Undergraduate Thesis Prospectus

Block Contagions in Social Networks using Dominating Sets

(technical research project in Computer Science)

Opposition to Anti-Pandemic Measures in Florida, 2020 - 2022

(sociotechnical research project)

by

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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General Research Problem

How can the United States government reduce damages from infectious diseases?

Infectious disease outbreak has become a major concern for the United States over the past years. For example, since January 2020, the COVID-19 pandemic has caused large social and economic damage (Nicola, 2020). However, due to both societal resistance and the lack of powerful tools, the US government failed to respond promptly. In the event of the next pandemic, it must take effective measures to reduce damages, protecting valuable assets and the safety of the American people.

Block Contagions in Social Networks using Dominating Sets

How can Scientists Block Contagions in Social Networks using Dominating Sets?

This is a solo capstone project, from the Computer Science Department. My technical advisor is Prof. Rosanne Vrugtman.

Contagions – such as viruses, misinformation, and technology – are ubiquitous in real-life; however, many of them are harmful to society. For example, misinformation and viruses, including COVID-19, can be both harmful and damaging. In the past 2 years, they have led to billions of dollars of losses, and a pronounced decline in people's well-being (Pak & Nicola, 2020). To combat these contagions, decision-makers, like governments and social media platforms, need effective ways to contain their spread.

This project aims to develop a novel algorithm to select individuals to "inoculate," building a defense against contagions. Constraints include the lack of computing resources required for analyzing the algorithm's performance.

Researchers have done extensive work to block contagions spread on social networks (He, 2016). Some have also created algorithms to select nodes to "inoculate," strengthening the population against contagious viruses (Chen, 2018). The researchers devised methods that can limit contagion spread with minimal computing resources. However, they often only have limited efficacy to eliminate contagion spread.

I will apply elements from the existing approaches, developing a new, effective algorithm. This method blocks contagions in social networks using nodes from dominating sets, a network science construct. It produces a prioritized list of dominating nodes using a Python program. By "inoculating" these nodes from the contagion, it effectively reduces the contagion's damage. We will also demonstrate the effectiveness of our approach by testing it on well-known social network datasets. Lastly, we will compare blocking results with those from the high degree heuristic (HDH), a common standard in blocking studies.

At the end of this research, I will complete the algorithm and have a general understanding of its performance compared to the standard blocking approach. This research will help scholars and policymakers make informed decisions, giving them a strong tool to reduce virus spread at scale. In the future, I will analyze the algorithm's blocking performance in detail, and optimize it for large-scale datasets.

Opposition to Anti-Pandemic Measures in Florida, 2020 - 2022

How did interest groups in Florida that opposed strict anti-pandemic measures succeed in 2020 - 2022?

What happens when different values – like personal freedom and expert guidance – collide? Starting in early 2020, the COVID-19 pandemic has caused significant economic stress

(Pak 2020). Meanwhile, it also led to social conflicts in states like Florida, where many opposed anti-pandemic measures in favor of personal freedom. This has led to a slow response to the pandemic, aggravating its destruction. How did these interest groups advance their agenda, opposing public health measures in 2020 - 2022?

Researchers have investigated how anti-restriction groups, and similar groups before, advanced their agendas. Kishi (2021) found that the anti-restriction groups have used demonstrations to raise visibility during the pandemic. The demonstrations spanned all US states, and they often involved violence. McNeil-Willson (2020) also found that the groups used propaganda to obtain popular support. They suggested that the government exaggerated COVID-19's threat, and used it as an excuse to "exercise control over populations." Lastly, With a Prohibition-era example, Andrews (2015) showed that interest groups have often gained support for social movements by conceptualizing threats. Specifically, pro-Prohibition activists framed alcohol as a threat brought by Irish and Italian immigrants. This evoked anger from "native rural, white residents," who were largely hostile towards the immigrants. As such, the activists gained popular support for Prohibition.

Notable participants supported the anti-pandemic measures like masking and vaccination. They include the Centers for Disease Control and Prevention (CDC). The agency aims to apply its scientific expertise to public health by "tracking diseases and researching ways to prevent them" (CDC, 2022). It mostly acted independently, publishing health policy guidance for the Federal and State governments. During the pandemic, it has suggested strict health measures, ordering "all unvaccinated persons to wear masks in public indoor settings" (CDC, 2021). Participants also include the White House. Since 2021, it has mostly advocated for CDC's health measures, executing the guidelines. For example, it has issued mask mandates to all federal

employees to control the pandemic (White House, 2021, Jan 20). It has also criticized state governments for "standing in the way" when they refuse to comply with CDC's guidelines (2021, Aug 3). Finally, they also include loosely-organized grassroots groups. One of them is the pro-masking parents in Florida, the plaintiff in a lawsuit against the Florida governor. Citing that the children are vulnerable to the virus, they argued that mask mandates "constitutes an important mitigation measure," calling the governor to "enact mask mandates" in schools (Appeal Court, 2021).

Meanwhile, numerous participants pushed against pandemic measures. They include the Governor of Florida. The official criticized strict measures proposed by the CDC as a "violation to constitutional freedoms." He advocated for "Parents' Freedom to Choose," proposing legislation barring mask mandates in schools (Government of Florida, 2021). He also claimed means like vaccine mandates unfairly punish non-compliant employees, leading to job losses and hurting the economy. Thus, he approved bills to penalize employers for enforcing vaccine mandates, with fines ranging from $10,000 to $50,000 per employee involved (Government of Florida, 2021). Participants also include the Surgeon General of Florida. Reporting to the Florida Governor, the office is responsible for the state's COVID-19 response. In 2021, it opposed and revoked measures from the White House at a local level. For example, the office pushed back against corporate masking, criticizing it as based on faulty statistics and "unscientific" (Government of Florida, 2022). It also issued an order to exempt private employers from COVID-19 vaccine mandates, invalidating CDC's guidelines (Surgeon General, 2021). In addition, the participants include the Florida Attorney General. The chief legal officer of the state, the attorney general sued the federal government for enacting strict mask mandates. Notably, it has led a "multi-state action" against the White House's travel policy, denouncing

them as “shortsighted, heavy-handed, and unlawful.” (2022) Finally, the participants include The Florida Freedom Alliance, a grassroots anti-vaccine organization. It argued that vaccine mandates are a severe violation of citizens’ “personal medical choices.” According to the group, the mandates may become a “slippery slope,” opening doors to other government violations that “undermine [citizens’] American and basic human rights.” It has held multiple rallies and lobbied legislators in the state to advocate against the mandates (Freedom Alliance, 2020).

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