, Citizens | Government | 100,001 to 1,000,000 | 0 | No repression | Economy/jobs, Food/water/subsistence |
| 6150061 | Algeria | Nationwide | 07-07-1996 | 07-08-1996 | Limited Strike | Pilots | Government | Unknown | 0 | No repression | Economy/jobs, Food/water/subsistence |
| 6150063 | Algeria | Nationwide | 11-01-1996 | 01-13-1997 | Limited Strike | University lecturers | Government | Unknown | 0 | No repression | Economy/jobs, Food/water/subsistence |
| 6150080 | Algeria | Nationwide | 10-05-1998 | 10-19-1998 | Limited Strike | Air Algeria staff | Air Algeria | Unknown | 0 | No repression | Economy/jobs, Food/water/subsistence |
| 6150082 | Algeria | Nationwide | 10-17-1998 | 10-28-1998 | Limited Strike | Teachers | Government | Unknown | 0 | No repression | Economy/jobs, Food/water/subsistence |
| 6150086 | Algeria | Nationwide | 11-16-1998 | 11-17-1998 | Limited Strike | Postal workers | Government | Unknown | 0 | No repression | Economy/jobs, Food/water/subsistence |

Armed Conflict Location and Event Dataset (ACLED)

CCAPS program partner ACLED includes armed conflict data from 1997 to 2010 for countries worldwide, and CCAPS expanded data available in ACLED for conflict events in Sahelian and southern African countries. ACLED tracks the actions of opposition groups, governments, and militias within unstable states, specifying the exact location and date of battle events, transfers of military control, headquarter establishment, civilian violence, and rioting. ACLED's disaggregation of civil war and transnational violent events allows analysis of the local factors that drive instability in Africa. ACLED data, maps, and country reports are available to the public at www.acleddata.com.

Authoritarian Regimes Data⁵

Barbara Geddes

Joseph Wright

Erica Frantz

<http://dictators.la.psu.edu/>

Regimes (*available 10/11*)

An authoritarian regime is a set of formal and/or informal rules for choosing leaders and policies. An important element of this set of rules is the identity of the group from which leaders can be chosen. We provide data on distinct authoritarian regimes, including their begin and end dates, as well as a brief description of the regime failure event. The universe of authoritarian regimes comprises over 280 distinct regimes in 110 countries from January 1 1946 to December 31 2010. Further, we categorize all other country-year observations not coded as authoritarian regimes to construct a complete data set of all country-year observations in the world from 1946 to 2010⁶. The data set also contains information on authoritarian regime types, coded using observable characteristics of the relationship between the leader, the military and the support party. The four main categories of regimes are: military, monarchy, party-based, and personalist.

Types of regime failures (*available 10/11*)

An important innovation in the new data is to code distinct types of regime failure to allow researchers to understand how various factors influence the likelihood of different types of transitions as well to understand how the risk of these different events influence dictators' behavior. We code every regime failure event along three margins.

First, we establish whether the regime failure leads to a transition to a democracy or to a subsequent dictatorship⁷. This distinction allows us to better understand why a regime failure – such as the recent removals from power of Zine al-Abidine Ben Ali in Algeria and Muammar Qaddafi in Libya – is likely to lead to a new democracy or yet another dictatorship. Previous research mostly focuses on coding transitions to democracy, which can not be used to model how the determinants of democratization differ from factors that destabilize authoritarian regimes. Researchers and policy-makers want to know, for example, whether destabilizing authoritarian rule using various foreign policy tools – such the imposition of economic sanctions – is likely to lead to democracy or a new dictatorship.

Second, we code regime failures according to the extent to which domestic coercion was used to supplant the incumbent regime⁸. Coercive transitions include: uprisings, coups, and civil war. Non-coercive transitions include: elections, step-downs, and changes in the institutional rules. Our data is unique because many events that comprise coercive transitions – such as coups or civil wars – do not entail actual

⁵ Generated from the Minerva project “How Politics Inside Dictatorships Affects Regime Stability and International Conflict” (Geddes et al)

⁶ Other country-year observations not coded as authoritarian regimes are categorized as: democracy; provisional; failed state; not independent; or foreign-occupied.

