



```
882 #' # the three output rasters are returned in a list of length 3
883 #' terrain
884 #' }
885
886 run_qgis <- function(alg = NULL, ..., params = NULL, load_output = FALSE,
887                     show_output_paths = TRUE, qgis_env = set_env()) {
888
889   # check if the QGIS application has already been started
890   tmp <- try(expr = open_app(qgis_env = qgis_env), silent = TRUE)
```

R-GIS bridges for Statistical Geocomputing

Jannes Muenchow



Where to find the material



https://github.com/geocompr/egu_19



R/GIS BRIDGES

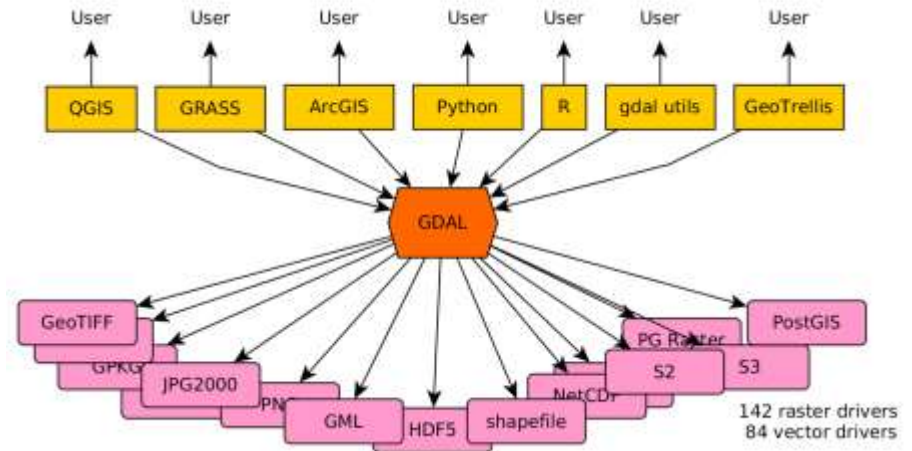


R AS A GIS



R as a GIS

- More than 100 geo-related R packages (<https://cran.r-project.org/web/views/Spatial.html>)
- Package **rgdal** for importing and exporting geodata

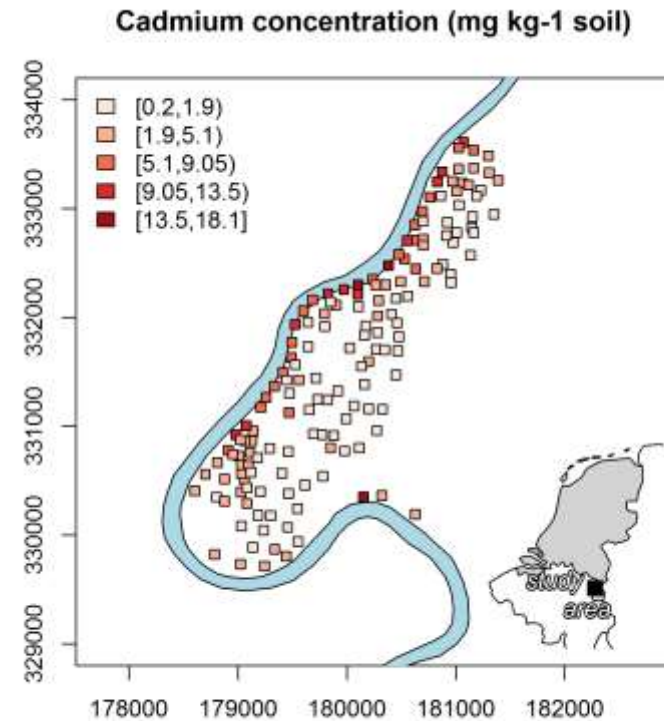


<http://r-spatial.org/2016/11/29/openeo.html>



R as a GIS

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- Package **rgdal** for importing and exporting geodata
- Packages **sp** and **sfc** for vector geodata

