

Data Driven Decision Making & Optimization

A faint, light gray map of North America, including the United States, Canada, and Mexico, serves as a background for the slide. The map is oriented with North at the top and is positioned on the right side of the slide, partially overlapping the title and subtitle text.

Converting Zip Code Data into Distances: A Case Study for Teaching Business Analytics

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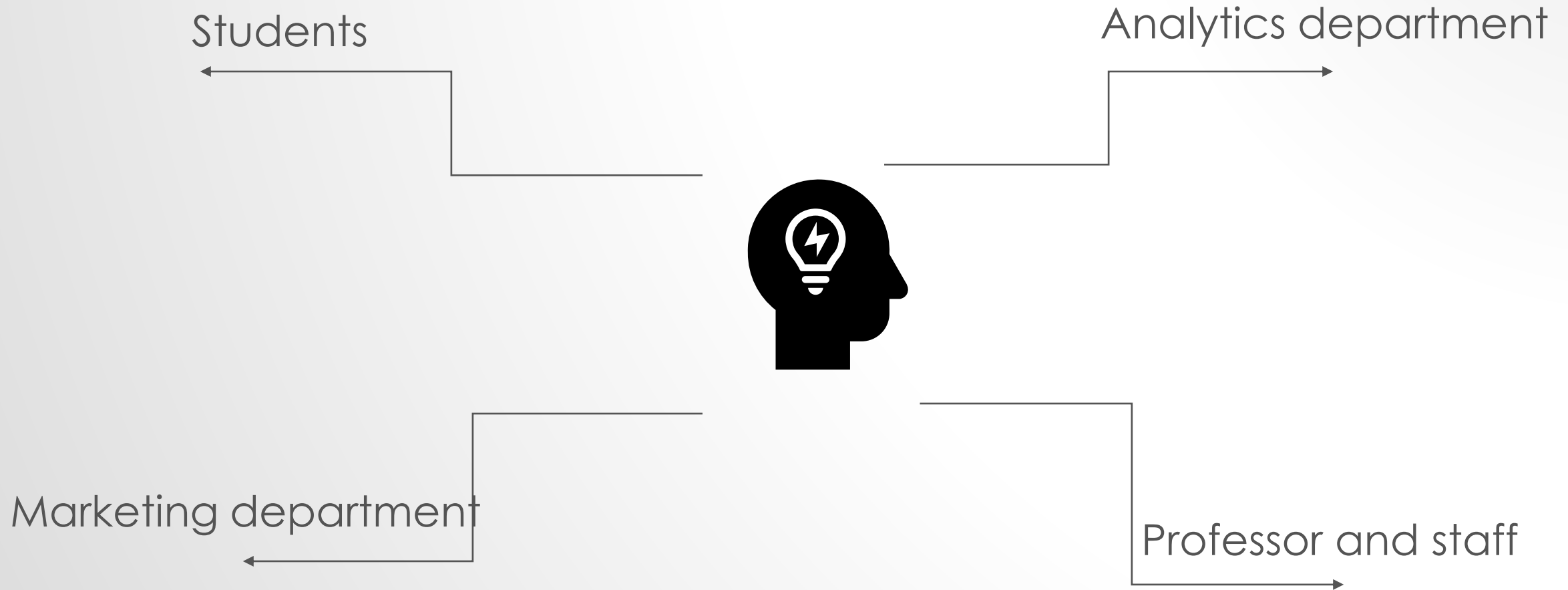
Agenda

- Business problem
- Objective
- Analysis scope and Decisions
- Model
- Results
- Recommendations

BUSINESS PROBLEM

- Business analysis of cases (10-12 requests) with limitations in technology, budget, and time on zip code data of students
 - Case1: Identifying Local, regional, and far away students from Atlanta Campus
 - Case2: Identifying students living near the Macon campus

STAKEHOLDERS





OBJECTIVE

- Fulfilling the business request
- Enhancing productivity and cost efficiency
- Understanding students' demographic