⁷ Residual category is a regime failure that results in no state, such as the fall of the East German Communist regime in 1989 or the demise of the Siad Barre regime in Somalia in 1991.

⁸ Foreign-imposed regime change, such as the U.S. invasion of Panama in 1989, is the residual category.

regime transitions. This data will thus not only allow researchers to disaggregate qualitatively distinct types of political change but will allow users to model when events such as civil wars and coups lead to regime breakdown.

Finally, we code the level of violence that occurs during the regime transition event. Following the literature on civil conflict, we mark the level of violence in four exclusive categories: 0 deaths; 1-25 deaths; 25-1000 deaths; and > 1000 deaths. Many influential theories of democratization rely on the threat of violence by an excluded class of citizens as the main mechanism to explain transitions to democracy. Yet in many observed transitions to democracy, the threat of violence appears to play little role in elite decisions (e.g., Brazil 1985, Mexico 2000). By coding transitions according to the level of violence, we can better understand the risk of democratization when the threat of violence (revolution) is apparent, as this may provide very different incentives for incumbent authoritarian regimes than the risk of a non-violent transition to democracy.

Authoritarian time horizons (*est. available 06/12*)

A second part of this project examines different forms of political instability in dictatorships – such as the risk of transition to a democracy or to a subsequent authoritarian regime – for both leaders and groups of elites. We aim to provide regime data – including regime duration and different types of failures – as well as comprehensive data on covariates such as economic indicators, coups, political institutions, elections, resource wealth, and civil and international conflict for use in estimating various types of failure risk. We will also provide a guide for using the predicted risk of regime failure in applied work, in which we address how to deal with issues such as non-proportional hazards, unit heterogeneity, estimates that vary across calendar time periods, and second-stage variance corrections.

Time-varying authoritarian features (*est. available 12/12*)

A final part of this project codes time-varying data on multiple characteristics of authoritarian regimes. This data will enable users to estimate latent dimensions of authoritarianism as well as to develop better measures of important concepts such as the size and depth of the support coalition and the extent to which the leader controls the military and the support party. Currently, researchers use regime type dummy variables as proxies for various concepts, such as coalition size, constraints on the ruler, and leader audience costs. However, these dummy variables are not only time-invariant across the lifetime of a particular regime but they are noisy measures in themselves, potentially conflating important concepts.

Finally, time-varying measures of multiple dimensions of authoritarian rule will enable researchers to better understand how personalist rule evolves over time. This question is of central importance to both academics and policy-makers because extant research shows that these dictatorships have a higher likelihood of conflict initiation and nuclear investment, and are the least likely to transition to democracy once the regime falls.

A Real-Time Contextual Mapping and Visualization Dashboard for Muslim Social Movements⁹

