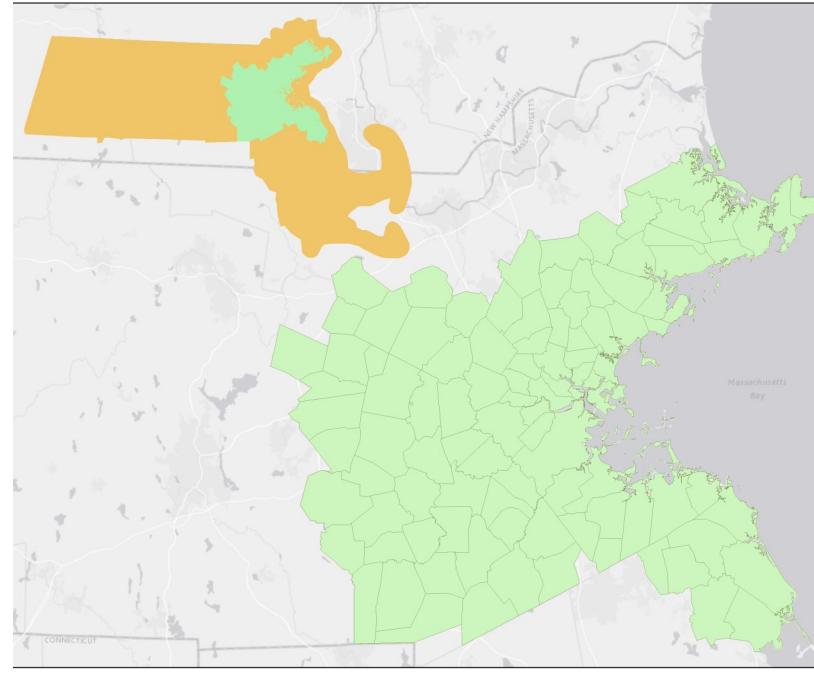


HOW EASY IS IT TO HAVE FUN

Measure the accessibility to entertainment destinations



INTRODUCTION



Research Area

The Metropolitan Area Planning Council (MAPC) is the regional planning agency serving the people who live and work in the 101 cities and towns of Metropolitan Boston.

A considerable body of research seeks to develop models and measures of accessibility, which has been defined as "the ease with which activities at one place may be reached from another via a particular travel model. Compared with adults, the main daily destinations for young students after school (defined as below 21 years old) may be entertainment facilities, such as amusement parks and public libraries. As for travel model, most young students do not have their own car or haven't reached the legal driving age, also in some semi-urban counties, the public transportation is not complete enough to rely on. Therefore, walking is a popular travel model among young students in MAPC. However, there is relatively little research on accessibility using walk as travel mode to entertainment destinations.

DATA DESCRIPTION

Students' Locations & Entertainment Destinations

The student data is from Tufts data Lab, M-drive. This is a table with students' information include age, income, and GEOIDs for each student. I select students under 21 years old. Since block is a very small spatial unit, I assume each student is at the center of its block. Then I join the block shapefile which has longitudes and latitudes with the student table through GEOID10 and get the points shapefile for students' locations (there are more than one students in some blocks, they are shown as a same point).

Four categories of destinations are included to represent entertainment destinations in this project. They are beaches, amusement parks, parks, and public libraries. Data for those destinations are tables from Reference U.S.A. with longitudes and latitudes. I also geocode them to get points shapefiles for those locations.

Roads

The roads data is a line shapefile form Tufts data Lab, M-drive with length (in feet) of all walkable roads in Massachusetts.