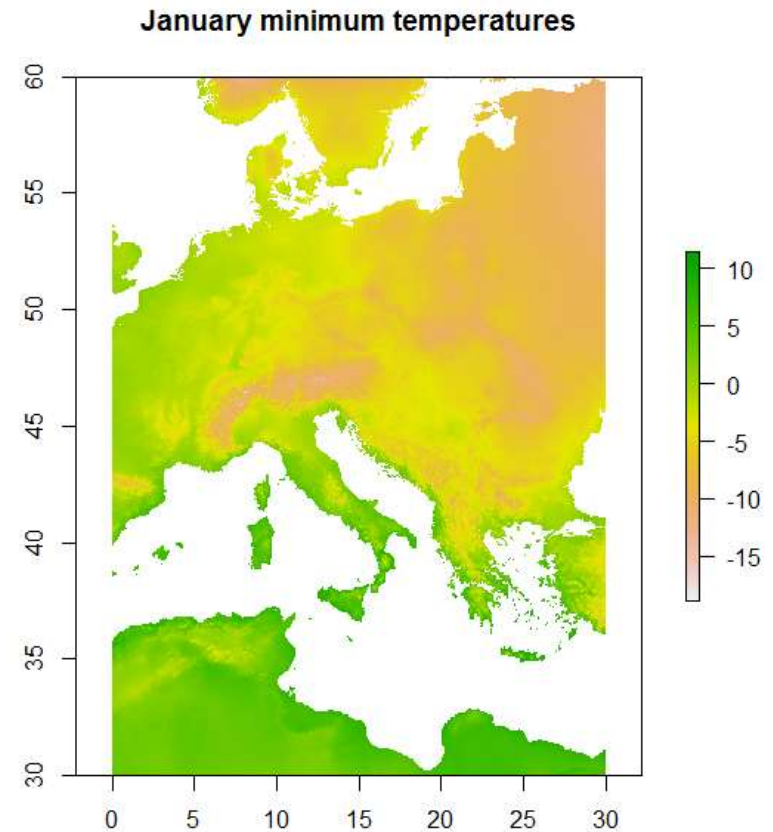


Data: Rikken, M.G.J & Van Rijn, R.P.G. (1993).



R as a GIS

- More than 100 geo-related R packages (<https://cran.r-project.org/web/views/Spatial.html>)
- Package **rgdal** for importing and exporting geodata
- Packages **sp** and **sf** for vector geodata
- Package **raster** for raster geodata



Data: <http://www.worldclim.org/>.

Interactive map handling

- Interactive visualization through **mapview** (based on **leaflet**)



R as a GIS



Defining a GIS as a system for the analysis, manipulation and visualization of geographical data (Longley, Goodchild, Maguire, and Rhind 2011), one could argue that R has become a GIS

But what about...

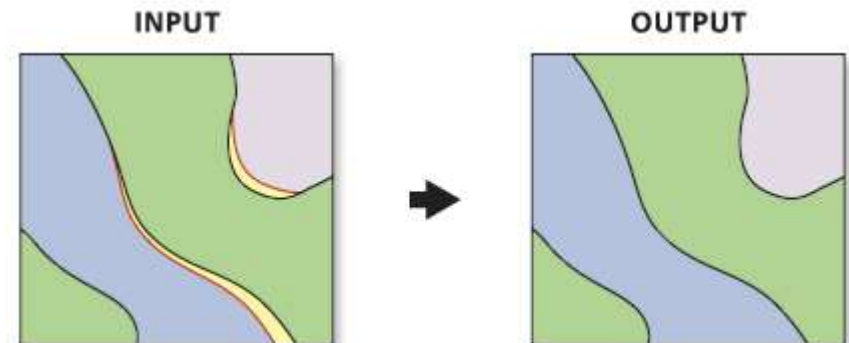


(digitizing)



