NSF Spatiotemporal Innovation Center May 2020 Monthly Newsletter

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May 31th, 2020

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2020 June IAB Meeting is Coming

The I/UCRC for Spatiotemporal Thinking, Computing and Applications (a.k.a. NSF Spatiotemporal Innovation Center) will hold its semi-annual Industrial Advisory Board (IAB) meeting on June 12, 2020 virtually in a concise fashion due to the outbreak of COVID-19. This meeting reviews the center's innovative research and identifies new projects to be supported through collaborations among academia, industry, and agencies. All center research results are freely shared among members to boost their products, services, and businesses. All companies or agencies (with interest in geospatial and spatiotemporal research themes) are welcome to participate. This is a prime time to become familiar with cutting-edge research results, leverage the innovative outcome for your future products and services, increase your efficiency, improve your competitiveness, and boost your business.

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Introduction of COVID-19 Policy Stringency Index Dataset in Global and USA

Mr. Dexuan Sha gave an introduction of policy dataset collected for COVID-19 epidemic, including the data acquisition, data collation, quantification methodology, and data structure of the epidemic prevention and control policies product of various countries around the world. The quantification method of the indicators of the prevention and control policy data of overseas territories was introduced in detail. At the same time, Dexuan Sha provided general baseline ideas how to use the data by subsequent visual analytics.

The Oxford University New Crown Outbreak Government Response Tracking System (OxCGRT) tracks government interventions, such as school suspensions, workplace closures, public event cancellations, and public transportation closures. The standardized epidemic prevention and control policies data could be used for comparison with global policies. The severity of the response could help policy makers and researchers to better understand the impact of interventions in different countries (Supported by NSF I/UCRC COVID-19 Rapid Response Project).





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Taking the Pulse of COVID-19: A Spatiotemporal Perspective

The sudden outbreak of the Coronavirus disease (COVID-19) swept across the world in early 2020, triggering the lockdowns of several billion people across many countries, including China, Spain, India, the U.K., Italy, France, Germany, and most states of the U.S. The transmission of the virus accelerated rapidly with the most confirmed cases in the U.S., and New York City became an epicenter of the pandemic by the end of March. In response to this national and global emergency, the NSF Spatiotemporal Innovation Center brought together a taskforce of international researchers and assembled implemented strategies to rapidly respond to this crisis, for supporting research, saving lives, and protecting the health of global citizens. This perspective paper presents our collective view on the global health emergency and our effort in collecting, analyzing, and sharing relevant data on global policy and government responses, geospatial indicators of the outbreak and evolving forecasts; in developing research capabilities and mitigation measures with global scientists, promoting collaborative research on outbreak dynamics, and reflecting on the dynamic responses from human societies. (Supported by NSF I/UCRC COVID-19 Rapid Response Project and International Task Forces; https://covid-19.stcenter.net/)

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Spatiotemporal Event Detection: A Review

The advancements of sensing technologies, including remote sensing, in situ sensing, social sensing, and health sensing, have tremendously improved our capability to observe and record natural and social phenomena, such as natural disasters, presidential elections, and infectious diseases. The observations have provided an unprecedented opportunity to better understand and respond to the spatiotemporal dynamics of the environment, urban settings, health and disease propagation, business decisions, and crisis and crime. Spatiotemporal event detection serves as a gateway to enable a better understanding by detecting events that represent the abnormal status of relevant phenomena. This paper reviews the literature for different sensing capabilities, spatiotemporal event extraction methods, and categories of applications for the detected events. The novelty of this review is to revisit the definition and requirements of event detection and to layout the overall workflow (from sensing and event extraction methods to the operations and decision-supporting processes based on the extracted events) as an agenda for future event detection research. Guidance is presented on the current challenges to this research agenda, and future directions are discussed for conducting spatiotemporal event detection in the era of big data, advanced sensing, and artificial intelligence. (Collaborated with Myra Bambacus/NASA Goddard and Daniel Duffy/NCCS)

KEYWORDS: GeoAI, geography and geoscience, human dynamics, digital earth, computational challenges, cloud computing, internet of things

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Over 120 countries have accessed our COVID-19 data sources





Instant visualization of hundreds of millions of tweets in real time, from the global level all the way down to your neighborhood.

Building a Spatiotemporal Platform for Rapid Response to COVID-19

Building a Spatiotemporal Platform for Rapid Response to COVID-19 In response to the COVID-19 pandemic, the NSF Spatiotemporal Innovation Center brought together taskforces of international researchers. The project integrates near real-time data collection, high performance computing resources, analytic tools and workflows, and spatiotemporal expert knowledge into one platform in support of rapid response to the challenges of COVID-19. It builds on research from interdisciplinary teams, enables rapid spatiotemporal analysis for pandemic mitigation, such as revealing disease transmission patterns, modeling social and economic impacts, identifying vulnerabilities, evaluating the effectiveness of policies, assessing health facility capacity, and predicting public sentiment from social media. The platform provides essential resources needed for COVID-19 research through a single gateway, allowing global researchers to jump-start their research, collaborate across disciplines, and in turn share their data, analytical workflows and research findings through the platform for others to replicate and expand on, thus quickly produce results for decision support and workforce development. Visit the Spatiotemporal Rapid Response Gateway. Read a recent news release containing direct links to data content (Supported by NSF I/UCRC COVID-19 Rapid Response Project and Spatiotemporal I/UCRC IAB).

Geospatial Data Science Tools now on Harvard's High Performance Computing Infrastructure

In collaboration with OmniSci Technologies and the NSF Spatiotemporal Innovation Center, and in close coordination with Harvard Research Computing (FASRC), the CGA has deployed OmniSci Immerse and PostGIS on Harvard's large computation cluster, (the CGA served as an incubator for OmniSci in 2012-2013). It is now possible for researchers across Harvard to access these geospatial data tools flexibly and at low or no cost. The first dataset to be hosted by CGA on the cluster is the Geotweet Archive. The CGA has been harvesting and archiving geolocated tweets since 2012, and this dataset has been recently merged with other tweet archives through a collaboration with the University of Salzburg. The resulting multi-billion record dataset is now within easy reach of a wide variety of data science tools.

A presentation on this work given at OmniSci's Virtual Summit by Ben Lewis and Devika Kakkar of CGA, and Raminder Singh of Harvard Research Computing, is here <u>Read More</u>.