

A Spatial Analysis of the Relationship between IT Jobs and Regions in Saudi Arabia

Nouf Alqahtani, Wafa Alqarawi, Amani Alghamdi, Ohud Alosaimi, Omer Alrwais

Information Systems departments,

College of Computer and Information Sciences, King Saud University

Email Id: oalrwais@ksu.edu.sa

Abstract: Saudi Arabia has vast area with sprawling regions. As a result of diversification of kingdom's land-use (such as agriculture, residential, commercial and industrial), the employment opportunities are varied from one region to another. Saudi Arabia struggles with both high aggregate unemployment rates and persistent regional unemployment rate differentials. In this paper, we focus on Saudis' male and female job seekers who imposes IT certifications or capabilities and sectors either public or private which provide IT job opportunities in Saudi's regions. Using GIS-based analysis, in this research, we attend to examining spatial distributions of IT jobs and IT jobs seeker, and analyze relationship between IT jobs and Saudi's regions in order to help both IT job seekers and providers to identify their destination for fill or provide suitable job vacancies and alleviate unemployment. This research shows that the regions with high residential density are highly centralized IT jobs and IT job seekers.

Indexed Terms-GIS, spatial analysis, IT, Job seeker, Sectors, unemployment.

I. INTRODUCTION

Recently we observe the importance of spatial analysis in all life aspects, whether in education, industry, medicine, agriculture or other. We can define spatial analysis as geographic information systems (GIS) vital part. There are three types of operations when spatial analysis involves GIS which are spatial query, new data sets generation from thgenerated databases and attribute query. There are multiple methods of spatial analysis such as single/multiplayer operations/overlay, geometric modeling, surface analysis, point pattern analysis, raster/grid analysis, network analysis, spatial modeling etc. [1].

Spatial analysis has benefits in different fields such as in economic, political, social and other. In this research, we study an important topic that focuses on these different fields and it is clearly reflected in society. In 2018, the General Authority for Statistics conducted a survey of job seekers number for Saudi females and males, where the number of unemployed reached to 923,504. This survey shows the most ages of unemployed are between 25 and 29 years, reaching about 307,514. The result of statistical survey about unemployed is large number and this is disturbing, which led us to focus our research on this matter.

This paper aims to use spatial analysis to alleviate some of the increase in unemployment of information technology (IT) specialists by identifying workplaces that require this specialization in Saudi Arabia. This research contributes to help IT who plan to seek jobs in Saudi Arabia, they often find themselves in a double bind. They may be qualified for many jobs, but have no way of reaching government and private sectors that providing IT jobs either in suburban or urban regions, or they may also be easily able to reach many jobs nearby, but lack the qualifications required for them. On the other hand, sectors that provide IT jobs need to know the regions that have a lot of suitable IT specialists for their jobs. Therefore, in this research, we attendant to analyze the relationship between IT jobs and regions in Saudi Arabia in order to help both IT job seekers and sectors that provide IT jobs to identify their destination to

look for fill or provide suitable job vacancies and alleviate unemployment.

In this study we present various sections, including the previous works. After that, we discuss the data that used in our work in detail. Then, we mention the most important types of spatial analysis that contributed to reaching our goal and showing the important maps in this analysis. Finally, we discuss our results by show the obstacles that encountered us.

II. LITERATURE REVIEW

Through this paper, we will analyze the relationship between IT jobs and regions in Saudi Arabia, to help government and private sectors that provide IT jobs to know the regions that have a lot of suitable people for these jobs. In addition, these people have skills that qualify them to work in these jobs. However, these regions have a lack of the sectors that provide them IT jobs. We will identify the context of the problem through this diagram:

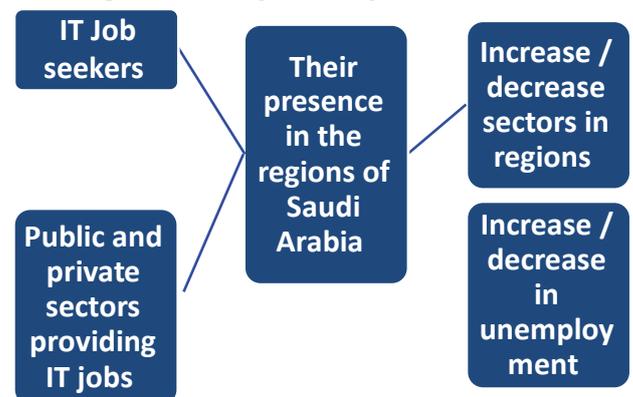


Figure 1: The context of the problem.