METHODS

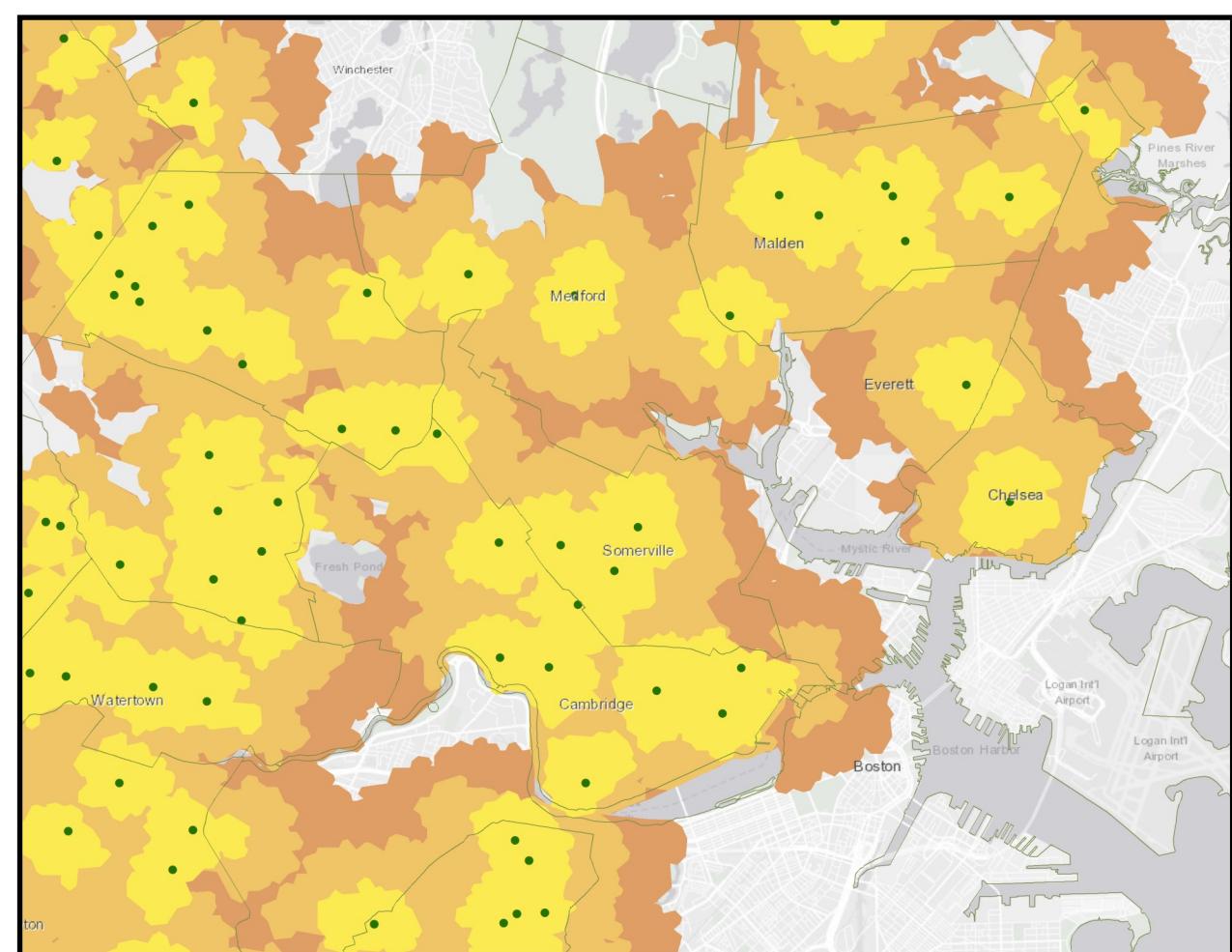
