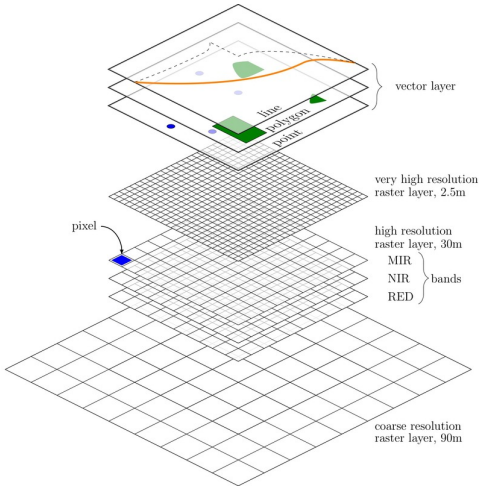
Spatial R Cheat Sheet

Remote Sensing and GIS functions



book.ecosens.org
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Packages

Packages which are used in the book are listed here, more relevant packages are however available within R

`RStoolbox`	various RS functions
`raster`	for raster data manipulation
`rgdal`	data import and export, projections
`sp`	for vector data manipulation
`rgeos`	geometry commands
`wrspathrow`	provides Landsat WRS-2 information
`gfcanalysis`	access to Forest Cover Change product
`modis`	download and analyse MODIS data
`bfast`	analyse time-series data
`dismo`	species distribution modelling
`move`	access and analyse movement data

More spatial R packages are listed here:
cran.r-project.org/web/views/Spatial.html

Relevant commands are listed below, actual syntax needs to be checked within the manual pages of each command.

Raster

Raster data manipulation is similar to a spreadsheet or matrix manipulation but with coordinates and projections, hence various also not explictly spatial commands can be applied. Here we mainly list commands designed for spatial data handling.

Import and export

raster()	import (or generate) one raster layer
brick()	import raster with multiple layers
writeRaster()	export raster data to file
writeFormats()	list of supported raster file types
getData()	retrieves DEM and climate data directly from the web

Information

click()	interactively query raster plot
hist()	histogram of raster values per layer
cellStats()	summary statistics of single layers
summary()	overall summary statistics
extent()	extent of raster data set
ncell()	number of cells (of one layer)
nlayers()	number of bands
names()	prints or sets layer names
str()	print the data structure
NAvalue()	get or set background values

Visualisation

ggR(), ggRGB()	ggplot2 plotting commands implemented in RStoolbox
plot(), plotRGB()	raster plot and RGB plot. Usefull arguments: y=bandnumber, add=TRUE (overlay multiple plots)
image(), spplot()	alternative plotting commands

RasterVis package

levelplot()	fancy way to plot raster data information
densityplot()	raster value density plot
bwplot()	violin plot of raster data values
hovmoller()	spatio-temporal plotting options

Projections

projection()	query or set projection (does NOT reproject)
projectRaster()	reprojects raster to new coordinate system

Data manipulation

Most raster commands will output a file to a chosen location, if filename= is specified. Otherwise it will use temp files.

stack()	stack different raster layers together
addLayer(); dropLayer()	add/drop a raster layer
crop()	crop raster set to smaller extent
drawExtent()	draw extent on a plot for e.g. inclusion in crop(raster,extent)
drawPolygon()	create SpatialPolygon by drawing on a plot
mask()	masking of background values
merge()	combine raster tiles to a raster with larger extent (ignores NAs)
mosaic()	combine raster tiles and apply function to overlapping pixels, e.g. mean
extract()	extract values from Raster objects, using vector data

Basic Operations

raster*2/raster2	any basic algebra operation
calc()	more efficient raster algebra, applies a function to raster data
overlay()	apply a function which uses specific bands, e.g. to calculate NDVI
focal()	moving window operations
distance()	calculate distance to closest feature, e.g. distance to water
terrain()	calculate terrain attributes from DEM, e.g. slope
zonal()	zonal statistics, for classified raster
reclassify()	reclassify raster values
subs()	substitutes values
resample()	resampling of raster to raster
aggregate()	aggregation of cells to coarser resolution
disaggregate()	disaggregation of cells to finer resolution
rasterToPoints()	converts a raster to vector points
rasterToPolygons()	converts a raster to polygons
rasterToContour()	converts raster values to contour
[[ ]]	address specific raster layer, e.g. myRaster[[1]] for first layer
x <- raster > 50	boolean operation, binary output
raster[raster <= 50] <- 0	replace all values < 50 with 0
r1[r1==50] <- r2[r1==50]	pixels in r1 of value 50 are replaced by the corresponding values of r2
sampleRandom()	random sample from cell values
sampleRegular()	regular sample from cell values
sampleStratified()	stratified sample from cell values