GIS will help us alleviate this problem by:

1- Public and private sectors they know the number of IT job seekers and their skills in the Saudi Arabia regions. Therefore, they will put it as one of the values they take it when they want to open a branch in Saudi Arabia.

2- On the other hand, it will help IT job seekers to find out which regions in Saudi Arabia they have jobs, and thus help them to identify their destination to look for these jobs.

In [2], This paper focused on studying the spatial patterns of unemployment in four countries in Europe which are Germany, Poland, Czechia and Austria. The main objective is to recognize axes of potential secondary blue bananas Stretch, the main economic development Axis in Europe. The authors used two methods in spatial analysis: Specifically, Moran's and LISA analysis. Moran's concept is used to determine the spatial clustering intensity, it acts as a global spatial autocorrelation measure. LISA statistic is used to detect spatial clusters forming development axes, it's acts as a local spatial autocorrelation measure. The spatial results for Moran's analysis about unemployment in Germany, Poland, Austria and Czechia are 0.65 ,0.58, 0.48 and 0.29 respectively While LISA statistics showed a large polarization of unemployed concentrated in the West and East.

Other research [3] interested in female unemployment in Poland. The main goal of this study was identified and study female unemployment in Poland from a spatial perspective. The methods used in this study: geographical information systems (GIS) and spatial analysis including Geographically Weighted Regression which helps to determine regression coefficients variability in the space geographical. The study was conducted on 340 Polish unemployed and showed the results the economic factors led to increased employment opportunities for women in 2016 in different regions of Poland, which reduced the proportion of female unemployment, but still more than men.

Don Webber and Gail Pacheco wrote about changes in intra-city employment patterns using spatial analysis [4]. The main objective of this research is to find area-level labour market dynamics from the spatial side. This analysis is purpose to better understand the social and economic actors related with the shifts in unemployment across a big metropolitan city. The methodology they followed in this research Based on two New Zealand census data waves, this study integrated approach of unrelated regression with a model of spatial lag. They Found the spatial autocorrelation determine regard employment status patterns within this major New Zealand city motivates a case for heterogeneous employment policies across the city.

Another work [5] focused on the spatial analysis of both male and female unemployed in the United States of America. Data were collected through a one-year survey in all regions of the United States. They used approach of two-level individuals' models (I) nested within PUMAs (p). Corresponding macro-level within the PUMA of individual's residence. These multi-level models identify how unemployment of Local and regional levels and their interaction impact the possibility that the person is unemployed. The results indicate that unemployment men is higher than women, the results also indicate the vast majority of variation in unemployment focuses on the personal characteristics of the unemployed not in local characteristics. Finally, results indicate that age and occupation at the individual level and the right to work at

the PUMA level are the variables that characterize unemployed men and women better.

III. STUDY DESCRIPTION

We needed to obtain data to analyze the relationship between IT jobs and regions in Saudi Arabia. Therefore, we collected and extracted the following data:

A. Data for job seekers in IT:

We obtained 436 IT job seekers by creating a questionnaire using Google forms as you can see in figure 2 and 3. The devices that we used is personal computers to create the form and mobiles to publish the questionnaire. This questionnaire main aims are:

- How many job seekers in IT jobs who graduated from universities and colleges that is inside Saudi Arabia.
- How many employees in IT jobs and measure their satisfaction.
- To find out how many employees are working in the same their region or vice versa.



Figure 2: The cover page of the questionnaire.

We divided the questionnaire results into two Excel files.

1- Results of the questionnaire - Number of IT job seekers.xlsx:

We performed cleaning process on this data, which had 436 rows, but after removing the empty rows and the rows that containing the wrong data. In addition, we moved the people that on IT jobs to the Excel file (Results of the questionnaire - Number of employees.xlsx). We have 354 rows (job seeker in IT) as shown in figure 3. The type of this data is point. As for data attributes, it shown in the table1.

