

Section Two: Detecting

Sensing sociocultural factors and elements in an environment

Lashon B. Booker, The MITRE Corporation

Capability Area 2: Detecting

“Capabilities to discover, distinguish, and locate operationally relevant sociocultural signatures through the collection, processing, and analysis of sociocultural behavior data” (Schmorrow, 2011, p. 42).

Sociocultural signatures that potentially have operational relevance cover a vast domain, encompassing the perceptions, sentiments, attitudes, and behaviors of various populations of interest. Challenges in developing a robust capability to detect these signatures are equally daunting. Such a capability depends on processing and then analyzing voluminous collections of relevant data sources, with data types ranging from raw sensor measurements to text, image, and audio data, to qualitative assessments about attitudes. The data cover varying time spans, and describe phenomena at a variety of scales and levels of detail. Further, detection requires analysts to resolve many technical issues, including the need to isolate meaningful signals in a deluge of noise, manage both structured and unstructured data, process data streams in real time, and identify rare events. The chapters in this section describe state-of-the-art capabilities available to meet some of these challenges, as well as emerging capabilities that are likely to become useful in the near future.

Data Processing

Irvine’s chapter, “Transforming data into information: enabling detection and discovery for sociocultural analysis,” reviews the issues involved in transforming raw data into the information that researchers need to detect interesting sociocultural patterns. The discussion focuses primarily on four types of data sources: surveys, social media, imagery, and video. Surveys provide controlled methods for collecting data about individuals and societies. Social media supply direct and timely data about the opinions of individuals, as well as the unfolding of events. Imagery is becoming an increasingly valuable source of data about societies in general as well as local attitudes and behaviors. Video contains data that can be used to analyze temporal events and detect both simple activities and complex behaviors.

Each type of data presents its own set of challenges, and the data processing methods available to address those challenges have varying levels of maturity. Numerous methods are available for analyzing the data and drawing inferences from the results. This chapter pays special attention to

two somewhat recent paradigms for conducting analysis: social network analysis, which represents the relationships among individuals and groups and facilitates analysis of the interactions among sociocultural actors; and change detection methods that can identify significant shifts in a pattern of activity or behavior.

Computational Modeling

In “Current trends in the detection of sociocultural signatures: data-driven models,” Sanfilippo, Bell, and Corley address detection of sociocultural activities and events from a modeling perspective. The prominent theme here is that analysts must “harvest” data in forms that enable them to build, calibrate, and run computational models of sociocultural phenomena. This means that parameters of data records relevant to the content categories of interest must first be extracted and measured to produce sociocultural data signatures. Many techniques are available to assist in this process. Computational models then use the data signatures to characterize the behavioral patterns of interest in the underlying data. While there are many different kinds of computational models, all can be viewed in terms of sociocultural model signatures that specify how to detect and assess sociocultural patterns.

Social media content provides some unique challenges and opportunities for computational modeling. The authors review new data harvesting methods specifically designed to address those challenges, along with examples of the kinds of models that can use social media data to detect sociocultural patterns. They also provide a brief discussion about how detection models can be used as a starting point to help make predictions.

Visualization

Even after the relevant sociocultural data have been processed, and analysts have drawn inferences with the aid of computational models or other analytical tools, the sociocultural phenomena we wish to discern from the data might still not be self-evident. Detection typically requires some further examination and interpretation of the analytic results. As Fricker, Buttrey, and Evans point out in their chapter, “Visualization for sociocultural signature detection,” visualization techniques provide invaluable support for this final step in discovering the sociocultural signatures associated with the data and identifying when those signatures change.

This chapter provides a broad overview of the most widely used approaches to visualizing data. The authors devote particular attention to the methods best suited for the data types relevant to the detection of sociocultural signatures: networks, geographic information, survey data, linguistic data, and social media data. While the methods discussed are applicable to the other operational capability areas (understanding, forecasting, and mitigation) as well, this chapter emphasizes how those capabilities are employed for detection. Accordingly, the discussion highlights exploratory data analysis, as well as simplifications that help focus attention on differences across a data collection or on changes in the data that occur over time.

Training

Sociocultural signatures must be interpreted in context. Consequently, detecting sociocultural signatures requires more than discovering indicators of sociocultural phenomena in data or in analytic results. It also demands a deep understanding of the real-world signatures associated with the findings in the data, why they are important, and what they mean. In “Cross-cultural training and education for detection,” Glazer, Saner, Barnes, and Pavisic explain how sociocultural analysis can aid understanding of *how* and *why* the observed phenomena manifest themselves in a particular form in a given setting. They also point out the importance of cross-cultural training and education as prerequisites for conducting robust sociocultural analysis.

Knowledge about culture provides the context needed to achieve the level of sociocultural awareness required for detection. This chapter provides an overview of culture and culture-general concepts, reviews findings from state-of-the-art research on culture, and identifies gaps in current analytic practice. Glazer and colleagues also offer observations about implications regarding the most effective methods and designs to train and educate intelligence professionals to increase their sociocultural awareness.

As these brief descriptions show, analysts can apply a wide variety of methods and technologies to help them discover, distinguish, and locate sociocultural signatures. More work remains, however, to make these capabilities routinely available for operational use, and each chapter indicates some promising directions.

References

- Schmorrow, D. (2011). *Sociocultural behavior research and engineering in the Department of Defense context*. Washington, DC: Office of the Secretary of Defense, Assistant Secretary of Defense for Research and Engineering, Human Performance, Training, and BioSystems Directorate.