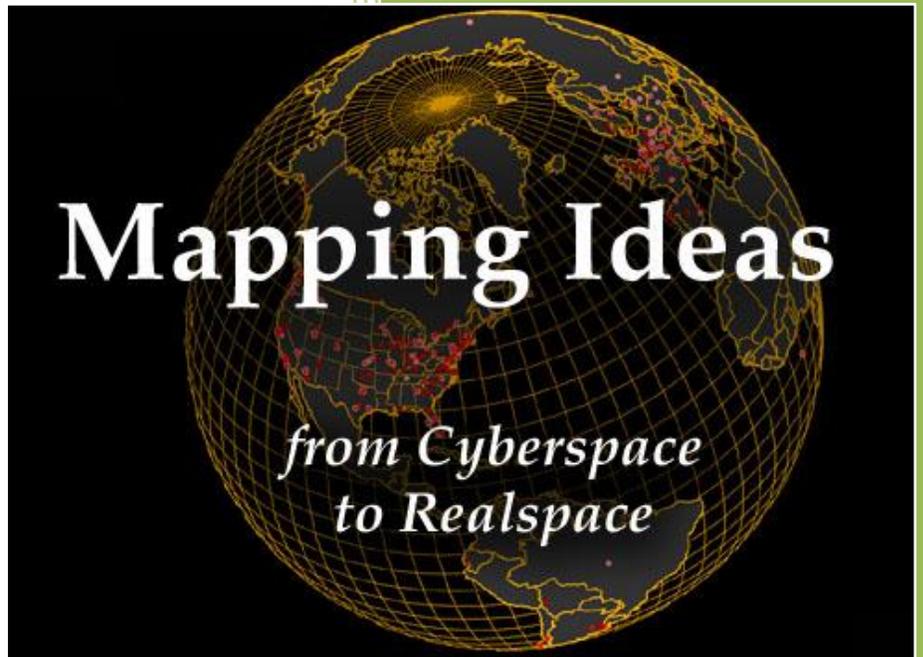


# 2011

## NSF-CDI Specialist Meeting Report

**Mapping Ideas: Discovering and Information Landscape**  
**6/29/2011 – 6/30/2011, San Diego State University**



**Project Website:**  
<http://mappingideas.sdsu.edu>

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State University  
Funding: NSF-CNS # 1028177

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# NSF-CDI specialist meeting: Mapping Ideas: Discovering and Information Landscape, 6/29 - 6/30, 2011, San Diego State University

## INTRODUCTION

The spread of ideas in the age of the Internet is a double-edged sword; it can enhance our collective welfare as well as produce forces that can destabilize the world. This specialist meeting aims at understanding the dynamic process by which the impact of a single event or idea disperses throughout the world over time and space. Dramatic events, especially when reported through the new media of cyberspace, have the potential to transform ideas into realities, in ways that can either inform or inflame the public passions. It is possible there are geographic and chronological patterns that coincide to reveal the nature of significant events and the ways in which information about these events is consumed and used by those engaged with such media. This two days specialist meeting (workshop) was funded by an NSF-CDI project (#1028177, *Mapping Cyberspace to Realspace: Visualizing and Understanding the Spatiotemporal Dynamics of Global Diffusion of Ideas and the Semantic Web*, <http://mappingideas.sdsu.edu/>). The goal of this workshop was to foster the multidisciplinary collaboration in related research disciplines, including geography, linguistics, computer science, political science, and communication. The two-day workshop (June 29, 30, 2011), organized by San Diego State University, brought together eleven specialists drawn from the many disciplines with interest in these issues. The workshop assessed the current state of the art, identified and prioritized a research agenda, and began the development of a research community of collaborating scholars working on these issues. The meeting included plenary presentations by invited experts, and ample time for group discussion of scientific research issues.

Specific research questions addressed in the workshop included:

1. *How to quantify and map space-time changes of idea diffusion?*
2. *What kinds of geo-locating techniques and visualization tools are appropriate for mapping cyberspace activities and web contents?*
3. *How to identify the networks of social/radical groups and how their networks changes over time?*
4. *Moving data-rich tools into theory-rich models—how do we theorize the social functions of information in the web?*
5. *How can content-driven analysis and social network analysis be fruitfully combined in in social and political classification of websites?*

This report highlights key ideas addressed in the specialist meeting and the plenary suggestions for the next steps of this CDI project, including short-term actions and long-term strategies. Summarized discussion points and reference resources are also listed at the end of this report.

