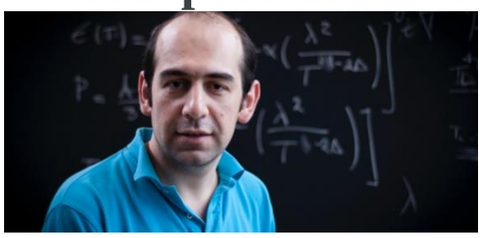
Canadian Centre for Disease Modelling
Distinguished Lecture Series
Modeling and Control of Infectious Diseases

A novel predictive framework for the novel coronavirus



Dr. Niayesh Afshordi

(University of Waterloo
Perimeter Institute for Theoretical Physics)

Thursday October 29, 2020

10:30 am – 11:30 am (Eastern Time)

Webinar: Connect at https://yorku.zoom.us/j/99459742714?pwd=cTA2Unp3VXR5SnozWTk4Vktxa24rdz09
Also see announcement at cdm.yorku.ca

Abstract: It would be hard to exaggerate the impact that COVID-19 pandemic outbreak, caused by the rapid spread of the SARS-CoV-2 coronavirus, has had on human civilization. Cascading effects from the impact of the pandemic on national healthcare systems, as well as the shutdown of a large fraction of global socioeconomic activity can further impact the health and livelihood of the world population and lead to secondary fatalities, as well as shortening and/or deterioration of lives. Therefore, it is of paramount importance to understand the true dynamics and efficiency of mitigation strategies, so that a proper, transparent, and balanced response can be designed and adopted by local governments across the world. We offer a new data-driven way of attacking this problem via a dynamical causal model informed by our unusual array of backgrounds in cosmology, quantum mechanics, and mathematical modeling. We have developed a physical model for the growth of the disease based on the collision of infected and susceptible populations in a community, with a cross-section+stochastic incubation of the virus. We then calibrate the cross-section and incubation, in terms of population demographics of the county, its Google social mobility, search trends, and weather, by comparing the model to the actual growth rates of COVID in all US counties. This leads to a powerful model (with fewer than a dozen parameters) that can be used to predict the growth/decay of pandemic across the United States, through our online dashboard: https://wolfr.am/COVID19Dash . We hope this framework can be scaled up to more regions/data, and be used to inform smart region-specific policies to suppress and/or mitigate the pandemic and its adverse effects.

Bio: Afshordi obtained his PhD in Astrophysical Sciences from Princeton University in 2004. He was then an inaugural postdoctoral fellow at the Institute for Theory and Computation at Harvard University, and then a Distinguished Research Fellow at the Perimeter Institute for Theoretical Physics in Waterloo, Ontario. In 2009, he joined the department of Physics and Astronomy at the University of Waterloo, where he is currently Associate Professor, jointly appointed as Associate Faculty in Cosmology and Gravitation at the neighbouring Perimeter Institute for Theoretical Physics. He has won several international awards and recognitions, including the Buchalter Cosmology prize in 2016 and 2019 from the American Astronomical Society, the Vainu Bappu Gold Medal in 2011 from the Astronomical Society of India, and the Early Researcher Award in 2011 from the Government of Ontario. Afshordi's research program focuses on interdisciplinary approaches that shed novel light onto fundamental problems in physics and astrophysics. He has made important contributions to both theoretical and observational aspects of cosmology and astrophysics. These range from novel statistical methods to extract small signals by using cross-correlation techniques to novel models for big bang, dark energy, black holes, and quantum gravity. His research has been featured in numerous popular media outlets such as the covers of Scientific American and Science Magazine, as well as the Guardian and the New York Times.

Panelists: Julien Arino (U Manitoba), Jacques Belair (U Montreal), Jane Heffernan (YorkU), Jude Kong (York U), Michael Li (U Alberta), Junling Ma (U Victoria) James Watmough (U NewBrunswick), Huaiping Zhu (York U)
Organizers: Canadian Centre for Disease Modeling (CCDM)

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