HELIOS AGAINST COVID 19

#EUvsVirus

Problem your project solves

Coronaviruses are a large family of viruses which may cause illness in animals or humans. In humans, several coronaviruses are known to cause respiratory infections ranging from the common cold to more severe diseases. People can catch COVID-19 from others who have the virus. The disease spreads primarily from person to person through small droplets from the nose or mouth, which are expelled when a person with COVID-19 coughs, sneezes, or speaks.
https://www.who.int/news-room/q-a-detail/q-a-coronaviruses

Due to the fast spread of the virus it would be useful to provide a tool that helps control outbreaks and governments to monitor concrete areas and the flow of the infected people, in order to avoid paralyzing a country and its economy, with the subsequent impact on the day-to-day life of the population.

In several countries, one of the most demanded resources are Covid-19 tests because of the lack of them in the market. Apparently the countries that are better at controlling the virus curve are those that run more tests, and it seems clear that it is critical to control the asymptomatic cases that can spread the disease.

Solution you bring to the table

We have built a system that predicts the probability of getting COVID19 based on the interaction between people that move between places and when that interaction occurred.

By tracking the contacts between people you can define the spread of the virus in a society and get the probability of being infected. The machine learning algorithm gives support to identify which population has a higher probability of being infected in order to decide the safest way to move in a city or some highly populated areas.

Our solution is based on graph algorithms to track all the interactions and control who has been exposed to the virus by being in contact with infected ones. This can lead to a better method to plan and organize the movements in an environment.

The system could be used to control the movement of a group of individuals. While there are essential workers, such as nurses and law enforcement officers, that are inevitably exposed to the virus, there are other people, such as people working from home, that only get exposed to the virus on a few occasions. This solution can be used to reduce even more the exposure of

the latter to the virus, by reducing the number of contacts between infected and non-infected individuals.

The output of the system could be used, for example, to better plan the hospital resources, i.e tests, by knowing the people with a higher probability of being infected. Trying to save the resources or at least optimise the use for the people with more chances of being infected. It is a fact that, in so many countries, a real problem is the lack of tests. Our system could help with using the tests they have for the people that need it the most.

What you have done during the weekend

HeliosSpain has focused the weekend on applying the idea into a use case of a specific hospital by tracking all the health personnel and patients based on the agendas and the defined rooms in a known and controlled location. Using an AI algorithm we can make a prediction based on the infected people and the interaction with others to obtain the probability of carrying the virus.

This solution not only would help to detect the virus in its early stages but would also help to use the medical supplies in a much more efficient way. We create the system with the idea of saving tests and facial masks and help in those cases where there is a lack of both, as is the case in many countries.

The application allows to track down all the health personnel and patients in a hospital showing a graph based on the interaction between these people in a specific date and estimate the infection probability.

The system is a web application architecture made for being executed in a cloud environment connected to a graph database (Neo4j).

Solution’s impact to the crisis

During these complicated times all around the world, our system could help the governments and the population to control the infection and track the flow of the virus. The data that the system could collect during several months ahead of this pandemic could be used to predict more efficient strategies to face new outbreaks of the virus.

This pandemic has exposed that it is essential to have all the real data so it is possible to make a picture, a “bone scan” of the impact map in the different areas. That is why our solution is focused on an scalable architecture that would allow us to manage a big amount of data based on Big Data technologies.

These kinds of technologies manage big volumes of data in real-time. For example, location of individuals through cell phones, with whom they are, their interactions, where they go… These are hundreds of thousands of people.

We tried to think about a solution that could be implemented in a real case in a short period of time and add real value in the detection of the COVID-19 cases. It could be helpful for a long term solution, not only in medical scenarios and pandemic control and prevention by tracking and studying the virus life. But also, for helping in the future with controlling large populations.

The system could protect against new infections in environments, also a safer way to acquire necessities for possible lockdowns like we are experiencing in many countries these days, and in the final point suggest a better way of moving within a city or country.

A trained machine learning model could provide guidelines for hospitals, companies or governments to track and identify people that spread the virus unknowingly. The expansion of the virus through asymptomatic cases is the most difficult spread to detect and control. The system provides a real advantage to achieve this goal due to the model and the expansion parameters.

Necessities in order to continue the project

In order to follow the idea and fulfill the construction of the whole system that we have thought of for supporting the decisions of each individual inside a society such as the probability of being infected to lock down yourself or go out in the safest way possible. It is important to make this next steps:

- Automatic integration with several calendars APIS in order to get the user information.
- Implement in real hospitals across the EU
- Evolve the machine learning model and its parameters for a more precise detection of the infecteds.
- Geolocation integration with mobile devices.
- Evolve the AI model in order to add predictions for suggestions to move inside a pandemic in a safe way.
- Real time news to follow the evolution of the pandemic.
- Adapt to different sectors in order to give service to as many sectors of the population as it’s possible.

Value of your solution(s) after the crisis

This system, which is focused on tracking the movements of people, could be used for a more efficient control of the flow of the population in a defined area to prevent not just possible contagion outbreaks but also for preventing large congregations.

The positive impact of this solution is applicable not only during this pandemic, as has been described in depth above, but also in the long run, in order to avoid new outbreaks by preventing the spread during the first stage.

Through data mining and more advanced upgrades to the algorithm, as has been proposed, the system can define more controlled movements inside a specific area.

As a new approach, the same idea could be re-used as a decision support system that can help users select less crowded beaches, cinemas, shopping centres, parking lots, countryside areas etc. This ensures a reduced number of queues, or alternative plans if the specific area is already crowded. This way it would be possible to optimise both, city and nature resources, for the enjoyment of a society.

URL to the prototype [Github, Website,...]

Website: http://35.228.138.176:8080/heliosspain-against/

Github: https://github.com/juan-sequeiros/heliosspain

URL YouTube

https://youtu.be/7yIgJj8W_Lc

References

[1] https://www.who.int/news-room/q-a-detail/q-a-coronaviruses