## KEY IDEAS

### **Adopting Time Geography Framework and Selecting Appropriate Spatial Units and Time Units for Space-Time Analysis.**

Haegerstrand's Time Geography framework is highly applicable for this CDI project. The framework can be used to define and analyze the Space-Time relationship of web information landscapes. Researchers can use the framework to visualize the linkages between "physical spaces" and "virtual spaces" and to describe the spatial-temporal changes of individual's activities. One scientific challenge is how to define the locations of human activities in both virtual world and real world. Another challenge is to assess the uncertainty (or accuracy) of cyberspace locations. If we can understand these spatial relationships between the web pages (messages) and individuals (human beings), we might be able to improve our understandings of human activities and behaviors.

However, Time Geography framework did face a few major challenges, including Modifiable Areal Unit Problem (MAUP) and Modifiable Time Unit Problem (MTUP?). The analysis results of spatio-temporal relationships will be different if the original data were classified by different map units (cities, states, zip codes, street blocks) or by different time units (by hour, by date, by week, or by year). Also, traditional Haegerstrand-based Time Geography cannot provide a good visualization method for displaying a large number of activities or group relationships. This project might need to create a new space-time framework to define new visual methods and to select appropriate map units and time units for cyberspace activities and web information landscapes. Several developments by S-L. Shaw and his colleagues, in extending Haegerstrand's conceptual architecture to diverse data sources suggest promise in pursuing a new theoretical nomenclature and framework for visualizing and analyzing such data, and grappling with this unitizing problem.

### **Creating Interactive, Real Time Visualization Tools for Mapping Keyword Search Results.**

Real time visualization tool is another important function needed for the analysis of cyberspace information landscapes. Current analysis procedures in this project are manual and time-consuming for analyzing a single keyword. It will be very useful to develop an easy-to-use, accessible, and real time analysis tools for keyword analysis/visualization. Ideally, users can easily type-in or change keywords, phrases, time-units, and spatial units in the mapping system. So experts can sit in front of computer screens to see if these keywords make sense or not. The real time visualization tools will include exploratory spatial analysis functions (similar to the Space-Time Analysis of Regional Systems (STARS) developed by Dr. Serge Rey at SDSU) with interactive analysis processes.

### **Classifying different types of web pages and social media for content and linguistic analysis**

Current search engines (such as Yahoo and Bing) only rank websites by their internal ranking algorithms. We need to develop an intelligent software filter to classify different categories of websites, such as news, personal blogs, Wikipedia, online forum, etc. The research team should identify whether the web page is truly positive or negative about our searched keywords

or concepts. Maybe we can utilize computational linguistics tools to identify positive or negative ranking among these web pages.

There are five major categories of violent extremists: political, instrumental, socio-psychological, historical, and theological. If we can create a ranking system to indicate the different web pages from mentioning something passively to advocating action-based strategies, it will be very useful. Research on identifying and evaluating written threat messages is advancing, and providing a variety of frameworks from which to analyze the seriousness of such threats.

Furthermore, we need a *group-relative notion of popularity* by identifying and classifying the verbal expressions of such group-identification. We should focus on names and how they are used in different situation and scenarios. We need to create a semantic dictionary (databases) to indicate these unique keywords or notions which have specific group-labeling meaning (for example, using different spelling methods for "Koran" or "Quran").

Another related method is to generalize "links" within and between webpages (first order links - direct hyperlink or quote, second order link - sharing same "concept node" or group identities). We should measure how many shared concepts in this particular site are associated with a particular group.

One research question suggested: Can recognition of "talking points" in web data facilitate the identification of social groups? (Talking points are succinct arguments intended to persuade, in service of an agenda.)

