

# Spatial Workspace

**Spatial Workspace** is an automated web platform to generate and organize spatial data of points and areas from addresses (text). In addition, the platform allows the analysis of the fractal dimension of georeferenced data using the Correlation Dimension method and the compatibility with Geographic Information Systems (GIS) for the construction of choropleth maps and other types of spatial analysis, such as kernel maps.

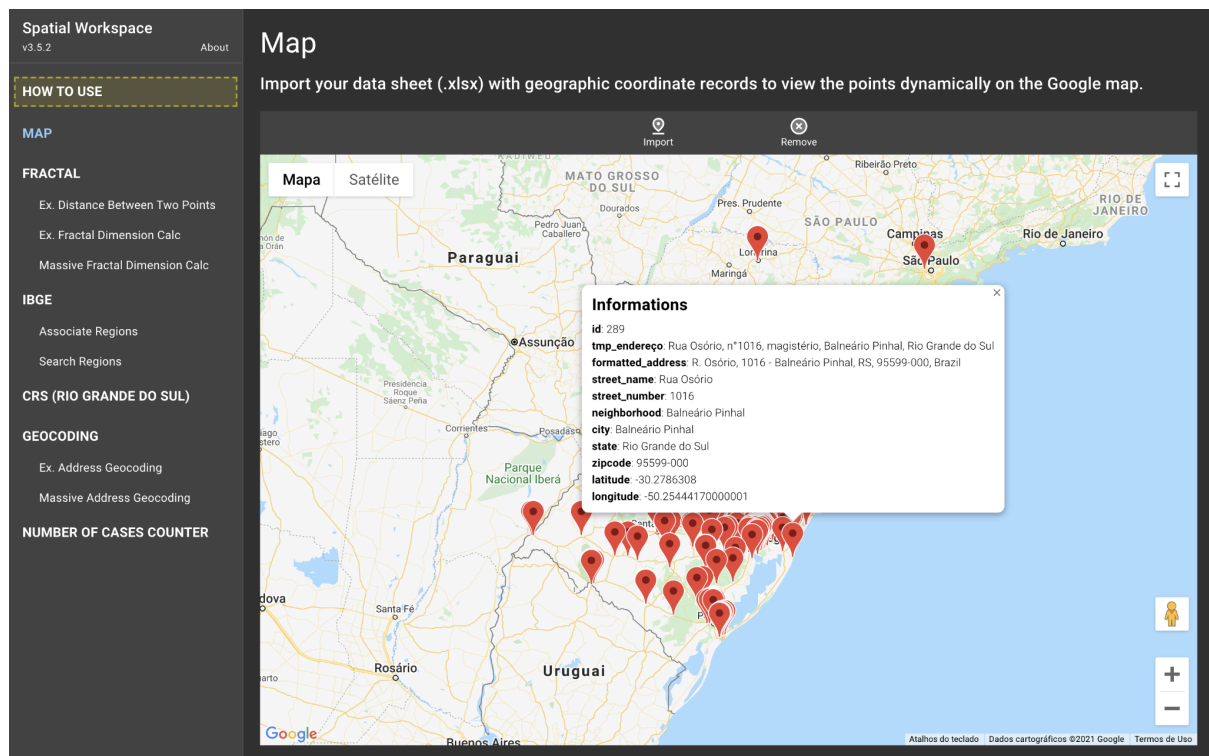
## Summary

<b>MAP</b>	<b>1</b>
<b>FRACTAL</b>	<b>2</b>
Ex. Distance Between Two Points	2
Ex. Fractal Dimension Calc	3
Massive Fractal Dimension Calc	4
<b>IBGE</b>	<b>5</b>
Associate Regions	5
Search Regions	6
<b>CRS (RIO GRANDE DO SUL)</b>	<b>7</b>
<b>GEOCODING</b>	<b>8</b>
Ex. Address Geocoding	8
Massive Address Geocoding	9
<b>NUMBER OF CASES COUNTER</b>	<b>10</b>

# MAP

In this interface, it is possible to import georeferenced data (latitude and longitude) from a spreadsheet file (.xlsx) for dynamic visualization of events on the Google map. By clicking on the points on the map, it is possible to view the information associated with them.

In addition, this view makes it possible to observe which event points are within your study area or not.



# FRACTAL

## Ex. Distance Between Two Points

This interface exemplifies the angular distance between 2 pairs of events. By clicking on the map it is possible to change the location of events (source and destination). The angular and kilometers distance between events is automatically calculated after clicking on the map. This interface can be used for educational purposes.

More information on angular distance calculation can be seen at: [click here](#).

