# **Process documentation**

# For geojson scripting and visualization planning

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For geojson scripting and visualization planning

## JSON FORMATTING

# **GEOJSON CONVERTER SCRIPT**

Step 1

Step 2

Step 3

Step 4

**VALIDATING DATA IN GEOJSON FORMAT** 

THE FILES - The data is being transferred to three separate geojson files.

## **DATA CLEANING**

Missing tuition data schools

Degree columns

**Dual columns** 

**Directions for filling in NULL values** 

# **DATA VISUALIZATION IDEAS**

Planned visuals

Design scheme + method

**MAPS** 

**TABLES** 

**HEATMAPS** 

MAPS WITH TABLES

**STILLS** 

### **EMBEDDING**

**Shortcoding** 

**Scripts** 

**Hosting** 

## JSON FORMATTING

In order to take our Excel data and turn it into interactive maps and tables, it needs to be taken out of spreadsheet format. A format that will incorporate our geopoint data while also respecting the nested structure of the data is geojson.

## Sample geojson:

```
{ "type": "FeatureCollection",
  "features": [
    { "type": "Feature",
        "geometry": {"type": "Point", "coordinates": [102.0, 0.5]},
        "properties": {"prop0": "value0"}
     },
    { "type": "Feature",
        "geometry": {"type": "Point", "coordinates": [102.0, 0.5]},
        "properties": {"prop0": "value0"}
     },
     ]
}
```

### **GEOJSON CONVERTER SCRIPT**

### Step 1

A base template is written for the geojson.

```
template = [
 { "type": "Feature",
 { "properties": {
    "uni_name": UNINAMEs,
    "ISTandF": IN STATE,
    "ISTLOC": IN_CAMPUS,
    "OOSLOC": OUT CAMPUS,
    "ISTLOFFC": IN NOCAMPUS,
    "OOSLOFFC": OUT NOCAMPUS,
    "ISTLWF": IN_FAMILY,
    "OOSLWF": OUT FAMILY,
    "PERCENTADMIT": PERCENT_ADMIT,
    "FUNDINGSOURCE": PUBPRI,
    "DegreeCOUNT": DEGREE COUNT,
    "url": URLS,
    "landgrantYN": LAND_GRANT,
    "census region": REGION,
    "census_division": DIVISION,
```

```
"city": CITY,
   "state": STATE
   },
{
   "geometry": {
    "type": "Point",
    "coordinates": [
        LATs,
        LONGs
    ]
   }
}]
```

#### Step 2

To help refine the template into a more readable format, a new template is written that condenses everything into a string with blanks for the input data and removes special characters that might interfere with the way the script is being read in the notebook. A key is written so the new characters can be replaced after the data is exported.

```
other_template = "%'type': 'Feature','properties': % 'uni_name': [{}],'ISTandF': [{}],'ISTLOC': [{}],'OOSLOC': [{}],'ISTLOFFC': [{}],'OOSLOFFC': [{}],'ISTLWF': [{}],'OOSLWF': [{}],'PERCENTADMIT': [{}],'FUNDINGSOURCE': [{}],'DegreeCOUNT': [{}],'url': [{}],'url': [{}],'andgrantYN': [{}],'census_region': [{}],'census_division': [{}],'city': [{}],'state': [{}]+, 'geometry': % 'type': 'Point', 'coordinates': ${},{}^\ ++,"
```

## Step 3

The data is imported into the notebook to fill in the blanks in the template.

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UNINAMEs = ['Alabama A & M University','Auburn University','Tuskegee University','University of Arkansas', University of Central Arkansas', Arizona State University-Tempe', Northern Arizona University'.'University of Arizona'.'Academy of Art University'.'California Baptist University', California College of the Arts', California Polytechnic State University-San Luis Obispo', California State Polytechnic University-Pomona', California State University-Northridge', New School of Architecture and Design', San Jose State University', Sonoma State University', Southern California Institute of Architecture', University of California-Berkeley', University of California-Davis', University of California-Irvine', University of California-Los Angeles', University of Southern California', Woodbury University', Colorado State University-Fort Collins', University of Colorado Boulder', University of Colorado Denver/Anschutz Medical Campus', University of Connecticut', University of Hartford', Yale University', Catholic University of America', 'George Washington University', 'Georgetown University', 'Howard University', University of the District of Columbia', University of Delaware', Florida Agricultural and Mechanical University', Florida Atlantic University', Florida International University', Florida State University', 'University of Central Florida', 'University of Florida', 'University of Miami', 'University of Central Florida', 'University of Florida', 'University of Miami', 'University of Central Florida', 'University of Florida', 'University of Central Florida', 'University of Florida', 'University of Central Florida', 'University of Florida', 'University of Central Florida', 'University of South Florida-Main Campus', Georgia Institute of Technology-Main Campus', Georgia State University', 'Kennesaw State University', 'Savannah College of Art and Design', 'Savannah Technical College', 'University of Georgia', 'University of Hawaii at Manoa', 'Iowa State University', 'University of lowa', University of Idaho', Illinois Institute of Technology', Judson University', School of the Art Institute of Chicago', Southern Illinois University-Carbondale', University of Illinois at Chicago', University of Illinois at Urbana-Champaign', Western Illinois University', Ball State University', Indiana University-Bloomington', Purdue University-Main Campus', University of Notre Dame', Kansas State University', University of Kansas', University of Kentucky', University of Louisville', Louisiana State University and Agricultural & Mechanical College', Louisiana State University and Agricultural & Mechanical College', Louisiana Tech University', Tulane University of Louisiana', University of Louisiana at Lafayette', University of New Orleans', Boston Architectural College', Boston University', Harvard University', Massachusetts College of Art and Design', Massachusetts Institute of Technology', Northeastern University', Tufts University', University of Massachusetts-Amherst', University of Massachusetts-Boston', Wentworth Institute of Technology', Westfield State University', Anne Arundel Community College', Goucher College', Maryland Institute College of Art', Morgan State University', Salisbury University', University of Maryland-College Park', University of Maine at Augusta','Andrews University','Eastern Michigan University','Ferris State University','Lawrence Technological University', Michigan State University', University of Detroit Mercy', University of Michigan-Ann Arbor', Wayne State University', Western Michigan University', Dunwoody College of Technology', Minnesota State University-Mankato', Saint Cloud State University', University of Minnesota-Twin Cities', 'Drury University', 'Missouri State University-Springfield', 'Saint Louis University', Southeast Missouri State University', University of Missouri-Kansas City', Washington University in St Louis', Jackson State University', Mississippi State University', Montana State University','Appalachian State University','East Carolina University','North Carolina A & T State

