Project Title: Graphical analysis of coronavirus infection network

Company Background:

Catalyst Health Tech Integration (HTI) located on 3515 Brighton Blvd in downtown Denver's RiNo district includes an off-site location for Mines site focusing on an initiative for AI in bio and health. The Catalyst HTI is a networking hub for stakeholders in the health domain in Denver featuring over 70 companies, academic and non-profit institutions. Mines has an off-campus location at the Catalyst HTI. The vision for Mines@Catalyst is to foster collaboration between entrepreneurs, industry leaders, engineers & researchers as the fastest way to accelerate innovation, advance care, and improve lives. The Colorado School of Mines has joined the Catalyst community to showcase its presence in the health-tech sector and the city of Denver. The Catalyst provides opportunities for seamless integration of Mines with the health tech community in Denver. In the current crisis, our projects focus on COVID-19.

Background and Motivation: COVID-19 Pandemic

April 2, 2020 marked a grim milestone in the COVID-19 epidemic caused by the novel coronavirus: more than a million people are confirmed to be infected and more than 50,000 people have died. The largest number of confirmed cases of any country is in the US: 250,000 people diagnosed, with an unknown number of undiagnosed cases. Life as we know it is on hold, affecting everyone in the US and the world. Stay home orders are in place since several weeks but the number of cases still rises exponentially [1]. We therefore urgently need to investigate the role diverse factors play at the individual and the population levels in determining disease spread. Here, we want to predict how infection continues to be spread despite stay home orders.

Team Size: 3-4 Students

Location: Remote, client/team meetings with zoom, frequent communication via slack/email

Project Summary:
There are a number of ways where breakdown of social distancing can occur, despite stay-home orders. For example, covert beauty treatments, sports clubs, or other networks e.g. through house calls, the virus may spread. We can analyze social networks through graph representations using Twitter data, which provides contact edge information, and Strava data, which provides "fly by data", which is a combination of GPS and time based data of runners in proximity to each other. Other routes include fomite contamination of cardboard and theoretical spread through amazon.com and other deliveries. Nosocomial infection rate of previously unexposed resulting from testing and admission to hospitals are other demonstrated means of viral spread. Through graphical analysis we can identify why some people super-spreaders (Korean church example), which includes hospitals, because virus load is related to symptom severity (healthcare professionals were infected multiple times with repeated doses of virus). Thus, different professions have different likelihood of

exposure (similar to construction workers being expose to fiberglass, thus more likely to develop lung disease).

Key Skills/Technologies: identify which data is available. At a minimum, we know that we can access Twitter data, but hopefully also Stava and delivery data. Use NHANES data (available data from American households collecting demographic and health realted data) to correlate professions with susceptibility to diseases.

Student Benefits:

- Learn about collaborating with non-experts (here biologists)
- Work on a high impact project

Contact Information:

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