ANALYSIS SCOPE AND DECISIONS

Control: student information

Non-controls: Quality of information, budget and time

Future business development: in-person/online program, marketing events



MODEL

- Great – circle distance formula

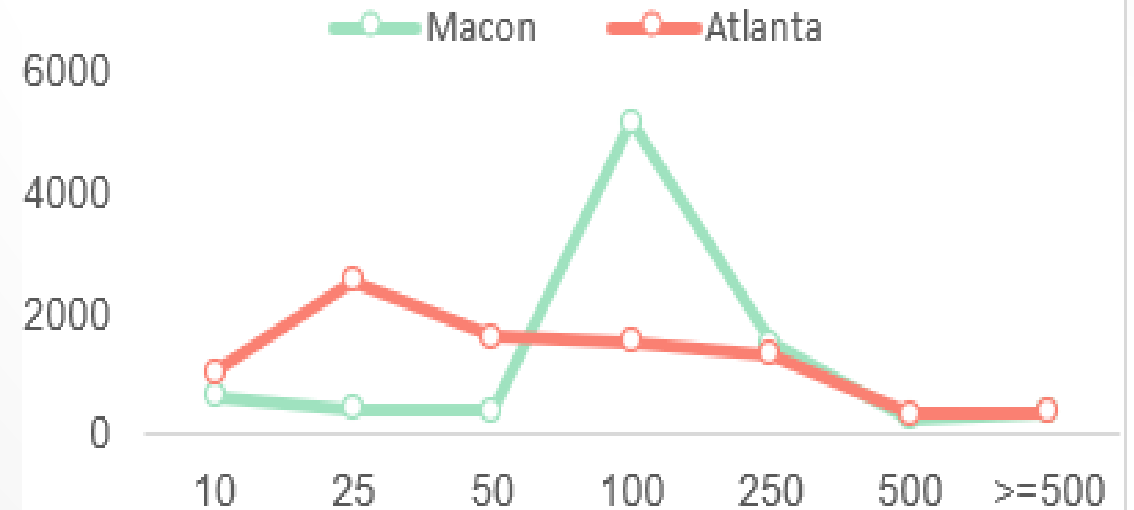
=ACOS(SIN(E5*PI()/180)*SIN(\$O\$5*PI()/180)+COS(E5*PI()/180)*COS(\$O\$5*PI()/180)*COS(\$P\$5*PI()/180-F5*PI()/180))*3443.8985*1.15077945										
Zip Code of All Students										
System StudentID	State	Student Zip Code	Zip Code Standard	Latitude	Longitude	Distance from Macon	Distance from Atlanta	Remark	Country	City
270219	GA	31204	31204	32.83	-83.65	1.15077945	82.988	Keep_Valid to calculate distance	America	MACON
278717	GA	30083	30083	33.8	-84.17	73.520	10.179	Keep_Valid to calculate distance	America	STONE MOUNTAIN
279571	CA	90017	90017	34.05	-118.26	1989.946	1938.817	Keep_Valid to calculate distance	America	LOS ANGELES
242979	GA	30214-1824	30214	33.44	-84.46	63.099	33.123	Keep_Valid to calculate distance	America	FAYETTEVILLE
264983	MD	20874	20874	39.17	-77.26	565.509	534.404	Keep_Valid to calculate distance	America	GERMANTOWN
267087	GA	30062	30062	33.95	-84.54	92.971	14.202	Keep_Valid to calculate distance	America	MARIETTA
197168	GA	30084	30084	33.85	-84.22	77.863	5.750	Keep_Valid to calculate distance	America	TUCKER
266648	GA	30542	30542	34.18	-83.92	94.669	29.145	Keep_Valid to calculate distance	America	FLOWERY BRANCH
267682	GA	30339	30339	33.86	-84.47	85.562	10.146	Keep_Valid to calculate distance	America	ATLANTA
277804	CT	6611	6611	41.25	-73.2	818.623	791.743	Keep_Valid to calculate distance	America	TRUMBULL
286841	GA	30076-4532	30076	34.03	-84.35	92.317	9.438	Keep_Valid to calculate distance	America	ROSWELL
288003	GA	30248	30248	33.34	-84.1	43.870	40.410	Keep_Valid to calculate distance	America	LOCUST GROVE
289595	GA	30144	30144	34.02	-84.61	99.230	19.626	Keep_Valid to calculate distance	America	KENNESAW
259097	GA	30206	30206	33.09	-84.43	48.711	56.525	Keep_Valid to calculate distance	America	CONCORD
283995	FL	32052-6228	32052	30.51	-82.95	165.680	247.421	Keep_Valid to calculate distance	America	JASPER
288657	GA	31643	31643	30.78	-83.56	141.898	220.088	Keep_Valid to calculate distance	America	QUITMAN
96214	GA	30084-2728	30084	33.85	-84.22	77.863	5.750	Keep_Valid to calculate distance	America	TUCKER