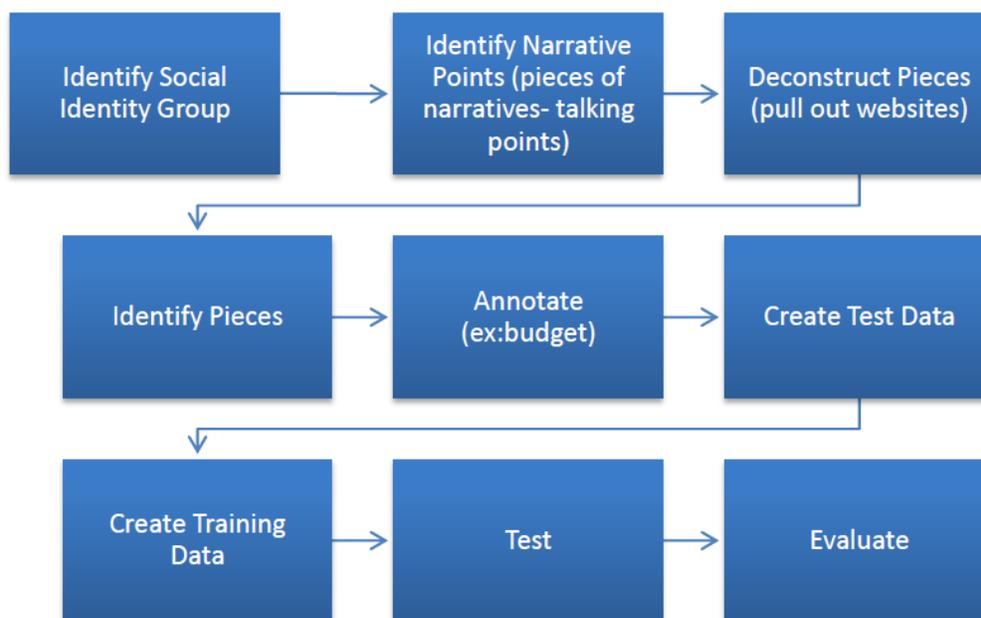


Figure 1. The analysis of Talking Points.

Figure 1 illustrates the process of talking points analysis.

- Identify a group
- Collect data from the web from this group
- Identify the talking points in the data

- Annotate data
- Separate test and training sets - Train classifier on training data
- Test on the test data
- Correlate with independently acquired group network data.
- Maybe test this using Dr. Goncalves's Twitter data.
- The presidential election could also prove to be an interesting place to test these ideas.

How are talking points related to the language markers? The idea we are looking for is small and linguistically identifiable.

- Very closely related, language markers might be more general.
- Talking points will have language markers of their own.
- They are not exactly the same thing, but language markers are important in finding the talking points.

## Developing new communication theories for cyberspace social networks

There are many traditional communication theories related to this research topic, such as the diffusion of innovation theory and social networks. However, we may need to create a new theory or modify the old theories. The research should emphasize the “structure” of diffusion networks and the detection of information cascades. For example, tweets and retweets are a good cascading example. How many users retweet to what other users said? Can we measure the probability of one user’s tweet being retweeted? Can we analyze their influence? We may be able to create a **conversation tree** to illustrate where one user says something then goes through threads to other people and then they reply to others.

Our research should also address the following questions: 1). how do the information receivers transform the radical ideas into real actions? What kinds of "affordance" can social media provide? What kinds of persuasion power? Will human behaviors and reactions be different from virtual world to real world? What is the percentage of people who really take actions following the radical ideas in virtual world? How will they modify their behaviors from virtual to reality?

Behavioral ecology is another important theory which implies that we (human beings) are actors engaging in an ecological system of media sources of information that we have to process. Media becomes proxy person to us via technology.

Routine activities theory or explanatory concepts (in criminology) (environment/space theory)

1. Limits of Predictability and Human Mobility
2. Motivations/behavior/needs are the same but actions are influenced by info sphere.
3. We are re-allocating our time and effort because things are more accessible.
4. Should be possible to create a general theory and then work down within specific categories

Combining geospatial analysis with narrative analysis is also important to analyze the involvement of stories (related to radical ideas or events) -- the trajectory and spread of stories and their motivation and impacts. The analysis of group identities should focus on the competence and affordance of media from both micro and macro perspective (communication models).

## **Create a matrix to compare different types of social networks and social media (such as Twitters, YouTube, Facebook, personal blogs, websites, and on-line forums) and analyzing their variations and different user profiles**

We should extend our keyword search from websites to YouTube, twitters, and other social network media. Recently, Al-Qaeda recruitment started to launch their campaigns using YouTube (2008?), Facebook (2010?), and many other social media. These social media can provide virtual learning environment for recruitment needs and trainings. How can we track these changes of recruitment activities and who is accessing this information? One example is to use TouchGraph (visual networking analysis tool for people's relationships). (<http://www.touchgraph.com/navigator>) to illustrate the complicated social networks and relationships among radical groups.

