Bivariate Mapping Based on Students Spatial Preferences in the Selection for a Student's Dormitory Location in Bandar Lampung Area

Rachmawati Fitri Oktaviani[1]*, Mochamad Firman Ghazali[2], and Armijon[1]

[1]*Department of Geodesy and Geomatics, Faculty of Engineering, Universitas Lampung, Jl. Prof. Dr. Sumantri Brojonegoro No.1 Bandar Lampung 35145, Indonesia*

[2]*Department of Geography Education, Faculty of Teacher Training and Education, University of Lampung, Jl. Prof. Dr. Sumantri Brojonegoro No.1 Bandar Lampung 35145, Indonesia*

[*]*Corresponding e-mail: rachmawati.fitri3004@students.unila.ac.id*

Article Information:

Received:
6 November 2022

Received in revised form:
2 January 2023

Accepted:
5 May 2023

Volume 5, Issue 1, June 2023
pp. 7 – 13

http://dx.doi.org/10.23960/jesr.v5i1.106

Abstract

Boarding houses, or better known as student's dormitory, are a choice of places to live for overseas students, both from outside the island and outside the city, who are studying at a university. Most students who choose a boarding house as a place to live consider cost savings and flexible rental times. The need for boarding houses is very necessary for students. The purpose of this research is to find out the strategic location of boarding houses to live in based on their main preferences. In this study the technique of collecting data was in the form of distributing questionnaires, which were allowed to be filled out by Universitas Lampung (Unila) students. This research uses Geoda to produce LISA maps and uses Qgis to produce bivariate maps. From the results of the analysis above, it can be concluded that based on testing the significance of the Moran's Index, the results obtained were 92 non-significant, 3 Low-High and 5 High-Low with a Moran'I value of -0.052. The implications of this research are based on the results of the research so that students know the location of boarding houses which are strategic and in accordance with the factors needed.

Keywords: *Student's dormitory, Bivariate Map, LISA maps, and Geoda.*

I. INTRODUCTION

Along with the increasing population from time to time and the rapid process of urbanization and transmigration in people's lives, the need for housing also increases proportionally [1]. Migrating is a social phenomenon that has existed since ancient times until now. One of the factors that encourage someone to migrate is to achieve success through better quality education in the desired field. Bandar Lampung is one of the destinations for most students from various regions to study. Their presence has implications for the increase in various necessities of life, one of which is temporary housing. Kampung Baru Village is a densely populated area with boarding houses filled with students because the Kampung Baru Village area is close to several college campuses in this city.

Lampung University is one of the state universities in Lampung Province. Every year, the University of Lampung accepts a large number of new students. In this case, it causes an increase in the student's need for a boarding house to be used as a place to live. However, everyone has considerations when they want to choose something. These choices of something are called preferences [2]. In determining the decision to choose a boarding house, of course, there are several factors that influence student decisions. There are several main preferences of students in choosing a boarding house, namely location, price, distance, accessibility and facilities. However, with the many needs of students in choosing boarding houses, sometimes students will move between boarding houses for several reasons, namely the rental price which they think is becoming more expensive, the comfort of the boarding house itself, and also the location of the boarding house which is far from campus, where to eat, or other places to eat.

According to the Big Indonesian Dictionary, boarding house is staying at someone else's house with or without food (by paying monthly). Boarding houses or better known as boarding houses are one of the choices of residence for overseas students from outside the island or outside the city who are studying at a university. Most students who choose a boarding house as a place to live, consider cost savings and flexible rental times. Considering that most of the students have not earned their own fixed income and still expect fees from their parents. The existence of different considerations and desires, gives rise to a preferred choice so that when students feel they do not fit into the boarding house they are occupying. Because shelter is a primary need in human life in addition to clothing and food. Boarding houses are an alternative for students who live outside their hometowns [3]. The area around the campus is the right place for boarding house service providers to provide various facilities to attract consumers [4]

In this research, the dependent variable is distance and the independent variable is price. According to the Big Indonesian Dictonary (KBBI), distance means "the space between (long or far) between two objects or places." Students will choose a boarding house location that is close to campus, but this is still related to the student's decision to rent the boarding house (Widaningsih, 2018). Price is one of the factors that can influence students in determining a decision on the selection of boarding houses. In determining the boarding house rental price, students usually choose a boarding house rental price that is relatively cheap, because the economic situation of each student is different [5]

