

Problem n.2

The *Bes* project was launched in 2010 by Istat (the Italian National Institute of Statistics) to measure Equitable and Sustainable Well-being, with the aim of evaluating the progress of society not only from an economic but also from a social and environmental point of view.

The shapefile `DataProvItaly` contains borders of Italian administrative units (Provinces), *univocally* identified by an ID (a two-letter acronym, to be used as ID variable) and, together with other indicators, two *Bes* province-level indicators:

- `CncrMrt`, the cancer mortality (20-64 years), standardized per 10000 residents;
- `InjrRt`, the rate of fatal injuries and permanent disability, standardized per 10000 employed.

By using **either** the `GeoDa` application **or** the R package `rgeoda`, answer the following questions. **Remark:** if you use `GeoDa` application, either you submit a .pdf file with the screenshot of the main performed steps, or you explain those steps in words on the .pdf file of your solutions.

- a) For `DataProvItaly`, define a Queen contiguity weight, with an order of contiguity equal to 2. Report the min, max, mean and the median number of neighbours and the sparsity percentage (i.e. the non-zero percentage). What does the imposition of an order of contiguity equal to 2 (instead of 1) induce?
- b) What is the difference between Rook contiguity and Queen contiguity? How would the results of point (a) change if Rook contiguity weights are adopted (again, set order of contiguity equal to 2)? Comment on the differences between points a) and b) and what could cause them.
- c) Create now K-Nearest neighbour weights with $k=10$ and apply inverse on distance. Focus on `CncrMrt`; report Moran's I, the LISA cluster and significance maps and comment on them. **Remark:** If you are working in R, set `legend(..., cex = 0.5)`
- d) Repeat the analysis in point (c) but focus now on `InjrRt`.

Upload your solution [here](#)