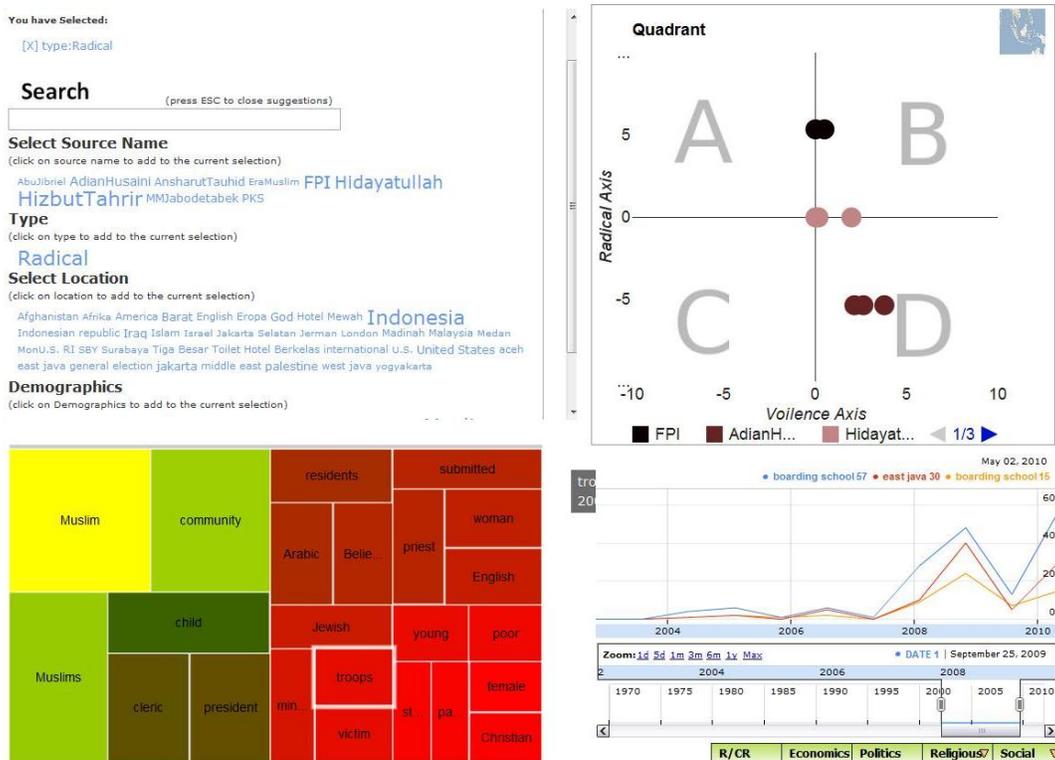
Mark Woodward, Arizona State University

The overall contribution of the project will be an empirically-based multidimensional portrait of counter-radical networks across critical regions within the Muslim world and their shifts through time and space.

Project team is creating a web portal that provides access to a broad range of information. This will include a database that tracks both radical and counter-radical networks of ideas and actors. The web portal's dashboard will graphically map the diffusion and influence, geographically and diachronically, of these ideas and actors. An enormous amount of data, heretofore amassed in slow and piecemeal fashion, will be made fully available through this project. The portal dashboard will feature:

- The ability to search and return results which include descriptive information about and classification of the search terms and constructs.
- A visual representation of where along multiple spectrums any particular group lies at a defined period of time based on the project's analysis of multi-faceted cross-regional and cross-disciplinary data using theoretically driven non-binary models which capture the complexity of the material.
- Ability to track peaking religious, political, socio-economic markers driving Muslim social movements, their target demographics, and locations.

Screenshot of the RTCM Dashboard



⁹ Generated from the Minerva project “Finding Allies in the War of Words: Mapping the Diffusion and Influence of Counter-radical Muslim Discourse” (Woodward et al.)



Explorations in Cyber International Relations:

Material for Inclusion in
*Handbook on Social Science Resources for Academics and
Policymakers*

Contents

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5. Class Materials: Future of Cyber Security
6. Wiki: Cybersecurity Wiki
7. Operational Integration of Cyberspace and International Relations



1. Cyber Data: ECIR Data Dashboard

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The Explorations in Cyber International Relations (ECIR) Data Dashboard has gathered and organized various cyber related data (e.g., cyber attacks, number of servers, population) for various countries around the world for the years 2000-2010 and allows you to view and graph the data in various ways.

To use, go to <http://coin.mit.edu:8080/Dashboard/> after login (only need to enter your name – no password required), you set the following variables:

1. Choose one or more countries/regions

The Dashboard allows you to choose one or more countries (e.g., “China”, “USA”) and/or regions (e.g., “World”, “Europe”). The attributes of these countries/regions will be then show up in one chart and one table for comparison. [**Hint:** In order to choose two or more countries/regions, you need to hold down the “Ctrl” on your keyboard and click multiple countries and/or regions.]

2. Select the observation period

Select the start year (e.g., 2002) and end year (e.g., 2008) for the observation.

3. Select the attribute to be observed (single attribute or product/ratio)

Single attribute: Select the attribute of interest (e.g., “Total Cyber Crime Cases”) in the listbox of Attribute 1.