Based on research by Sugianto, et al. Many factors can influence students in choosing, such as distance, rental rates, room size, and other factors. To overcome the existing problems, a decision support system is needed that can assist students in choosing the right boarding house. The system built using the AHP and TOPSIS methods, where the AHP method is used to calculate the weight of each criterion while the TOPSIS method is used in ranking to get the best boarding alternative. There are 6 criteria used in the system this, namely distance, price, area, type of boarding house, curfew limits and security. the purpose of this research is to map and find out the location of strategic boarding houses to live in based on the distance and price aspects.

II. MATERIALS AND METHODS

A. Study Area

The research was conducted at the University of Lampung in the city of Bandar Lampung which is the capital city of Lampung Province. Geographically, Bandar Lampung City is located at 5o 20' to 5o 30' South Latitude and 105o 28' to 105o 37' East Longitude. Administratively, Bandar Lampung City is limited by: In the north it is bordered by Natar District and South Lampung Regency. To the south it is bordered by Lampung Bay. To the west it is bordered by the District of Gedung Tataan and Padang Cermin, Pesawaran Regency. In the east, it is bordered by Tanjung Bintang District, South Lampung Regency.

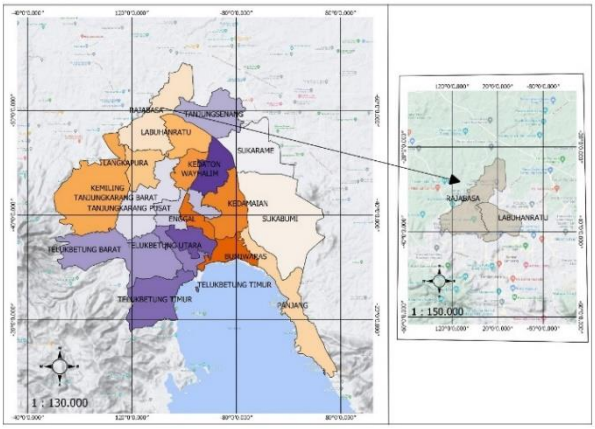

Figure 1 Research Location Map

B. Data

The method of data collection in this study is to use primary data or data obtained directly by researchers such as conducting interviews, distributing questionnaires and direct observations. The questionnaire was filled in by students of the University of Lampung Class of 2018-2021. The population in this study were all students of the University of Lampung, Class of 2018 to 2021. In this study, 100 data were obtained with the number of each per generation as shown in table 1. In this study, distance as the dependent variable and price as the independent variable can be seen in table 2.

Table 1 Research Sample

No	Class Year	Amount
1.	2018	35
2.	2019	37
3.	2020	13
4.	2021	15

Table 2 Research Variable

No	Variable	Indicator

1	Distance (Y)	Distance from boarding house to campus
2	Price (X)	The price for renting a boarding house per year

C. Pre-Processing Data

In the pre-data processing stage, the data that has been obtained is normalized before going to the data processing stage. What is meant by normalizing the data first is that all data that was originally in the form of qualitative data is converted into quantitative data. in Figure 2 it is explained starting from the preparation stage, namely searching for literature and collecting data, the data processing stage with the chi square method and the final stage with the results of bivariate index maps.