DASHBOARD

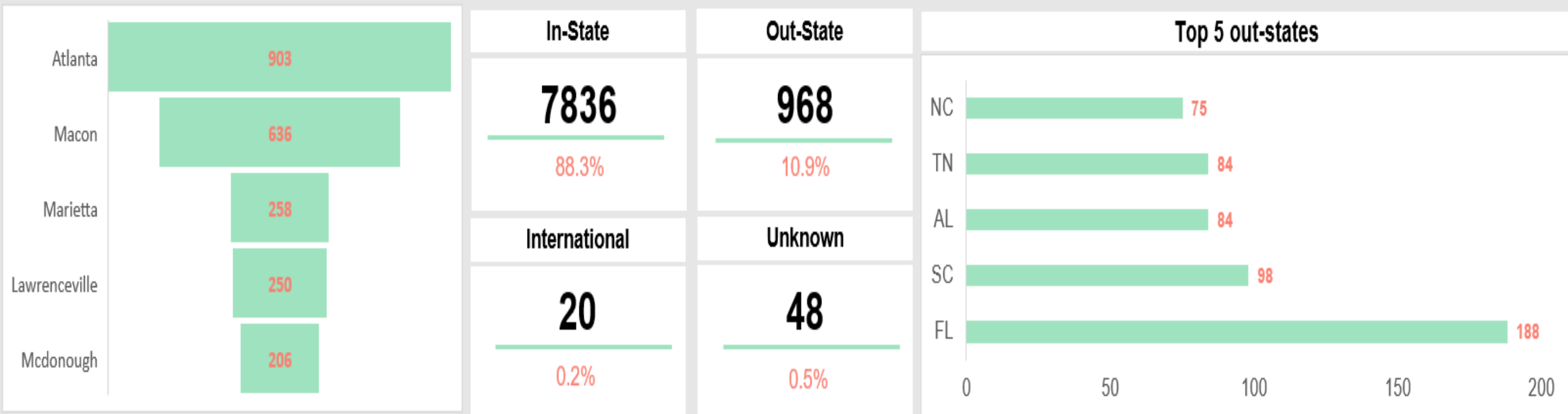
Distance (miles)	Macon	Atlanta
10	636	1051
25	432	2548
50	406	1609
100	5162	1551
250	1525	1320
500	274	360
>=500	389	385

