CORONASYS INNOVATION SHEET 30

AI- EPIDEMIOLOGY- MODEL

Background

Covid- 19 cases are still surging across the globe while governments are trying to figure out which measures are most effective in curbing the spread of the disease[1]. Researchers of the Massachusetts Institute of Technology[2] (MIT) have developed a tool that combines machine learning and epidemiology and could help in assessing the effectiveness of nationwide lockdowns.

Features

The researchers developed a novel model that analyses and compares the role of quarantine control policies globally and across continents. While other models rely heavily on data derived from the past SARS and MERS outbreaks, this one uses machine-learning optimized algorithms on publicly available COVID-19 data based on an augmented SIR-model[3]. The SIR-model is a standard epidemiological tool for outbreak analysis[4]. Among other adaptions, the model was enhanced by training a neural network to include the number of infected people under quarantine, who are therefore no longer spreading the infection to others[5]. The researchers found that there was "generally strong correlation between strengthening of the quarantine controls as learnt by the model and actions taken by the regions' respective governments"[6].

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Publication: November 17, 2020

Country: USA/ International

Focus area: Evaluation

Developers: Massachusetts Institute of Technology

- Raj Dandekar
- Chris Rackauckas
- George Barbastathis

Beneficiaries:

- Researchers
- Governmental policy makers
- Local authorities

Potentials

The model is globally applicable and can help to assess the impact of certain policies aimed at slowing down the spread of SARS- CoV-2. The data are accessible online via a public platform that shows the results for the 70 most-affected countries[7]. According to the researchers, the model could also be extended to include even more and more complex data (e.g. hospitalization rates, distinctions between symptomatic and asymptomatic carriers, …) so that it could be adapted to any province, state, or country globally. This could be a useful tool for policymakers[8].

Points to consider

The model does not (yet) have predictive elements. To do so, it would need real-time data on social distancing and other parameters that are currently under development. [9]

Conclusion

The model might be a helpful addition to other tools in assessing the impact of certain measures to curb the spread of SARS-CoV-2.

[1] "WHO Coronavirus Disease (COVID-19) Dashboard." Accessed November 20, 2020. https://covid19.who.int.

[2] MIT. "The Massachusetts Institute of Technology (MIT)." Massachusetts Institute of Technology. Accessed November 20, 2020. http://web.mit.edu.

[3]Dandekar, Raj, Chris Rackauckas, and George Barbastathis. "A Machine Learning-Aided Global Diagnostic and Com-parative Tool to Assess Effect of Quarantine Control in COVID-19 Spread." Patterns 0, no. 0 (November 17, 2020). https://doi.org/10.1016/j.patter.2020.100145 .

[4] University of Graz. "SIR - A Model for Epidemiology." Accessed November 20, 2020. http://systems-sciences.uni-graz.at/etextbook/sw2/sir.html.

[5] . Gallagher, Beth. "Model Quantifies the Impact of Quarantine Measures on Covid-19's Spread." MIT News | Massa-chusetts Institute of Technology, April 16, 2020. https://news.mit.edu/2020/new-model-quantifies-impact-quarantine-measures-covid-19-spread-0416

[6] Dandekar, Raj, Chris Rackauckas, and George Barbastathis. "A Machine Learning-Aided Global Diagnostic and Comparative Tool to Assess Effect of Quarantine Control in COVID-19 Spread." Patterns 0, no. 0 (November 17, 2020). https://doi.org/10.1016/j.patter.2020.100145.

[7] Dandekar, Raj, Chris Rauckauckas, Emma Wang, and George Barbastathis. "COVID19 - ML| QuarantineControl." Accessed November 20, 2020. https://rajdandekar.github.io/COVID-QuarantineStrength/.

[8] Dandekar, Raj, Chris Rackauckas, and George Barbastathis. "A Machine Learning-Aided Global Diagnostic and Com-parative Tool to Assess Effect of Quarantine Control in COVID-19 Spread." Patterns 0, no. 0 (November 17, 2020). https://doi.org/10.1016/j.patter.2020.100145.

[9] Dandekar, Raj, Chris Rackauckas, and George Barbastathis. "A Machine Learning-Aided Global Diagnostic and Com-parative Tool to Assess Effect of Quarantine Control in COVID-19 Spread." Patterns 0, no. 0 (November 17, 2020). https://doi.org/10.1016/j.patter.2020.100145.

Background on Innovation Sheet Series

As part of a real-time evaluation of the SARS CoV 2 pandemic (with focus on epidemiological, medical, economical, societal, technical, and cultural developments in Germany and Armenia) the CoronaSys research team, under the leadership of Prof. Dr. Martin Voss, is conducting a continuous monitoring of developments and medical, technical, and social innovations concerning Covid-19.

Multiple national and international media outlets, research platforms, and scientific and organizational guidelines, briefs, and updates are screened to feed into this outlet. The rationale behind this is to support the projects' network partners in Armenia and Germany with short summaries of key developments and promising innovations that are shaping the global, German, and Armenian outbreak response and recovery.

The aim of these short briefs is to give condensed and structured information on selected innovations emerging out of the conducted horizon scanning. This could be mainstream big-ticket items or fringe subjects that are easily overlooked in the global flood of information. Some innovations will be followed through their evolution in time while others may only appear once. While subjectively selected, the briefs are descriptive in nature and leave analysis and critical interpretation to the reader. Network partners in both countries are invited to provide feedback on their interest areas and suggest particularly relevant topics for the CoronaSys Workshop series.

The CoronaSys Innovation Sheet Series is published by the Academy of the Disaster Research Unit, which is, as a non-profit limited liability company, a spin-off of the Disaster Research Unit at the Free University of Berlin. The series is part of the research project "CoronaSys: Addressing the corona pandemic in Armenia through systemic risk management", sponsored by the German Federal Ministry of Education and Research.

If you have any questions, suggestions, or if you wish to be taken on (or off) the project mailing list for CoronaSys updates, innovation sheets, and workshop invitations, please send a message to Janina Schäfer (schaefer@a-kfs.de). For general project inquiries, you may contact the team lead Sara Merkes (merkes@a-kfs.de) or the project lead Martin Voss (voss@a-kfs.de).

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7 BinaxNOW Antigen Test
8 Corona Traffic Light
9 Aproof at Home Antibody Test
10 IVAT Hygiene Tower
11 LY-CoV555 Antibody Treatment
12 4C Mortality Score
13 Regional Corona Prediction Model
14 Computer-designed Mini- Proteins
15 Covid-19 Simulator
16 Trimodulin
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All previous CoronaSys Innovation Sheets are available online:
http://coronasys.a-kfs.de/category/innovation-stream/

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