Spatial Workspace  
v3.5.2

About

HOW TO USE

MAP

FRACTAL

Ex. Distance Between Two Points

Ex. Fractal Dimension Calc

Massive Fractal Dimension Calc

IBGE

Associate Regions

Search Regions

CRS (RIO GRANDE DO SUL)

GEOCODING

Ex. Address Geocoding

Massive Address Geocoding

NUMBER OF CASES COUNTER

### Example of Distance Between Two Points

Click on the map to change the position of the markers. The angular distance between the two points is automatically calculated.

Origin

Latitude  
-6,329810195253717

Longitude  
-58,009084425000005

Destination

Latitude  
-17,154741828578917

Longitude  
-43,595021925000005

Info

1975.47 km of distance.  
And the angular distance is 0.31007.

Mapa

Satélite

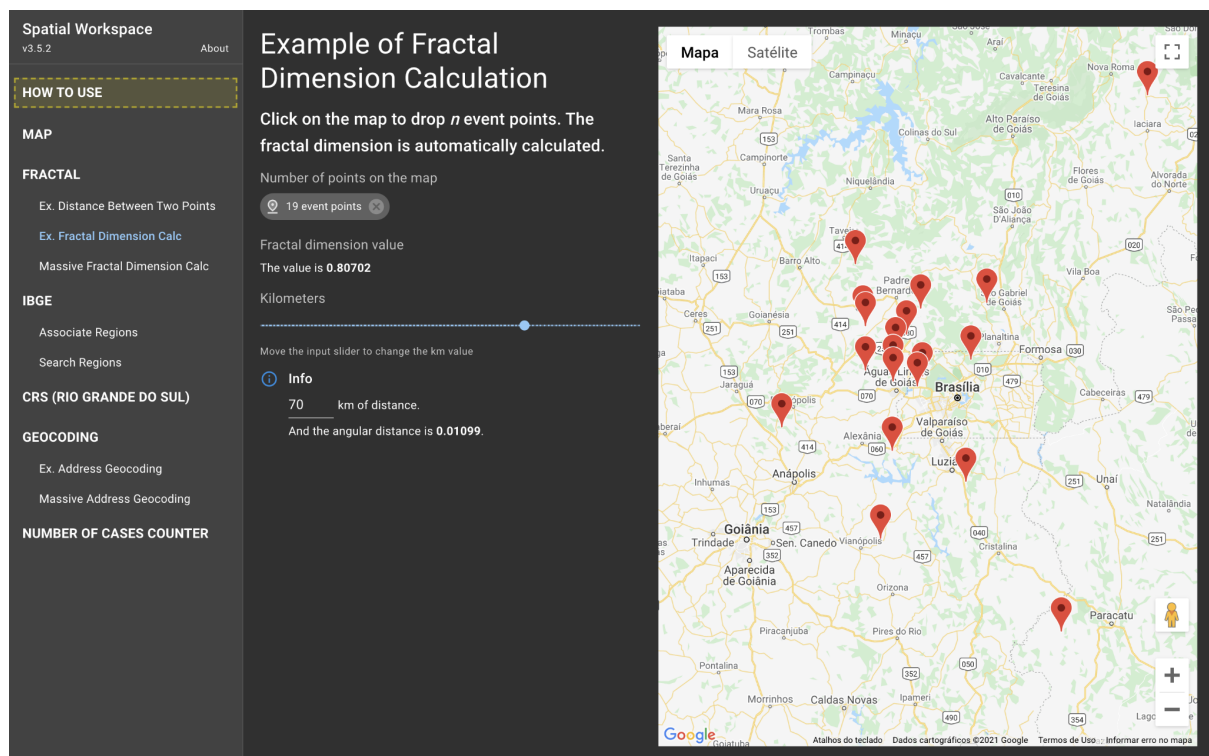
Google

Atalhos do teclado Dados cartográficos ©2021 Google, INEGI Termos de Uso

## Ex. Fractal Dimension Calc

This interface exemplifies the calculation of the fractal dimension through the Correlation Dimension method between  $n$  pairs of events. Click on the map to add new event points. The fractal dimension calculation is automatically calculated after clicking on the map. Variations between the distance of events can be performed on the input slide. This interface can be used for educational purposes.

More information about the Correlation Dimension method can be seen in the scientific article: ["Identifying spatial clustering properties of the 1997–2003 Liguria \(Northern Italy\) forest-fire sequence"](#).



# Massive Fractal Dimension Calc

In this interface, it is possible to calculate the fractal dimension, through the Correlation Dimension method, of a set of georeferenced data. To calculate the fractal dimension you must import a data file in .xlsx format and select the columns that represent the geographic coordinates (lat & lng). After that, you must choose an area of interest so that the calculation can be performed in a comparative way between the areas.