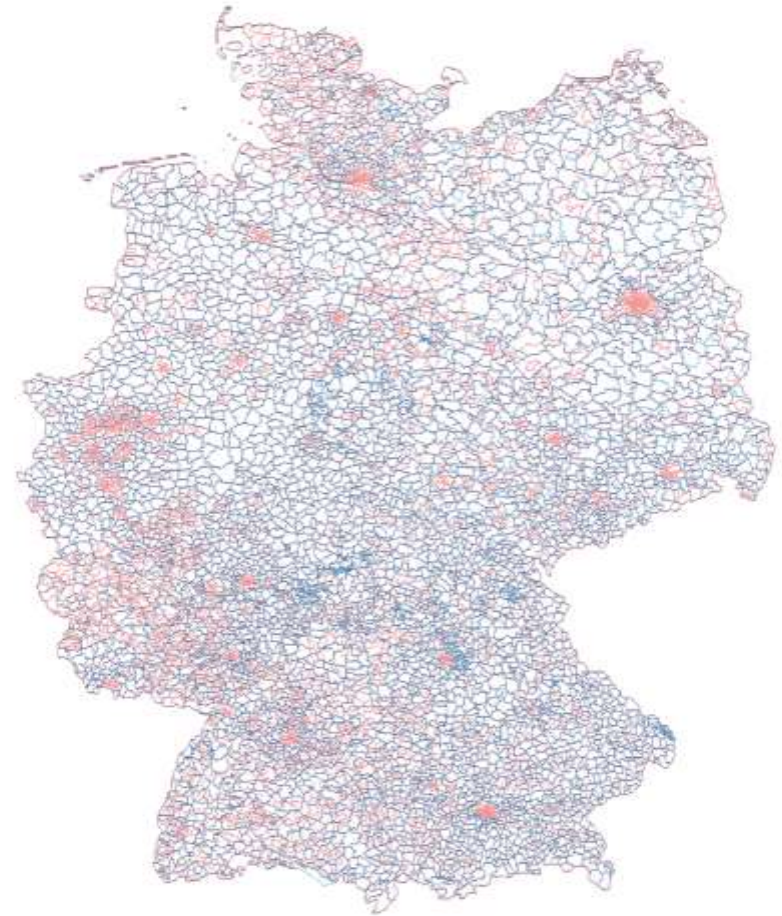
(Geodatabase-functionality
and topology rules)

<http://www.unioneag.org>



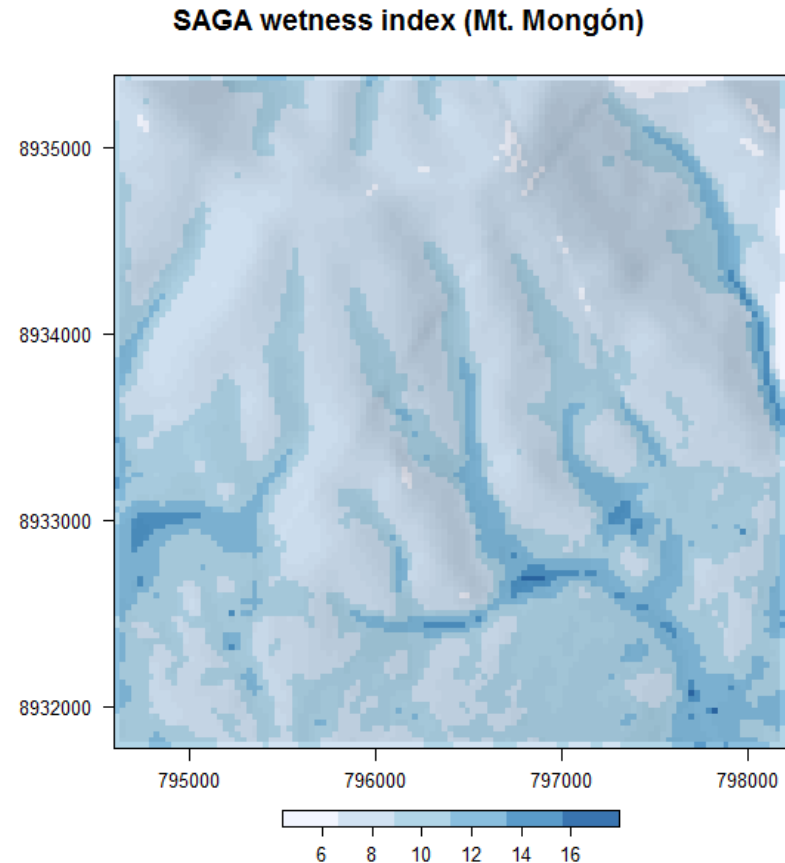
Computationally demanding operations

- Computationally demanding operations



Missing geoalgorithms

- Catchment area
- Catchment slope
- Saga Wetness Index
- Lidar processing
- ...



Interface



R has been designed from the beginning as an interactive interface to other software packages (Chambers, 2016).