The distances of Macon & Atlanta





DASHBOARD





RECOMMENDATIONS

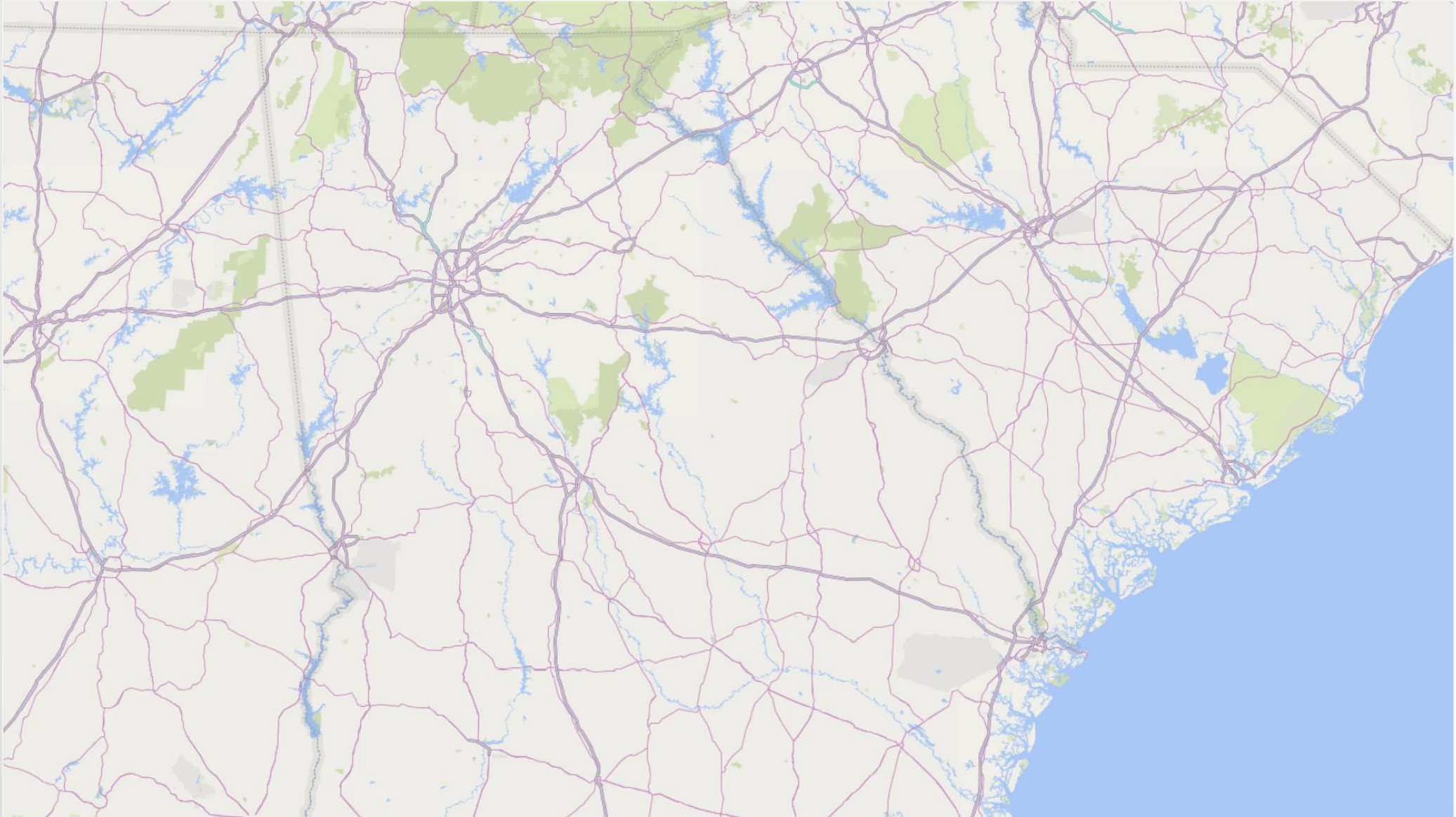
- ✓ Using different free to use features in excel
 - Using functions like Geography or using VLOOKUP
 - Visualizations like Maps and 3D maps
- ✓ Nearly more than 50% of students are regional or far away students.
 - We can offer better housing packages/facilities
 - Also increasing the housing capacity would help to cope with demand



RECOMMENDATIONS

- ✓ Planning admission drives at local high schools for in-state students and offer scholarships for out of state students with the focus being in top 5 states NC, SC, TN, AL and FL.
- ✓ We should onboard more International students

