



Geographical Information Systems

Political Data Science

Anders Woller

March 27, 2018

Considering writing thesis within DPS?

Digital Political Science Group (DPGS) launches event for prospective thesis students

→ May 22nd, 15:00, 4.2.53

- 1 Motivation
 - Conceptual
- 2 GIS
- 3 Spatial Objects
- 4 Vector formats

What's the fuss about?

Tobler's 1st law of geography:

"everything is related to everything else, but near things are more related than distant things"

⇒ spatial relationships characterized by distance decay function: $\mu = \frac{1}{d}$, $d > 0$

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Why this is awesome:

→ It allows us to merge data sources that only relates to each other spatially

- Africa: Electricity, taxes, or aid to co-ethnic area? Leader's birth region? (geo-EPR, GADM)
- Russia: Public companies directed towards pro-Kremlin areas? (geo-vKontakte)
- Pakistan: Does drone strikes affect anti-US sentiment? How much? (geo-Twitter)
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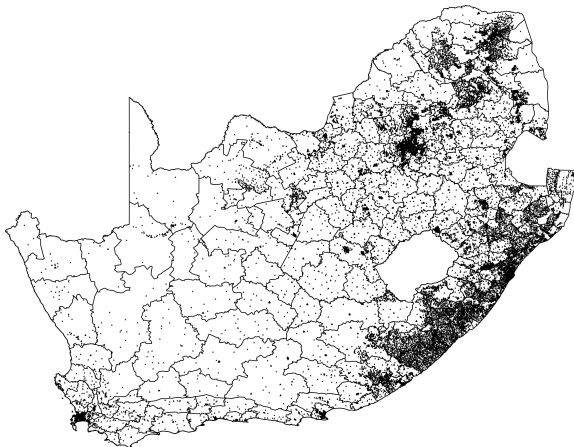
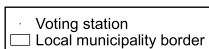
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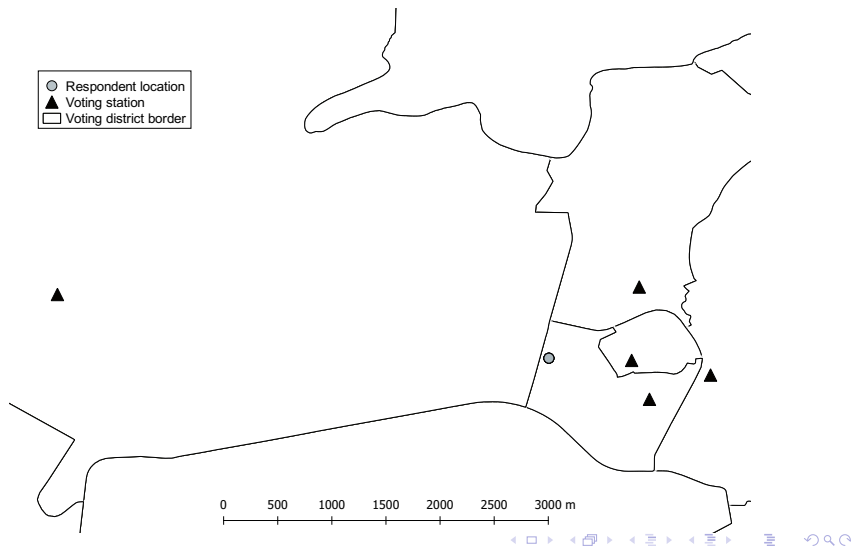
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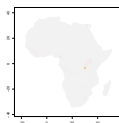
Distance: Clientelism in South Africa



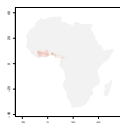
Distance: GIS and Causal Identification



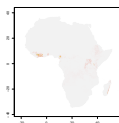
Mapoverlaying: Redistributive Politics



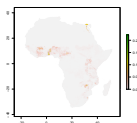
(a) Banana



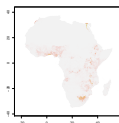
(b) Cocoa



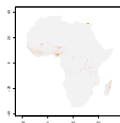
(c) Coffee



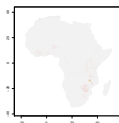
(d) Cotton



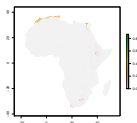
(e) Maize



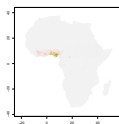
(f) Rice



(g) Tobacco



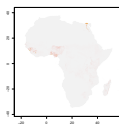
(h) Wheat



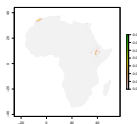
(i) Yam



(j) Palm Oil



(k) Mango



(l) Lentils

- 1 Motivation
- 2 GIS
 - Intro
- 3 Spatial Objects
- 4 Vector formats

What is GIS?