R-GIS bridges



RSAGA



RQGIS



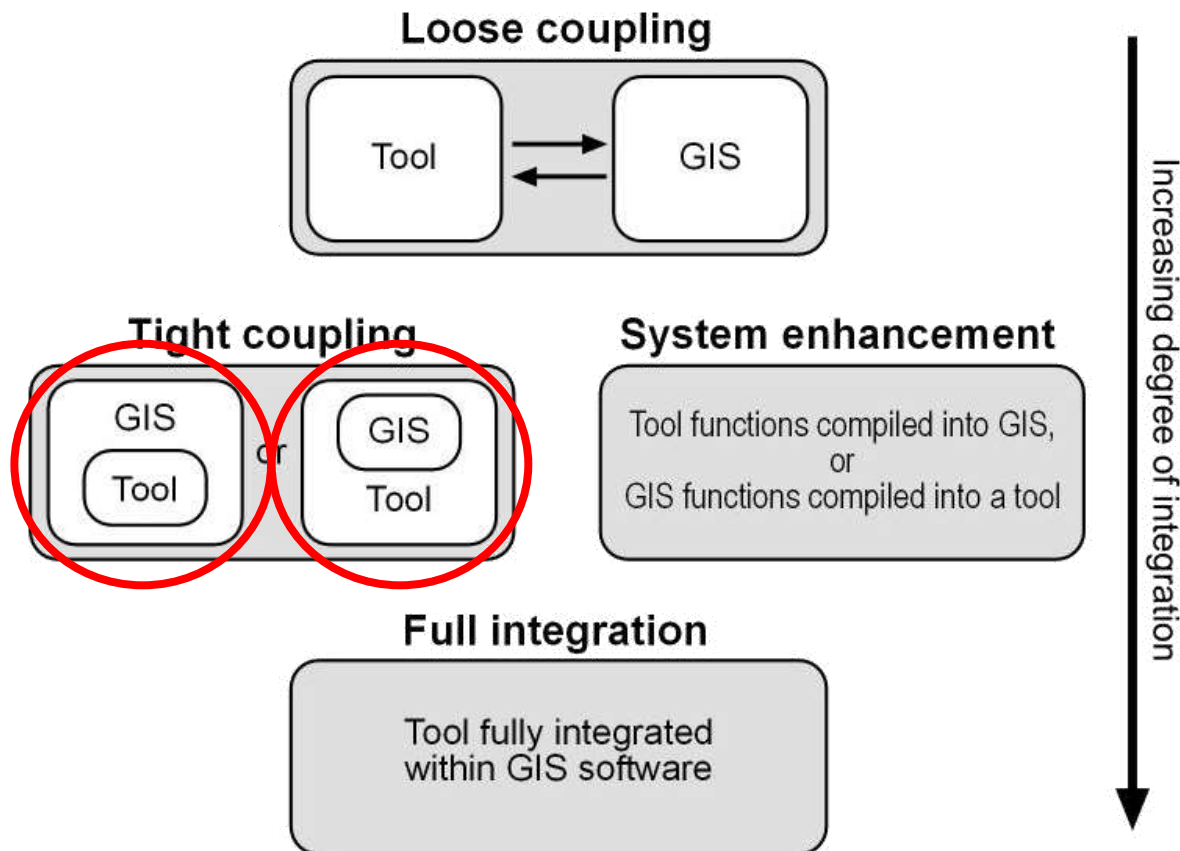
GRASS GIS

rgrass7



RPyGeo

GIS interfaces



<http://www.geocomputation.org/2000/GC009/Gc009.htm>

GIS-R bridges - GRASS



```
GRASS GIS 7.2.1 Ebenen-Manager
Datei  Einstellungen  Raster  Vektor  Bildverarbeitung  3D raster  Datenbank  Temporal  Hilfe

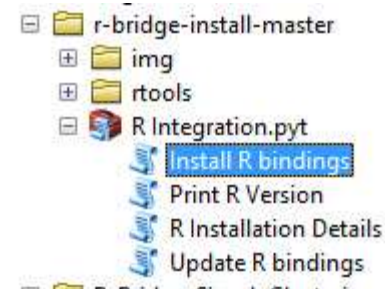
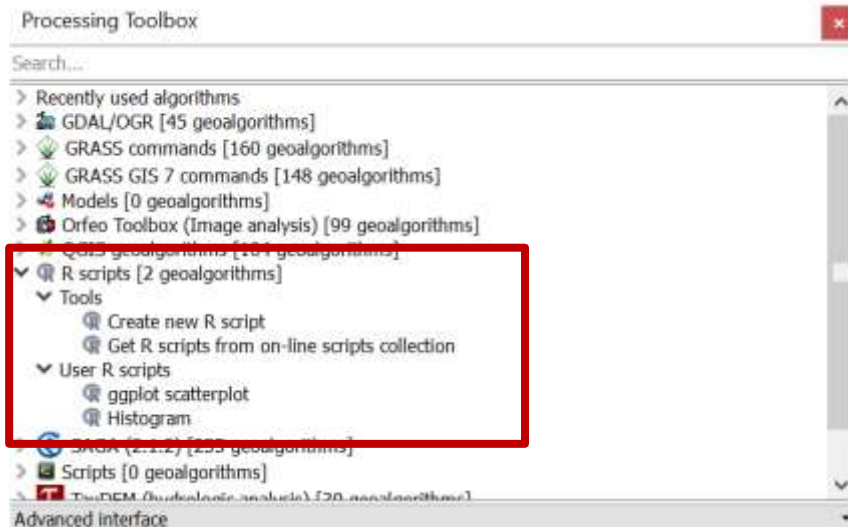
Rterm (64-bit)
R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.

Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.

