BIO-FI: LEVERAGING THE POWER OF BIOLOGICAL BIG DATA FOR ADVANCED ANALYTICS AND MODELING OF CHEMICAL AND BIOLOGICAL THREATS

Development Of A Data-driven Tool To Assess Epidemiological Model Prediction Accuracy

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The Defense Threat Reduction Agency (DTRA) Technical Reachback provides round-the-clock, dedicated and independent Chemical, Biological, Radiological, Nuclear and high-yield Explosive (CBRNE) technical and analytical operational support to federal agencies. As part of this mission, Reachback analysts are often called upon to model emerging infectious disease outbreaks to inform their clients' preparedness and response planning. Throughout the COVID-19 pandemic response, Reachback has conducted regular epidemiological modeling of COVID-19 outbreak response dynamics in Department of Defense (DoD)-relevant locations throughout the world using the EpiGrid COVID-19 model, developed by Los Alamos National Laboratory (LANL) with funding support from DTRA. To date, analysts have calibrated this model by visually comparing recent model predictions to real-world data and manually adjusting model parameters as necessary. Manual calibration is time-consuming and may not lead to optimal calibration since visually evaluating model results is subjective. To improve the model refinement and calibration process, Gryphon Scientific is developing a tool for rapid data-driven evaluation of model accuracy, which will assist analysts in developing and calibrating the EpiGrid COVID-19 epidemiological model The tool will incorporate a statistically rigorous method for quantitatively evaluating the performance of epidemiological models. A range of methods suited for regression models will be investigated, including accuracy-focused methods (which seek to quantify the degree to which a model's predictions numerically match the actual outcome) and correlation methods (which quantify the relationship between predicted and actual values). Candidate methods will be tested on historical outbreak scenarios. The test scenarios will cover different time periods and locations and exhibit varied levels of prediction accuracy, enabling the selection of a statistical method that is flexible for a range of outbreak situations. The selected method will be incorporated into a user-friendly, Excel-based tool, which analysts can use to rapidly assess the accuracy of recent EpiGrid COVID-19 model predictions after inputting EpiGrid model results and the corresponding real-world data. By incorporating this tool into their model calibration workflow, analysts will be able to calibrate models more quickly and accurately. This tool will also contain guidance for the methods employed, as well as steps to take to interpret the results and implement improvements as necessary. The methods and tools developed could be adapted to build calibration tools for other epidemiological models in the future. This work is in-progress but is anticipated to be completed before the CBDS&T Conference, enabling presentation of the full results.

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