

advanced qgis

adam okulicz-kozaryn

`adam.okulicz.kozaryn@gmail.com`

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outline

geocoding

SQL

spatial join

>probably finish first part here>

geo-processing

Extra/bonus

example: apts close to episcopal church in Philly

example: hwys in NJ

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geocoding: address \rightarrow (lat,lon)

- ◇ let's say that we have some addresses and we want to geocode them
- ◇ https:
`//sites.google.com/site/adamokuliczkozaryn/
gis_int/apartments-for-rent.xls`
 - open, and for simplicity just keep first 10!
- ◇ looks reasonably clean, and save as csv

MMQGIS-Geocode

- MMQGIS-Geocode-Geocode CSV with Google/OpenStreetMap
 - ◇ it works better if you specify more information
 - ◇ make sure Address Field, City Field, State Field are right
- make sure notfound.csv is saved where you want
- ◇ let's hit ok, it takes like 10sec
- ◇ <https://mangomap.com/blog/how-to-make-a-web-map-from-a-list-of-addresses-in-a-spreadsheet/>
- if goog complains, try the other one, or get goog API key, cheap
-
- ◇ btw, if already got X/Y lat/lon:
just add your csv with “Add Delimited Text Layer” tool

important to check!

- ◇ see notfound.csv: mostly those with a range of street numbers (if you geocode everything)
- ◇ need to fix them/adjust them:
 - to check can just google them and see if you get a clean hit
- ◇ check location on OpenLayers
 - does it make sense? houses in river or park?
 - zoom-in to street, click some points with “identify tool”: pop-up address—does it match with the street?
 - usually some miscodings, say few percent
 - usually because the address is misspelled or incomplete

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SQL: Structured Query Language

- ◇ full blown (not in qgis) SQL is only little more complicated
 - very much English-like, just with some strict syntax rules
- ◇ also a job market skill: put it on your linkedIN next to 'gis' skill
 - very easy to master in no time
- ◇ <https://www.youtube.com/watch?v=afPL7-QfHr4>
- ◇ <https://www.youtube.com/watch?v=jJeae7PJVv4>

advanced filter (expression): SQL

- ◇ nj_counties-Open Attribute Table
- ◇ bottom left box- “Advanced Filter (Expression)”
 - Fields and Values “REGION”
 - and on the right Load values: “all unique”
 - then we can type
- ◇ “REGION” = 'CENTRAL' and hit OK
 - now easy to modify at the bottom of table, say:
- ◇ “REGION” = 'CENTRAL' OR “REGION” = 'SOUTHERN’
- ◇ “REGION” = 'CENTRAL' AND “POP2010” > 598349

regular expressions

- ◇ can also match part of a string:
- ◇ `regexp_match(" COUNTY", 'C.*N')`
- ◇ `regexp_match(" COUNTY", '^C.*N')` must start with 'C'
- ◇ `regexp_match(" COUNTY", '^C.*N$')` and end with 'N'
- ◇ then can hit ctrl-a to select all data
- right click layer, save as (check "selection")

saving selection often necessary

- ◇ keep in mind simplicity principle!
- drop all unnecessary clutter
- do not map things that you don't care about

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doing it commonsensically

- ◇ you can actually spatial join with regular join we've covered
- ◇ the idea is that you have non-matching geographical levels
- ◇ say hospitals in excel and zip-codes in shapefile,
- ◇ you want to map sum of patients in hospitals per zipcode
- ◇ you can do it in qgis (next slides)
- ◇ but you can do it by hand:
 - use stata, excel, sas, spss, etc
 - just add patients within each zipcode and
 - merge zipcode patient sums with gis file at zipcode level

a proper spatial merge

- ◇ as above: things do not fit geographically...
 - say zip codes in one data, and counties in another data
- ◇ can map both and merge based on location
- ◇ so called “spatial join”
 - have to pick: mean, sum, or first

join counties with universities

◇ nj_counties

<https://docs.google.com/uc?id=1xJDhcRCkgv7k4tNCa720og5bohV6dTB2&export=download>

◇ and universities

https://sites.google.com/site/adamokuliczkozaryn/gis_int/hsip_colleges.zip?attredirects=0&d=1