It is also possible to perform a filter on the data, for example: records of a certain race or disease. The fractal dimension is dynamically calculated and presented in the table on the side. Variations between the distance of events can be performed on the input slide. By clicking on the "submit" button, it is possible to download the information presented in the table.

Spatial Workspace  
v3.5.2

About

HOW TO USE

MAP

FRACTAL

Ex. Distance Between Two Points

Ex. Fractal Dimension Calc

Massive Fractal Dimension Calc

IBGE

Associate Regions

Search Regions

CRS (RIO GRANDE DO SUL)

GEOCODING

Ex. Address Geocoding

Massive Address Geocoding

NUMBER OF CASES COUNTER

Massive Fractal Dimension Calculation

Import your georeferenced data sheet (.xlsx) to automatically calculate the fractal dimension for a specific region.

Attached file

Click here to import a file

Geographic columns

latitude longitude

Region

nm\_mesol

This column will be used to calculate fractal dimension per area

Filter  $n$  values if you want

id

city

disease

cd\_mun

cd\_micro

nm\_micro

region	dimension	cases
Centro Oriental Rio-grandense	0.28387	31
Nordeste Rio-grandense	0.24599	34
Centro Ocidental Rio-grandense	0.61538	14
Sudeste Rio-grandense	0.59192	45
Metropolitana de Porto Alegre	0.41921	215
Noroeste Rio-grandense	0.07201	42
Sudoeste Rio-grandense	0.34783	24

# IBGE

## Associate Regions

In this interface, it is possible to associate the political-administrative regions of the Brazilian Institute of Geography and Statistics (IBGE) to the cities in its dataset. To make the association, you must select the Federative Unit (UF) under study. When selecting, it is dynamically retrieved, from the API of Localities of IBGE, all the cities of the UF selected with the regions where they belong.

After selecting the Federative Unit, import a data file in .xlsx format and select the column that represents the city of your records to carry out the association of regions. Clicking the "submit" button downloads a .xlsx file with the association generated between cities and regions. The records that were successful in the region association will be on the "success" sheet. The records that possibly failed in the region association will be on the "failures" sheet. For the records that failed, it is recommended to observe if there is any difference between the name of the record in the .xlsx file and the name listed by the IBGE Localities API.

Note: the associations generated facilitate the construction of thematic maps in QGIS and ArcGIS. More information about the IBGE Locations API can be seen at: [click here](#).

**Spatial Workspace**  
v3.5.2    About

**Associate Regions**

Import your data sheet (.xlsx) and select the "city" column to associate your respective IBGE regions.

Select the UF  
Rio Grande do Sul

You can also type to filter other options

497 municipalities were recovered from Rio Grande do Sul.

Attached file  
[Click here to import a file](#)

City  
city

Select the column that represents the city name

**SUBMIT**

```
[
  {
    "id": 4300034,
    "nome": "Aceguá",
    "microrregiao": {
      "id": 43031,
      "nome": "Campanha Meridional",
      "mesorregiao": {
        "id": 4306,
        "nome": "Sudoeste Rio-grandense",
        "UF": {
          "id": 43,
          "sigla": "RS",
          "nome": "Rio Grande do Sul",
          "regiao": {
            "id": 4,
            "sigla": "S",
            "nome": "Sul"
          }
        }
      }
    }
  },
  {
    "regiao-imediata": {
      "id": 430010,
      "nome": "Bagé",
      "regiao-intermediaria": {
        "id": 4302,
        "nome": "Pelotas",
        "UF": {
          "id": 43,
          "sigla": "RS",
          "nome": "Rio Grande do Sul",
          "regiao": {
            "id": 4,
            "sigla": "S",
            "nome": "Sul"
          }
        }
      }
    }
  }
]
```

# Search Regions

In this interface it is possible to filter cities from a specific Federative Unit (UF) and view their regions. In addition, this view makes it possible to find possible spelling errors between your data and the data available in IBGE's API for locations.

Spatial Workspace  
v3.5.2

About

HOW TO USE

MAP

FRACTAL  
Ex. Distance Between Two Points  
Ex. Fractal Dimension Calc  
Massive Fractal Dimension Calc

IBGE  
Associate Regions  
Search Regions

CRS (RIO GRANDE DO SUL)

GEOCODING  
Ex. Address Geocoding  
Massive Address Geocoding

NUMBER OF CASES COUNTER

Search Regions

Filter a city from a specific Federation Unit (UF),  
Brazil, and view its respective regions.

Select the UF  
Rio Grande do Sul

You can also type to filter other options

497 municipalities were recovered from Rio Grande do Sul.