In the matrix we need to identify the advantages of using them and what are the constraints and limitations of these social media along with our keyword search capabilities. We should also provide highlighted summary for the matrix.

### **Focusing on the civil liberty implications of social networks and the Web.**

The analysis of web contents and social networks will have many civil liberty implications in terms of privacy, security and human rights. We need to prepare the criticism that may come forward and start to engage some ethical considerations that can potentially have some huge implications. Many results from this research may have significant impact to public policies and decision makings, related to terrorism and a broad amount of subjects. Traditional IRB ethics concerns view research such as ours as benign because the data are all currently public domain. Nevertheless, there may be increasing levels of individual or personal detail that may be reflected in such tools that would require consideration of ethical concerns.

## **NEXT STEPS**

Our specialists identified a few short term actions (within one year) and long term strategies (3-4 years) for related web content search and social network research.

### **SHORT-TERM ACTIONS**

1. Develop metrics and ways to quantity space-time diffusion of idea.
2. Develop effective statistical methods to unveil potential relationships between information diffusion patterns and socioeconomic/demographic characteristics that may underlie such patterns.
3. Create a filter for different web sources (news, Wikipedia, etc.) and the filter will be modified with different keywords (For example, with disaster events, we want to include news, but for terrorist groups, we will not include news).
4. Analyze the classified ranking of web pages and track it over time. Look at those who increase over time and analyze their content --- comparing to those who decrease over time. Identify which ideas seem to be gaining in popularity over time versus those that do not.

5. Improve the usability of web analysis tools. We want to hide the complexity of tools in the system and make them user friendly. The design of tools can adopt the heuristic approach and focus on how people process social data and use this information?
6. Develop applications, such as “social radar”, to study flash mobs and powerful social media. How the phenomenon happens? Can we plot and predict that type of decision making (flash mobs) when it happens on a group basis?
7. Re-think spatialization: as we move into the virtual space/world, we as geographers need to re-think about the models that we have accepted for decades (for example, what is location and distance in virtual space) and how can we “spatialize” virtual space if we don’t have an understanding about it?
8. How to increase the reliability of the information and how to reduce the bias in our analysis? Think about how to improve the reliability of it and reduce the noise
9. Can we identify language markers of these radical groups? Use language to differentiate between in group and out of group. The Jihadi rhetoric has changed: they are evolving more at the street level. We can use different words and different spellings to signify group identity
10. Figure out the network of connections between the forum posters and follow how this network changes over time.
11. Develop case studies (political election, terrorism, climate change): use these case studies to find the emerging changes and create a theoretical framework
12. Need to do more research about the web search algorithm on how they rank things.

## **LONG-TERM STRATEGIES (WITH SOME RESEARCH QUESTIONS IDENTIFIED)**

- A. The research topics related to threatening communication and behaviors can be extended to the monitoring of such threatening communications and behavior during the upcoming election campaign through coordination with appropriate government and campaign security details. This would allow analysis of deception actions via a variety of mediums (in the sense of tweets, electronic communication and even telephone communications).
- B. What does “space” mean on the internet? Is there some alternative concept of space in that domain and how do you map back in that Cartesian space?
- C. Need to take a more holistic setting/approach to link all of these individual/fragmented disciplines to do the research and organize the efforts for the next step.
- D. Pursue the development of a communication model that explains “distance” and “closeness” as a primary theoretical concept (specifically, what are the “influence?”).

- E. Calling for a vision to guide what kinds of applications we may develop for these case studies.
- F. How to verify the data we collect and the map we create? One way is to compare our map to the real world situation and verify if our result is corresponded to the reality.

### Discussion Points I: Project Strengths

- Interdisciplinary
- Already accomplished a lot in the first few months of the project
- Bringing diverse groups of people together to tackle important research questions
- Baseline standardization
- GIS and internet activity – an exciting area of research
- Information landscape and web surveillance are a huge area to develop
- Specialist meeting great for exchange of ideas and fostering collaboration
- Overview conversations helpful for setting context of project and participants
- Great potential to make unique contribution to science
- Perhaps a new integrated field

### Discussion Points II: Issues/Challenges

- Conceptual/theoretical framework
- Uniting data analysis and theory
- Defining real vs. virtual locations and relationships in space and time
- Need real-time, integrated system of space-time processing capability
- Diffusion of data
- Simplifying complex data for dissemination and ease of interpretation