Ratio or Product of two attributes (e.g., the ratio of “Total Cyber Crime Cases” and “Population” to compute “Total Cyber Crime Cases per capita”): you need to select the appropriate Operator and Attribute 2. For example:

- a) To observe the ratio of “Total Cyber Crime Cases” to “Population”, select Attribute 1 as “Total Cyber Crime Cases”, Attribute 2 as “Population”, and the Operator needs to be “Divided By”.
- b) To observe the product of “Total Cyber Crime Cases” and “Polity Index”, select Attribute 1 as “Total Cyber Crime Cases”, Attribute 2 as “Polity Index” and the Operator needs to be “Multiply”.

4. Choose Y-Axis Style (i.e., Linear or Logarithmic) for the Y-Axis of the chart.

Logarithmic is helpful if there is wide variance in values (e.g., comparing large and small countries.)

5. Click the “Show Chart” button and the chart of interest will show up in the next web page.

Hints: (a) The result web page will present the chart of interest and the data table corresponding to the chart. The chart gives the visual impression of the data



trends that you are looking at. The corresponding table shows the actual data that are gathered and stored in the database. (b) For each missing data, you will see a “gap” in the corresponding data curve shown in the chart. Also, the data table below the chart will give the red-colored “N/A” in the corresponding cell.

Other resources

- Click the “**Click Here for Info on Data Sources**” button if you want to see the overview of the Data Dashboard data attributes and information about the data sources.
- Click the “**Click Here for Info on Data Availability**” button if you want to see the data availability status of the Dashboard database, including which data we have and which is missing.

Some background material can be found in this report: “Explorations in Cyber International Relations (ECIR) - Data Dashboard Report #1: CERT Data Sources and Prototype Dashboard System “ at <http://web.mit.edu/smadnick/www/wp/2009-07.pdf> For more info, contact smadnick@mit.edu

Sample screen shots

Setting attributes

MRI Topic 5: ECIR - Explorations in Cyber International Relations
DATA DASHBOARD

User Name: Stuart Madnick
Login Role: admin
Please set what chart you want to display in the dashboard.

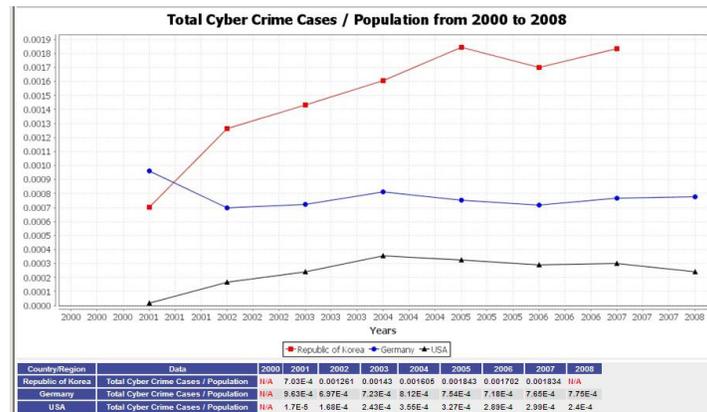
| | | |
|---|---------------------------------------|---|
| Choose one or more countries/regions | X-Axis: select the observation period | Y-Axis: select attribute to be observed |
| -----Europe -----Croatia -----Estonia -----Germany -----Latvia -----Russia -----North America -----USA -----Oceania -----Australia | Start Year: 2000 End Year: 2008 | Attribute 1: Total Cyber Crime Cases Operator: Divided By Attribute 2: Population |

Click here for info on Data Sources
Click here for info on Data Availability

Y-Axis Style: Linear Logarithmic

Click Here to Show Chart Reset Cancel

Results displayed



2. Simulation Model: Modeling Complexities of Cyber Politics: Combining the Real and the Virtual

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Summary—Recent events in North Africa and the Gulf States have highlighted both the fragility of states worldwide and the ability of coordinated dissidents to challenge or topple regimes. The common processes of ‘loads’ generated by dissident activities and the core features of state resilience and its ‘capacity’ to withstand these ‘loads’ have been explored in the traditional “real world” view we are familiar. More recently, however, there has been increased attention to the “cyber world”—the role of cyber technologies in coordinating and amplifying dissident messages, as well as in aiding regimes in suppressing anti-regime dissidents. As of yet, these two views (real and cyber) have not been integrated into a common framework that seeks to explain overall changes in regime stability over time. Accordingly, we develop a framework of state stability by: a) representing the nature and dynamics of ‘loads’ generated by dissident activities in the real (i.e. protests) and cyber (i.e. planning and coordination via cyber venues) domains; b) articulating the core features of state ‘capacity’ and its real (i.e. violent repression of dissident) and cyber (i.e. blocking access to cyber venues) to withstand these ‘loads’, on the other. The problem is to determine and how and when activities in both domains override the resilience of the state and, more importantly, to articulate how emerging pathways to instability exist by combining activities in both domains.