TABLE 1: THE DATA ATTRIBUTES OF THE QUESTIONNAIRE

Column Name	Description
Gender	find out the gender of job seekers, to measure whether the unemployment is concentrated in a particular gender.
Age	discover the age of job seekers, to measure whether the unemployment is concentrated in a particular age.
Region	determine in which region the number of job seekers is increasing.
City	see in which city the number of job seekers is increasing.
Academic Qualification	determine if the academic qualification affects their unemployment. That is, if they have a master degree, the chance of their unemployment would be reduced.
University / College	find out if their choice of this university / college affected their unemployment.
Major	find out if their choice of this major affected their unemployment.
GPA	determine if the GPA affects their unemployment. That is, if they obtain an excellent, the chance of their unemployment would be reduced.
Employee	see if they are employees or not.

In this file, we have 59 rows (employees in IT). The type of this data is point. As for data attributes, some attributes we mentioned before in the table 1 and the rest attributes as shown in the table 2.

TABLE 2: THE DATA ATTRIBUTES FOR NUMBER OF EMPLOYEES.

Column	Description
Do you work in the same region where you lived?	To find out how many employees are working in the same their region or vice versa.
Do you prefer to work in the same your region?	To determine how many employees prefer to work in the same their region or vice versa.
If you are offered a job matching your wishes but outside your region, will you accept?	To see how many people would like to work in a job that matches their wishes but in another region.

3. Arab Sea data

Arab sea is a company interested in giving programs to governmental, private and semi-government sectors. The existence of programs and programs in the company requires the presence of IT staff to deal with them and solve problems that may face the sector that allows it to achieve the desired goal. We collected dataset from Arab Sea Company to find out who needs programs and therefore needs employees. This data consists of 400 rows and three columns which are customers, location and region id as shown by table 3.

TABLE 3: THE DATA ATTRIBUTES FROM ARAB SEA.

Column Name	Description
Customers	This column aims to know number of customers.
Location	This column helps us to find out the location of companies, and then we can locate the IT job. In other words, help the job seekers to go in the right place in order to get a job.
Region Id	This column helps to identify in which region the number of jobs is increasing.