### Discussion Points III: Suggestions

- Integrated analysis and dynamic tools
- Web-based interactive window for real-time processing
  - Google Fusion Table and Arc GIS 10 for mapping?
  - So that subject matter experts can use it for analysis without being an expert on the mapping and tools
  - Could explore daily at different levels (county, city, state, etc...)
- Explore further funding sources
- Include experts on:
  - Civil liberties/ethics
  - Social networking
- Consider looking at flash mobs
- Need methods to map patterns and flag changes
- Another column to show uncertainty of website location
- Ranking system from idea to action
- Different kinds of data needed for exploring different perspectives of the data
  - Knowing who someone talks to (as in Gonçalves' work) seems to be the most reliable type of information
- Focus not only on terrorism but also on other phenomena of equal importance that may have more readily available data
- Case studies
- Be careful not to overreach the data – say what is there and supported

- Considering the interdisciplinary nature of the project, consider a dictionary/table that clarifies what different terms mean in different fields and which ones are similar
- Develop more holistic approach to link disciplines and organize research efforts
- Large database of broad types of datasets (environmental, political, etc...) for public to explore using modeling tools and spatial analysis
- Take into account the heuristics of how people process data
- Create pattern from very complex data to impact culture (primary visualization)
- Increase communication and make project less departmentalized
- Make predictions of outbreaks and explore results
- Incorporate data matrices: design tool to monitor and summarize highlights
- Continuation of dialogue and collaboration among participants after specialist meeting

## Resources & Further References

- Tools:
  - NVIVO
  - Dynet <http://www.casos.cs.cmu.edu/projects/DyNet/>
  - Shaw – ArcGIS extension mapping tools (on project website)
  - Hypernym stemming via WordNet
  - Krippendorff's Alpha (reliability measure): <http://www.asc.upenn.edu/usr/krippendorff/dogs.html>
  - TouchGraph (identifying networks): <http://www.touchgraph.com/navigator>
  - Slides: <https://bitbucket.org/rivanvx/beamer/wiki/Home>
- Data centers/Contacts:
  - Carnegie Mellon, CASOS (<http://www.casos.cs.cmu.edu/>)
  - DOD HSCB (human social cultural)
  - Army geospatial center collaboration
  - Open source intelligence portal (opensource.gov)
  - AAAS Katherine Carter – social networks expert/contact
  - Combating Terrorism Center (<http://www.ctc.usma.edu/>)
  - Navigating Military Internet: <http://www.nps.edu/Library/Research%20Tools/Subject%20Guides%20by%20Topic/Military%20Resources/Military%20Internet/Navigating%20The%20Military%20InternetEssay.html>
  - [www.talkingpointsmemo.com](http://www.talkingpointsmemo.com) (liberal political blog), with blogroll (other blogs they approve of)
- Publications/Sources:
  - Haegerstrand and space-time concepts
  - Shaw – special issue on Time Geography
  - Updated article on GIS and Social Media (Sui & Goodchild)
  - Lewin's Field Theory <http://wilderdom.com/theory/FieldTheory.html>
  - Pontius and Millones 2011: Death to Kappa; Pontius 2010
  - Interactive Spatial Data Analysis – Bailey
  - MIT and cell phone communications redefined boundary lines as different from political boundaries
  - George Tita. 2000. "Mapping the Social Space of Gangs" in The Atlas of Crime, Eds. Elaine H.Hendrix, Borden Dent and Linda S. Turnbull. Oryx Press. Phoenix: AZ
  - Militant Ideology Atlas <http://www.ctc.usma.edu/posts/militant-ideology-atlas> (3 parts)