During startup - Warning messages:
1: Setting LC_CTYPE=de_DE.cp1252 failed
2: Setting LC_COLLATE=de_DE.cp1252 failed
3: Setting LC_TIME=de_DE.cp1252 failed
4: Setting LC_MONETARY=de_DE.cp1252 failed
> library("rgrass7")
Loading required package: sp
Loading required package: XML
GRASS GIS interface loaded with GRASS version: GRASS 7.2.1 (2017)
and location: newLocation
> 
```




GIS-R bridges – QGIS & ArcGIS



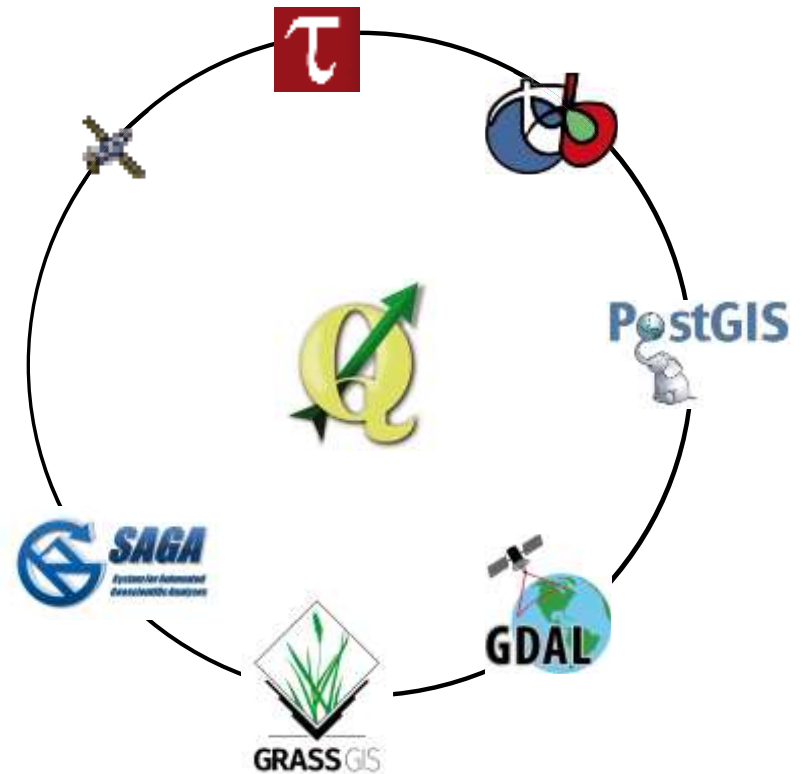
<https://www.r-bloggers.com/combining-arcgis-and-r-clustering-toolbox/>