Description—To evaluate the dynamics of state stability, we use the system dynamics methodology. System dynamics is an approach for modeling and simulating (via computer) complex physical and social systems and experimenting with the models to design policies for management and change. The core of the modeling strategy is representation of system structure in terms of stocks and of flows. In this connection, feedback loops are the building blocks for articulating the dynamics of these models and their interactions can represent and explain system behavior. We anticipate that by



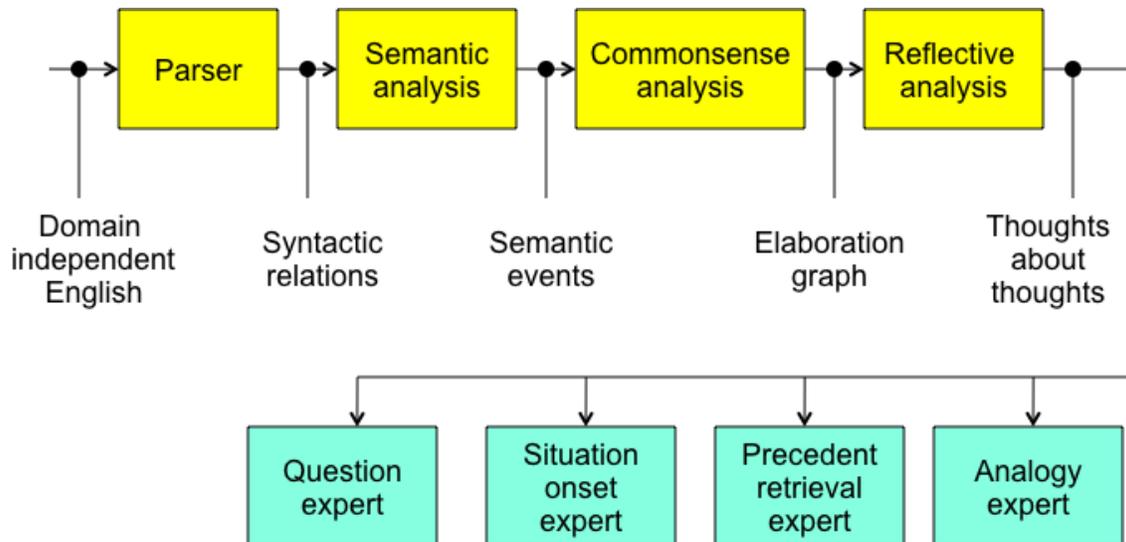
3. Artificial Intelligence Tool: The Story Workbench

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The Story Workbench is a generic platform for text annotation. It is free, open-source, cross-platform, and user friendly. It can be used to annotate the 'surface semantics' of various social science texts relevant to Minerva objectives.



System Structure



4. Cyber News & Events: Cyber Clipping System

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A system used to capture cyber focused open source materials (news items, reports, scholarly articles, etc). The repository includes over 9300 items across Cyber defense (2940), Information Control (882), International cyber relations (1677), Threat landscape (2359). This facility offers broad cyber awareness to over 80 ECIR and external researchers and a wider audience via RSS.



