Bibliography

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Project Ideas

Abstract

In my project I want to explore how modelling, regression, and Bayesian Inference can be used to determine susceptibility of individuals to disease, depending on their health backgrounds. To do this, I plan to use data sets that link certain genetic and health markers (things like familial histories, heart health indicators, vaccination status, etc.). I want to use Bayesian inference and regression models (like naive Bayes classifiers and Bayesian neural networks) to make accurate predictions about the outcomes of disease.

Secondarily, I also want to explore how disease spreads using branching processes and Poisson processes. Then, I want to see if I can use this epidemiologic spreading information in conjunction with the Bayesian models that predict mortality to see if I can make predictions about the possible size and lethality of certain diseases. As case studies, I plan to use well known epidemics and pandemics, like ebola, COVID-19, HIV, and the Spanish Flu, that have a lot of the necessary modelling information available (R_0 values, incubation times, etc.)

References

Background Sources.

[1] Davidson-Pilon, C. (2016). *Bayesian Methods for Hackers: Probabilistic Programming and Bayesian Inference*. Addison-Wesley.

[2] Andrieu, C., de Freitas, N., Doucet, A. *et al.* (2003). An Introduction to MCMC for Machine Learning. *Machine Learning* 50, 5–43. `https://doi.org/10.1023/A:1020281327116`

[3] Tse, K. (2014) Some Applications of the Poisson Process. *Applied Mathematics*,05,3011-3017. DOI: `10.4236/am.2014.519288`.

[4] Gut, A. (2009). *An Intermediate Course in Probability*. Springer. [DOI] `10.1007/9781-4419-0162-0`

Disease Mapping Specific Sources.

[5] Lupague, R. M.J.M., Mabborang, R. C., Bansil, A. G., & Lapague, M. M. (2023). Integrated Machine Learning Model For Comprehensive Heart Disease Risk Assessment Based On Multi-Dimensional Health Factors. *European Journal of Computer Science and Information Technology*, 11(3), 44-58. https://doi.org/10.37745/ejcsit.2013/vol11n34458

[6] Coly, S., Garrido, M., Abrial, D., & Yao, A. (2021). Bayesian hierarchical models for disease mapping applied to contagious pathologies. *PLoS ONE*, 16(1): e0222898. https://doi.org/10.1371/journal.pone.0222898

[7] Jarad Niemi, Ph.D. (2013, Jan 22). Bayesian inference for Poisson data [Video]. YouTube. [URL] https://www.youtube.com/watch?v=lNrpPNk6InU

Disease Specific Research.

COVID-19.

[8] Liu, Y., Gayle, A. A., Wilder-Smith, A. & Rocklov, J. (2020).The reproductive number of COVID-19 is higher compared to SARS coronavirus. Journal of Travel Medicine, 1-4. 10.1093/jtm/taaa021

[9] Centers for Disease Control and Prevention. (2023, May 11). Isolation and Precautions for People with COVID-19. COVID-19. [URL] https://www.cdc.gov/coronavirus/2019-ncov/your-health/isolation.html#:~:text=If%20you%20test%20positive%20for,at%20home%20and%20in%20public.

[10] Manathunga, S. S., Abeyagunawardena, I. A., & Dharmaratne, S. D. (2023). A comparison of transmissibility of SARS-CoV-2 variants of concern. Virology Journal, 20(59). https://doi.org/10.1186/s12985-023-02018-x

[11] Achaiah, N. C., Subbarajasetty, S. B., & Shetty, R. M. (2020). R0 and Re of COVID-19: Can We Predict When the Pandemic Outbreak will be Contained?. Indian Jounrla of Critical Care Medicine, 24(11), 1125-1127. 10.5005/jp-journals-10071-23649

[12] Netherlands Ministry of Health. (2023, June 11). Reproduction Number. Coronavirus Dashboard. [URL] https://coronadashboard.government.nl/landelijk/reproductiegetal

[13] Ryu, S., Kim, D., Ali, S. T., & Cowling, B. J. (2022). Serial Interval and Transmission Dynamics during SARS-CoV-2 Delta Variant Predominance, South Korea. Emergine Infectious Diseases (CDC), 28(2), 407-410. 10.3201/eid2802.211774

[14] A Year of COVID in Pennsylvania. (2021). ABC 27 WHTM. Retrieved November 06, 2023, from https://www.abc27.com/timeline-of-a-year-of-covid-19-in-pennsylvania/

[15] Procter, R. (2021, March 04). Remember when? Timeline marks key events in California's year-long pandemic grind. Cal Matters, [URL] https://calmatters.org/health/coronavirus/2021/03/timeline-california-pandemic-year-key-points/.

