

Suitability Map of
COVID-19 Virus
Spread

Version 2

Mar 23, 2020

Suitability Map of COVID-19 Virus Spread V.2

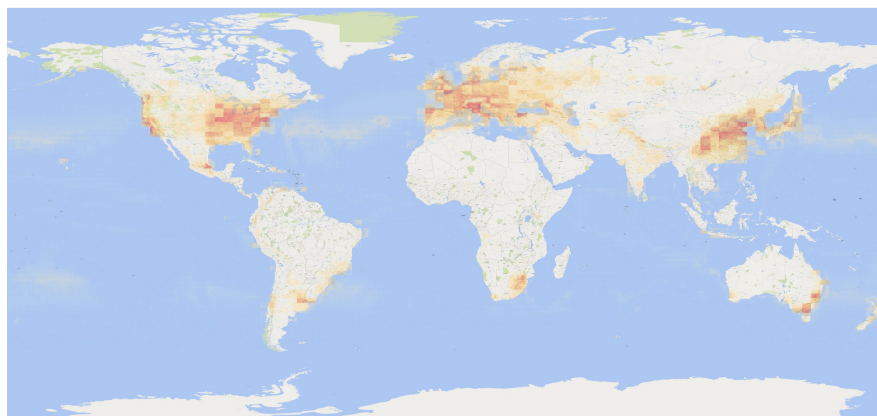
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1 Works for me dx.doi.org/10.17504/protocols.io.bd25i8g6

Coronavirus Method Development Community

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ABSTRACT



This image reports a Maximum Entropy model that estimates *suitable* locations for COVID-19 spread, i.e. places that could favour the spread of the virus just in terms of environmental parameters.

The model was trained just on locations in *Italy* that have reported a rate of new infections higher than the geometric mean of all Italian infection rates. The following environmental parameters were used, which are correlated to those used by other studies:

- Average Annual Surface Air Temperature in 2018 (NASA)
- Average Annual Precipitation in 2018 (NASA)
- CO2 emission (natural+artificial) averaged between January 1979 and December 2013 (Copernicus Atmosphere Monitoring Service)
- Elevation (NOAA ETOPO2)
- Population per 0.5° cell (NASA Gridded Population of the World)

The model file (in ASC format) and all parameters used are attached.

A higher resolution map and also the model file (in ASC format) and all parameters are available at the external link (Zenodo).

The model indicates highest correlation with *infection rate* for CO2 around $0.03 \text{ gCm}^{-2}\text{day}^{-1}$, for Temperature around $11.8 \text{ }^{\circ}\text{C}$, and for Precipitation around $0.3 \text{ kg m}^{-2} \text{ s}^{-1}$, whereas Elevation and Population density are poorly correlated with *infection rate*.

One interesting result is that the model indicates, among others, the Hubei region in China as a high-probability location, and Iran (around Teheran) as a suited location for virus' spread, but the model was not trained on these regions, i.e. it did not know about the actual spread in these regions.

Files

Name (Size)

 **1_covid_suitability_preview.png** (5.7 MB)

md5:dea4e66a1c66d0dfc3b0872adfaa020f

 **2_covid_suitability_v2_Hi_Resolutionv2.png** (47.3 MB)

md5:069727a6c5656d276c475606c9b96d47

Altitude.asc (1.9 MB)

md5:ca91c4d56654b77bf572eef1a42af7a5

CO2.asc (5.1 MB)

md5:0ed217e20ab32aad4ab96e5403670ee4

MaxEnt_Temperature_Precipitation_Elevation_CO2.asc (2.8 MB)

md5:79639fd3540c68450d86fde288edb264

Population.asc (4.6 MB)

md5:57aa6c172b3fc036c08d0560f01436ba

Precipitation.asc (5.5 MB)

md5:3ab587ea0e0fbc3fcb9ea6b7844271a

Temperature.asc (4.7 MB)

md5:7ea930f59e5ff627a18383f02737f78d



MD5 checksum: This is the file fingerprint, which can be used to verify the file integrity.

References



Coro, G., Panichi, G., Scarponi, P., & Pagano, P. (2017). Cloud computing in a distributed e-infrastructure using the web processing service standard. *Concurrency and Computation: Practice and Experience*, 29(18), e4219.

EXTERNAL LINK

<https://zenodo.org/record/3719184>

THIS PROTOCOL ACCOMPANIES THE FOLLOWING PUBLICATION

Gianpaolo Coro. (2020). Suitability Map of COVID-19 Virus Spread (Version 4) [Data set]. Zenodo. <http://doi.org/10.5281/zenodo.3722606>

MATERIALS TEXT

This experiment was done using the DataMiner cloud computing system of the D4Science e-Infrastructure and the BiodiversityLab Virtual Research Environment. (<https://services.d4science.org/group/biodiversitylab/>)



Gianpaolo Coro. (2020). Suitability Map of COVID-19 Virus Spread