	A	B	C	D	E	F	G	H	I	J	K
1	TimeStamp	Gender	Age	Region	RegionId	AcademicQual	University/College	Major	GPA	Employee	City
2	2/10/2019 22:11:57	female	25-30	Ar Riyad	2015	Bachelor	KING SAUDI UNIVERSITY	Computer Science	Satisfactory	No	Riyadh
3	2/10/2019 22:17:17	female	25-30	Ar Riyad	2015	Bachelor	PRINCES NORAH UNIVERSITY	Information Systems	Outstanding	No	Riyadh
4	2/10/2019 22:11:24	female	21-24	Ar Riyad	2015	Bachelor	PRINCES NORAH UNIVERSITY	Information Systems	Very Good	No	Riyadh
5	2/10/2019 22:19:13	female	21-24	Al Qassim	2014	Bachelor	ALQASSEM UNIVERSITY	Computer Science	Good	No	Ar-Rass
6	2/10/2019 22:20:12	female	25-30	Ar Riyad	2015	Bachelor	PRINCES NORAH UNIVERSITY	Information Systems	Outstanding	No	Riyadh
7	2/10/2019 22:20:59	female	21-24	Al Qassim	2014	Bachelor	ALQASSEM UNIVERSITY	Computer Science	Acceptable	No	Burydah
8	2/10/2019 22:24:05	female	25-30	Ar Riyad	2015	Bachelor	PRINCES NORAH UNIVERSITY	Information Systems	Good	No	Riyadh
9	2/10/2019 22:29:23	female	21-24	Al Qassim	2014	Bachelor	ALQASSEM UNIVERSITY	Computer Science	Good	No	Ar-Rass
10	2/10/2019 22:29:44	female	21-24	Al Qassim	2014	Bachelor	ALQASSEM UNIVERSITY	Computer Science	Acceptable	No	Ar-Rass
11	2/10/2019 22:30:22	female	25-30	Ar Riyad	2015	Bachelor	PRINCES NORAH UNIVERSITY	Information Systems	Outstanding	No	Riyadh
12	2/10/2019 22:30:40	female	25-30	Ar Riyad	2015	Bachelor	PRINCES NORAH UNIVERSITY	Information Systems	Satisfactory	No	Riyadh
13	2/10/2019 22:44:11	female	21-40	Ar Riyad	2015	Bachelor	Qassim National Colleges	Computer Science	Outstanding	No	Riyadh
14	2/10/2019 22:49:14	female	25-30	Al Qassim	2014	Bachelor	ALQASSEM UNIVERSITY	Computer Science	Very Good	No	Ar-Rass
15	2/10/2019 22:38:53	male	25-30	Al Madinah	2013	PGD	ISLAMIC UNIVERSITY	Computer Science	Outstanding	No	Medina
16	2/10/2019 22:47:56	female	21-24	Hail	2017	Bachelor	HAL UNIVERSITY	Information Systems	Acceptable	No	Riyadh
17	2/10/2019 22:48:17	female	25-30	Asi Sharqiyah	2016	Bachelor	KING FASAL UNIVERSITY	Information Systems	Excellent	No	Al-Ahsa
18	2/10/2019 22:48:31	female	21-40	Ar Riyad	2015	Bachelor	HAL UNIVERSITY	Computer Science	Satisfactory	No	Riyadh
19	2/10/2019 21:14:06	female	21-24	Ar Riyad	2015	Bachelor	KING SAUDI UNIVERSITY	Information Systems	Good	No	Riyadh
20	2/10/2019 21:16:40	female	25-30	Ar Riyad	2015	Bachelor	PRINCES NORAH UNIVERSITY	Computer Science	Very Good	No	Riyadh
21	2/10/2019 21:17:06	female	21-40	Al Qassim	2014	Bachelor	ALQASSEM UNIVERSITY	Computer Engineering	Excellent	No	Burydah
22	2/10/2019 21:18:19	female	21-40	Ar Riyad	2015	Diploma	PRINCES NORAH UNIVERSITY	Computer Science	Outstanding	No	Riyadh
23	2/10/2019 21:20:37	female	25-30	Ar Riyad	2015	Bachelor	KING SAUDI UNIVERSITY	Information Technology	Very Good	No	Riyadh
24	2/10/2019 21:51:55	female	21-40	Al Qassim	2014	Diploma	ALQASSEM UNIVERSITY	Information Systems	Satisfactory	No	Burydah
25	2/10/2019 21:57:04	male	21-24	Makkah	2016	Diploma	College of Technical Trainers(Makkah)	Computer Engineering	Good	No	Makkah
26	2/10/2019 21:42:07	female	21-24	Al Qassim	2014	Bachelor	ALQASSEM UNIVERSITY	Computer Science	Outstanding	No	Ar-Rass
27	2/10/2019 21:19:52	female	25-30	Al Qassim	2014	Bachelor	ALQASSEM UNIVERSITY	Computer Science	Insufficient	No	Ar-Rass
28	2/10/2019 21:54:13	female	25-30	Ar Riyad	2015	Master	KING SAUDI UNIVERSITY	Information Technology	Outstanding	No	Riyadh
29	2/10/2019 21:04:53	female	21-24	Ar Riyad	2015	Bachelor	KING SAUDI UNIVERSITY	Information Technology	Excellent	No	Riyadh
30	2/10/2019 21:05:32	female	25-30	Ar Riyad	2015	Bachelor	KING SAUDI UNIVERSITY	Information Systems	Very Good	No	Riyadh
31	2/10/2019 21:28:11	male	21-40	Ar Riyad	2015	Bachelor	KING SAUDI UNIVERSITY	Computer Science	Satisfactory	No	Riyadh
32	2/10/2019 21:28:31	female	21-24	Ar Riyad	2015	Bachelor	ALMAJMAH UNIVERSITY	Information Technology	Outstanding	No	Riyadh
33	2/10/2019 21:40:00	female	21-24	Tabuk	2021	Bachelor	TABUK UNIVERSITY	Computer Science	Outstanding	No	Tabuk
34	2/10/2019 21:11:23	male	25-30	Al Madinah	2013	Bachelor	TUBAH UNIVERSITY	Computer Science	Acceptable	No	Medina

Figure 3: Part of the results of questionnaire after processing.

