



Geocomputation with R



Introducing RQGIS and RSAGA

Jannes Muenchow

GeoStats 2018

Find the slides and the code



https://github.com/geocompr/geostats_18

Installing QGIS

- **Follow** the steps described in
!





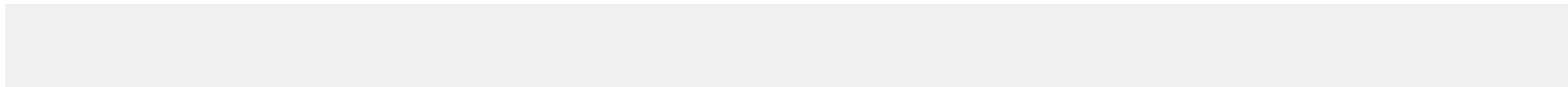
Installing QGIS

- **Follow** the steps described in
!
- Windows users: Use the **OSGeo-network-installer** (also described in the vignette)!

Installing RQGIS



You can either install the developer...



Installing RQGIS



You can either install the developer...

... or the CRAN version



Installing RQGIS

You can either install the developer...

... or the CRAN version

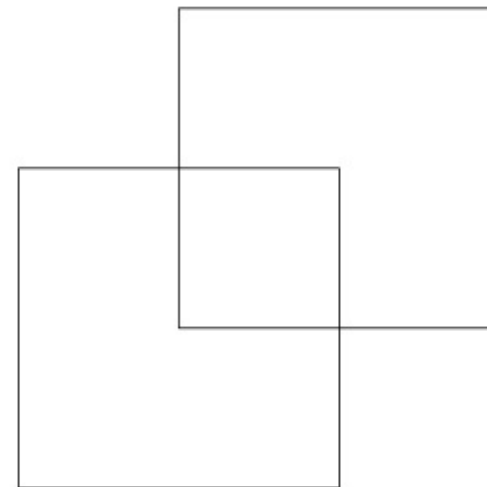
For more information and a short introduction by example refer to:

<https://github.com/jannes-m/RQGIS>

RQGIS by example



To introduce the RQGIS package, let's find the intersection between two polygons. For this we create two polygons using the `polygons` package.



Find a QGIS algorithm



Now we would like to know which QGIS geoalgorithm we can use for this task.
We assume that the word _____ will be part of the short description of the searched geoalgorithm.

How to use it



To find out the parameter names and corresponding default values, use

.



How to use it

To find out the parameter names and corresponding default values, use

.

Here, we only have three function arguments, and automatic parameter collection is not necessary, but when I first looked at...





But looking at the QGIS GUI...

r.slope.aspect - Generates raster layers of slope, aspect, curvatures and partial derivatives from a... ? X

Parameters Log Help Run as batch process...

Elevation
[Dropdown menu] ...

Format for reporting the slope
degrees [Dropdown menu]

Type of output aspect and slope layer
CELL [Dropdown menu]

Multiplicative factor to convert elevation units to meters
1,000000 [Spin box] ...

Minimum slope val. (in percent) for which aspect is computed
0,000000 [Spin box] ...

GRASS GIS 7 region extent (xmin, xmax, ymin, ymax)
[Leave blank to use min covering extent] ...

GRASS GIS 7 region cellsize (leave 0 for default)
0,000000 [Spin box] ...

Slope
[Save to temporary file] ...

0%

Run Close

Convenience function



Access the online help



By the way, use [this link](#) to access the online help and possibly find out more about a specific geoalgorithm:




GRASS GIS manual: r.slope.aspect - Mozilla Firefox

File Edit View History Bookmarks Tools Help

GitHub - jannes-m/RQGIS... GRASS GIS manual: r.slope...

https://grass.osgeo. Search

Google Web of Science Google Scholar metacoon Friedolin Bookmarks



[Table of contents](#)

NAME

r.slope.aspect - Generates raster maps of slope, aspect, curvatures and partial derivatives from an elevation raster map. Aspect is calculated counterclockwise from east.