University', North Carolina State University at Raleigh', University of North Carolina at Chapel Hill', University of North Carolina at Charlotte', University of North Carolina at Greensboro', North Dakota State University-Main Campus', University of Nebraska-Lincoln', Plymouth State University', 'Kean University', 'New Jersey Institute of Technology', 'Princeton University', 'Rowan University':Rutgers University-New Brunswic':University of New Mexico-Main Campus':University of Nevada-Las Vegas', Columbia University in the City of New York', Cooper Union for the Advancement of Science and Art', Cornell University', CUNY City College', CUNY Hunter College', New York Institute of Technology', New York University', Pratt Institute-Main', Rensselaer Polytechnic Institute', Rochester Institute of Technology', SUNY at Albany', SUNY College of Environmental Science and Forestry', SUNY College of Technology at Alfred', SUNY University at Buffalo','Syracuse University','The New School','Belmont College','Bowling Green State University-Main Campus', Cleveland State University', Kent State University at Kent', Miami University-Oxford', Ohio State University-Main Campus', University of Cincinnati-Main Campus','Ursuline College','Oklahoma State University-Main Campus','University of Oklahoma-Norman Campus', Clatsop Community College', Portland State University', University of Oregon', Bucks County Community College', Carnegie Mellon University', Delaware Valley University', Drexel University', Indiana University of Pennsylvania-Main Campus', Jefferson (Philadelphia University + Thomas Jefferson University)', Marywood University', Pennsylvania State University-Main Campus', Temple University', University of Pennsylvania', University of Pittsburgh-Pittsburgh Campus', West Chester University of Pennsylvania', Polytechnic University of Puerto Rico', Pontificial Catholic University of Puerto Rico', Universidad Ana G. Mendez', University of Puerto Rico', Rhode Island School of Design', Roger Williams University', Salve Regina University', University of Rhode Island', American College of the Building Arts','Clemson University','College of Charleston','South Dakota State University','Belmont University', Middle Tennessee State University', The University of Tennessee-Knoxville', University of Memphis', Del Mar College', Prairie View A & M University', Rice University', Texas A & M University-College Station', Texas Southern University', Texas Tech University', The University of Texas at Arlington', The University of Texas at Austin', The University of Texas at San Antonio','University of Houston','University of North Texas','University of Utah','Utah State University', Hampton University', James Madison University', University of Virginia-Main Campus', Virginia Commonwealth University', Virginia Polytechnic Institute and State University', 'Norwich University', 'University of Vermont', Eastern Washington University', University of Washington-Seattle Campus', University of Washington-Tacoma Campus', Washington State University', 'Western Washington University', 'University of Wisconsin Colleges', 'University of Wisconsin-Milwaukee', Fairmont State University', West Virginia University' IN\_STATE =

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## OUT\_NOCAMPUS =

['30795','49954','40037','40162','28187','42698','40915','53607','40750','51644','63986','39033','36411 ','38179','NULL','39025','38934','67750','61261','57861','59910','60308','72209','57801','41795','52742', 44114','53112','55086','NULL','62482','69368','NULL','NULL','34524','47782','34805','36466','38148','34 904','38353','43409','69534','32324','52000','39921','36755','52952','18420','43414','51550','34442','43 567','37624','63772','40704','62920','42770','42488','NULL','27495','40510','48739','40414','69395','380 20','41074','45634','42048','50643','50643','31434','69764','38540','NULL','40654','70302','NULL','51400 ','50892','68177','70600','48135','46941','54071','30156','29188','55840','60460','35253','34102','52970 ','29498','44704','40746','28902','NULL','53424','59152','62176','42965','27895','32508','26896','28920',' 39655','37705','28502','57214','26539','34927','71975','30914','38410','38121','34380','38277','30776',' 42048',51152','34855','34781','33478','39664','35784','34631','50818','NULL','39454','53452','38058','3 8193';80973';64685';70291';34842';34884';55118';71790';70288';NULL';54714';37193';30608';23 868','43470','65480','65375','13538','31971','30825','34046','51064','45229','46602','43350','38686','43 764','21450','43989','47928','25128','54910','54128','68792','32513','58180','46640','51572','46970','71 715','44812','38253','NULL','NULL','NULL','67620','41516','53486','44602','NULL','50516','47026','2 8454','50740','40458','49350','36372','16646','36232','63158','53848','41770','33425','39860','51786','3 4892','39941','34122','42985','34204','43326','42522','62633','51204','44024','56234','55288','38895','5 1159','50874','41675','38067','26513','35510','27322','35476']