Remote Sensing Operations

superClass()	supervised classification
unsuperClass()	unsupervised classification
rasterCVA()	change vector analysis for change detection
rasterPCA()	principal component analysis
tasseledCap()	tasseled cap transformation
spectralIndices()	computation of spectral indices
fCover()	analysis of fractional cover
cloudMask()	cloud masking

Vector

Vector data often come in shp format including a variety of auxiliary files. All of them are relevant and are needed for further analysis. Note that readShapePoly() etc. from package maptools do NOT automatically read projection information from shapefiles. It is reccomended to use readOGR() instead.

Import and Export

readOGR()	import vector file
writeOGR()	export vector file
ogrDrivers()	list supported file formats

Information

plot()	vector plot. add=TRUE overlays multiple plots, e.g. combine with raster data
summary()	metadata and data summary
extent()	extent/bounding box of vector data
coordinates()	sets spatial coordinates to create spatial data, or retrieves spatial coordinates

Projections

projection()	query or set projection (does NOT reproject)
spTransform()	reproject vector data to new coordinate system

Data Manipulation

Check out the functions in the rgeos package, which provides most of the classical vector GIS operations such as buffers etc.

subset()	subset spatial data, based on a condition, e.g. keep only certain points
merge()	Merge a Spatial object having a data.frame (i.e. merging of non-spatial attributes)
over()	spatial overlay for points, grids and polygons
rasterize()	Rasterize points, lines, or polygons
distanceFromPoints()	computes the distance to points, output is a raster
extract()	extracts raster values behind points, lines or polygons
gIntersection()	intersection of vector data sets
gBuffer()	Buffer Geometry

Spatial Modeling

kfold()	partitioning of data set for training/validation purpose
evaluate()	cross-validation of models with presence/absence data
randomForest()	fits a randomForest model
maxent()	executes Maxent from R
gam()	fits a GAM
predict()	predicts statistical model into space (raster)

Movement Analysis

For most of the following commands the data sets need to be converted to a specific format. The commands are mainly provided in the "move" package but same names might exist in other packages. Use move::spTransform() to address the move command. Please consider checking the AniMove R cheat sheet (www.animove.org).

show()	summary of the move object
as()	coerce movement between object types
angle()	extracts turning angles from a move object
speed()	extracts speed from a move object
distance()	extracts distance between locations from a move object
time.lag()	extracts time lag between locations from a move object
spTransform()	changes the projection of a move object to a default of Azimuthal Equidistance
mcp()	calculates minimum convex polygons for SpPdf
kernelUD()	calculates a kernel density surface for SpPdf
brownian.bridge()	claculates constant variance Brownian bridges
brownian.bridge.dyn()	calculates dynamic Brownian bridges
move()	import of movement data sets from movebank.org
moveStack()	stacks multiple animal tracks
split()	splits stack into single move objects
movebankLogin()	stores movebank.org credentials
searchMovebankStudies()	reports the studies in movebank.org matching search criteria
getMovebankData()	import tracks directly from movebank.org

Miscellaneous

Some useful commands which are related to spatial data analysis.

gmap()	get google maps for your plot
geocode()	geocoding in R
complete.cases()	returns only cases with no missing values
gridSample()	sample point from a grid e.g. just one point per pixel
function(...){..}	generates a defined functions
return(...)	returns the output of a function
if (...) {...} else{...}	if else statement
for (...) {...}	for loop
while (...) { ...}	while statement

Further Packages

`rNOMADS`	data retrievel from NOAA, global and regional weather models
`...`	access and analyse movement data
`bcpa`	analyse movement tracks

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