KEYWORDS

[raster](#), [terrain](#), [aspect](#), [slope](#), [curvature](#)

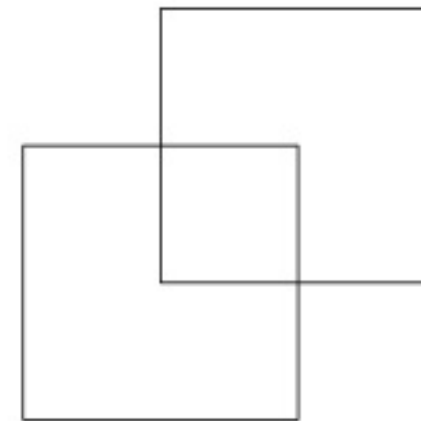
SYNOPSIS

```
r.slope.aspect
r.slope.aspect --help
r.slope.aspect [-a] elevation=name [slope=name] [aspect=name]
[format=string] [precision=string] [pcurvature=name]
[tcurvature=name] [dx=name] [dy=name] [dxx=name] [dyy=name]
```




Back to our use case

We have created two polygons using
, and would like to find the
intersection between the two.



Back to our use case

We also know the name of the geoalgorithm (parameters



), and its



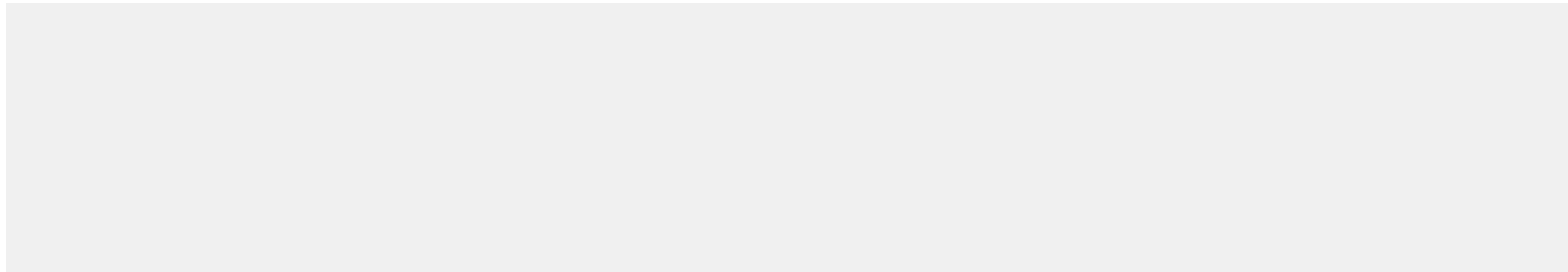
Back to our use case

We also know the name of the geoalgorithm (parameters

), and its

Hence, we have to specify , and . We can do so using R named arguments.

Run QGIS from within R



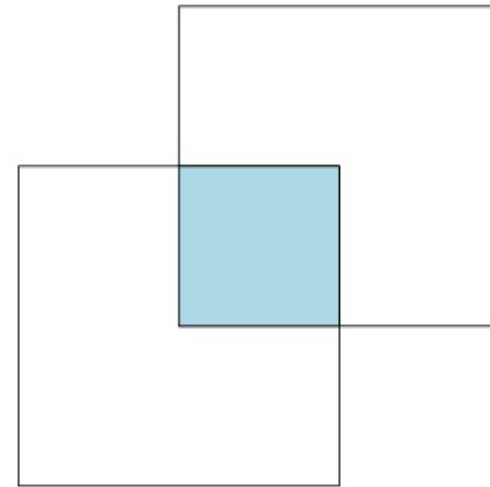
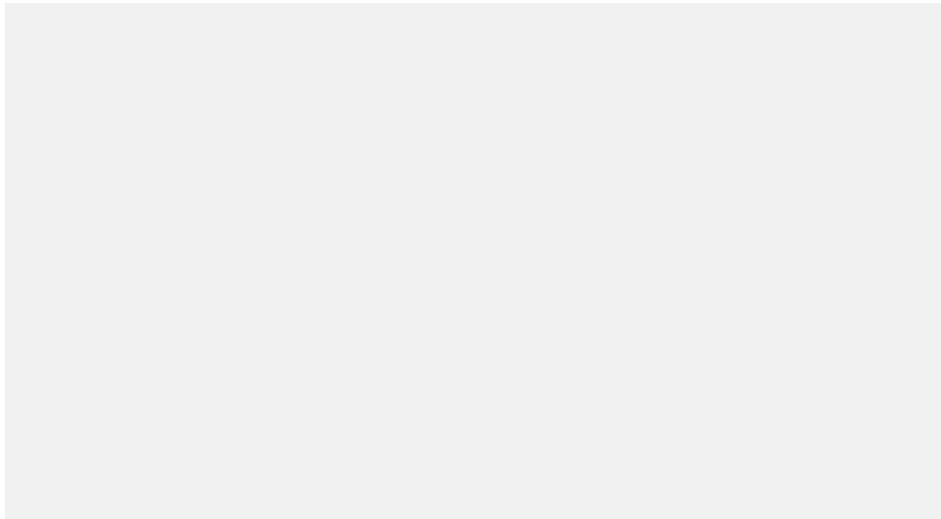
Spatial objects as inputs