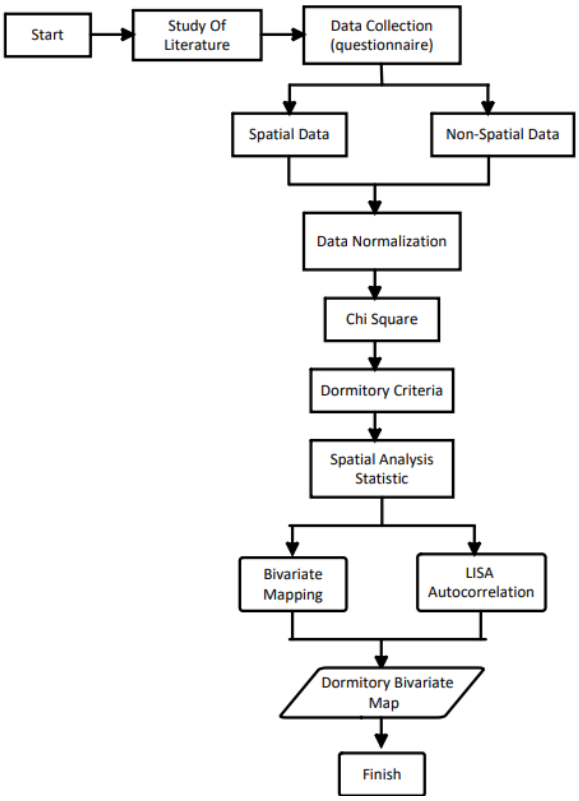

Figure 2. Research Flowchart

D. Data Processing

1. Uji Chi Square

Chi Square test is one type of non-parametric comparative test which is carried out on two variables, where the data scale of these two variables is nominal [6]. The chi square test is also one way to find out the significance of the difference between the proportions of subjects or research objects whose data has been categorized. The usefulness of this chi square is to get the relationship or influence of two nominal variables (independent test between two variables), the strength (degree) of the relationship between one variable and another nominal variable which is expressed by the symbol C stands for *Coefficient of Contingency*. After the chi square test has been carried out, we will calculate the price of the contingency coefficient which is given the symbol C. This contingency coefficient is to find or calculate the close relationship between two variables that have ordinal symptoms or categories. Here's the formula to calculate the contingency coefficient.

$$\mathbf{C} = \sqrt{\frac{X^2 hitung}{x^2 hitung + N}}$$

where:

C = Coefficient Contingency

X^2hitung = The Calculation result Chi Square

N = amount of data

The the maximum contingency coefficient price is calculated by the formula below:

$$Cmaks = \sqrt{\frac{m-1}{m}}$$

Information :

Cmaks = Price Contingency Coefficient

m = minimum price between row and column

After we get the values of C and Cmax, then we compare the closeness between variable I and variable II which is determined by the percentage notated by Q.

$$Q = \frac{C}{Cmaks} x\ 100\%$$

Based on the results of the comparison of the values of c/cmax, it can be concluded that the closer c is to cmax, the greater the relationship between the two variables. According to Supranto [7] the comparison of the value of c/cmax is as follows :

1) Very close if C/Cmaks ≥ 0.70
2) Close if C/Cmaks 0.50 – 0.69
3) Close enough if C/Cmaks 0.30 – 0. 49
4) Less tight if C/Cmaks 0.10 – 0.29
5) Can be ignored if C/Cmaks 0.01 – 0.09
6) Nothing if C/Cmaks = 0.0

2. Local Indicator of spatial association (LISA)

Local Indicator of Spatial Association introduced by Anselin (1995) provides a way to assess the level of local spatial patterns, besides that it can also be used the same as the Moran Scatterplot [8]. Spatial autocorrelation is a spatial analysis to determine the pattern of relationships or correlations between

locations (observations). Some of the tests in this spatial autocorrelation are Moran's I, Geary's Ratio, and Local Indicator of Spatial Association (LISA). This method is used for identification of spatial modeling and also to obtain information about the pattern of distribution of the characteristics of an area and the interrelationships between locations within it [9]. The outputs of the LISA analysis are in the form of a significance map, cluster map, box plot, and Moran scatter plot.

3. Significance Map

The significance map shows areas with significant statistical (p-value) values. The significance map classifies areas with significant differences in values. The p-value on the significance map can be said to be significant if it is below 0.05 [10]. The significant value indicates the level of spatial relationship between regions [11].

4. Cluster Map

The cluster map consists of four quadrants, quadrant I high-high, quadrant II low-high, quadrant III low-low and quadrant IV high-low. In addition, this cluster map displays areas that are not classified (not significant) and areas that do not have a neighboring relationship with other areas (neighbor less).

a. The HH (High-High) quadrant shows that areas with high observation values are surrounded by areas with high observation values.
b. The LH (Low-High) quadrant shows that areas with low observation values are surrounded by areas with high observation values.
c. In the LL (Low-Low) quadrah, it shows that areas with low observation values are surrounded by areas with low observation values.
d. In the HL (High-Low) quadrant, it shows that areas with high observation values are surrounded by areas with low observation values.

5. Box Plot

Box Plot is a summary of data presented in the form of a graphic diagram that aims to see how the data is distributed. in this box plot displays the presence or absence of data with extreme values or commonly called outliers.

