

# advanced qgis

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# outline

geocoding

SQL

spatial join

>probably finish first part here>

geo-processing



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## geocoding: address→(lat,lon)

- 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, looks reasonably clean, save as csv

# MMQGIS-Geocode

- MMQGIS-Geocode-Geocode CSV with Nominatim
- 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
- note: 3.2 will freeze for 2min or so (but it works!)
- <https://mangomap.com/blog/how-to-make-a-web-map-from-a-list-of-addresses-in-a-spreadsheet/>
- 
- 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 'basic SQL' 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=jJae7PJVv4>

## 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](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
  - ideally, you should find out what these enrollments are: eg call the institution

## dropping cases

- universities-Open Attribute Table
- select features using an expression
  - "ENROLL" >0
- layer-Export selected features as

# MMQGIS-Combine-Spatial Join

- Output: nj counties
- Spatial Operator: Contains
- Data (Join) Layer: universities
- Attribute Operation: Sum
- Fields: COUNTY\_LAB AND ENROLL
- (make sure ENROLL is float)
- note: it often crashes, yet it saves the joined layer
- so if crashed try opening first the saved layer :)

## double check

- 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
  - let me know— some may not be useful for this class
- those that i think are especially useful are covered below
- most are under 'Vector', and also 'Plugins'



# dissolve

- nj\_counties

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

- dissolve into a larger area

- (get rid of inside boundaries)

- Vector-Geoprocessing Tools-Dissolve

- nj\_counties

- uncheck “Dissolve all”

- otherwise it will dissolve all

- “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'
- play with “tolerance” to achieve desired simplicity
  - try 1000–turn off/on to compare to original: see the difference?
  - can also 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:
- buffer (circle) around a point or poly or line; eg:
  - 'dry zone' around schools
  - waste processing plants and houses
  - 2-mile heavy pollution around hwy
  - walkability to healthy stores, etc
- load nj universities
  - [https://sites.google.com/site/adamokuliczkozaryn/gis\\_int/hsip\\_colleges.zip](https://sites.google.com/site/adamokuliczkozaryn/gis_int/hsip_colleges.zip)
- Vector-Geoprocessing Tools-Fixed Distance Buffer
- use 20,000 feet (buffer size is in map units)
- Properties-Metadata or even -General: unit is US ft
- 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
- [https://docs.google.com/uc?id=1T\\_n1y\\_Mj5yQiWpZwrbuuFFwmIVJ2QWFZ&export=download](https://docs.google.com/uc?id=1T_n1y_Mj5yQiWpZwrbuuFFwmIVJ2QWFZ&export=download)
- make smaller, say size of .4 so can better see

# MMQGIS-Combine-Spatial Join

- Output: Buffer
- Spatial Operator: Contains
- Data (Join) Layer: NJ contaminated sites
- Attribute Operation: Sum
- Fields: NAME



## 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

## related: select by location (say id problematic ones)

- say select polluted sites within 1000 ft from a school
- Vector-Geoprocessing Tools-Fixed Distance Buffer
- Vector-Research Tools-Select by location
- Layer to select from: NJ Contaminated Sites
- Additional layer (intersection layer): Buffer
- Gemetric predicate: within
- and then: NJ contaminated sites-Save As
  - check 'Save only selected features'
  - and save as csv
  - got 80 places we can call and ask to clean up