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#### OUT\_FAMILY =

['22416','36622','28776','29458','21859','32883','30981','39407','27592','38484','53166','25899','23823 ','23717','NULL','24564','24472','56650','54813','55071','54013','53749','59395','44643','31463','40162', 32360','40548','42740','NULL','48166','56368','NULL','NULL','18099','35450','25109','24999','28144','24 446','28589','33499','52608','22624','37874','27661','25288','42017','8610','35458','37532','25896','344 09','28426','52972','34204','53400','32148','33088','NULL','17865','31838','39975','33114','54505','3009 2','30798','32776','34158','34631','34631','26538','59164','28794','NULL','25408','56882','NULL','41900', 52710','52297','62500','37877','36741','43307','19467','18658','47340','49990','23576','22622','38922',' 22298','30636','34254','21230','NULL','43398','49702','53338','33245','19685','24858','19768','20362','2 9803','31415','19965','46218','17824','25005','57331','24814','29016','28871','25946','35882','23516','3 5430','39596','25029','27437','26018','29138','27318','24009','40418','NULL','29355','35066','27074','28 907','61578','48775','55991','19802','19844','41426','54126','54788','NULL','42294','27443','21843','144 72','30993','49922','49825','10394','24097','18325','24220','38777','35949','33358','36900','29746','331 76','13422','31158','38092','17878','56310','44300','54902','21133','45176','38640','39608','32494','566 49','33862','27151','NULL','NULL','NULL','55566','36662','42886','39074','NULL','42550','36138','16 989','39160','32066','38654','27006','10968','28111','49308','43480','28057','23398','30936','41716','24 194','28874','25566','33049','24264','29841','33426','51023','39698','35104','42862','46758','27642','39 042','40224','30319','26826','17863','24950','18166','27136']

## PERCENT\_ADMIT =

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## PUBPRI =

['Public','Public','Private','Public','Public','Public','Public','Private','Private','Private','Public','Publi c','Public','Private','Public','Public','Public','Public','Public','Public','Public','Private','Private','Public','Publi lic', Public', Public', Private', Private', Private', Private', Private', Private', Public', Pub Public', Public', Public', Private', Private', Public', P ,'Private','Public','Public','Public','Public','Public','Public','Public','Private','Private','Private','Private','Private','Private','Private','Public','Pu e', Private', Private', Private', Private', Private', Public', Public', Private', Public', Private', Private', Public', Public', Public', Public', Private', Public', Private', Public', Private', Public', ','Private','Public','Public','Private','Public','Private','Public','Public','Private','Public','Public','Publi c', Public', ','Public','Public','Public','Public','Private','Private','Private','Public','Public','Private','Private','Pri vate','Private','Public','Public','Public','Public','Private','Private','Private','Public','P ublic', Public', Private', Public', Public', Public', Public', Public', Public', Private', Private', Private', Public', Private', 'Private', ' vate','Private','Public','Private','Public','Private','Public','Pu Private', Public', Pu Public', Pub Public'

## DEGREE\_COUNT =

 $\begin{bmatrix} [2',6',1',8',2',12',2',13',10',3',4',8',8',2',8',1',1',6',14',1',3',8',9',6',1',3',7',1',2',3',8',1',1',1',4',3',4',4',7', \\ 2',1',17',7',3',14',2',1',6',3',5',4',14',1',6',5',3',5',5',9',11',1',17',4',1',3',5',5',9',2',6',6',3',6',4',5',13',5', \\ 11',2',13',11',4',10',1',6',1',11',1',1',3',1',8',1',3',2',2',6',8',4',11',2',2',11',2',1',21',2',2',1',2',3',11',2',6 ',2',2',3',1',14',3',5',1',4',6',1',1',7',3',1',9',10',5',11',2',16',6',2',5',1',13',7',2',2',10',3',7',3',6',1',5',3',1 \\ 0',4',7',13',2',5',13',2',5',13',1',13',2',4',2',13',4',10',9',12',4',2',3',1',5',3',6',5',1',2',1',12',4',4',1',2',4', \\ 3',2',4',4',12',2',4',7',15',9',8',1',5',4',1',1',8',4',11',2',1',2',13',5',7',1',4',5',3',7' \end{bmatrix} \\ URLS =$ 