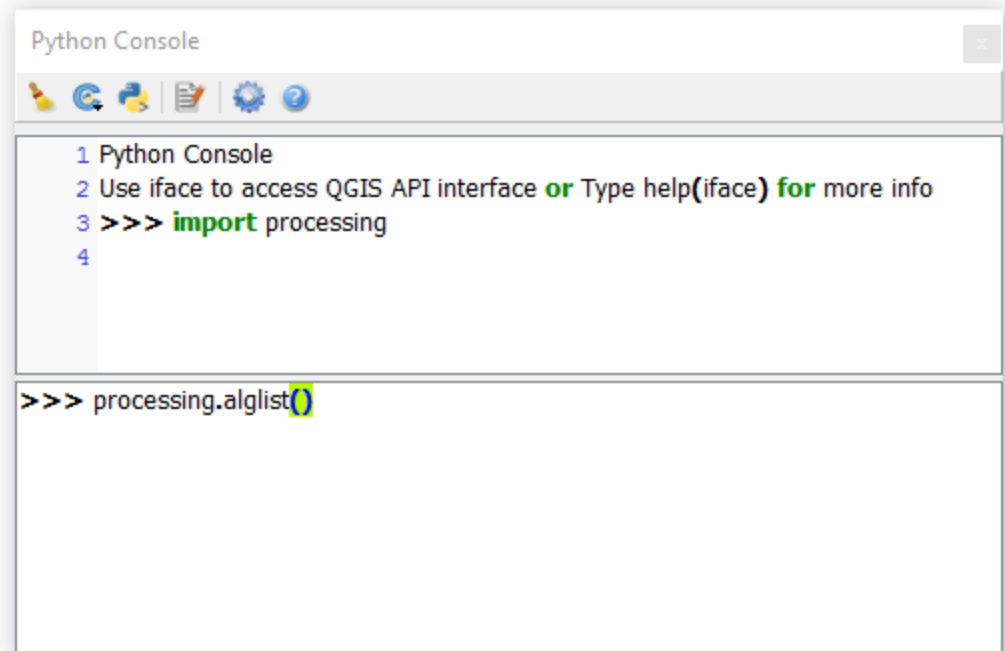
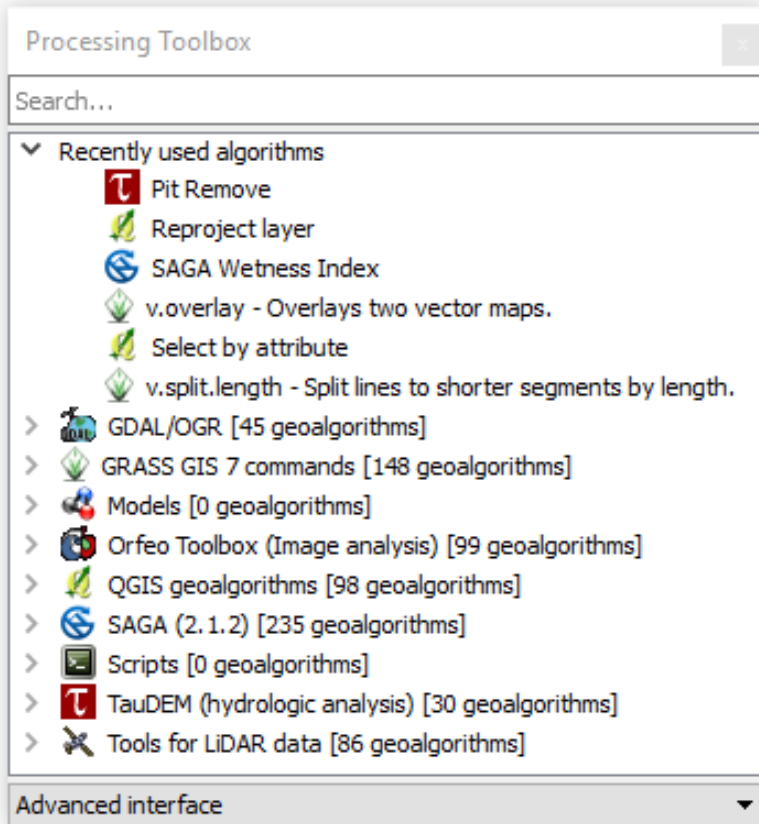
R-GIS BRIDGES

Why (R)QGIS?

