Purpose

SpatialEpiApp is a **Shiny** web application that allows to visualize spatial and spatio-temporal disease data, estimate disease risk and detect clusters.

The application allows to fit Bayesian disease models to obtain risk estimates and their uncertainty by using **R-INLA**, and to detect clusters by using the scan statistics implemented in **SaTScan**.

The application allows user interaction and creates interactive visualizations such as maps supporting padding and zooming and tables that allow for filtering. It also enables the generation of reports containing the analyses performed.

Structure

The application consists of three pages:

- 'Inputs' where the user can upload the input files and select the type of analysis
- 'Analysis' where statistical analyses are carried out, results can be visualized, and reports can be generated
- 'Help' containing information about the application use and references.

Inputs page

The 'Inputs' page is the first page we see when we launch the application. In this page we can upload the required files and select the type of analysis to be performed. It is composed of four components: - Upload map - Upload data - Select analysis - Contents

Start analysis button

When we click the 'Start analysis' button the application checks the files and options entered are correct and calculates the expected counts for each area and date. It also computes the ratio of the observed divided the expected. This ratio is called SIR irrespectively if data refers to mortality or incidence. Then the application redirects to the 'Analysis' page.

Analysis page

In the 'Analysis' page we can visualize the data, perform the statistical analyses, and generate reports. On the top of the page there are four buttons:

- 'Edit Inputs' button is used when we wish to return to the 'Inputs' page to modify the analysis options or upload new data.

- 'Maps Pop O E SIR' button creates plots of the population, observed, expected and SIR variables.

- 'Estimate risk' button is used for estimating the disease risk and their uncertainty

- 'Detect clusters' is used for the detection of disease clusters

The 'Analysis' page also contains four tabs called 'Interactive', 'Maps', 'Clusters' and 'Report' that include tables and plots with the results.

Help page

Both the 'Inputs' and the 'Analysis' pages include a 'Help' button that redirects to the 'Help' page. This page shows information about the use of the application, the statistiscal methodology and the developing tools employed.

Dependencies

SpatialEpiApp has been developed using **R** and **Shiny** and is dependent on the following software and **R** packages:

Software	
R	Language and environment for statistical computing and graphics
SaTScan	Software that analyzes spatial, temporal and space-time data using scan statistics
R packages	
dplyr	A fast, consistent tool for working with data frame like objects, both in memory and out of memory
dygraphs	Interface to 'Dygraphs' Interactive Time Series Charting Library
ggplot2	Creates elegant data visualisations using the grammar of graphics
htmlwidgets	Provides a framework for easily creating R bindings to JavaScript libraries
knitr	Tool for dynamic report generation in R
leaflet	Create Interactive Web Maps with the JavaScript 'Leaflet' Library
mapproj	Converts latitute/longitude into projected coordinates
maptools	Set of tools for manipulating and reading geographic data, in particular ESRI shapefiles
RColorBrewer	Provides color schemes for maps and other graphics
rgdal	Provides bindings to Frank Warmerdam's Geospatial Data Abstraction Library (GDAL)
rgeos	Interface to Geometry Engine - Open Source (GEOS) using the C API for topology operations on geometries
rmarkdown	Convert R Markdown documents into a variety of formats including HTML, MS Word, PDF, and Beamer
R-INLA	Performs full Bayesian analysis on generalised additive mixed models using Integrated Nested Laplace Approximations
shiny	Web Application Framework for R
shinyjs	Perform common useful JavaScript operations in Shiny apps that will greatly improve the apps without having to know any JavaScript
sp	Classes and Methods for Spatial Data
SpatialEpi	Contains methods for cluster detection, disease mapping and plotting methods
spdep	Contains a collection of functions for spatial dependence: weighting schemes, statistics and models
xts	Extensible time series class and methods

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