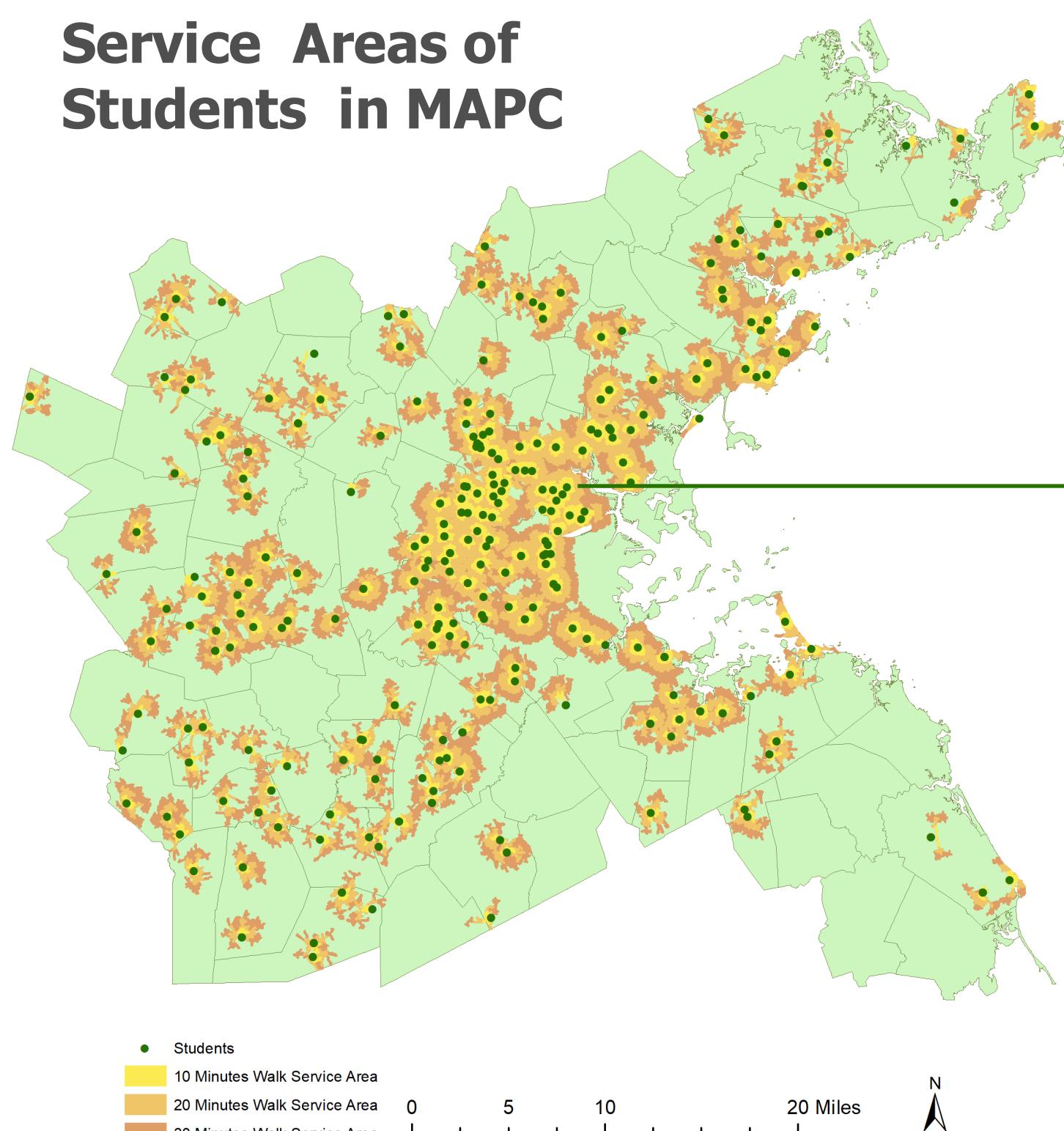
Build service area