- One of the most-widely used Desktop GIS
- Unified interface
- Quite user-friendly

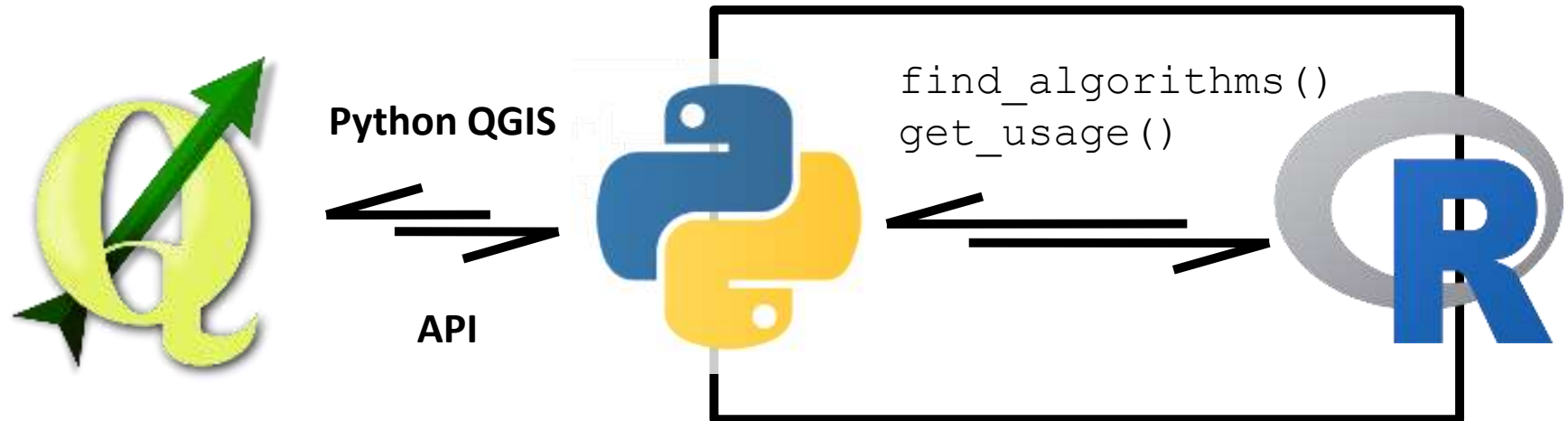


QGIS – Python API



Python tunnel via reticulate

Python tunnel via **reticulate** (`open_app()`)



(R)SAGA



- First SAGA release in 2004
- Also open-source
- Started out with a focus on raster processing
- >600 geoalgorithms
- Documentation improvable



RSAGA



RSAGA interface

- The RSAGA package provides R geocomputing functions that make use of the command line interface of SAGA GIS, `saga_cmd.exe`, to execute SAGA GIS modules.

```
#####  ##  #####  ##
###    ###  ##    ###
###   #  ##  ##  #####  #  ##
      ### #####  ##    # #####
##### #   ##  ##### #   ##

SAGA Version: 2.1.2 (64 bit)

under GNU General Public License (GPL)

Usage:

saga_cmd [-h, --help]
saga_cmd [-v, --version]
```



RSAGA structure

Geoprocessing environment

- List data structure with information on working directory, location of SAGA GIS binaries, etc.

Geoprocessor (using SAGA GIS)

- Workhorse that calls SAGA GIS and provides low-level access to all SAGA GIS modules

User-level interface functions (using SAGA GIS):

- e.g., `rsaga.local.morphometry`, `rsaga.hillshade`

Local and focal functions (written in R):

- e.g., `multi.focal.function`, `grid.predict`

Utility functions (written in R):