Load QGIS output into R



Visualizing the result





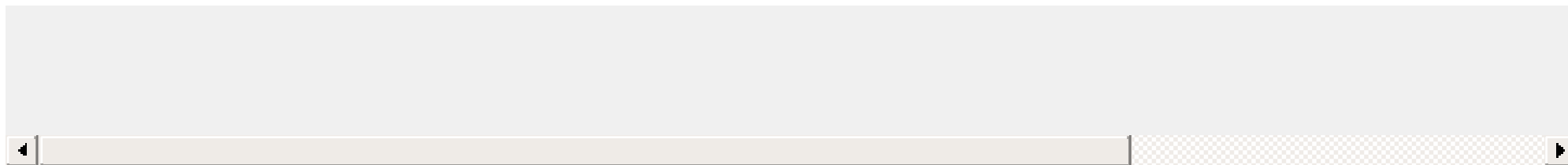
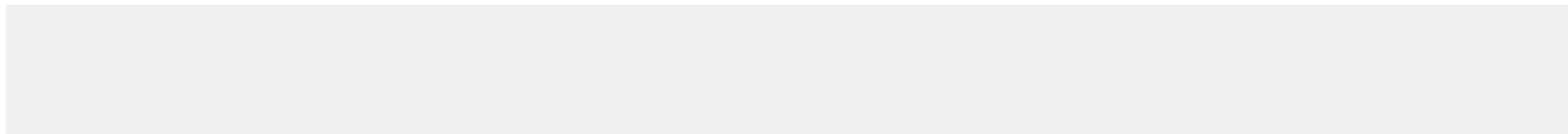
Further (R)QGIS reading

- [RQGIS R Journal paper](#) (Muenchow, Schratz, and Brenning, 2017).
- Nice paper on QGIS and its architecture (Graser and Olaya, 2015).
- <https://geocompr.robinlovelace.net/gis.html>

RSAGA



Ok, let's do the same using **RSAGA**. First, we need to tell our system where SAGA is installed, searches our system automatically for a SAGA installation.



SAGA modules



Remember SAGA is structured in modules. It also might to have a look at the SAGA GUI. Let's have a look at the available module libraries.

Geoalgorithms



We want to intersect two polygon layers, so we would assume to find a corresponding function in module .

