COVID Information Commons (CIC) Research Lightning Talk

Transcript of a Presentation by Zhenlong Li (University of Southern California), August 2021

Title: Monitoring the Spatial Spread of COVID-19 through the Lens of Human Movement using Big Social Media Data

Zhenlong Li CIC Database Profile

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Youtube Recording with Slides

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Transcript

Lauren Close:
So next I'd like to introduce our second speaker, Professor Zhenlong Li. Professor, you're welcome to share your presentation and get started.

Slide 1

Zhenlong Li:
Can you see my screen? Okay. I think before - I'm going to send a chat. So some systems here, all right, I'm going to go here.

Thanks for the introduction, Lauren, and good morning, afternoon, everyone. Today I'm going to share some of the work that we have been doing using social media data for marrying the human movement during this pandemic year. So this work is funded by NIH and also the University of South Carolina so it's kind of an interdisciplinary project working with other team members of University and also other other parts of the nation.

Slide 2

So a brief background about human movement in COVID-19 here. And human movement is among the very important forces that drive the spread of the COVID-19 virus and this has been confirmed by numerous studies, you can see the publication from *Nature*, *Science*, and from all the other journals. And also funded by the University of South Carolina from those kinds of grants. Here, we ask serious questions related to human movement and COVID-19 spread. For example, here, a whole [group] of

people holding the social distancing orders and how effective is the order for, you know, stopping the spread of the virus. So are there any disparities in implementing these orders in the U.S. and what are the driving factors, some socioeconomic factors, and other kind of disparity patterns that we can find here. And also how to integrate human mobility to predict models along with other data sources, like vaccination data now, and there are a lot of other - a lot of other questions that we have been trying to ask here. So those questions actually, especially, are relevant now since we see the spreading of the variants.

Slide 3

So we take a place-based view try to think about how we can marry this human mobility using social media. We are using Twitter data. and so if you think about look at this diagram here - this diagram here - we have to think about, you know, we have places here like county, like stage, like country, right? Different levels of places. And then we have population moving in each place - you can think about social media, like Twitter users, here. And then we can start by looking at the those popular flows, but since we are interested in geotagged Twitter, for example, and those - we are interested in data that have location information. We can first extract and we try - the population flows give us just an overall view of how this flow changes. And then we can measure the population, further measure movement, for example, the average movement distances in the county during a specific day. And then further on, we can measure connectivity between places. So those kinds of movements - measurement here is all in the place and time framework. So this is, kind of, an overall diagram, you know, a place-based [inaudible] that - how we can guide our study to measure human movement using the Twitter data, using social media.

Slide 4

And the whole thing - I'm going to show you some results here. [Inaudible] the time notation, I'm not going to give a lot of details about how we get this but we do have the publications, you can see, as each of the slides here and this without shows us the changes of the cross-state population flows in March 2020. As you can see, the first one is from March 12th to March 13th last year, and then you can see the color, the intensity of the movement, is decreasing gradually as we see the order of national, kind of, emergency declare - of national emergency [declarations]. And we can see that population movement actually decreased. That is clearly reflected from this map here. And also we can see the similar pattern when you look at the global scale. So we developed an interactive web portal for visualizing of this data here in the link I just shared with you [http://gis.cas.sc.edu/GeoAnalytics/COVID19.html]- there the first one, it’s about this photo. It's still there but we stopped updating that - this photo [is] already [outdated], but you can still see the time period last year. You can, you know, click a time here- I did here, and then, you know, zoom in, zoom out, back, to see how that looks like.

Slide 5

And the second one is that we develop a method to estimate the daily number of visitors and residents at a specific geography, for example, county. For each county, we can - we try to use Twitter data to estimate how many visitors are there - visitors are there - in each county on a specific day.

Slide 6

And then, this is the result for 2017 using the method here. Kind of validation of our method here, you can see 2017 - we know there [was a] total solar eclipse in the U.S. here and you can see on August 21st, 2017, there is a very clear green belt showing us that there are more users - more users - more visitors there on that specific day. And even after this eclipse, you can still see some, you can still see the blue belt here but much weaker, right? People start to leave that region and you can see the spatio-temporal dynamics of this visitor changes at this county level, in this large geographic scale, like the whole nation here. So this is for - this [is] using the solar eclipse as a case study to show pieces.

Slide 7

And then if we look at using the same method to look at 2020, like last year, this one shows us the county-level visitor changes before and after the national emergency declaration in March. So you can see this is a Saturday on March 7th last year, and again, the blue color indicated there - the green color indicates there are more users more visitors. And then orange indicate there are less visitors. So on Sunday ,normally, on weekends, there are a lot of movements - a lot of travels. And then, but on this Saturday, which is March 28th, you can see the movement had been decreased a lot. There, we can see a kind of a lot of brown color, which means, you know, a lot of people don't travel and stay at home in their own county, at least. So we also have a publication for this one, if you're interested, you can look at the method in more detail and other kinds of application here.

Slide 8

And we further developed a scalable platform for, kind of, extracting, analyzing, and also sharing this consumer mobility data that we get from Twitter and also from other big data sources associated here. And we combine this, kind of, you know, billion mobility and combined with ODT data model which is origin-destination-time data model it's a data cube. And then combine that with HPC - High Performance Computing. And then we are able to quickly query, and query, and visualize, and aggregate the flows at different geography scales and for different applications here.

Slide 9

And here this map - this map shows you the human mobility patterns at different kinds of geographic levels. You can see the country level, and county level and also the sensor track level. You can see the daily trends revealed from this human mobility from our - by using this system here.

Slide 10

And finally, we have - we developed the ODT Flow Explorer which is - it's online interactive web portal. I also shared this link with you already [http://gis.cas.sc.edu/GeoAnalytics/od.html]. You can go there to explore human mobility at different geographic scales like tract, county, country, state, and for the whole world. There are some scales that we don't have that - for other countries. And also, you can try to

download the data for your own research. So the [inaudible] have been listed by thousands of our users and we have served over 1.8 billion fluid sections from over the world. And also used by other researchers in their own research. So if you are interested feel free to try this out and I already have a link there.

Slide 11

So that's it. Thank you. If you - anyone is interested in working on or looking at more details about data that we produce feel free to contact me and I have my email address here [zhenlong@mailbox.sc.edu}. All right, thank you!