- Threatening Communications and Behavior: Perspectives on the Pursuit of Public Figures
- Understanding Terror Networks – Sageman  
<http://www.upenn.edu/pennpress/book/14036.html>
- Study: What is the ecological footprint of a keyword typed into Google?  
[http://news.cnet.com/8301-11128\\_3-10140142-54.html](http://news.cnet.com/8301-11128_3-10140142-54.html)
- Bloom's taxonomy of learning domains:  
<http://www.nwlink.com/~donclark/hrd/bloom.html>
- Other Projects:
  - Shaw – project website: <http://web.utk.edu/~sshaw/NSF-Project-Website/default.htm>
  - Supramap: <http://supramap.osu.edu/> (human genome project/Google Earth combo)
  - China Geo-Explorer (Xu Zhang; Xinyan Zhu; Bing She; Shuming Bao; , "The spatial data integration and analysis with China Geo-Explorer," *Geoinformatics, 2009 17th International Conference on* , vol., no., pp.1-8, 12-14 Aug. 2009)
  - Global Argus <http://www.argus-global.net/> developed after the SARS epidemic
  - FutureICT European project <http://www.futurict.ethz.ch/FuturICT>
- Literature Review:
  - O'Hair, H. D., Bernard, D. R., & Roper, R. R. (2011). Communication-based research related to threats and ensuing behavior. In C. Chauvin (Ed.), *Threatening communications and behavior: Perspectives on the pursuit of public figures* (pp. 33-73). Washington DC: The National Academies Press.
  - Chung, C. K., & Pennebaker, J. W. (2011). Using computerized text analysis to assess threatening communications and behavior. In C. Chauvin (Ed.), *Threatening communications and behavior: Perspectives on the pursuit of public figures* (pp. 3-32). Washington DC: The National Academies Press.
  - Meloy, J. R. (2011). Approaching and attacking public figures: A contemporary analysis of communications and behavior. In C. Chauvin (Ed.), *Threatening communications and behavior: Perspectives on the pursuit of public figures* (pp. 75-106). Washington DC: The National Academies Press.
  - Meloy, J. R., Hoffmann, J., Guldemann, A., & James, D. (2011). The role of warning behaviors in threat assessment: An exploration and suggested typology. *Behavioral Sciences and the Law*. Online: DOI: 10.1002/bsi.999
  - Schoeneman, K. A., Scalora, M. J., Darrow, C. D., McLawsen, J. E., Chang, G. H., & Zimmerman, W. J. (2011). Written content indicators of problematic approach behavior toward political officials. *Behavioral Sciences and the Law*, 29, 284-301.

## CONCLUSION

All participants and panelists agree that this specialist meeting is very informative and successful. Many specialists suggested that we should continue our discussion and collaboration either through personal contacts or through the project or a future conference to continue the dialogue between different disciplines. We will continue to organize the CDI Specialist meeting in summer 2012 with the support from the NSF-CDI funding.

Our research methods will enable scientists to detect and investigate spatial patterns and spatial fingerprints among web information landscapes. However, many key technologies and

social media are changing and evolving very quickly. In the context we will continue to create a well-articulated research framework and develop sustainable system/tools.

## REPORT PREPARED BY:

Ming-Hsiang Tsou (PI), Sarah Wandersee (Graduate Assistant, Ph.D. student), and Alejandra Coronado (Undergraduate Assistant).

## Meeting Participant List:

[http://mappingideas.sdsu.edu/events\\_workshop\\_participants2011.html](http://mappingideas.sdsu.edu/events_workshop_participants2011.html)

## AGENDA

San Diego State University, San Diego, California  
June 29, 30 (Wednesday, Thursday), 2011

Tuesday, June 28

7:00 pm. Informal gathering for those interested in dinner (coordinated by Dr. Brian Spitzberg) .

Wednesday, June 29

**7:30 – Free Breakfast at Mission Inn Old Town San Diego (hotel).** (Former name: Holiday Inn Express Old Town). Hot Breakfast served starting at 6:30AM.

**8:20 Bus Shuttle from the Hotel Lobby -- to San Diego State University (CESAR lab).**

8:50	Welcome and Introductions (PI)	Ming-Hsiang Tsou
9:00	Welcome from the Dean (the College of Arts and Letter)	Paul Wong
9:10	Background and Introduction to Meeting Goals (Co-PIs) (5 minutes for each Co-PI)	Dipak Gupta, Mark Gawron, Brian Spitzberg, Li An.
	Participant self introduction (1 minute per person)	Participants
9:40	Overview of CDI project and Research Topics (15 mins presentation + 5 mins discussion)	Ming-Hsiang Tsou
10:00	<b>GIS Perspective Session (chaired by Tsou):</b> Space, Time, and Human Activities in Virtual and Physical Spaces (15 mins presentation + 5 mins Q&A)	Shih-Lung Shaw
	Mapping and Modeling Strategic Manipulation and Adversarial Propaganda in Social Media: Towards a tipping point/critical mass model (15+5 mins)	Daniel Z. Sui
<b>10:40 Break</b>	<i>[coffee and snacks]</i>	
10:55	<b>Linguistics Perspective Session (chaired by Gawron):</b> Using shared references to uncover social networks (15+5 mins) Social Groups and Infectious Ideas (15+5 mins)	Mark Gawron Gary Strong

Online Political alignment and Information Diffusion (15+5 mins) Gonçaves Bruno  
11:55 Group Discussion (10 mins) – open to all participants.