City  
Viamão

You can also type to filter other options

```
[
  {
    "id": 4300034,
    "name": "Acegua",
    "microrregiao": {
      "id": 43031,
      "name": "Campanha Meridional",
      "mesorregiao": {
        "id": 4306,
        "name": "Sudoeste Rio-grandense",
        "UF": {
          "id": 43,
          "sigla": "RS",
          "name": "Rio Grande do Sul",
          "regiao": {
            "id": 4,
            "sigla": "S",
            "nome": "Sul"
          }
        }
      }
    }
  },
  "regiao-imediata": {
    "id": 430010,
    "name": "Bogé",
    "regiao-intermediaria": {
      "id": 4302,
      "name": "Pelotas",
      "UF": {
        "id": 43,
        "sigla": "RS",
        "name": "Rio Grande do Sul",
        "regiao": {
          "id": 4,
          "sigla": "S",
          "nome": "Sul"
        }
      }
    }
  }
}
]
```

# CRS (RIO GRANDE DO SUL)

In this interface, it is possible to associate the Regional Health Coordinations of the state of Rio Grande do Sul, Brazil, to the cities in your dataset. To carry out the association, it is necessary to import a data file in .xlsx format and select the column that represents the city of your records. Clicking the “submit” button downloads a .xlsx file with the association made.

Spatial Workspace  
v3.5.2

About

HOW TO USE

MAP

FRACTAL  
Ex. Distance Between Two Points  
Ex. Fractal Dimension Calc  
Massive Fractal Dimension Calc

IBGE  
Associate Regions  
Search Regions

CRS (RIO GRANDE DO SUL)

GEOCODING  
Ex. Address Geocoding  
Massive Address Geocoding

NUMBER OF CASES COUNTER

localhost:3000/crs

Associates CRS with City

Import your data sheet (.xlsx) and select the "city" column to associate your respective Coordenadoria Regional de Saúde of Rio Grande do Sul.

497 municipalities were recovered from Rio Grande do Sul with their Coordenadorias Regionais de Saúde.

Attached file

[Click here to import a file](#)

SUBMIT

```
[
  {
    "id": 1,
    "crs": "Porto Alegre",
    "counties": [
      "Araucária",
      "Bardão",
      "Brochier",
      "Cambará do Sul",
      "Campo Bom",
      "Canoas",
      "Capela de Santana",
      "Dois Irmãos",
      "Estância Velha",
      "Esteio",
      "Harmonia",
      "Igrejinha",
      "Ivoti",
      "Lindolfo Collor",
      "Maratá",
      "Montenegro",
      "Morro Reuter",
      "Nova Hartz",
      "Nova Santa Rita",
      "Novo Hamburgo",
      "Pareci Novo",
      "Parobé",
      "Portão",
      "Presidente Lucena",
      "Riozinho",
      "Rolante",
      "Salvador do Sul",
      "Santa Maria do Herval",
      "São Francisco de Paula",
      "São José do Hortêncio",
      "São José do Sul",
      "São Leopoldo",
      "São Pedro da Serra",
      "São Sebastião do Cai",
      "Sapiranga",
      ...
    ]
  }
]
```



# GEOCODING

## Ex. Address Geocoding

This interface exemplifies the georeferencing of an address record. To perform accurate georeferencing, the complete address of a location is required. When you type the address and click the "submit" button, a request is sent to the Google Maps API Geocoding service. The data returned from the API is handled locally and presented to users in an organized way in the following structure: formatted address, latitude, longitude, street name, house number, neighborhood, city, state and zip code.

More information about the Google Maps Geocoding API can be accessed at: [click here](#).

The screenshot displays the 'Spatial Workspace v3.5.2' application interface. On the left is a dark sidebar with a menu containing sections: 'HOW TO USE' (highlighted with a dashed yellow box), 'MAP', 'FRACTAL' (with sub-items: 'Ex. Distance Between Two Points', 'Ex. Fractal Dimension Calc', 'Massive Fractal Dimension Calc'), 'IBGE' (with sub-items: 'Associate Regions', 'Search Regions'), 'CRS (RIO GRANDE DO SUL)', 'GEOCODING' (with sub-items: 'Ex. Address Geocoding', 'Massive Address Geocoding'), and 'NUMBER OF CASES COUNTER'. The main content area is titled 'Example of Address Geocoding' and includes the instruction: 'Enter your full address and click the submit button to view an example of the geocoding process.' Below this is a text input field labeled 'Address' containing the text 'Rua Monteiro Lobato, 420, Centro, Bom Conselho, Pernambuco'. A 'SUBMIT' button is positioned below the input field. To the right of the input field, a JSON object displays the geocoding results: { "formatted\_address": "R. Monteiro Lobato, 420, Bom Conselho - PE, 55330-000, Brasil", "latitude": -9.1650242, "longitude": -36.67645, "street\_name": "Rua Monteiro Lobato", "street\_number": "420", "neighborhood": "", "city": "Bom Conselho", "state": "Pernambuco", "zipcode": "55330-000" }.