I use a Model with for iterator to set up service area. Each student is defined as a facility. The service areas are based on 10, 20 and 30 minutes walk. The walking time is converted to walking distance through the average walking speed (272.3 feet/min).

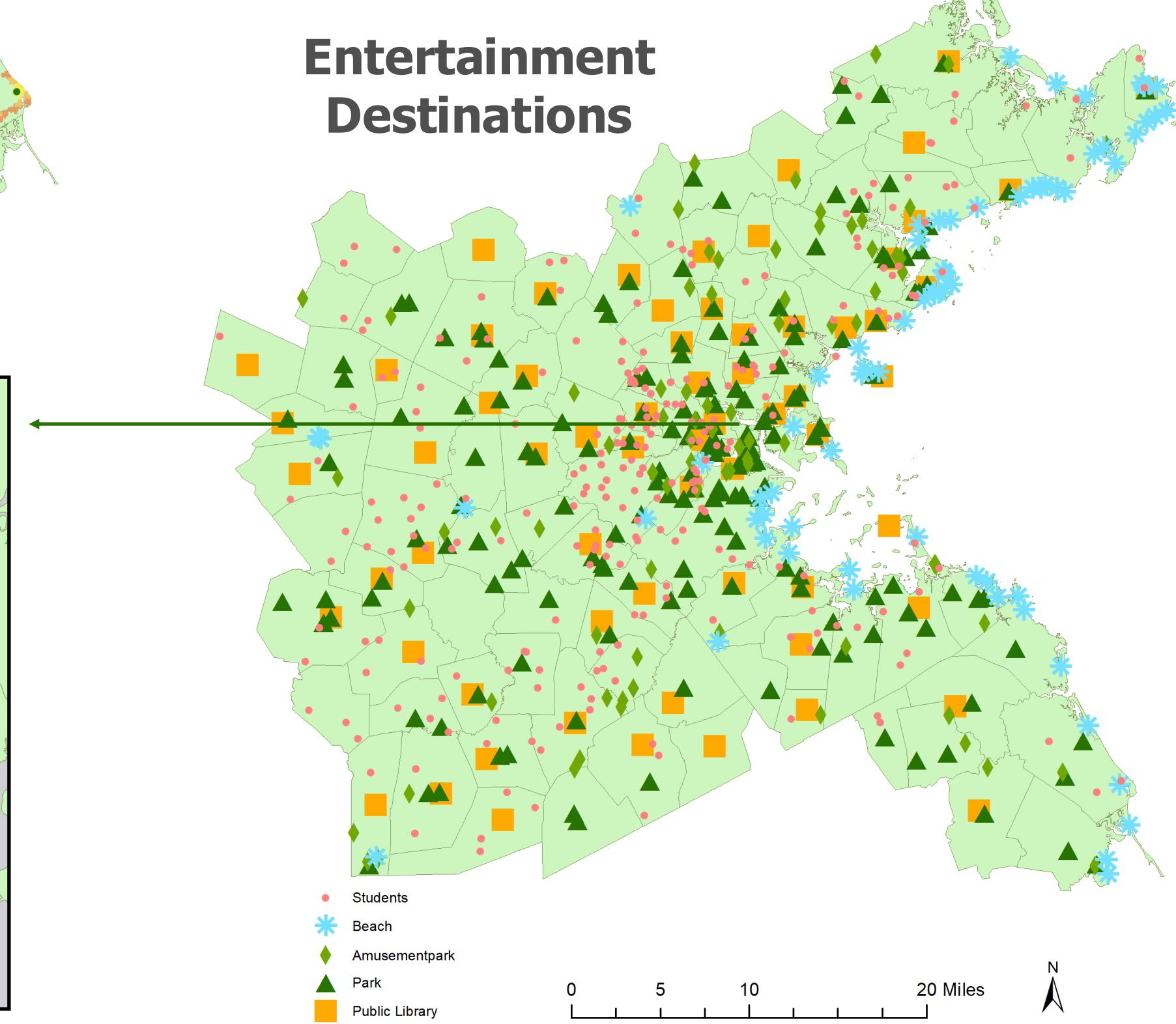
Calculate weighted scores for each student

1) Count destination numbers in each service area: I join four destination shapefiles with three service area shapefiles(10, 20 30 minutes) to count how many des-

