Lab 3: Spatial prediction

April 19, 2021

Summary

In this lab session, you will use the Galicia dataset for the year 2000 to

- perform spatial predictions with and without covariates
- compute and visualise summaries of the predictive distribution

Predict lead concentration in Galicia

1. Upload the `GaliciaData.csv` in the MBG app. To open the MBG app type the following in the R console: `shiny::runGitHub(repo="MBGapp", username= "olatunjijohnson", ref="main", subdir = "inst/MBGapp")`.
2. Fit the following intercept only geostatistical model to the log-lead concentration:

$$Y_i = \beta_0 + S(x_i)$$

   where Y_i is the log-lead concentration and $S(x_i)$ is a spatial Gaussian process with an exponential correlation function.
3. Go to the `Prediction` tab and generate predictions at a resolution of 1km.
4. Visualise the mean outcome and the standard errors. In what areas do you have the lowest levels of uncertainty? Why?
5. Re-fit the model of point 2. by adding PM10 as a covariate:

$$Y_i = \beta_0 + \beta_1 PM10(x_i) + S(x_i).$$

6. To obtain predictions with a covariate with the MBG app you will need to provide both a grid of prediction locations along with the value of your covariates at those locations. You can use the pre-computed `grid_pred_galicia.csv` and `predictors_galicia.csv` files. Upload these two files to the Prediction tab of the MBG app.
7. Can you see any changes in the predicted mean log-lead concentration? What about the uncertainty?

Exercises in `R`

The `Lab3.R` script contains the code needed to complete steps 2 - 4 above. Adapt it to perform steps 5 - 6.