**12:10 Lunch - SDSU Faculty Club (hosted by the CDI project).**

**1:30 Terrorism Theories Perspective Session (chaired by Gupta):**  
Understanding The Tools of Radical Action: The Jihadi Web Sites Dipak Gupta  
Women’s Jihadi Networks: Ensuring Longevity and Success for Mia Bloom  
the Future of Jihad (15+5 mins)  
The Challenge of Identifying Radicalized Networks (15+5 mins) Jarret Brachman  
Understanding Extremists’ Use of Narrative to Influence Steven Corman  
Contest Populations (15+5 mins)

2:50 Group Discussion (10 minutes) – open to all participants.

**3:00 Break [coffee and snacks]**

**3:10 Communication Approaches Session (chaired by Spitzberg):**  
Communication Theory and the Mapping of Ideas in Cyberspace Brian Spitzberg  
(15+5 mins)  
Discovering Online Radicalization Narratives: Mapping the Diffusion  
of Ideas (15+5 mins)  
Space, Time, and Human Activities in Virtual and Physical Spaces James Turner  
(15+5 mins)  
Group Discussion (10 minutes) – open to all participants

**4:20 Break**

**4:40 Space-Time Analysis and Integration Session (chaired by An):**  
Tracking and understanding information spread through advanced Li An  
space-time analysis (15+5 mins)  
Designing mathematical measurements to quantify changes Robert Gil Pontius  
across space and time (15+5 mins)  
Comparative Space-Time Dynamics of Idea Diffusion (15+5 mins) Xinyue Ye  
Group Discussion (10 minutes) – open to all participants

5:50 DAY-1 Conclusion and Discussion (Feedbacks from Participants).

**6:10 Dinner at Kensington Grill 619- 281-4014**  
**Address: [4055 Adams Avenue, San Diego CA 92116](https://www.kensingtongrill.com/)**

Thursday, June 30

**7:30 Free Hot Breakfast served starting at 6:30AM.**

**8:20 Bus Shuttle from Hotel Lobby to San Diego State University**

9:00 Review of the Day-1 Discussion (3 minutes from each person – 50 minutes)  
9:50 Charge to the breakout groups (Four Groups - four persons for each group).  
10:00 Breakout Focus Groups

Specific research questions to be addressed in the workshop may include:

5. **How to quantify, map, and understand space-time changes of idea diffusion? (An)**
6. **How to identify the networks of social/radical groups and how their networks changes over time? (Gupta)**
7. **Moving data-rich tools into theory-rich models—how do we theorize the social functions of information in the web? (Spitzberg)**
8. **How can content-driven analysis and social network analysis be fruitfully combined in social and political classification of websites? (Gawron)**

Locations:      Group 1: Remote Sensing Lab.  
                     Group 2: CESAR lab,  
                     Group 3: REGAL lab,  
                     Group 4: SAL lab.

Each group will be asked to create **one new research question** after their group discussion (for the CDI research project and related research activities).

**11:00 Break** [*coffee and snacks*]

11:10 Reports from the breakout groups. (15 minutes for each group – four groups) + 10 minutes group discussion.

(Introduce the new research topic focus group discussion for the afternoon)

**12:20 Lunch - SDSU Faculty Club** (hosted by the CDI project).

2:00 **The four new research topics (multidisciplinary) will be led by four participants (not Co-PI), and participants can sign up for their preferred groups. (Please try to select different people in each group).**

Each group will create a collaboration plan or research agenda (short-term, medium-term, and long-term actions) (for their scientific communities) among our participants.

**2:10 Breakouts for new research topic discussion.**

Group 1: Remote Sensing Lab. Group 2: CESAR lab, Group 3: REGAL lab, Group 4: SAL lab.

**3:10 Break** [*coffee and snacks*]

**3:30 Reports from the breakout Group.** (15 minutes for each group – four groups) + 10 minutes group discussion.

**4:20 Break**

**4:30 Plenary Discussion: Next Steps.**

**5:30 Project and Workshop evaluation questionnaires.**

6:00 Take group photos.

**6:10 Dinner at China Max** (858)-650-3333

Address: 4698 Convoy Street #C101, San Diego, CA 92111.