How to use a specific geoalgorithm



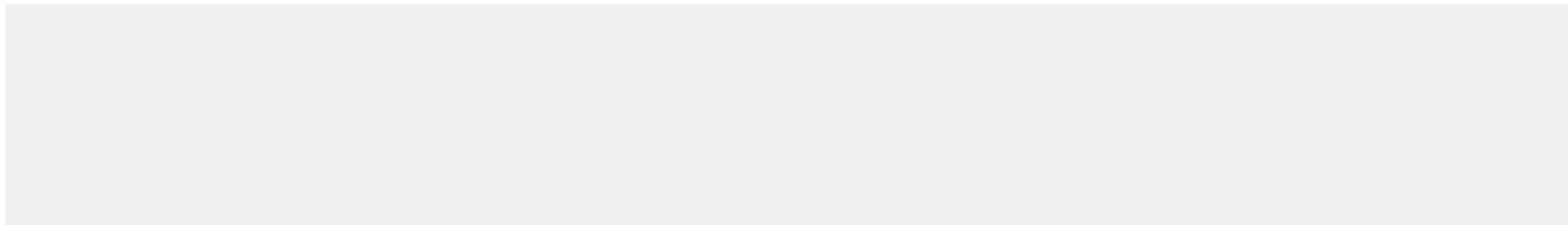
Now that we found out that there is an
know its parameters.

command, we need to

Run SAGA



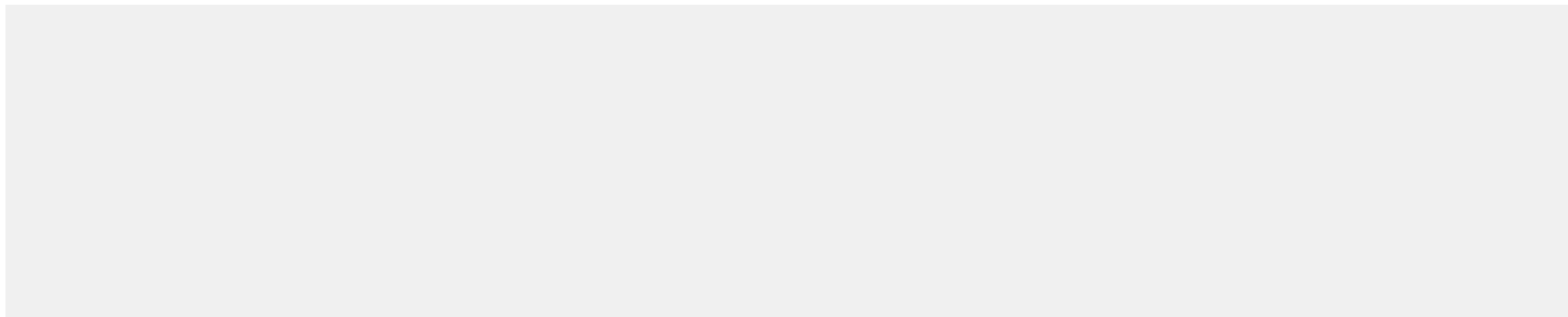
Ok, before running SAGA, we need to export our -objects.





Now, run SAGA

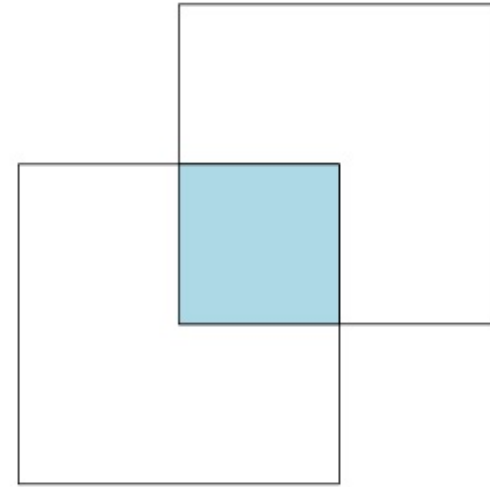
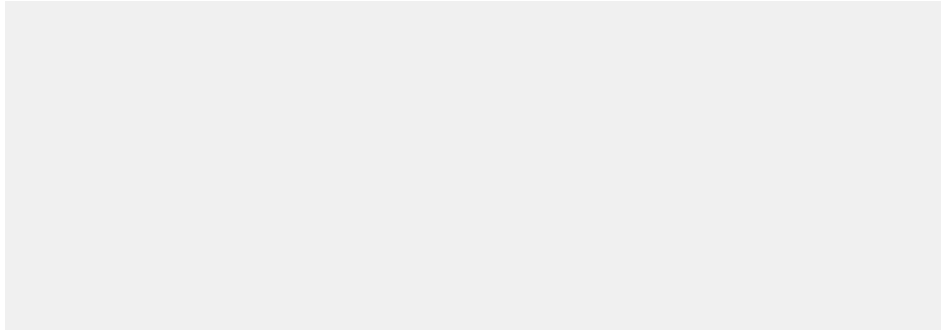
is the workhorse that calls the SAGA algorithms using the command-line API. Parameters and corresponding arguments have to be specified in a list (looks a bit like).