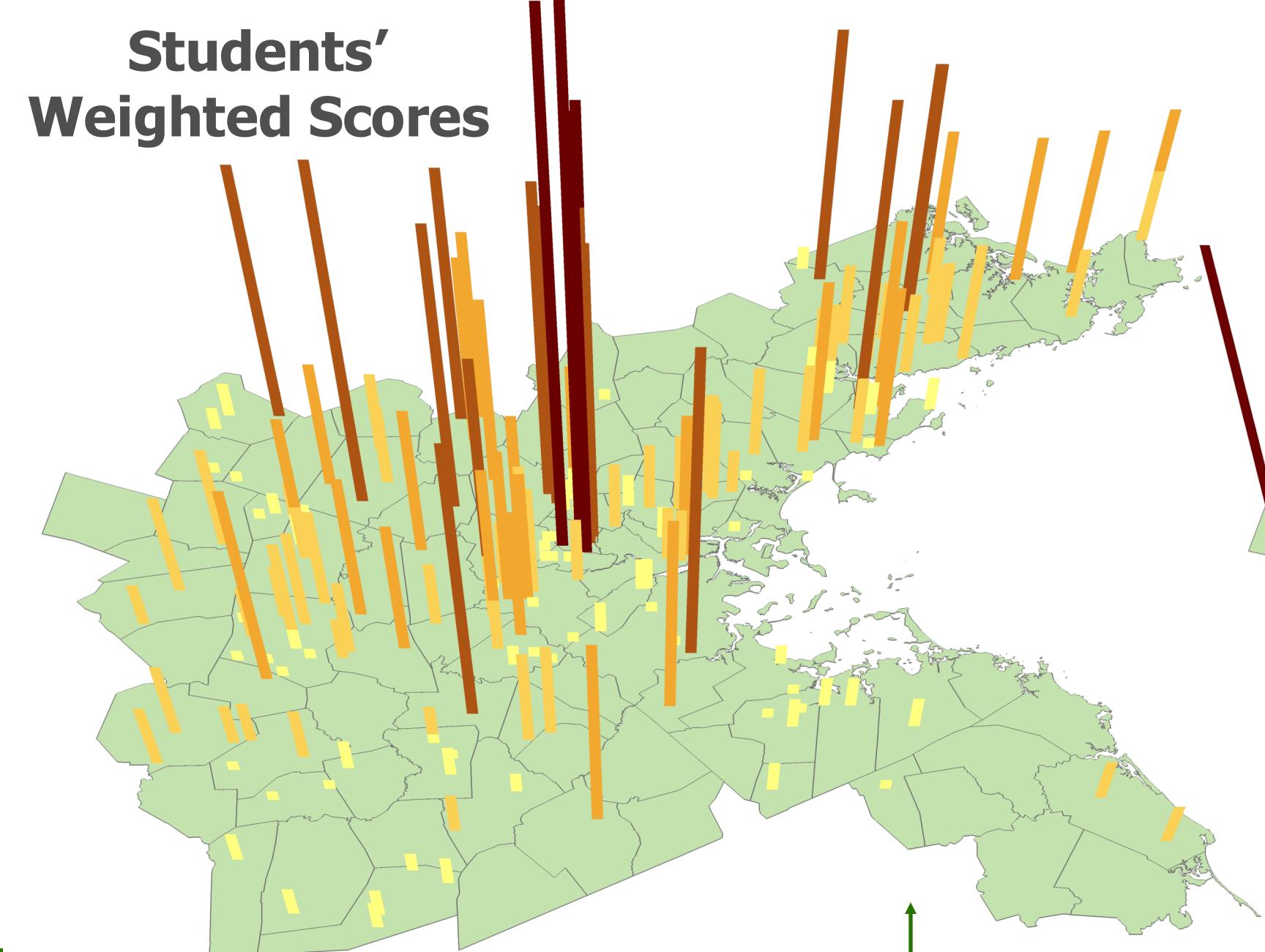
Service Areas of Students in MAPC