5. Class: Future of Cyber Security

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In Winter 2011, we developed a cybersecurity course designed to expose Harvard and MIT graduate students with a general overview of the topic. The class focused on basic technical, legal, economic, military and political developments pertaining to cybersecurity affairs within the U.S. and international context. The class was quite successful, receiving very positive reviews from students, professors, the HKS administration and ONR/Project Minerva staff. We look to expand the class next year and incorporate it into the general curriculum for International and Global Affairs (IGA) concentrators. Below please find an overview of the syllabus:

President Obama recently emphasized that "securing cyberspace" is one of the United States' vital national interests. The United States is not unique in its concern about cybersecurity. Around the globe, public and the private sector actors struggle to find the technology and policy solutions that will improve the security, reliability and robustness of the internet. Threats abound: cybercrime, cyberespionage, cyberwar and cyberterrorism all represent genuine risks to nations, firms and individuals around the world. Despite the magnitude and complexity of the issue, the field of cybersecurity policy is still relatively new and nascent. The overall goal of these class materials is to provide the initial spark for a new generation of cybersecurity policymakers.

With that goal in mind, the course has four primary objectives. First, the instructors will develop students' understanding of the technical fundamentals of cyberspace. Second, the course will explore the nature of current and future cybersecurity threats. Third, the instructors will push students to develop possible cybersecurity solutions in both the private and public sectors. Finally, the course will build professional skills. Students will gain expertise in developing cybersecurity policy, craft concise policy recommendation memos, provide briefings and participate in at least one crisis simulation exercise. No computer science background or expertise is necessary.



6. Wiki: Cybersecurity Wiki

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This Cybersecurity Wiki provides a set of evolving resources on cybersecurity, broadly defined, and includes an annotated list of relevant articles and literature, which can be searched in a number of ways. This wiki is intended as a tool/resource for researchers, technologists, students, policy-makers and others who are interested in cybersecurity issues more broadly. The resources have been assembled by Jack Goldsmith, professor at Harvard Law School, in conjunction with a team at the Berkman Center for Internet & Society also at Harvard Law School.

It can be found at: http://cyber.law.harvard.edu/cybersecurity/Main_Page

| Author 1 | Author 2 | Year | Title | Source | Expertise | Full Text |
|--|--------------------|---------|---|--------------------|--|---|
| Anderson, Ross J. | | 2008 | Security Engineering | Book | Moderate:Technology; Moderate:Cryptography | N/A |
| Anderson, Ross, et. al | | 2008 | Security Economics and the Internal Market | Study | Low:Economics | Pdf# |
| Anderson, Ross | | 2001 | Why Information Security is Hard | Conf. Paper | None | Pdf# AltPdf# |
| Anderson, Ross | Moore, Tyler | 2006 | The Economics of Information Security | Journal Article | Low:Economics | Pdf# AltPdf# |
| Arora et al. | | 2006 | Does Information Security Attack Frequency Increase With Vulnerability Disclosure | Journal Article | Moderate:Economics | Pdf# |
| Aviram, Amital | Tor, Avishalom | 2004 | Overcoming Impediments to Information Sharing | Law Review | Low:Economics | Pdf# SSRN# |
| Barkham, Jason | | 2001 | Information Warfare and International Law on the Use of Force | Law Review | Moderate:Law | Pdf# Alt Pdf# |
| Beard, Jack M. | | 2009 | Law and War in the Virtual Era | Law Review | Low:Law | Pdf# |
| Bohme, Rainer | | 2005 | Cyber-Insurance Revisited | Conf. Paper | High:Economics | Pdf# |
| Bohme, Rainer | Kataria, Gaurav | 2006 | Models and Measures for Correlation in Cyber-Insurance | Conf. Paper | High:Economics | Pdf# |
| Bohme, Rainer | Schwartz, Galina | 2010 | Modeling Cyber-Insurance | Conf. Paper | High:Economics | Pdf# |
| Brown, Davis | | 2006 | A Proposal for an International Convention To Regulate the Use of Information Systems in Armed Conflict | Law Review | Moderate:Law | Pdf# |
| Camp, L. Jean | Lewis, Stephen | 2004 | Economics of Information Security | Book | High:Economics | N/A |
| Camp, L. Jean | Wolfram, Catherine | 2004 | Pricing Security | Book Chapter | Low:Economics | Web# SSRN# |
| Center for Strategic and International Studies | | 2008 | Securing Cyberspace for the 44th Presidency | Independent Report | Low:Policy | Pdf# |
| Clarke, Richard A. | Knake, Robert | 2010 | Cyber War | Book | None | N/A |
| Clinton, Larry | | Undated | Cyber-Insurance Metrics and Impact on Cyber-Security | Online Paper | Low:Technology; Low:Law | Pdf# |
| Computer Economics, Inc. | | 2007 | 2007 Malware Report | Industry Report | None | Purchase# |
| Computing Research Association | | 2003 | Four Grand Challenges in Trustworthy Computing | Independent Report | None | Pdf# |
| | | | | Government | | |

Please contact for access.