['www.aamu.edu/','www.auburn.edu','www.tuskegee.edu','www.uark.edu','www.uca.edu','www.asu.edu/','nau.edu/','www.arizona.edu','www.academyart.edu','www.calbaptist.edu','www.ca.edu','cal poly.edu','www.cpp.edu','www.csun.edu','www.newschoolarch.edu','www.sjsu.edu','www.sonoma.edu','www.sciarc.edu','www.berkeley.edu','www.ucdavis.edu','www.uci.edu/','www.ucla.edu/','www.usc.edu/','www.ucdenver.edu/','uconn.edu/','www.hartford.edu','www.yale.edu','www.cua.edu','www.gwu.edu','www.georgetown.edu','www.howard.edu','www.udc.edu','www.udel.edu/','www.famu.edu','www.fau.edu/','www.fiu.edu','www.fsu.edu','www.usf.edu','www.gatech.edu','www.gsu.edu','www.kennesaw.edu','www.scad.edu','www.savannahtech.edu','www.uga.edu','www.manoa.hawaii.edu','www.iastate.edu','www.uiowa.edu','www.uidaho.edu','www.iit.edu','www.bsu.edu','www.iub.edu','www.bsu.edu','www.iub.edu','www.bsu.edu','www.louisville.edu','www.lsu.edu','www.lsu.edu','www.lsu.edu','www.lsu.edu','www.louisville.edu','www.lsu.edu','www.lsu.edu','www.lsu.edu','www.louisville.edu','www.lsu.edu','www.lsu.edu','www.lsu.edu','www.louisiana.edu','uno.edu','

www.the-bac.edu','www.bu.edu','www.harvard.edu','www.massart.edu','web.mit.edu/student/','ww w.northeastern.edu','www.tufts.edu','www.umass.edu','www.umb.edu','WWW.WIT.EDU','www.west field.ma.edu','www.aacc.edu','www.goucher.edu','www.mica.edu','www.morgan.edu','www.salisbur y.edu','www.umd.edu','www.uma.edu/','www.andrews.edu','www.emich.edu','www.ferris.edu/','ltu.e du','https://www.msu.edu','www.udmercy.edu','www.umich.edu','www.wayne.edu','https://wmich.e du/','www.dunwoody.edu','www.mnsu.edu','www.stcloudstate.edu','twin-cities.umn.edu/','www.dru ry.edu','www.missouristate.edu','www.slu.edu','www.semo.edu','www.umkc.edu/','www.wustl.edu',' www.jsums.edu','www.msstate.edu','www.montana.edu/','www.appstate.edu/','www.ecu.edu','ww w.ncat.edu','www.ncsu.edu','www.uncc.edu','www.uncg.edu','https://www.ndsu.edu ','www.unl.edu/','www.plymouth.edu','www.kean.edu','www.njit.edu/','www.princeton.edu','www.ro wan.edu','newbrunswick.rutgers.edu/','www.unm.edu','www.unlv.edu/','www.columbia.edu','www.c ooper.edu','www.cornell.edu','www.ccny.cuny.edu','www.hunter.cuny.edu','www.nyit.edu','www.nyu. edu','www.pratt.edu','www.rpi.edu','www.rit.edu/','www.albany.edu','www.esf.edu','www.alfredstate .edu','www.buffalo.edu','syr.edu/','www.newschool.edu/','www.belmontcollege.edu','www.bgsu.ed u','www.csuohio.edu/','www.kent.edu','www.miamioh.edu','www.osu.edu/','www.uc.edu','www.ursu line.edu','www.okstate.edu/','www.ou.edu','www.clatsopcc.edu','www.pdx.edu','www.uoregon.edu',' www.bucks.edu/','www.cmu.edu/','www.delval.edu','www.drexel.edu','www.iup.edu','www.philau.e du','www.marywood.edu/','www.psu.edu/','www.temple.edu','www.upenn.edu','www.pitt.edu','www .wcupa.edu','www.pupr.edu','https://cupey.uagm.edu/',http://www.uprrp. edu/','www.risd.edu','www.rwu.edu','www.salve.edu','web.uri.edu/','acba.edu','www.clemson.edu',' www.cofc.edu','www.sdstate.edu/','www.belmont.edu','www.mtsu.edu','www.utk.edu','www.memp his.edu','www.delmar.edu','www.pvamu.edu','www.rice.edu','www.tamu.edu','www.tsu.edu','www.tt u.edu','WWW.UTA.EDU','www.utexas.edu','www.utsa.edu/','www.uh.edu/','www.unt.edu','www.utah. edu','www.usu.edu','www.hamptonu.edu','www.jmu.edu/','www.virginia.edu/','www.vcu.edu/','WW W.VT.EDU','www.norwich.edu','www.uvm.edu','www.ewu.edu','www.washington.edu','www.tacoma .uw.edu/','wsu.edu/','www.wwu.edu','www.uwc.edu','www.uwm.edu','www.fairmontstate.edu/','ww w.wvu.edu']

## LAND\_GRANT =

['TRUE','TRUE','TRUE','FALSE','TRUE','FALSE','TRUE','FALSE','TRUE','FALSE','FA

'FALSE','TRUE','FALSE','FALSE','TRUE','FALSE','FALSE','FALSE','FALSE','FALSE','FALSE','FALSE','FALSE','FALSE','FALSE','FALSE','TRUE','FALSE','TRUE','FALSE','FALSE','TRUE','FALSE','TRUE','FALSE','TRUE','FALSE','TRUE']
REGION =

['South','South','South','South','West','West','West','West','West','West','West','West','West','West','West', West', 'West', 'Northeast', 'Northeast', 'Northeast', 'West', Northeast','South','So uth','South','South','South','South','South','South','South','West','Midwest','Midwest','Midwest','Mi dwest', Midwest', Midwest' idwest', 'Midwest', 'South', 'South', 'South', 'South', 'South', 'South', 'South', 'Northeast', 'N ortheast','Northea st','South','South','South','South','South','Northeast','Midwest','Midwest','Midwest','Midwest','Mi dwest', Midwest', Midwest' idwest', 'Midwest', 'Midwest', 'Midwest', 'South', 'South uth','South','South','Midwest','Mortheast','Northeast' theast','West','West','Northea ';Northeast','Northeast','Northeast','Northeast','Northeast','Northeast','Northeast','Northeast','Northeast','Northeast', east', Midwest', Midwest', Midwest', Midwest', Midwest', Midwest', Midwest', Midwest', South', South', West', 'West', 'West', 'Northeast', 'Northea Northeast', Northeast', Northeast', Northeast', Puerto Rico', Puerto Rico', Puerto Rico','Puerto

