Undergraduate Thesis Prospectus

Visualizing and Communicating COVID-19 Data Effectively

(technical research project in Computer Science)

The Struggle to Reduce the Digital Divide in the United States

(sociotechnical research project)

by

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November 2, 2020

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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 a greater share of Americans access the vital information they need?

We live in the "Information Age," but the term can be misleading. More information does not necessarily mean a more informed public. Scheufele and Krause (2019) observe that information does not "reach all segments of the population equally well." Even people with ample access to information may have insufficient information literacy to locate it (Jenson, 2004). An informed public is a precondition of a stable democracy, but according to Fowler and Margolis (2013), "many Americans are uninformed about the positions of the major political parties on key issues." They report that "one in three Americans (36%) misunderstood the concept of probability; half of the population (49%) was unable to provide a correct description of a scientific experiment; and three in four (77%) were unable to describe the idea of a scientific study." The researchers diagnose a "disconnect between public opinion … and the scientific consensus" (Fowler & Margolis, 2013). Before the possibilities of the Information Age can be realized, both access to and understanding of information must be improved.

Visualizing and Communicating COVID-19 Data Effectively

How can digital technology be used to help U.S. citizens remain informed about and engaged with public health data?

The COVID-19 pandemic has dramatically affected all U.S. citizens, and is front page news every day, but keeping up to date on relevant information can still be difficult for several reasons. First, within the general public, there are varying levels of information literacy, which is necessary in order to "navigate and make good use of the overabundance of information available" (Katz, 2005). Additionally, according to Pew Research, over 50% of individuals

between ages 18-29 who were surveyed in late March said that they were not following news about the pandemic very closely (Jurkowitz & Mitchell, 2020). Given that this survey was conducted early in the pandemic, and new statistics and warnings are published regularly, it is possible that alert fatigue, or "desensitization from repeated exposure to the same alert over time" (Ancker et al., 2017), will lead to fewer and fewer people paying close attention to virus information as time goes on. In order to combat these factors and keep as many people as possible informed, critical data must be presented concisely and effectively. Communicating data in an engaging way, including with visualizations, allows that information to be "summarised in ways that tell a story," which will "enable intuitive interpretations" (Lloyd et al., 2020). Increased awareness and understanding of virus data will result in a "more resilient public able to make more sensible, evidence-based decisions" (Kevany & Canyon, 2020).

The proposed technical project is a web application which displays data related to COVID-19 and allows users to actively engage with that information. Users could select to receive periodic, tailored digests providing pandemic updates, and to receive notifications when various statistics reach specified levels (for example, when the number of active cases in Charlottesville reaches 1,000). The proposed system would also allow users to visualize and explore relevant data with an interactive map. This application will allow users to more actively engage with data that is already available but not easily understandable and digestible. Many pandemic dashboards exist, including those maintained by state governments. However, encouraging users to actively interact with the data has typically fallen by the wayside. For example, the Virginia Department of Health's COVID-19 dashboard simply displays numerical values for several statistical categories, but does not offer opportunities for interaction or personalization. Additionally, requiring users to navigate to these dashboards every time they

wish to see updated statistics is a friction point - the ability of the proposed application to send notifications about this information directly to users would be advantageous.

The technical advisors for this project are Computer Science professors Yanjun Qi (primary) and Sebastian Elbaum (secondary). This team capstone project will be completed with Eddie Moder and Matt Hoffman.

The Struggle to Reduce the Digital Divide in the United States

How have advocates of universal Internet access in the United States strived to diminish the digital divide?

As Internet usage proliferated in the United States, it did not do so equally. In the aggregate, minorities, poor people, and residents of rural communities did not enjoy the same access to computers and the Internet that white, wealthy, and urban citizens did; in 2002, probably less than 25 percent of African-American and Latino households had Internet access, compared to almost 50 percent of white households (Phillips, 2002). Similar discrepancies have characterized cellular service and, more recently, wireless Internet (DeNardis, 2017). In 2015, 20 percent of U.S. households were "offline entirely, lacking a single member who used the Internet from any location" (Lewis, 2016). Deficient access exacerbates longstanding disadvantages as economies grow increasingly digital (Greene, 2011). How have advocates of digital access strived to improve it?

Researchers have investigated such efforts. According to Loube (2003) the Federal Communications Commission (FCC) promoted universal telephone access through direct federal subsidies and by incentivizing subsidies from the states. Jain et al. (2007) examined how the city of Philadelphia developed a municipal wireless network to serve districts with deficient Internet

access through private services. *The Journal of Blacks in Higher Education* (2005) found that public schools played a significant role in closing the digital divide for black children, often providing them access to computers and the Internet before they had such access in their homes.

Telecommunications companies and the trade associations representing them are striving to bridge the digital divide by means consistent with their business interests. NTCA, the Rural Broadband Association, claims its member companies "are leading innovation in rural and small-town America" in order to "build a better broadband future" (NTCA, n.d.). Primarily a lobby for telecom companies, NTCA characterizes its efforts as "advocacy, education, communications, and outreach" to improve rural broadband access.

The Wireless Internet Service Providers Association (WISPA) is a trade association representing "thousands of small businesses that provide fixed wireless broadband services … in rural and remote areas that would otherwise be unserved" (WISPA, n.d.). Many of those member companies "have built their networks with private, at-risk capital without using federal subsidies." To help its members compete with large Internet service providers, WISPA lobbies on their behalf.

The Competitive Carriers Association (CCA) is a trade association for rural wireless carriers. CCA says it strives to "streamline the review and permitting process for wireless network deployments" (CCA, n.d.). To promote rural broadband access, FCC funds some of the telecommunications infrastructure that rural communities require, and some CCA members depend on this funding.

Libraries are means of internet access in many underserved communities. The American Library Association (ALA) reports that it "provides internet access … for those who lack home broadband," and works to "spur home adoption by increasing awareness of and confidence in

using online resources and services" (ALA, 2020). To Congress and the FCC, ALA is an advocate for greater broadband access.

Silicon Harlem is an advocacy working to promote affordable access to high-speed Internet in the underserved community of Harlem. It strives to improve local digital literacy and to foster local tech innovation. Silicon Harlem wants to establish a "Community as a Platform," where local citizens are involved in planning and deployment. It strives to set an "affordable, fast, resilient, and smart" example for other communities (Silicon Harlem, n.d.).

The FCC is the federal agency that regulates the telecommunications industry, consistent with the Communications Act of 1934 and the Telecommunications Act of 1996. FCC claims to favor high-speed Internet "for all consumers at just, reasonable, and affordable rates" (FCC, n.d.-c). Towards this end, it has established the Universal Service Fund, to which telecommunications companies must contribute a share of their revenue. The fund sponsors programs such as the Connect America Fund, which serves citizens in rural areas that "lack access to infrastructure" for broadband (FCC, n.d.-a). The Universal Service Fund supports the FCC's Lifeline program, which subsidizes phone and broadband services "for qualifying low-income consumers" to "ensure that all Americans have the opportunities and security" they offer (FCC, n.d.-b).

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