6. Moran Scatter Plot

The Moran scatter plot shows the value of Moran's I. Moran's I aims to identify autocorrelation coefficients locally by finding spatial correlations in each area. Moran's I interpretation can be seen through a regression line that describes a linear relationship between observations and the spatial lag of the value of the observations themselves. Moran Scatterplot is a tool to assess how similar the observed values are to neighboring observations [12].

Table 3 Quadrant

QUADRANT II LH (LOW-HIGH)	QUADRANT I HH (HIGH-HIGH)
QUADRANT III LL (LOW-LOW)	QUADRANT IV HL (HIGH-LOW)

Spatial autocorrelation was carried out to obtain a bivariate map based on student preferences and the relationship between cost distance and cost price. In this study, spatial autocorrelation was measured using the Moran I Index method using the GeoDa application. The stage to perform autocorrelation in GeoDa begins by filling in the Weight File ID Variable, after that the autocorrelation test with Bivariate Local Moran's I and LISA, then enters the cost distance variable and also the cost price variable.

Overall, the research stages consist of: 1) The data collection stage, the stage which is the beginning of this research by collecting the data needed in accordance with the objectives to be achieved. 2) The pre-data processing stage, where at this stage the data that has been obtained is normalized first. 3) The data processing stage, is the stage of data processing to determine the relationship between the distance of the boarding house and the cost of the cost which then the results will be used as a bivariate map.

III. RESULTS AND DISCUSSIONS

A. Test Chi Square

In this research, the first step is to process the data using the chi square test using the SPSS 20 software application, where the chi square test is used to test the relationship and measure the strength of the relationship between one variable and another variable. Below are the results of the chi square test between the distance variable and the price of the boarding house per year.

The table below is the result of the calculation of the chi square test using SPSS 20 that the results of the chi square test between the distance and the price of the

annual boarding house are 0.963, df (degree of freedom) 4, and p-value 0.602.

Table 4 Amount of the Data

Distances (kilometers)	Price *)			Total price
	< 5	5 – 7	> 7	
< 1	16	21	2	39
2 – 3	23	25	3	51
> 4	6	4	0	10
Total	45	50	5	100

*) in million rupiahs or 1,000,000 IDR

Table 5 The Calculation Result Chi Square

Parameters	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1,543[a]	4	,819
Likelihood Ratio	2,007	4	,734
Linear-by-Linear Association	,930	1	,335
N of Valid Cases	100		

a) 4 cells (44,4%) have expected count less than 5.

The minimum expected count is 0,50.

B. Local Indicator of Spatial Association (LISA)

To see a general picture of boarding house mapping in the city of Bandar Lampung, which has a significant spatial effect, the LISA value is used. The LISA value can be used as an indication of the grouping of significant spatial relationships, and significantly has certain spatial relationships such as high-high (HH), low-low (LL), low-high (LW) and high-low (HL).

From the cluster map below (Figure 3), when connected to the Moran's I graph, it can be seen that the red dot is a boarding house location that has a boarding distance and a high boarding house price. In addition, the blue dot is the location of the boarding house which is far away and the price of the boarding house is low. Although there are some pink and light blue dots that fall into the low-high and high-low clusters

Below is a significance map showing the results of the clustering modeling, it is found that the green dots have a higher probability of clustering. This is indicated by the dark green color. The lower the level of significance, the greater the possibility for clustering. In Figure 5 Moran's index on the boarding house distribution data shows a value of 0.007, the value is closer to 0, which indicates that the boarding house distribution data has a positive spatial autocorrelation (> 0).