◇ and first make ENROLL numeric: text-to-float

thinking

- ◇ as always, think what you are doing and what does it mean
 - and double check
- ◇ here there are some institutions with 0 enrollment
 - they were missing ("") before the text-to-float
 - and that affects of course sum of enrollment for a county
 - and it is impossible that an institution has zero enrollment
 - so ideally, you should find out what these enrollments are...e.g. call the institution

drooping cases

- at the very minimum, acknowledge the problem by saying that totals have negative bias (say which ones and how many schools missing)
 - or maybe better replace with avg; but for now just drop them
- ◇ universities-Open Attribute Table
 - ◇ bottom left box- "Advanced Filter (Expression)"
 - "ENROLL" >0
 - ◇ then in table without zeros, Ctrl-a to select all
 - ◇ layer-Save as, ('Save only selected features')

MMQGIS-Combine-Spatial Join

- ◇ Output: nj counties
- ◇ Spatial Operator: Contains
- ◇ Data (Join) Layer: universities
- ◇ Attribute Operation: Sum
- ◇ Fields: COUNTY AND ENROLL
- ◇ double check: say Atlantic has 2 and sum of 13,880
- ◇ use identify tool: $7035+6845=13,880$
- ◇ click on ENROLL col header to sort and we see that
 - Essex County wins with COUNT of 9 and ENROLL of 65k
- ◇ now could do graduated map of ENROLL for counties

more about spatial join

- ◇ matching census tracts with towns <http://trendct.org/2015/05/29/tutorial-how-to-merge-data-from-two-different-maps-using-qgis/>

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this is a whole bag of tools

- ◇ we switch gears a little and discuss
 - more advanced topics beyond mapping
 - more like typical GIS/IT stuff
- ◇ we will just cover few tools
- ◇ there are dozens of them
- ◇ you may present some of those for extra credit
 - do let me know which one(s)!– some may not be very useful for this class
- ◇ those that i think are especially useful are covered below
- ◇ most are under 'Vector', 'Processing', 'MMQGIS', and also 'Plugins'

dissolve

- ◇ dissolve into a larger area
 - (get rid of inside boundaries)
- ◇ Vector-Geoprocessing Tools-Dissolve
 - nj_counties
- ◇ “dissolve field:” region

dissolve your way

- ◇ can dissolve into your own categories/definitions
- ◇ let's take regions and dissolve into south and north jersey
- ◇ Open attribute table-toggle editing-New column-integer:
'southNorth'
- sort on REGION and mark southern regions with 1, and the rest with 0
- may also highlight the row to see which county is where
- ◇ Vector-Geoprocessing tools-Dissolve
- ◇ "Dissolve field:" southNorth
- ◇ often you will have to do something like this
- ◇ no way to find a shapefile for South Jersey online!

simplify polygons

- ◇ remember from principles: simplify as much as possible
- ◇ simplifying polygons means dropping vertexes, so that polygons are defined by fewer coordinates **draw**
- ◇ it reduces size of a file
- ◇ Vector-Geometry tools-Simplify Geometries
 - Input: 'nj_counties'
- ◇ can play with “tolerance” to achieve desired simplicity
 - try 1000—see the difference?
 - also, you can simplify lines (fewer nodes)
- ◇ and i guess you can also simplify points (fewer dec points)
 - reference <http://gis.stackexchange.com/questions/25914/how-to-smooth-generalize-a-polygon-in-qgis>

centroids

- ◇ calculate a center of a polygon or turn polygon into a point
 - useful when merging non-overlapping polygons—say congressional districts and counties
 - then you can calculate centroid of one of those and merge with polygons of the other layer if a centroid is in that polygon using spatial merge
- ◇ draw a picture
- ◇ Vector-Geometry tools-Polygon centroids
 - Input: nj_counties

centroids

- ◇ note: the new shapefile will have the same data
- ◇ can now map another variable and overlay on another variable
- ◇ can map both points and polygons with some symbology
- ◇ let's map population for polygons
 - and population density for points
 - note: make points bigger to see symbology well
- ◇ this solves the problem of showing 2 vars in one map

buffering

- ◇ kind of opposite of centroids:
 - make a buffer (circle) around a point
- ◇ say, need a 'dry zone' around schools
- ◇ load 2007_11_30_NJ_COLL_UNIV_NJSP
- ◇ Vector-Geoprocessing tools-Buffer
- ◇ use 20,000 feet (buffer size is in map units)
- ◇ save as 'colBuf'
- ◇ Properties-Metadata or even -General
 - unit is us feet
- ◇ note: buffer is a new layer and then can spatially merge it with another layer

example: environmental problems around univ

- ◇ download and add to qgis
 - http://www.nj.gov/dep/gis/digidownload/zip/statewide/Envr_mon_gw_KCSL.zip
- ◇ Vector-Data Management Tools-Join Attributes By Location
- ◇ Target: colBuf
- ◇ Join: Envr_mon_gw_KCSL
- ◇ Take summary of intersecting features
 - say 'mean'; but we only care about counts, which is automatic
- ◇ Keep all records

do here 'select by location tool !'