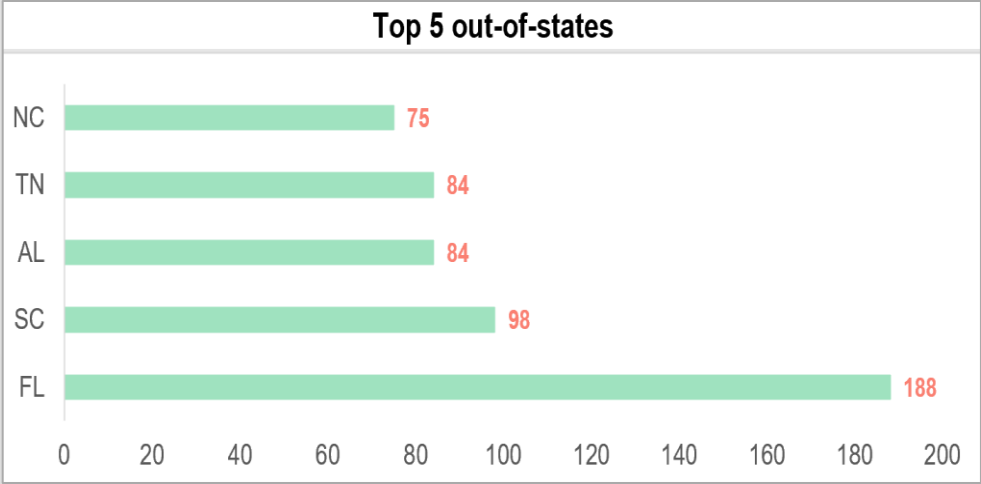
3D MAPPING



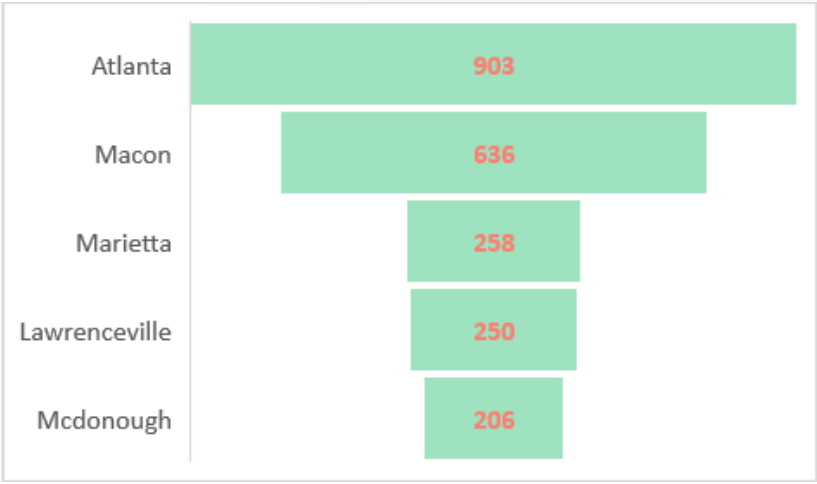
APPENDIX

- Distance in Miles=
$$\text{ACOS}[(\sin(\text{Lat_place_1} * \text{PI}() / 180) * \sin(\text{Lat_place_2} * \text{PI}() / 180) + \cos(\text{Lat_place_1} * \text{PI}() / 180) * \cos(\text{Lat_place_2} * \text{PI}() / 180) * \cos(\text{Lon_place_2} * \text{PI}() / 180 - \text{Lon_place_1} * \text{PI}() / 180))] * 3963.1695$$
- <https://blog.batchgeo.com/manipulating-coordinates-in-excel/>
- Vlookup function