Ebola

[16] Kerkhove, M. D. V., Bento, A. I., Ferguson, N. M., & Donnelly, C. A. (2015). A review of epidemiological parameters from Ebola outbreaks to inform early public health decision-making. Scientific Data, 2. https://doi.org/10.1038/sdata.2015.19

[17] Centers for Disease Control and Prevention. (2019, March 18). 2014-2016 Ebola Outbreak in West Africa. CDC. [URL] https://www.cdc.gov/vhf/ebola/history/2014-2016-outbreak/index.html

[18] World Health Organization. (2015, January). Factors that contributed to undetected spread of the Ebola virus and impeded rapid containment. WHO. [URL] https://www.who.int/news-room/spotlight/one-year-into-the-ebola-epidemic/factors-that-contributed-to-undetected-spread-of-the-ebola-virus-and-impeded-rapid-conta

[19] Johns Hopkins Medicine. Ebola. Health. [URL] https://www.hopkinsmedicine.org/health/conditions-and-diseases/ebola#:~:text=If%20treatment%20is%20ineffective%20or,from%20the%20start%20of%20symptoms.

Datasets.

[20] Ministry of Health, Government of Mexico (2020). Information regarding COVID-19 cases in Mexico [Data set]. Salud. [URL] https://datos.gob.mx/busca/dataset/informacion-referente-a-casos-covid-19-en-mexico

[21] Center for Systems Science and Engineering (CSSE) at JOhns Hopkins (2023). Novel Coronavirus (COVID-19) Cases [Data set]. CSSE Johns Hopkins. [URL] https://github.com/CSSEGISandData/COVID-19

[22] Centers for Disease Control and Prevention (2021). Behavioral Risk Factor Analysis Surveillance System Data [Data set]. CDC. [URL] https://www.cdc.gov/brfss/annual_data/annual_2021.html

[23] Centers for Disease Control and Prevention (2019). 2014 Ebola Outbreak in West Africa Epidemic Curves [Data set]. CDC. [URL] https://www.cdc.gov/vhf/ebola/history/2014-2016-outbreak/cumulative-cases-graphs.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fvhf%2Febola%2Foutbreaks%2F2014-west-africa%2Fcumulative-cases-graphs.html.

[24] World Health Organization (2016). Ebola data and statistics [Data set]. WHO. [URL] https://apps.who.int/gho/data/node.ebola-sitrep.quick-downloads?lang=en

[25] Centers for Disease Control and Prevention (2020). Case Counts [Data set]. CDC. [URL] https://www.cdc.gov/vhf/ebola/history/2014-2016-outbreak/case-counts.html.

[26] Centers for Disease Control and Prevention (2014). CDC Estimates of 2009 H1N1 Influenza Cases, Hospitalizations and Deaths in the United States [Data set]. CDC. [URL] https://www.cdc.gov/h1n1flu/estimates_2009_h1n1.htm.

Epidemiology.

SIR Models.

[27] Smith, D. & Moore, L. (2004, December). *"The SIR Model for Spread of Disease - The Differential Equation Model"*. The Mathematical Association of America. https://maa.org/press/periodicals/loci/joma/the-sir-model-for-spread-of-disease-the-differential-equation-model

[28] Cooper, I., Mondal, A., & Antonopoulos, C. (2020). A SIR model assumption for the spread of COVID-19 in different communities. *Chaos, Solitons, & Fractals*, 139. DOI: https://doi.org/10.1016/j.chaos.2020.110057. URL: https://www.sciencedirect.com/science/article/pii/S0960077920304549?via%3Dihub

Branching Models.

[29] Jacob, C. (2010). Branching Proceseses: Their Role in Epidemiology. *International Journal of Environmental Research and Public Health*, 7(3), 1186-1204. DOI: 10.3390/ijerph7031204

[30] Bartoszynski, R. (1965). Branching Processes and the Theory of Epidemics. *Berkeley Symposium on Mathematical Statistics & Probability*, 4, 259-269. [URL] https://digicoll.lib.berkeley.edu/record/113134

[31] Laha A. K., & Majumdar, S. (2022). A multi-type branching process model for epidemics with application to COVID-19. *Stochastic Environmental Research and Risk Assessment*, 4, 259-269. DOI: https://doi.org/10.1007/s00477-022-02298-9

[32] Ahlberg, D. (2021, May 20). Epidemics and branching processes [Lecture notes]. Stockholm University. URL: https://staff.math.su.se/daniel.ahlberg/notes-epidemics.pdf

[33] Cooper, I., Mondal, A., & Antonopoulos, C. G. (2020). Title of article. A SIR model assumption for the spread of COVID-19 in different communities, 139. 10.1016/j.chaos.2020.110057