Rico','Northeast','Northeast','Northeast','South','Sou

DIVISION = ['East South Central', East South Central', East South Central', West South Central', West South

Central', Mountain', Mountain', Mountain', Pacific', South Atlantic', South Central', East North Central', East South Central', New England', South Atlantic', South Atlantic', South Atlantic', South Atlantic', South Central', East North Centr

Central', East North Central', West North Central', East South Central', East South Central', Mountain', South Atlantic', South Atlantic', South Atlantic', South Atlantic', South Atlantic', South Atlantic', Middle Atlantic', East North Central', Middle Atlantic', New England', New England', New England', New England', New England', South Atlantic', South Central', East South Central', Ea

Atlantic', Middle Atlantic', Mexico, Middle Atlantic', Mexico, Middle Atlantic', Mexico, Middle Atlantic', Mexico, Mexico, Mexico, Mexico, Middle Atlantic', New England', New England', New England', New England', New South Central', New England', New England', New England', New England', Pacific', Pacific', Pacific', Pacific', Pacific', East North Central', South Atlantic', South

CITY = ['Normal','Auburn','Tuskegee','Fayetteville','Conway','Tempe','Flagstaff','Tucson','San Francisco','Riverside','San Francisco','San Luis Obispo','Pomona','Northridge','San Diego','San Jose','Rohnert Park','Los Angeles','Berkeley','Davis','Irvine','Los Angeles','Burbank','Fort Collins','Boulder','Denver','Storrs','West Hartford','New

Haven', 'Washington', 'Washington', 'Washington', 'Washington', 'Washington', 'Newark', 'Tallahassee', 'Bo ca Raton', Miami', 'Tallahassee', Orlando', 'Gainesville', Coral

Gables', Tampa', Atlanta', Atlanta', Kennesaw', Savannah', Savannah', Athens', Honolulu', Ames', Iowa City', Moscow', Chicago', Elgin', Chicago', Carbondale', Chicago', Champaign', Macomb', Muncie', Bloo mington', West Lafayette', Notre Dame', Manhattan', Lawrence', Lexington', Louisville', Baton Rouge', Baton Rouge', Ruston', New Orleans', Lafayette', New

Orleans','Boston','Boston','Cambridge','Boston','Cambridge','Boston','Medford','Amherst','Boston','Boston','Westfield','Arnold','Baltimore','Baltimore','Baltimore','Salisbury','College Park','Augusta','Berrien Springs','Ypsilanti','Big Rapids','Southfield','East Lansing','Detroit','Ann

Arbor', 'Detroit', 'Kalamazoo', 'Minneapolis', 'Mankato', 'Saint

Cloud';Minneapolis';Springfield';Springfield';Saint Louis';Cape Girardeau';Kansas City';Saint Louis';Jackson';Mississippi State';Bozeman';Boone';Greenville';Greensboro';Raleigh';Chapel Hill';Charlotte';Greensboro';Fargo';Lincoln';Plymouth';Union';Newark';Princeton';Glassboro';New Brunswick';Albuquerque';Las Vegas';New York';New York';Ithaca';New York';New York';Old Westbury';New York';Brooklyn';Troy';Rochester';Albany';Syracuse';Alfred';Buffalo';Syracuse';New

York', Saint Clairsville', Bowling Green', Cleveland', Kent', Oxford', Columbus', Cincinnati', Pepper Pike', Stillwater', Norman', Astoria', Portland', Eugene', Newtown', Pittsburgh', Doylestown', Philadelphia', Indiana', Philadelphia', Scranton', University Park', Philadelphia', Philadelphia', Pittsburgh', West Chester', San Juan', Ponce', San Juan', San

Juan', Providence', Bristol', Newport', Kingston', Charleston', Clemson', Charleston', Brookings', Nashville', Murfreesboro', Knoxville', Memphis', Corpus Christi', Prairie View', Houston', College Station', Houston', Lubbock', Arlington', Austin', San Antonio', Houston', Denton', Salt Lake City', Logan', Hampton', Harrisonburg', Charlottesville', Richmond', Blacksburg', Northfield', Burlington', Cheney', Seattle', Tacoma', Pullman', Bellingham', Madison', Milwaukee', Fairmont', Morgantown' STATE =

### Step 4

A script running a loop will place each value into its place within the template script.

for a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s in zip(UNINAMEs, IN\_STATE, IN\_CAMPUS, OUT\_CAMPUS, IN\_NOCAMPUS, OUT\_NOCAMPUS, IN\_FAMILY, OUT\_FAMILY, PERCENT\_ADMIT, PUBPRI,DEGREE\_COUNT, URLS, LAND\_GRANT, REGION, DIVISION, CITY, STATE, ONG\_ID, AT\_ID): print(other\_template.format(a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s))

### VALIDATING DATA IN GEOJSON FORMAT

Validating the converted geojson data is a bit tricky. I recommend this validator from jsonformatter.org.