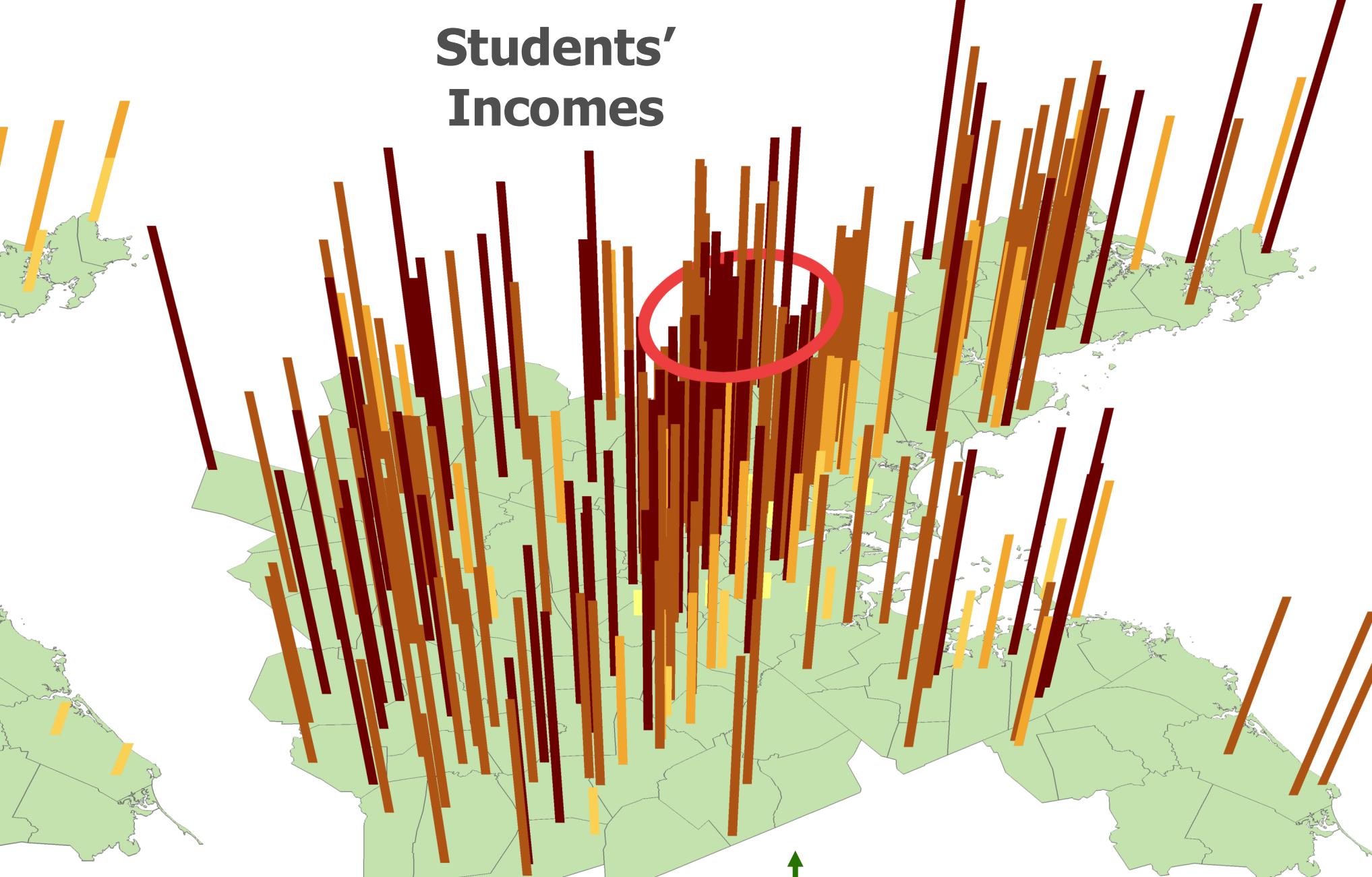
Entertainment Destinations



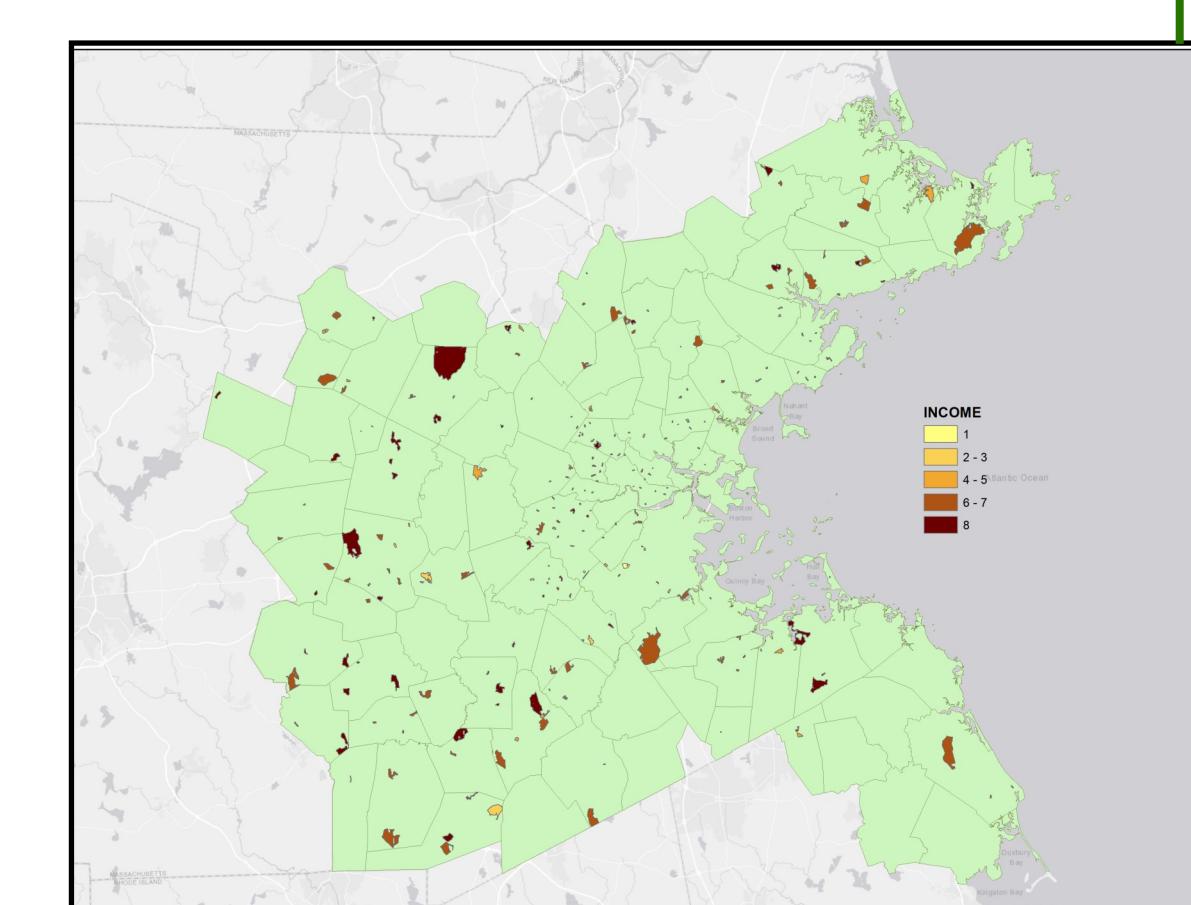
