COVID Information Commons (CIC) Research Lightning Talk

Transcript of a Presentation by Ashok Srinivasan (University of West Florida) and Sirish Namilae (Embry-Riddle Aeronautical University), September 16, 2020

Title: *Leveraging New Data Sources to Analyze the Risk of COVID-19 in Crowded Locations*

Ashok Srinivasan CIC Database Profile

NSF Award #: 2027514

YouTube Recording with Slides

September 2020 CIC Webinar Information

Transcript Editor: Macy El Moujabber

Transcript

Katie Naum:

So next up we have Sirish Namilae who is joining us in place of his colleague Ashok Srinivasan who unfortunately lost power due to the hurricane in Florida. So many thanks Sirish for joining on such short notice and we look forward to hearing about your work.

Sirish Namilae:

Slide 1

Thank you Katie. This was supposed to be presented by Ashok Srinivasan. He is based in Pensacola and which is being hammered with the hurricane right now so he asked me to present instead. I'm in the aerospace engineering department at Embry-Riddle Aeronautical University. The title of the talk and the title of our project is *Leveraging New Data Sources to Analyze the Risk of Covid-19 in Crowded Locations*.

The project brings together two teams. The VIPRA team: myself, Ashok, Matthew Scotch, and Anuj Mubayi. We were looking at pedestrian dynamics and infection spread models for air travel for the past two three years and the CAM2 team with Yung-Hsiang Lu, David Barbarash, David Ebert, and George. They were looking at webcam data publicly available webcam data so here what we are doing is combining these two data sources publicly available webcam footage as well as LBS data to analyze pedestrian movement using models of pedestrian movement. And thank NSF for support.

Slide 2

Now the motivation for the project is as follows. We know that proximity between humans is the main driver for Covid-19 but social distancing - it poses an economic challenge and disrupts many human activities and some of the activities are unavoidable. For example, air travel. We can reduce it but complete stoppage of air travel would - would be economically not feasible so what we want to do is come up with fine-tuned policies which can be followed in built environments as to how pedestrians can - can move. For example, layouts. If you talk about air travel boarding procedures and so forth that can increase the social distance and decrease infection spread without disrupting the activities completely. Our approach - we use parallel computing to address different situations for a given policy and look - identify vulnerabilities in the overall system instead of predicting the number of infections. For example, we want to look at how the policy would be effective under different conditions using parallel computing.

Slide 3

Now our basic idea is to use pedestrian dynamics. This here is a simulation of pedestrian dynamics through boarding. For pedestrian dynamics we use an approach known as Social Force Model. This borrows a lot from molecular dynamic simulations where atoms interact with each other, so in place of atoms we have pedestrian particles which have balanced forces because they're pedestrians are moving towards a particular target and repulsion because of interactions. Now, for example, in this simulation of aircraft boarding we can come up with different patterns of boarding and look at the number of contact minutes. In a recent study, what we found is because of Covid-19 many airlines shifted to back to front boarding. But what we find is back to front boarding it increases the number of contact minutes of people within the aisles so there are alternate boarding approaches. For example dividing it into multiple zones or random with very slow boarding that would reduce the number of overall number of contact minutes in a boarding simulation now when we're talking about one aircraft it is easier to do this kind of simulation because the initial conditions are well known. But if you're talking about the entire airplane or a Disney theme park - large spaces - the initial conditions are highly variable and human behavior is inherently uncertain. So to account for these uncertainty, we want to incorporate new data sources in modeling the initial conditions and modeling the variation of behavior associated with humans in this pedestrian dynamics. The new data sources are location-based services based on cell phone usage data and publicly available webcam footage.

Slide 4

The overall idea is somewhat like this: we start with the layout and the procedures, policies. For example, if you're talking about an airport there are different stages at ticketing check-in security gate you know so there are these layouts and procedures associated with that at boarding and so forth. And we can do pedestrian dynamics at these various instances to we can do pedestrian dynamics to come up with the contacts and further do the infection studies through SIR infection model. This we augment with location-based services data and network cameras which can identify things like masks usage and provide information on pedestrian speed and density and so forth. This is the basic idea and I want to present a very quick example.

Slide 5

This is Orlando International Airport. When we use the cell phone data we can identify locations which have a highest pedestrian density that happen to be security checkpoints on either end of the airport and then we can come up with designs of the security queue that would reduce the number of contacts. We also find that using solid barriers, enforcing single file queue, all of these reduce the overall contact by up to 75 percent. I'll stop here thank you.