↪ A system designed to capture, store, manipulate, analyze, manage, and present spatial or geographic data

Two objectives within GIS

- 1) Spatial co-variates
- 2) Spatial econometrics

Tools: ArcGIS, QGIS, R

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- 1) Spatial co-variates ↪ this is us!
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Concepts when working with GIS

- 1) **Coordinates:** x, y, and z (longitude, latitude, and elevation)
- 2) → **Features:** points, lines, polygon
- 3) **Data types:** shapefile, raster
- 4) **Projections**
 - Maps are 2 dimensional - the earth's surface is not
 - Data used together **MUST HAVE** identical projections
 - Check projections using `proj4string()`

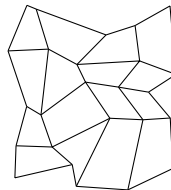
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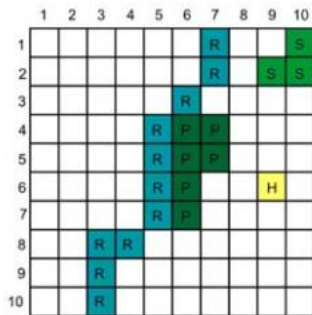
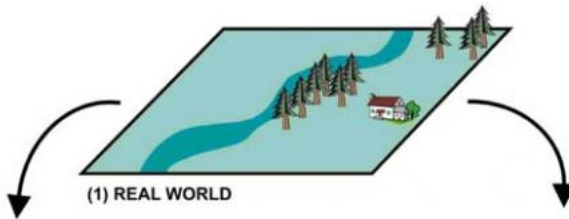
Spatial objects

Vector format (.shp) → EPRgeo, GADM

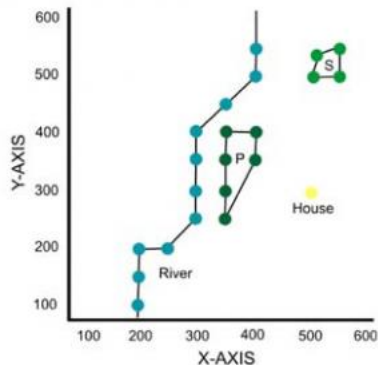


Raster format (.tif) → luminosity, FAO crops

2	8	9	3
2	9	3	8
4	3	8	4
1	2	2	5

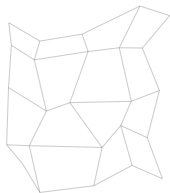


(2) RASTER REPRESENTATION

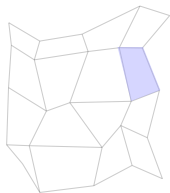


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 - shapefiles

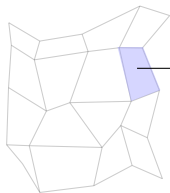
A closer look at shapefiles



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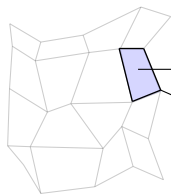
A closer look at shapefiles



Data frame element, `shp@data` and `shp$var`

ID	Pop	Area size	Country
→ Ain Benian	120.000	23	Algeria
Ain Bouihi	70.000	12	Algeria
Arib	90.000	16	Algeria

A closer look at shapefiles



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Polygon element (coordinates)

→ coords	(x,y; x2,y2; x3,y3; x4,y4)
coords	(x,y; x2,y2; x3,y3; x4,y4)
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How to: packages

rgdal::

`readOGR(), writeOGR()`

sp::

`over(), proj4string(), plot()`

raster::

`raster(), extract(), writeRaster(), crop()`

geosphere::

`distHaversine(), area()`

tmap, tmaptools::

`tm_shape(), tm_polygons(), save_tmap()`

rgeos & sf