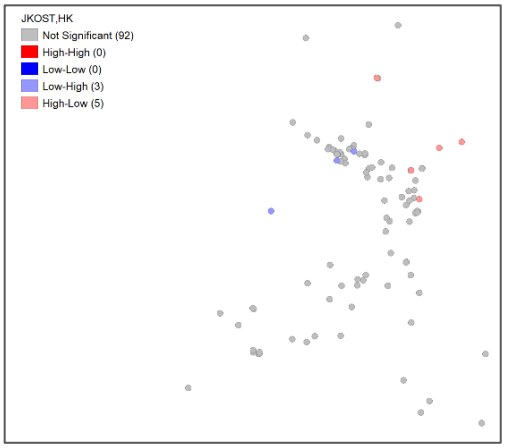

Figure 3 Cluster Map

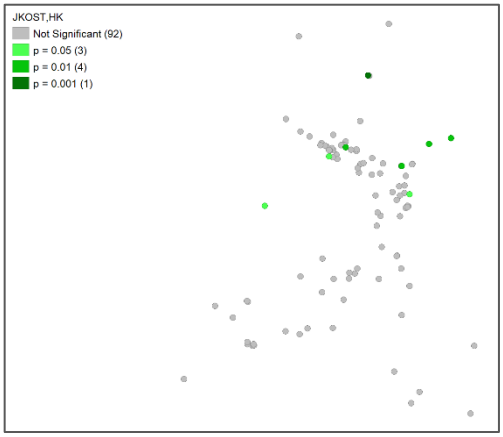

Figure 4 Significance Map

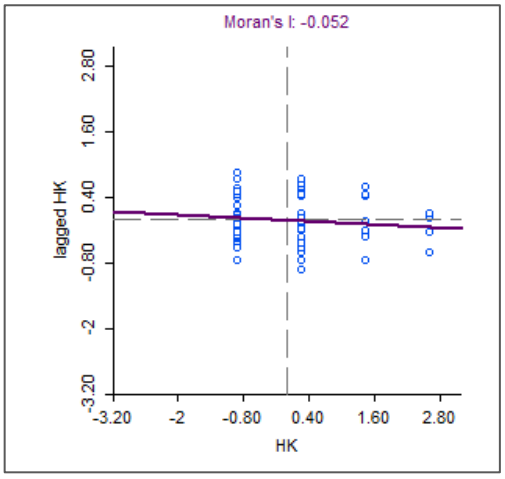

Figure 5 Moran Scatter Plot

C. Bivariate Mapping

Bivariate mapping is a type of thematic map that visualizes areas with color, gradation or pattern based on two variables. Below is the result of a bivariate map using the distance variable (y) and the price variable (x). The results obtained from the questionnaire that on average Unila students occupy boarding houses in Rajabasa District and Labuhan Ratu District. Unila students mostly choose boarding houses with locations that are closer to campus than those that are further away, with the results of the study that based on distances < 1km as many as 39, distances of 2-3 km as many as 51 and distances > 4km as many as 10. Meanwhile, based on the price variable, that students prefer a cheap/affordable price compared to a relatively more expensive price. Unila students choose boarding house rental prices < 5,000,000 for 45, prices for 5,000,000 – 7,000,000 for 50 and prices for > 7,000,000 for 5. Variables distance and price do not have a significant effect. But if the two variables are combined, it has a significant effect, because Unila students see distance and price. If the distance of the boarding house is too far and the price is too expensive, then Unila students prefer the distance that is close to campus and the price is relatively cheaper.