THE FILES - The data is being transferred to three separate geojson files.

- File 1: base university data
  - o Each element that is specific to the university but does not change with program
  - o Columns:
    - Added
      - university
      - main\_url
      - long
      - lat
      - geo
      - instate\_tuition\_and\_fees
      - In-state\_tuition\_living\_on\_campus
      - Out-of-state\_tuition\_living\_on\_campus
      - In-state\_tuition\_living\_off\_campus
      - Out-of-state\_tuition\_living\_off\_campus
      - in-state\_tuition\_living\_with\_family
      - Out-of-state\_tuition\_living\_with\_family
      - percent\_admitted
      - funding\_source
      - Land\_grant\_university
      - degree\_count
    - To be added
      - hbcu
      - Tribal\_college
      - number\_of\_undergrad\_students
      - healthcare\_schools
      - region\_count
      - university\_by\_region\_count
- File 2: individual program data
  - o Each feature is a specific program, independent of nested university
  - o Columns:
    - All data not included in file 1
    - No file 1 data except for:
      - Long
      - Lat
      - university
- File 3: grouped data
  - o Each university is a feature with nested program data within it
  - Columns:
    - All

## **DATA CLEANING**

Demographic data was removed because it was incomplete or unavailable.

Some data still needs to be added to fill in blanks:

- Significant instances of no data appear in the following columns:
  - o degree department, professional
- Scattered blank cells appear in:
  - degree\_type, accreditation, degree\_url, IPED\_BEA\_Level,
     IPED\_classification\_sector, IPED\_classification\_control
- Pockets of missing data that is across the entire row appear in:
  - dual\_type\_joint\_bach\_masters through dual\_subject\_other

## Missing tuition data schools

The missing data follows three distinct patterns with only one school missing all tuition data. The first pattern is schools are missing the two on-campus data values. The second is those missing the last four values, the off-campus and with-family tuition data for in and out of state. The last is schools that are missing all values aside from the base in-state tuition value (so no specifics or breakdown data is available. The split is pretty even among institution types (Public-15; Private -14). Pattern one schools are often missing percent\_admitted data, but not always. There are some schools that have missing admission data without a null tuition value (Cooper Union for the Advancement of Science and Art, Academy of Art University,). Those in pattern three all tend to be missing the following columns as well:

- hbcu
- tribal college
- IPED BEA Level
- IPED classification sector
- IPED classification control
- percent admitted
- number\_of\_undergrad\_students

Pattern one schools (missing in-state\_tuition\_living\_on\_campus, out-of-state\_tuition\_living\_on\_campus)

School	Public/Private
Del Mar College	Public
University of Wisconsin Colleges	Public
Southern California Institute of Architecture	Private

University of Colorado Denver/Anschutz Medical Campus	Public
Boston Architectural College	Private
University of Massachusetts-Boston	Public
Anne Arundel Community College	Public
University of Maine at Augusta	Public
Dunwoody College of Technology	Private
University of the District of Columbia	Public
Savannah Technical College - Savannah Campus	Public
Belmont College	Public
Clatsop Community College	Public
Portland State University	Public
Bucks County Community College	Public

Pattern two (missing in-state\_tuition\_living\_off\_campus, out-of-state\_tuition\_living\_off\_campus, in-state\_tuition\_living\_with\_family, out-of-state\_tuition\_living\_with\_family)

School	Public/Private
Yale University	Private
Georgetown University	Private
Howard University	Private
University of Illinois at Urbana-Champaign	Public
Harvard University	Private
Princeton University	Private
Rensselaer Polytechnic Institute	Private

Pattern three (missing in-state\_tuition\_living\_on\_campus, out-of-state\_tuition\_living\_on\_campus, in-state\_tuition\_living\_off\_campus, out-of-state\_tuition\_living\_off\_campus, in-state\_tuition\_living\_with\_family, out-of-state\_tuition\_living\_with\_family)

School	Public/Private
New School of Architecture and Design	Private
University of New Orleans	Public
Lawrence Technological University	Private
Polytechnic University of Puerto Rico	Private
Pontificial Catholic University of Puerto Rico	Private
Universidad Ana G. Mendez	Private
University of Puerto Rico	Public

## Missing all tuition values

- American College of the Building Arts

Missing data should be taken from **IPEDS**.

## Degree columns

There appear to be no consistent patterns for schools missing degree-related information.

A full spreadsheet of the missing data for this section can be found here.

Missing data totals vary widely, with the most missing being under the **Professional** column, and the next highest being **degree\_department**. No data is missing from the degree\_name or degree school type columns. A full list of missing values can be found below.

Column name	Missing count
degree_school	33
degree_department	156
degree_school_type	0
degree_name	0
degree_type	8

degree_level	37
Professional	247
accreditation	6
degree_url	3

#### **Dual columns**

Most schools missing this data are missing it for all rows. The following schools are missing data for ALL columns for the noted programs.

## Florida International University

- M. Architecture
- M.A. Architecture
- M.A. Healthcare Design

### University of Miami

- M.S. Architecture
- M. Urban Design
- M. Real Estate Development and Urbanism
- M. Construction Management

### University of Kentucky

- B.A. Architecture
- M. Architecture
- B.F.A. Interiors: Planning/Strategy Design
- M.A. Interiors: Planning/Strategy/Design
- M.S. Urban and Environmental Design

## Two exceptions include:

Yale University is missing column dual\_subject\_MSRED for the PhD program.