APPENDIX

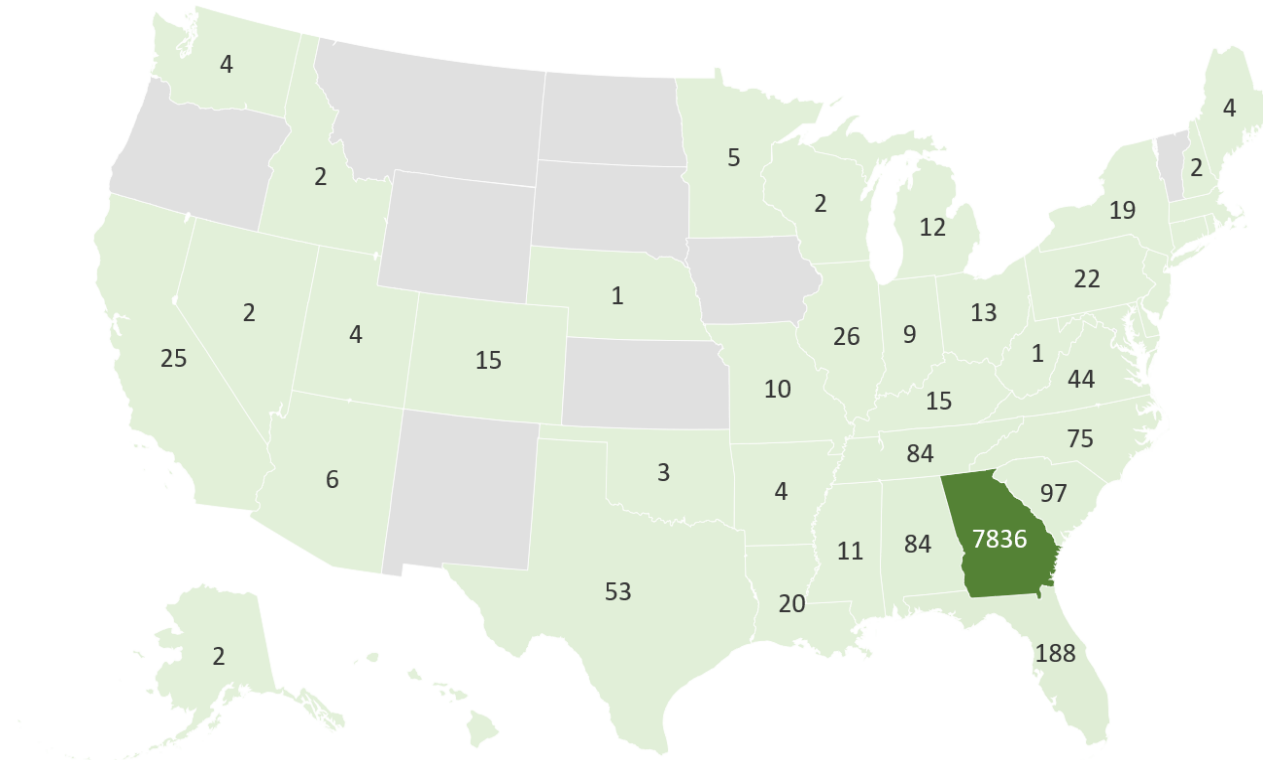


In-State	Out-State
7836	968
88.3%	10.9%
International	Unknown
20	48
0.2%	0.5%



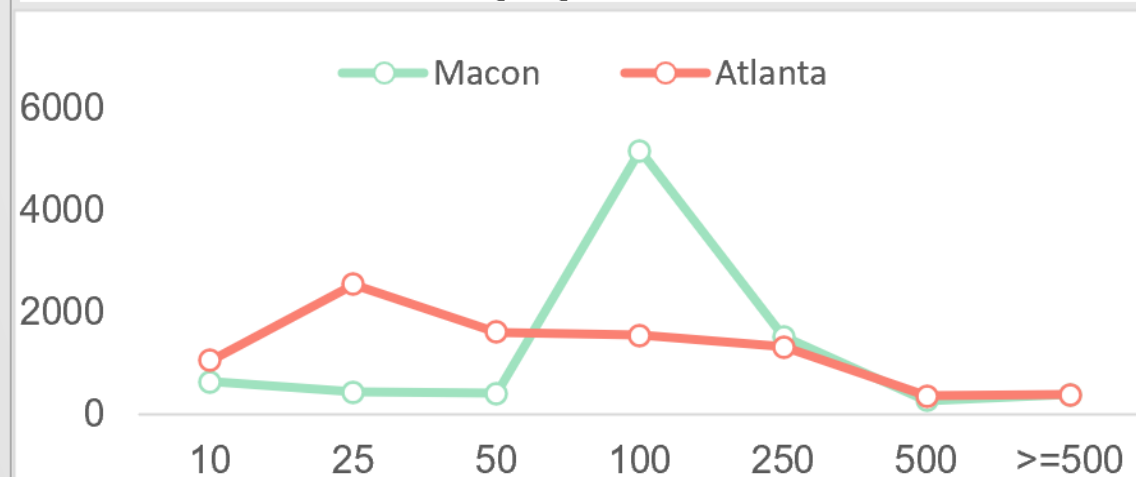
APPENDIX

The distribution of students in US



APPENDIX

The distance b/w pupil to Macon & Atlanta



% distance < 500 miles



% distance < 500 miles



APPENDIX

Field name	Description	Data Type
System Student ID	Student Identification number	Number
State	State code	Char
Student Zip Code	Postal code of the student location	Varchar
Zip Code Standard	Cleaned postal codes of student location	Varchar
Latitude	Geocode of location	Number
Longitude	Geocode of location	Number
Distance from Macon	Distance from student's location to Macon	Number
Distance from Atlanta	Distance from student's location to Atlanta	Number
Country	Country of student's location	Char
City	City of student's location	Char