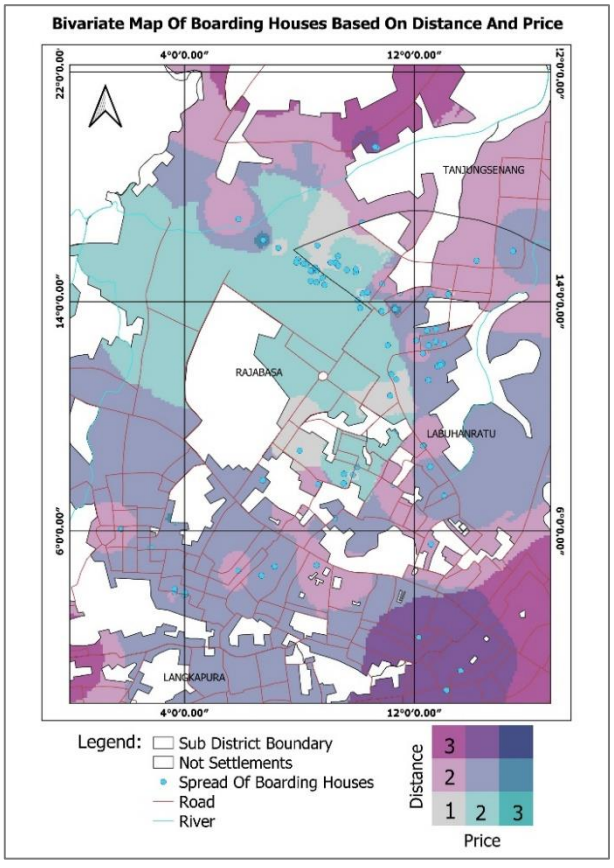

Figure 6 Bivariate Map

IV. CONCLUSIONS

In this study, LISA was applied to identify the distribution of boarding houses for Lampung University students for the 2018-2021 class based on questionnaire data totaling 102 samples. Based on the significance test of the Moran Index, the results are Low-High amounting to 3 and High-Low amounting to 2 with a Moran'I value of -0.052. And based on bivariate mapping, Kampung Baru and Kampung Baru Raya are the places where most students choose boarding houses based on the distance factor and also the rental price factor for boarding houses per year. There were 25 students who chose the location of the boarding house which was a bit far from the campus with a distance of 2-3 km and relatively slightly higher prices. From the results of this study, it is hoped that it can provide knowledge or contribute ideas to all people, especially students. The implications of this study examine how students choose strategic boarding locations to live in based on distance and price aspects.

V. ACKNOWLEDGMENT

The authors thank the Department of Geodesy and Geomatics Engineering, Faculty of Engineering, University of Lampung for their support.

VI. REFERENCES

[1] S. Kosasih, "Sistem Informasi Geografis Pemetaan Tempat Kost Berbasis Web," *CSRID (Computer Sci. Res. Its Dev. Journal)*, vol. 6, no. 3, p. 171, 2015.

[2] K. L. INSYIROH, "Mahasiswa Sebagai Kos Alternatif Menggunakan Metode Analytic Hierarchy Process (Ahp) (Studi Kasus : Kota Malang)," 2020.

[3] R. Melani, "Faktor-Faktor Yang Mempengaruhi Keputusan Mahasiswa Memilih Rumah Kost Perspektif Ekonomi Islam," *Al Ibtida J. Pendidik. Guru MI*, 2020.

[4] J. G. Paruntu, D. Hatidja, and Y. A. . Langi, "Keputusan Mahasiswa dalam Memilih Indekos dengan Analisis Faktor," *J. Ilm. Sains*, vol. 21, no. 2, p. 119, 2021.

[5] Sartika, Tika, 2019. Faktor-Faktor yang mempengaruhi Preferensi Mahasiswa Dalam Memilih Rumah Kost..

[6] ASTI HARDINI, "Penerapan Metode Chi Square Terhadap Hubungan Tingkat Pendidikan Dengan Lapangan Kerja Di Provinsi Sumatera Utara," *Angew. Chemie Int. Ed. 6(11), 951–952.*, pp. 2013–2015, 2021.

[7] Supranto, 2008. "Statistik-Teori-Dan-Aplikasi_Compress." .

[8] W. Weku, A. Setiawan, and J. . Sri Yulianto, "Analisis Pola Spasial dan Dinamika IPM Tahun 2006-2009 Provinsi Sulawesi Utara Menggunakan Metode Spatial Autocorrelation," *rosiding Seminar*

Nasional Matematika. 2012.

[9] D. I. Wulansari, D. M. Ariani, G. Meneng, and K. B. Lampung, "Komparasi spasial dan non-spasial statistik pada pemetaan pemebelajaran daring di universitas lampung," no. 1, 2020.

[10] H. Cui, K. Xie, B. Hu, H. Lin, and R. Zhang, "Analysis of Bus Speed Using a Multivariate Conditional Autoregressive Model: Contributing Factors and Spatiotemporal Correlation," *J. Transp. Eng. Part A Syst.*, vol. 145, no. 4, 2019.

[11] D. R. S. Saputro, P. Widyaningsih, N. A. Kurdi, Hardanti, and A. Susanti, "Local Indicator Of Spatial Association (LISA) Cluster Map untuk Identifikasi Penyebaran dan Pemetaan Penyakit Demam Berdarah Dengue (Dbd) di Jawa Tengah," *Semin. Mat. dan Pendidik. Mat. UNY*, pp. 23–30, 2017.

[12] R. Mailanda, D. Kusnandar, and N. M. Huda, "Analisis Autokorelasi Spasial Kasus Positif Covid-19," vol. 11, no. 3, pp. 483–492, 2022.