Determinants of Spatio-Temporal Patterns of Cybercrimes across the United States

LEAD PI: PETAR JEVTIĆ

Dynamic Patterns of Criminal Activity

SUMMARY

The main drivers of the spatio-temporal evolution of cybercrimes are still not well understood, making it difficult for effective cybercrime detection, prevention, and management. Law enforcement and homeland security agencies need a more in-depth understanding of the social, economic, and technological determinants that cybercriminals utilize for their targeted attacks. This project studies the relationship between spatio-temporal determinants across the continental United States and the varying occurrence of cybercrime.

PROBLEM STATEMENT

Cybercriminals continually upgrade their skills and evolve their tactics, adapting to technological advancements and societal changes, such as the prevalence of remote work. This evolution presents a significant challenge for law enforcement's cybersecurity units in detecting and tracking cybercriminal activities, emphasizing the need to understand emerging spatio-temporal trends for the effective allocation of law enforcement and Homeland Security resources.

APPROACH

In this study, we investigate the geographical significance of state-level socio-economic and technological determinants of cybercrime activities. We propose a geographically and temporally weighted regression (GTWR) approach to statistically quantify how the realization of state-level determinants explains the severity of cybercrimes. This approach will uncover trends in the underlying spatial-temporal process of cybercrime activities and enable practitioners to anticipate coefficients of the relevant determinants influencing them. This methodology enables statistical inference regarding the significance of determinants, such as business size, extent of remote work, and industry classification, in influencing cybercrime severity at varying temporal scales.

ANTICIPATED IMPACT FOR DHS

Our research will address the DHS CINA challenge area of analyzing the evolving dynamic patterns of cybercrime activity. Our work will exemplify how diverse cybercrime, socio-economic, and technological datasets compiled from many sources can be leveraged for advanced pattern detection in the evolving landscape of cybercrime operations. The proposed spatio-temporal model will allow for improved cybercrime analysis, cybersecurity resource allocation, and law enforcement response.

The primary DHS components whose missions this research would serve are HSI C3, the Federal Law Enforcement Training Center (FLETC) and CISA. CINA will socialize progress and results with the components by presenting research findings and results to HSI's Cybercrime Division and FLETC Technical Operations Directorate, as well as CISA's Cybersecurity Division and the Joint Cyber Defense Collaborative.