2- Results of the questionnaire - Number of employees.xlsx :

➤ Preprocess stage:

We applied cleaning process on this file to make a suitable data such as punctuation, space and null value are removed from cells. Also, we corrected the spelling errors.

➤ General Authority for Statistics data:

We obtained the data include on the distribution of population in the administrative regions of Saudi Arabia based on gender and nationality (for only Saudis). This data file consists of 14 rows and 5 columns as shown by table 4.

TABLE 4: THE DATA ATTRIBUTES FROM GENERAL AUTHORITY FOR STATISTICS.

Column Name	Description
Administrative Region	This column aims to know administrative regions in Saudi Arabia.
Region Id	This column helps to identify in which region the population is increasing.
Saudis (Males)	This column helps us to know population of Saudi males in each region by which can do some calculations to know percent of males' job seekers and others.
Saudis (Females)	This column helps us to know population of Saudi females in each region by which can do some calculations to know percent of females' job seekers and others.
Total	This column helps us to know population of Saudi males and Saudi females in each region by which can do some calculations to know percent of Saudi job seekers and others.

• Universities data

We collect the geographic data about the universities to take the benefits of knowing the distribution of the number of graduates from universities and the knowledge of the intensity of graduates in Saudi Arabia. This data file consists of 3 columns and 32 rows.

TABLE 5: THE DATA ATTRIBUTES OF UNIVERSITIES DATA.

Column Name	Description
University Name	This column helps us to distribute the place of universities.
Longitude	To define the precision location of a point on earth.
Latitude	To define the precision location of a point on earth.

IV. Data Analysis

The study area can be divided into five categories of IT job seekers density as follows:

- Regions where the density of IT job seekers is 0.00046 IT jobseekers/ km 2 and more and includes: Riyadh region and Asir region.
- Regions that ranging from 0.00035 to less than 0.00046 IT jobseekers/ km 2 and include: There isn't.
- Regions that ranging from 0.00023 to less than 0.00035IT jobseekers/ km 2 and include: Makkah region.
- Regions that ranging from 0.00012 to less than 0.00023IT jobseekers/ km 2 and include: Al Quassim region , Al Madinah region and Jizan region and

- Regions where the density of IT job seekers is less than 0.00012 and include:Al Bahah region , Al Hudud ash Shamaliyah region , Al Jawf region , Ash Sharqiyah region , Ha'il region , Tabuk region and Najran region.

TABLE 6 : THE DENSITY OF IT JOB SEEKERS IN SAUDI ARABIA REGIONS.

No.	Region	No. of IT job seeker	Area km ²	IT job seekers / area km ²
1	Asir	46	80,000	0.000575
2	Al Bahah	1	12,000	0.00008333
3	Al Hudud ash Shamaliyah	1	104,000	0.00000962
4	Al Jawf	3	85,000	0.00003529
5	Al Madinah	18	150,000	0.00012
6	Al Quassim	15	73,000	0.000205479
7	ArRiyadh	182	380,000	0.000478947
8	Ash Sharqiyah	23	540,000	0.00004259
9	Ha'il	5	120,000	0.00004167
10	Jizan	2	13,000	0.000153846
11	Makkah	44	137,000	0.000321168
12	Tabuk	12	136,000	0.00008824
13	Najran	1	130,000	0.00000769
Total		353	1,960,000	0.000180102

Table (6) shows that IT job seekers density in Saudi regions is 0.000180102 IT job seekers / km2. And the density varies between the regions, where the highest density of IT job seekers is in the Asir region of 0.000575 IT job seekers / km2, then Riyadh region is 0.000478947 IT jobseekers/ km2 then the lowest density is 0.00000769 IT job seekers/ km2 in Najran region. Table 6 is presented in a map format in figure 4.

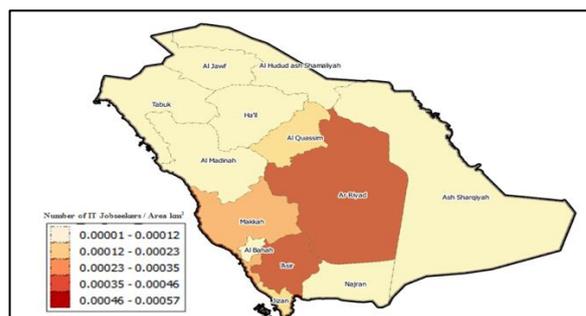


Figure 4 : Geographical distribution of the density of IT job seekers in Saudi Arabia regions.