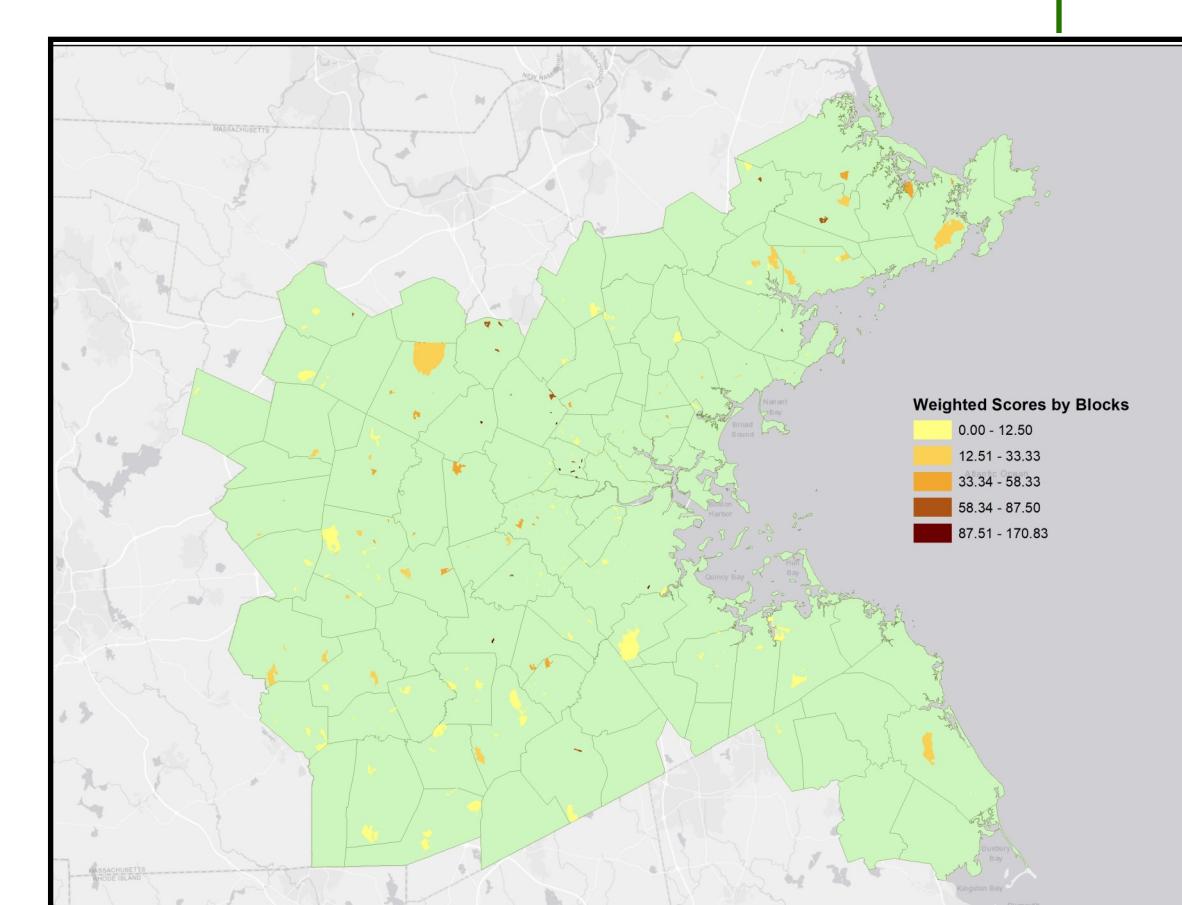
Students' Weighted Scores



