Background Information:

Covid-19 has hit the U.S. particularly hard. Since the first case was reported in late January, more than 1.3 million American have been infected and a total of more than 70 thousand deaths have been recorded.[[1]](#footnote-0) Moreover, recent autopsies reports in California pushed first Covid-19 death back to early February, though the first death was initially confirmed on February 26th in Washington State.[[2]](#footnote-1) As a result, Governor Gavin Newsom ordered autopsies back to December to find out how long the disease has ravaged the golden state. In the meanwhile, the mayor of Belleville, New Jersey, Michael Melham, claimed that he had coronavirus in November 2019, at which time he underwent a high fever, chills, hallucinations and a sore throat that ended up lasting for three weeks. Back then he was diagnosed with a bad flu, however, recently he went to test his blood for Covid-19 antibodies and got a positive.[[3]](#footnote-2) Putting these information together, it is safe to assume that Covid-19 has existed for a much longer time in the U.S. than people originally thought, and the situation may be worse than current models suggest.

Adding to the terrible situation is an incompetent adminitration and a polarized political climate in Washington, which only before-Civil-War partisian divergence came close. The Trump administration has delivered controversial if not stupid talks on several occasions. The president downplayed the pandemic in the beginning and the administration was significantly lagging behind in terms of preparing sufficient medical supplies for an imminent pandemic. [[4]](#footnote-3) Moreover, making falseful and dangerous claims such as injecting disinfectant into bodies[[5]](#footnote-4) or using of antimalarial drugs which never clinically proved to be effective[[6]](#footnote-5) to treat Covid-19 confused the public and exacerbated the situation.

In order to curb the effect brought by the super contagious virus, social distancing has been imposed in most states in U.S., and non-essential economic activities have been called to halt. Despite all efforts devoted to slow the spread of Covid-19, the number of new cases in the U.S. is increasing by over 20,000 constantly, and so far there is no sign of it going down soon.

On the other hand, owing to the halt of economic activities, all indices tracing American economy (except the equity market indices) have slipped to all time low since the Great Depression in the 1930s[[7]](#footnote-6). Meanwhile, the labor market is hit hard as well. Another 3.2 million people filed for initial jobless claims last weeking, bringing the total number of claims over 33 million. Initial claims are considered a proxy for layoffs or furloughs, and that level represents about 21% of the March labor force, which has been the worst since the 1930s.[[8]](#footnote-7) Projections into future weeks even suggest that the unemployment rate will surpass that in the trough of the Great Depression.

Now individuals and the government are facing a critical trade-off: should they continue to shut down the economy, more businesses will be forced to go bankrupt[[9]](#footnote-8); on the other hand, if the re-opening progresses at too fast a pace, more people are at risk of exposure to the virus, and an explosively increasing infection cases will drain the limited medical resources. As a result, the re-opening effort will only be supported, only when there are enough test kits to limit the scope of infection.

However, the number of tests still falls short of what is needed. Despite President Trump boasted about testing capabilities in the U.S. on several occasions, data shows that testing per capita in the U.S. ranks roughly 40th in the world and trails countries such as South Korea, which uses massive testing to keep down the number of infections. The testing capabilities in the U.S. simply cannot support a full re-opening.[[10]](#footnote-9)

Case Introduction:

The dire economic situation in the U.S., on the other hand, do not allow people to wait until the testing capability reaches its full potential. Thus, state by state, partial re-openings are being allowed to progress.[[11]](#footnote-10) Partial re-openings without massive testing will require people who are at high risk of succumbing to the virus to stay at home, and the limited test kits should be allocated to meet their needs first. The rest of the population who can exhibit little or no symptoms or recover from the infection will be spared from testing in order not to cause a shortage in test kits. As a result, accurately predicting and identifying those who are at high risk becomes an essential task in order to make the partial re-openings a smooth progress and to avoid future shut-downs again.

We are targeting such an objective in this report. Acquiring a dataset consisting of about 400,000 rows Covid-19 patients data, in which patient demographics, past diagnostic histories and mortality status are reported, we are set to predict whether a patient will succumb to the disease using demographic and diagnostic information. We will be training several machine learning models such as bagged logistic regressions, random forest and neural networks to achieve this target.

1. <https://coronavirus.1point3acres.com/> [↑](#footnote-ref-0)
2. <https://www.washingtonpost.com/nation/2020/04/22/death-coronavirus-first-california/> [↑](#footnote-ref-1)
3. <https://news.cgtn.com/news/2020-05-05/U-S-Belleville-mayor-claims-that-he-had-coronavirus-in-November-2019-Qfq40LrHlC/index.html> [↑](#footnote-ref-2)
4. <https://theintercept.com/2020/03/25/coronavirus-flu-comparison-trump/> [↑](#footnote-ref-3)
5. <https://www.nytimes.com/2020/04/24/us/politics/trump-inject-disinfectant-bleach-coronavirus.html> [↑](#footnote-ref-4)
6. <https://www.wsj.com/articles/antimalaria-drug-doesnt-help-treat-covid-19-large-but-inconclusive-study-finds-11588890515> [↑](#footnote-ref-5)
7. <https://www.nytimes.com/2020/04/29/business/economy/us-gdp.html> [↑](#footnote-ref-6)
8. <https://www.cnn.com/2020/05/07/economy/unemployment-benefits-coronavirus/index.html> [↑](#footnote-ref-7)
9. <https://www.marketwatch.com/story/neiman-marcus-and-jcrew-could-survive-bankruptcy-filings-experts-say-2020-05-08> [↑](#footnote-ref-8)
10. <https://www.theatlantic.com/science/archive/2020/05/theres-only-one-way-out-of-this-mess/611431/> [↑](#footnote-ref-9)
11. <https://www.nytimes.com/interactive/2020/us/states-reopen-map-coronavirus.html> [↑](#footnote-ref-10)