The density of companies in Saudi Arabia was 0.000203571 company / km2 distributed over 13 regions of Saudi Arabia. The highest density of companies in the Al Bahah region was about 0.000583333 company / km2. While the rest of the companies are distributed to other regions, where in some regions reached to 0.00041company / km2 and less.Although the largest number of companies concentrated in Riyadh region, but the density of companies was 0.000194737 company / km2.

TABLE 7 : THE DENSITY OF COMPANIES IN SAUDI ARABIA REGIONS.

No.	Region	No. of Companies	Area km ²	Companies / Area km ²
1	ArRiyad	74	380,000	0.000194737
2	Makkah	48	137,000	0.000350365
3	Al Madinah	40	150,000	0.000266667
4	Al Quassim	30	73,000	0.000410959
5	Ash Sharqiyah	68	540,000	0.000125926
6	Asir	26	80,000	0.000325
7	Tabuk	30	136,000	0.000220588
8	Ha'il	25	120,000	0.000208333
9	Al Hudud ash Shamaliyah	4	104,000	0.00003846
10	Jizan	2	13,000	0.000153846
11	Najran	15	130,000	0.000115385
12	Al Bahah	7	12,000	0.000583333
13	Al Jawf	30	85,000	0.000352941
Total		399	1,960,000	0.000203571

According to Table (7) and Figure (5), the study area can be divided into five categories of density of companies as follows:

Regions where the density of companies from 0.00047 company / km² and more and includes: Al Bahah region.

Regions that ranging from 0.00037 to less than 0.00047 company / km² and include: Al Quassim region.

Regions that ranging from 0.00026 to less than 0.00037 company / km² and include: Makkah region, Al Madinah region, Asir region and Al Jawf.

Regions that ranging from 0.00015 to less than 0.00026 company / km² and include: ArRiyad region, Tabuk region, Ha'il region and Jizan region .

Regions where the density of companies is less than 0.00015 and include: Al Hudud ash Shamaliyah region , Ash Sharqiyah region and Najran region.

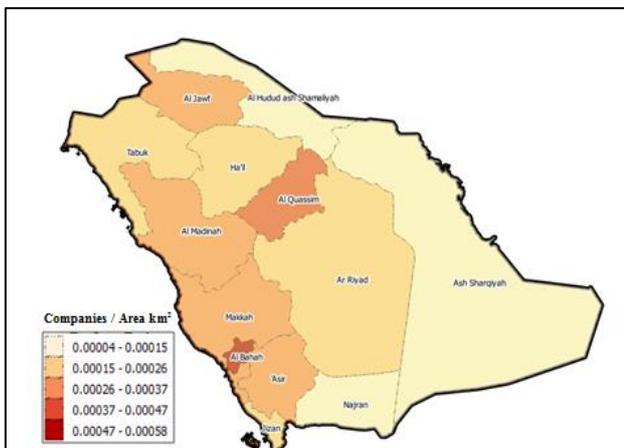


Figure5 : Geographical distribution of the density of companies in Saudi Arabia regions.

The density of companies for IT job seekers in the regions of Saudi Arabia was 0.884711779 IT job

seekers/company. Which are distributed differently across the country, where reached the highest density in the region of Ar Riyad to 2.459459459 IT job seekers / company compared to 74 companies . Although the largest number of companies are concentrated in this region. There are also 1.769230769 IT job seekers/companies in the Asir region. On the other hand, there are 26 companies in this region in front of the density of IT job seekers, which lead to a small job opportunity. Therefore, a few of job opportunity which makes job seekers go to other regions to seek a better job opportunities and a shorter waiting period, that leading to travel a long distance in order to reach the required company. And the lowest density in Najran region it has 0.066666667 IT job seekers/ company, as shown in table 8.

TABLE 8 : THE DENSITY OF COMPANIES FOR JOB SEEKERS IN SAUDI ARABIA REGIONS.