- e.g., `pick.from.ascii.grid`



The R-GRASS interface

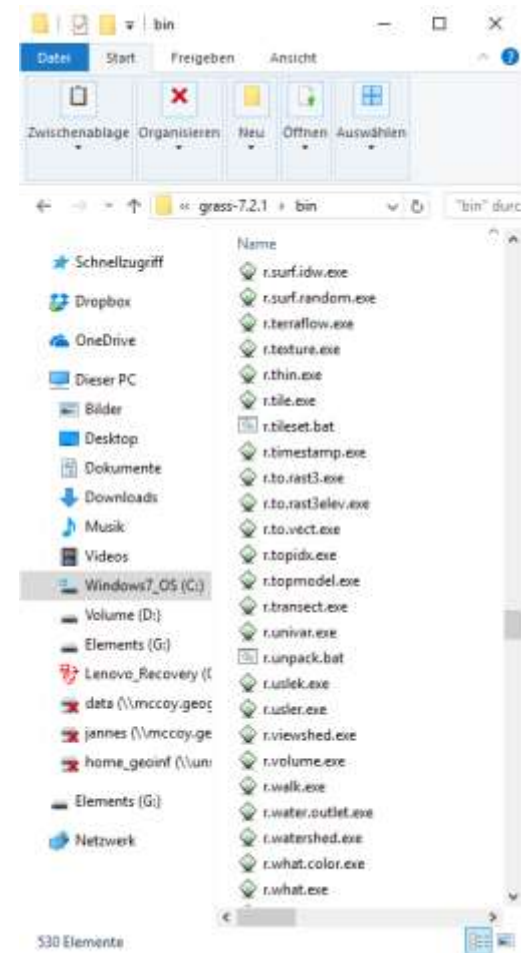
- First released in 1984
- In the beginning developed by the US Army (1982 – 1995), also with a focus on raster processing
- Since 1997 developed by scientists/user community
- >500 geoalgorithms
- Great documentation
- Uses SQLite as a geodatabase in the background





The R-Grass interface

“GRASS is a very large but very simple system – it is run as a collection of separate programs built using shared libraries of core functions. There is then no GRASS ‘program’, just a script setting environment variables needed by the component programs” (Bivand et al. 2008: 99).



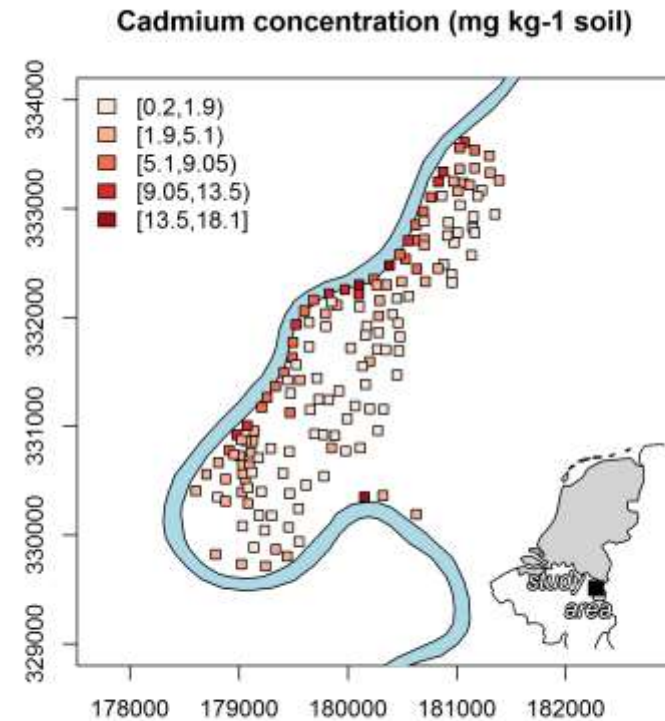
If you want to know more...



- [Bridges to GIS software](#)
- [RQGIS R Journal paper](#)

Wrap-up

- We can use R as a GIS



Data: Rikken, M.G.J & Van Rijn, R.P.G. (1993).

Wrap-up



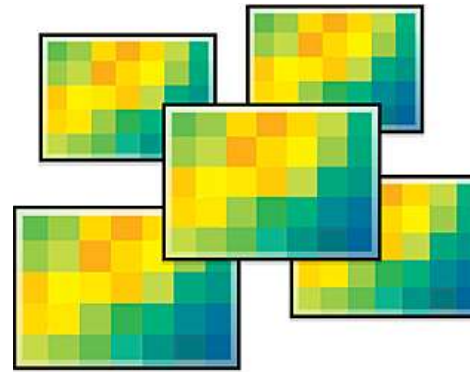
- We can use R as a GIS
- Geoprocessing is (often) better done with the help of a GIS





Wrap-up

- We can use R as a GIS
- Geoprocessing is (often) better done with the help of a GIS
- R-GIS bridges combine the best of two worlds
- RQGIS, RSAGA, rgrass7 are all great



Literature

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