7. Operational Integration of Cyberspace and International Relations

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The challenge is to connect cyberspace and the conventional venues of international relations, and help align international relations theory, policy, and practice with the emergent complexities of the 21st century.

Methodology

The method is generic, as follows: (1) we elaborate our claim that the focus and scope of international relations must change. We catalog some recent transformations in *traditional* international relations and the complexities that these create. (2) we develop a candidate framework that will allow those with background in international relations to understand and reason about cyberspace. To provide some structure and decomposition to the phenomenon, we will exploit a model familiar to technologists: a *layered* model of cyberspace. (3) we view cyberspace using a framework familiar in international relations, a *levels of analysis* perspective -- the individual and the aggregates, the state and non-state actors, the international system and its components, and the overall global system. (4) we tie these two frameworks together-- connecting the levels of analysis in international relations, with its actors, levers, and actions, and the layers of the Internet.

Layers Model in Cyberspace

- *The people* – that is, the users and constituencies of cyber venues who participate in and shape the cyber-experience—who communicate, work with information, transform the nature of cyberspace by working with its component services and capabilities, and by making direct and indirect demands for the construction of new functionalities.
- *The information* – in its various forms and man infestations -- that is stored, transmitted, and transformed in cyberspace.
- *The logical building blocks* that make up the services and support the platform structure of cyberspace.
- *The physical foundations* that support the logical elements, the fundamental physicality that enables the “virtual” manifestations of interactions.

Levels Model in International Relations

- *The individual* – generally considered as the first level of analysis. Cyber interaction allows for self-definition as well as individual expressing, framing, and organization of political stances.
- *The State System* – continues to be the major actor and the dominant level of analysis in international relations theory, with security and survival as its overarching concern



- *The International System* – consists of the states, actors and entities enfranchised by the state, and non-state transnational actors.
- *The Global System* -- the Earth, its geological and geographical features, and all life-supporting properties – as well as cyberspace created by human ingenuity. It spans the world's population, distributed across geographical areas (without reference to sovereign jurisdictions).

Results -- Two Illustrations

(1) Layers and Levels (with Differentiations)

| | Individual | State | Non-profits | Profit-seeking | International | Global |
|---------|--------------|--------------------------|------------------------------------|----------------|-----------------------|----------------------------------|
| Logical | People | Empowerment | Digital divide; resistance | Advocacy | Off-shoring | Resistance |
| | Information | Privacy; Peer production | Censorship | Wikileaks | Aggregation | Takedown; IPR, child pornography |
| | Applications | Peer production | Lawful intercept; blocking | | Control | |
| | Services | | Blocking DNS | | | Authority over DNS |
| | Internet | Home network mgt. | Network neutrality | | | Who sets standards? |
| | Physical | Home wiring | Facilities unbundling; competition | | Facilities investment | Satellite orbit spectrum |

(2) Actors, entities, and scope of action:

| | Individual | State | Non-profits | Profit-seeking | International | Global | |
|---------|--------------|---------------------------|------------------------------|------------------------|------------------------|-------------|--|
| Logical | People | FTC (consumer protection) | EFF, CDT | | | | |
| | Information | Copyright; Censors | Wikipedia Spamhaus; | Google, NetFlix, etc. | WIPO | | |
| | Applications | Freerate | W3C; Open software | Facebook, Twitter | | | |
| | Services | | ICANN* (DNS) | DynDNS, DNS registrars | I T U | I G F | |
| | Internet | | Agencies as ISPs; regulators | NANOG; IETF | ISPs | | |
| | Physical | | State-owned facilities | IEEE 802 | Fiber, satellite, etc. | | |