Visualize it



Visualize it





Further (R)SAGA reading

- We recommend reading **RSAGA** for a deeper look at
- Nice paper on SAGA, it's history and architecture (Conrad, Bechtel, Bock, Dietrich, Fischer, Gerlitz, Wehberg, Wichmann, and Böhner, 2015)
- <https://geocompr.robinlovelace.net/gis.html>

Your turn

1. Let us (together) reproduce the code).



example (download



Your turn

1. Let us (together) reproduce the [example](#) (download code).
2. Since we could also use **sf** to do the intersection (see also task 3), we will now compute the SAGA wetness index - an geoalgorithm unavailable in R. Calculate the SAGA wetness index of [this map](#) using RQGIS. If you are faster than the others or if you have trouble using SAGA, calculate the slope, the aspect (and the curvatures) of [this map](#) using GRASS through RQGIS.



Your turn

1. Let us (together) reproduce the [example](#) (download [code](#)).
2. Since we could also use **sf** to do the intersection (see also task 3), we will now compute the SAGA wetness index - an geoalgorithm unavailable in R. Calculate the SAGA wetness index of [this map](#) using RQGIS. If you are faster than the others or if you have trouble using SAGA, calculate the slope, the aspect (and the curvatures) of [this map](#) using GRASS through RQGIS.
3. Optional: calculate the intersection of [this map](#) and [this map](#) with the help of [this script](#), SAGA and/or GRASS (hint: overlay and [this script](#)).



Your turn

1. Let us (together) reproduce the [example](#) (download [code](#)).
2. Since we could also use `sf` to do the intersection (see also task 3), we will now compute the SAGA wetness index - an geoalgorithm unavailable in R. Calculate the SAGA wetness index of [this DEM](#) using RQGIS. If you are faster than the others or if you have trouble using SAGA, calculate the slope, the aspect (and the curvatures) of [this DEM](#) using GRASS through RQGIS.
3. Optional: calculate the intersection of [this DEM](#) and [this vector](#) with the help of `sf`, SAGA and/or GRASS (hint: `overlay` and `gproject`).
4. Optional: Select randomly a point from [this vector](#) and find all pixels that can be seen from this point (hint: `viewshed`). Visualize your result. Plot a hillshade, and on top of it the digital elevation model, your viewshed output and the point. Additionally, give [this DEM](#) a try.

References



Conrad, O, B. Bechtel, M. Bock, et al. (2015). "System for Automated Geoscientific Analyses (SAGA) v. 2.1.4". In: 1991-9603. DOI: [10.5194/gmd-8-1991-2015](https://doi.org/10.5194/gmd-8-1991-2015). URL: <http://www.geosci-model-dev.net/8/1991/2015/> (visited on Jun. 12, 2017).

8.7, pp. 1991-2007. ISSN:

Graser, Anita and Victor Olaya (2015). "Processing: A Python Framework for the Seamless Integration of Geoprocessing Tools in QGIS". En. In: 4.4, pp. 2219-2245. ISSN: 2220-9964. DOI: [10.3390/ijgi4042219](https://doi.org/10.3390/ijgi4042219). URL: <http://www.mdpi.com/2220-9964/4/4/2219> (visited on Jul. 21, 2018).

Muenchow, Jannes, Patrick Schratz and Alexander Brenning (2017). "RQGIS: Integrating R with QGIS for Statistical Geocomputing". In: 9 (2). Accepted for publication on 2017-12-04, pp. 409-428. URL: <https://rjournal.github.io/archive/2017/RJ-2017-067/RJ-2017-067.pdf>.