Pennsylvania State University-Main Campus is missing column dual\_subject\_ind\_design for the M.S. Architecture program.

## Directions for filling in NULL values

Mark any data that's origins are unknown within this document.

Ignore empty cells in city\_lat or city\_long data. Those columns are just copies of the other long/lat columns.

If no value is present, please print "NULL" in the empty cell according to the following conditions:

If an empty cell is a calculation, please put **TO\_CALC** in the empty cell until the calculation can be completed with the missing values.

- As of right now, there are no NULL values in calculation columns.

If an empty cell is in the dual columns, please fill it in with **NULL\_zero\_five** to indicate that the value plugged in cannot be outside of this numeric range.

If no value can be found, write **NULL\_F** in the empty cell. This will indicate that the final value can be assumed as NULL.

## DATA VISUALIZATION IDEAS

#### Planned visuals

- Maps
  - One with clickable regions
  - Each school has a dot on the map
  - Narrows down with selectable filters.
- Tables
  - Attached searchable table
  - Exportable filtered tables
- 3 variable plots/heatmaps
  - Using tuition price data with university program metrics

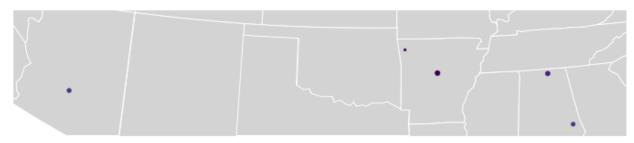
## Design scheme + method

- Presentation
  - Interactive web-based
  - All output should be static
- Method
  - D3 embed of python
- Page flow
  - Linear
    - 2-column design
      - Text on left, images on right
  - Text for column 1:
    - Long-form captions that explain the visuals, what they are and what they mean, how to interact with them, the context they were born from, and the implications of the data they represent
      - Use each long-form caption as a method of illuminating distinct features of the database to center student data collection and the green reconstruction framework that informs it
    - Should also place the maps within this column to interact with the text
      - Map is lead visual with a supporting table linked to the map
        - Second map follows
      - Maps are interactive with sorting elements and clickable regions that will change the table underneath or limit the schools displayed
        - Both are searchable, with filter options and color-coding to indicate regional or filter-option groupings
  - o Imagery for column 2 is support imagery:
    - Additional tables
    - Infographic pop-outs
- Design
  - Minalismistic
  - Clean lines

- Monochromatic or subdued colors
- Linear design emphasized by 2-column layout
- Possible options for style
  - Incorporates watermark
  - Layered text
  - Fine grey lines, de-emphasize borders
  - Grid-like maps
  - Play with white space

### **MAPS**

## [scripts for maps]



Sample map run on test set

```
Script for sample map
```

```
Step 1 - import the data and format for contiguous USA frame
       data3=gpd.read file("https://raw.githubusercontent.com/akrinaldi/geojsonfun/mai
       n/nostrfixed.geojson")
       data3 = data3.query('state not in ["HI", "PR"]')
       contiguous usa = gpd.read file(geoplot.datasets.get path('contiguous usa'))
Step 2 - denote the projection
       proj = gcrs.AlbersEqualArea()
Step 3 - create the axis and add aesthetic attributes, then draw and execute the plot
assigning hue and scale data to desired highlights
       ax = geoplot.polyplot(
              contiguous_usa,
              zorder=-1,
              linewidth=1,
              projection=proj,
              edgecolor='white',
              facecolor='lightgray',
              figsize=(15, 15)
       geoplot.pointplot(
              data3,
              hue='ISTandF',
```

```
scale='PERCENTADMIT', ax=ax
)
```

This code as applied to a fuller dataset produces the following result. This map does not include scaling for PERCENTADMIT because NULL values cannot be present in this value set unless they are recorded as a number (ie. 0).



### **TABLES**

[scripts for tables]

### **HEATMAPS**

Import the relevant Python packages.

from IPython.core.display import HTML import pandas as pd import numpy as np import seaborn as sns

Import the data as a csv file, then set the school value as the unique value for sorting.

```
tuition_raw = pd.read_csv('C:/users/name/folder/file.csv')
tuition_raw["school"] = pd.Categorical(tuition_raw["school"], tuition_raw.school.unique())
tuition_raw.head()
```

Create a matrix of the data.

```
tuition_matrix = tuition_raw.pivot("school", "tuition_type", "tuition_amount")
```

```
tuition_matrix
```

Turn the matrix into a heatmap using seaborn. Set the color scheme to a multi-color spectrum to emphasize tuition rates without outliers disturbing the gradient.

```
fig = plt.figure(figsize=(12,12))
r = sns.heatmap(tuition_matrix, cmap='coolwarm')
r.set_title("Heatmap of Tuition Prices by University")
```

### MAPS WITH TABLES

In RStudio, we can create linked html widgets with shared data.

- > library(leaflet)
- > library(DT)
- > library(crosstalk)
- > library(htmlwidgets)

After loading these packages, I put in a placeholder name ("certscsv" in this case) and loaded the file from a csv.

```
> certscsv <- read.csv("D:/COL_SHEETS/certscsv.csv")
```

Then I made that data into shared data.

```
> sharedcsvdata <- SharedData$new(certcsv)</pre>
```

Then I built the map using leaflet and the table using datatable() from DT.