# Massive Address Geocoding

In this interface it is possible to perform mass georeferencing of address records. To perform the georeferencing it is necessary to import a data file in .xlsx format, select the column that represents the address of the records and select the column that identifies the records (this column is intended to organize the records). By clicking on the "submit" button, the georeferencing of records is started. Upon completion, a .xlsx file with georeferenced records will be automatically downloaded. In the .xlsx file there will be 2 sheets, one with the records that possibly failed the georeferencing, due to lack of information or spelling errors, and another sheet with the records that were successful.

Spatial Workspace  
v3.5.2

About

HOW TO USE

MAP

FRACTAL  
Ex. Distance Between Two Points  
Ex. Fractal Dimension Calc  
Massive Fractal Dimension Calc

IBGE  
Associate Regions  
Search Regions

CRS (RIO GRANDE DO SUL)

GEOCODING  
Ex. Address Geocoding  
Massive Address Geocoding

NUMBER OF CASES COUNTER

## Bulk Geocoding of Address

Import your data sheet (.xlsx), select the address and identification columns to geocod the data set.

Attached file

[Click here to import a file](#)

36 data were recovered.

Address  
address

Column that represents the address

Identifier  
id

Column that represents the record identifier

SUBMIT

address
Rua Botucaraí, 1840 - Bairro Centro - Candelária, RS/96930-000
Rua Santo Antônio, 75 - Bairro Operario - Lagoa Vermelha, RS/95300-000
Cerro do Louro, SN - Bairro Ilterior - Formigueiro, RS/97.210-000
Rua Anibal Xavier Bitencourt, 262 - Bairro Pinheiro - Caçapava do Sul, RS/96570-000
Rua Helmut Klain, 41 - Bairro Planalto - Morro Reuter, RS/93990-000
Rua São Roque 431 - Bairro Moinhos - Estrela, RS/95880-000
Rua José Montaury 963 - Bairro Centro - Veranópolis, RS/95330-000
Avenida São João, 792 - Bairro Centro - São João do Polésine, RS/97230-000
Rua Constantino, SN - Bairro Interior - Progresso, RS/95925-000
Rua feliz, 58 - Bairro Industrial - Farroupilha, RS/95180-000
Rua Francisco Borges Vieira, 33 - Bairro Santa Teresinha - Vacaria, RS/95200-000
Rua Quarenta e sete, SN - Bairro Jardim Algarve - Alvorada, RS/94858-670
BR 116, 410 - Bairro Picada - Eldorado do Sul, RS/92990-000
Rua Paulo de Castro, 830 - Bairro Alesgut - Teutônia, RS/95890-000
Rua Corredor do João, 53 - Bairro Faxinal - Santa Cruz do Sul, RS/96840-540

# NUMBER OF CASES COUNTER

In this interface it is possible to automatically count the number of occurrences of a text or numerical value in a dataset. To perform the count, it is necessary to import a data file in .xlsx format and select the variable/column of interest for counting. The count data will be presented in the table opposite. If necessary, it is also possible to perform a filtering on the dataset. If clicked on "submit", the data presented in the table is downloaded in an .xlsx file.

Spatial Workspace  
v3.5.2

About

HOW TO USE

MAP

FRACTAL  
Ex. Distance Between Two Points  
Ex. Fractal Dimension Calc  
Massive Fractal Dimension Calc

IBGE  
Associate Regions  
Search Regions

CRS (RIO GRANDE DO SUL)

GEOCODING  
Ex. Address Geocoding  
Massive Address Geocoding

NUMBER OF CASES COUNTER

## Number of Cases Counter

Import your data sheet (.xlsx) to automatically count the total number of records for a specific region.

Attached file  
[Click here to import a file](#)

405 data were recovered.

Region  
nm\_meso

This column will be used to count the number of cases per area

Filter *n* values if you want

id

disease

city

cd\_mun

cd\_micro

nm\_micro

cd\_meso

nm_meso	cases
Centro Oriental Rio-grandense	31
Nordeste Rio-grandense	34
Centro Ocidental Rio-grandense	14
Sudeste Rio-grandense	45
Metropolitana de Porto Alegre	215
Noroeste Rio-grandense	42
Sudoeste Rio-grandense	24