investigate

- ◇ open attr table of merged shapefile
- ◇ go to last column 'COUNT' and click 2x to sort descending
- ◇ under 'NAME' we find that 'NEW JERSEY MEDICAL SCHOOL'
 - has biggest problem! over thousand contaminated sites
- ◇ select say 3 rows at top
- ◇ click at the top 'zoom map to selected features'
 - a lot of overlap there
- ◇ but from the table can select schools with greatest problems
 - and take some measures to help with the situation

buffering: applications

- ◇ why would you do buffering?
- ◇ sex offenders and schools
- ◇ liquor stores and schools
- ◇ waste processing plants and houses
- ◇ 2-mile heavy pollution around hwy
- ◇ walkability to healthy stores, etc
- ◇ many applications!

TODO: update to 2.x

references

- ◇ <http://maps.cga.harvard.edu/qgis/wkshop/buffer.php>
- ◇ can select by location:
 - (1.7!) <http://qgis.spatialthoughts.com/2011/12/tutorial-performing-spatial-queries-in.html>
 - (1.8!) <http://gis.stackexchange.com/questions/61753/how-to-select-points-within-a-polygon-from-another-layer>
- more towards bottom:
http://www.qgistutorials.com/en/docs/performing_spatial_queries.html

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other things/later

- ◇ analysis tools contains many useful tools
- ◇ can calculate line lengths: e.g. railroads
 - <http://qgis.spatialthoughts.com/2010/10/calculating-line-lengths-and-statistics.html>
- ◇ spatial queries—e.g. select objects within a distance
 - <http://qgis.spatialthoughts.com/2011/12/tutorial-performing-spatial-queries-in.html>
- ◇ calculate X,Y http://maps.cga.harvard.edu/qgis/wkshop/x_y_field.php

and there are many more

- ◇ mostly under vector menu
- ◇ but also using plugins
- ◇ you are more than welcomed to use things we did not cover in ps or final project
 - also you can have a presentation about some useful tool
 - just explore them and google them
- ◇ in any case it will be extra credit

next week is the last qgis class

- ◇ what would you like to cover ?
 - anything new ?
 - cover anything again?
- ◇ maybe use some new data for examples?
 - I have an impression that we should go to lower level
 - title of this class is also (cross-listed) “urban mapping”
 - maybe do tracts/blocks in Philly or Camden ?
 - maybe zoning or public transportation?
 - other ideas?

TODO: guess mv somewhere!

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- ◇ google 'list of philadelphia episcopal churches'
 - https://en.wikipedia.org/wiki/List_of_church_buildings_in_Philadelphia
- ◇ copy table, put into excel, clean up a bit,
 - drop pics, add cols with 'philadelphia' and 'pa'
 - save as csv and geocode with MMQGIS
- ◇ then geocode apt:
 - <http://philadelphia.apartmenthomeliving.com/apartments-for-rent.xls>
- ◇ make buffers: vector-geoprocessing tools-buffer; say on apt .01
- ◇ analysis tools-points in polygon
 - input polygon: apt buffer; input point: churches

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a question

- ◇ say we want to find out which county has the longest interstate hwy network...

nj roads

- ◇ `http://www.state.nj.us/transportation/gis/data.shtm`
- ◇ and get
- ◇ NJ Roadway Network
- ◇ `http://www.state.nj.us/transportation/gis/zip/NJ_Roads_`
`shp.zip`
- ◇ `SQL ROUTE_SUBT=1` (interstate hwys)
- ◇ and save selection as `hwy.shp`
- ◇ `VECTOR-ANALYSIS TOOLS-SUM LINE LENGTH`
 - Input polygon: `'nj_counties'`
 - Input line vector: `'hwy'`
- ◇ and the winner is... Morris county

getting creative with lines

- ◇ say you work for a local govt...
 - and want to lobby state to build more roads
 - may produce a map showing miles of roads per capita
- ◇ or say you want to build more bike lanes
 - calculate length of them per capita
 - and compare to other leading cities, say Portland, OR