I then saved the output as a webpage. Those are on the GitHub under the <u>crosstalk-items</u>.

For a more dynamic combination of map and table, the following combines geojson data with an expanded csv dataset. First, load the csv file with all universities and programs.

```
testing123 <- read.csv("D:/COL SHEETS/full data csv.csv")
```

Now load the geojson file with all universities.

testing234 <-

geojson\_read("https://raw.githubusercontent.com/buellcenter/GR-built-environment-program-dat a/main/fullmaps/ugradplusgrad.geojson", what = "sp")

Use leaflet to test that the geojson loaded correctly. A map with blue markers should appear.

leaflet(testing234) %>% addTiles() %>% addMarkers()

We will use this leaflet line with some slight customization for the combined html elements. We add the popup customization when we add our markers (popup = ~htmlEscape(university)). If we would like university labels to be on hover instead of as a popup on click, we can use addMarkers(label=testing234\$university).

The second part that we will build is the reactable table. This will use our csv data. We will customize is to group by university, which will condense multiple programs at one school into a single unit that expands on click. Then, we will make the table sortable by ascending and descending, and searchable, adding a search bar to the top right corner. We will have a default page size of 4 items per page so as not to flood the screen.

We combine these two items under bscols().

## bscols(

```
leaflet(testing234) %>% addTiles() %>% addMarkers(popup = ~htmlEscape(university)), reactable(testing123, groupBy = "university", sortable= TRUE, searchable = TRUE, defaultPageSize = 4))
```

This output can be saved as an html file using the R console. This creates the file "less crowded.html" on <u>GitHub</u> under maps-table-combos. Further add-ons, such as minimaps, can be found <u>here</u>. That said, if we wanted to use saveWidget from the htmlwidgets package, we would have to split these objects up.

```
hhh <- leaflet(testing234) %>% addTiles() %>% addMarkers(label=testing234$university)) iii <- reactable(testing123, groupBy = "university", sortable= TRUE, searchable = TRUE, defaultPageSize = 4))
```

```
saveWidget(hhh, file = "map.html", selfcontained = FALSE)
saveWidget(iii, file = "table.html", selfcontained = FALSE)
```

This creates two highly manageable html files. They are currently under the test folder in the GitHub repository.

### **STILLS**

Note: To change the name of the first column in imported data, use the following command:

```
colnames(data_name)[1] <- "new_name"</pre>
```

Make sure it is [1], otherwise you'll just change the name of the index in the data frame.

To make static graphs of specific comparisons, I started from the clean full dataset on GitHub. Then, I portioned the data into CSVs based on the comparison as necessary. Here, the data is split into public and private for analysis.

```
> publicunis <- read.csv("D:/COL_SHEETS/publicunis.csv")
```

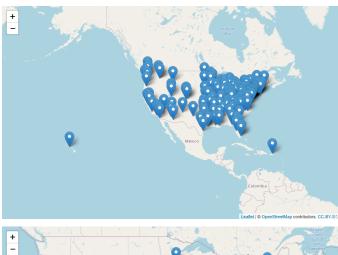
> privateunis <- read.csv("D:/COL\_SHEETS/privateunis.csv")

Then, feed that data into leaflet. Add customization as desired. Some customization options can be found here.

```
> publicunis %>% leaflet() %>% addTiles() %>% addMarkers()
```

> privateunis %>% leaflet() %>% addTiles() %>% addMarkers()

This generates the following images:





These can be saved as html files or as jpegs.

## **EMBEDDING**

## Shortcoding

As the Power website is hosted on drupal and not WordPress, the <u>shortcode system</u> is not the same. This required testing to troubleshoot. Currently, a solution has yet to be found.

### The GitHub module

There might be a method to embed the geojson maps on GitHub. A list of GitHub embedding tips for drupal can be found <a href="here">here</a>. This appears to require a module.

### Scripts

The key ingredient to getting the embed to work is to include the script that calls the relevant styling and formatting into the document. If the embed will recognize this within the body of the web document, it would save trouble. That said, R's html widgets call these scripts in the head.

On testing with d3's script and the ones from the R widget, the graphic would not load and the console returned multiple errors indicating that some of the scripts were either not being read at all or not being read properly.

#### HTML embed

Little progress was made in resorting to the most basic html embed tag. This appears to be a GitHub communication issue. The line I'm using is as follows:

<embed height="200"
src="https://raw.githubusercontent.com/buellcenter/GR-built-environment-program-data/
main/maps-table-combos/attempt2.html" width="500"></embed>

I have used both the link to the raw html and to the permalink from GitHub. Neither of these have worked. They return different errors. The raw link returns the following error:

Refused to display 'https://raw.githubusercontent.com/' in a frame because it set 'X-Frame-Options' to 'deny'.

Using the permalink returns this error:

Refused to frame 'https://github.com/' because an ancestor violates the following Content Security Policy directive: "frame-ancestors 'none".

Another attempt was made using the file path. This returned a 404 error.

## Hosting

If the shortcode does not work, the next option would be to host the page somewhere else and link out to it. This is not ideal, as it forces the user to leave the page. If the embed worked with this outside host, that might be less of an issue. That said, this has not been tested, as the web content is not currently hosted.

#### Possible R Alternatives

The following links show different d3 documents that capture something close to the original idea, but not quite.

- Click the table to zoom on the map
- Basic US Map
  - This could be paired with a table like in the first example