Students' Incomes



Peiyao Wang
Advanced GIS 12/17/2019
Data sources: Tufts data lab, Reference U.S.A.
Projection: Lambert Conformal Conic
Coordinate system: NAD1983 State Plane Massachusetts Mainland



tinations are in each student's three service area.

2) Calculate and weight scores: I use those two formulas to calculate the weighted score for each student

$$\text{score of service area} = \frac{(\text{number of beach} + \text{number of amusement park} + \text{number of park})}{\text{number of public library}} \times 1/4$$

$$\text{score of student} = \frac{\text{score of 10 minutes service area} \times 3/6 + \text{score of 20 minutes service area} \times 2/6 + \text{score of 30 minutes service area} \times 1/6}{3}$$

Show scores and compare with students' income

1) Use symbology of books to show scores and income. Since the block layer is joined with the student layer, the score of each student is also the score of each block. (even there may be more than one student in one block, the score represent the accessibility to entertainment destination, so it will remain same) **2)** Use Arc scene to show scores and income to make it more visible and compare the value based on spatial locations. **3)** Use regression to determine the relationship between students' incomes (X) and scores (Y).

RESULTS

Score (Dependent variable)

The calculated results of weighted scores for students are from 0 to 237.5. The average of scores is 19.89, the mode is 0 and the median is 4.17. This means a large of students are under low accessibility to entertainment destinations.

	Regression Statistics
Multiple R	0.001037082
R Square	0.0000010755
Adjusted R Square	-0.00244391
Standard Error	31.12488787
Observations	411
Don't Know	

Income (Independent variable)

The income of students is represent as numbers. From the 3D map, the spatial distribution is basically random in MAPC.

Relationship

For the excel regression result, multiple R representants the correlation coefficient. It tells us how strong the liner relationship is. Since multiple R equal to 0.001037 in the result, which is close to 0, the liner relationship between income and the accessibility to entertainment destinations is weak. However, the relationship may not be liner and there may also exist other factor which influence the scores.

CONCLUSIONS AND LIMITATIONS

Rich people can enjoy more resources?

The regression result may not be accurate enough because of the limitation of data. There is no significant high income cluster area looking from the 3D map. However, comparing two 3D maps, some students with high income (in red oval) is associated with high accessibility scores. Probably there do exist relationship between income and accessibility to local entertainment destination, may be not directly.

Data Limitation

The student data does not include all students of MAPC, there are only 444 students. Thus the result may not be accurate enough because of the missing of data. Also, each student is assumed to be at the center of each block. Since the accessibility to amusement destinations is related to spatial locations, although block is a small spatial unit, this assumption may cause error.