No.	Region	No. of IT job seeker	No. of Companies	No. of IT job seekers / No. of Companies
1	ArRiyad	182	74	2.459459459
2	Makkah	44	48	0.916666667
3	Al Madinah	18	40	0.45
4	Al Quassim	15	30	0.5
5	Ash Sharqiyah	23	68	0.338235294
6	Asir	46	26	1.769230769
7	Tabuk	12	30	0.4
8	Ha'il	5	25	0.2
9	Al Hudud ash Shamaliyah	1	4	0.25
10	Jizan	2	2	1
11	Najran	1	15	0.066666667
12	Al Bahah	1	7	0.142857143
13	Al Jawf	3	30	0.1
Total		353	399	0.884711779

The mean center is a point constructed from the average x and y values for the input feature centroids and the Standard Distance tool creates a new feature class containing a circle polygon or sphere multipatch centered on the mean for each case. Each circle polygon or sphere multipatch is drawn with a radius equal to the standard distance. The attribute value for each circle polygon or sphere multipatch is its standard distance value.

We do the Mean center and standard distance analysis for universities point feature to determine what region contain the greatest number of universities. The mean was allocated in Riyadh region is slightly tilted to the northwest, indicating the concentration of universities in the central region of Saudi Arabia.

Figure (6) shows that the standard distance of Saudi universities with a radius of 493.9 km has reached 31 out of 44 universities. The percentage of universities in the area of standard distance reached 70.45%. This indicates the concentration of universities in the central region and the rest of the universities are randomly distributed in the rest of the regions by 29.55%.

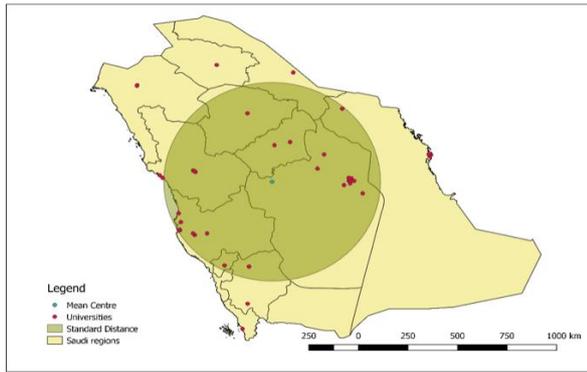


Figure 6: Mean center and standard distance for Saudi universities in Saudi regions.

Buffer Analysis is a basic GIS spatial operation. It automatically builds zones with a certain width around point, line, or region geometric objects according to a specified buffer distance.

We create a multi-buffer around the job seekers point object to identify zones that company need to know the location that will be near to IT job seekers. And what region covered by job seeker more than other.

The scope of the accumulation of job seekers includes the central and western regions of Saudi Arabia. This is illustrated by Figure (7). Where the accumulation of unemployed covers 92% of the Saudi regions.

Nearest neighbor analysis examines the distances between each point and the closest point to it, and then compares these two expected values for a random sample of points from a CSR (complete spatial randomness) pattern. CSR is generated by means of two assumptions:

- 1) That all places are equally likely to be the recipient of a case (event) and
- 2) All cases are located independently of one another.

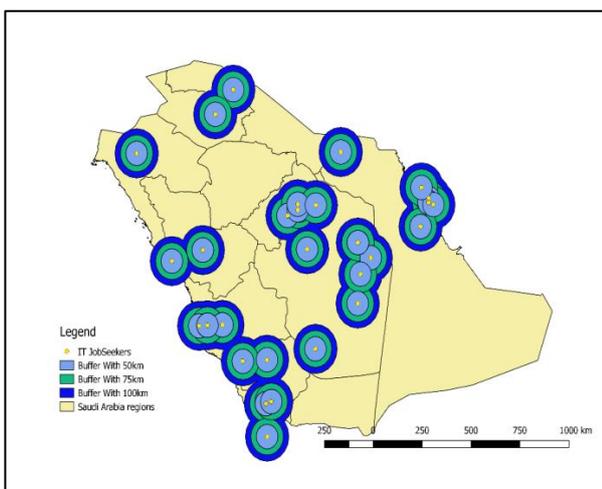


Figure 7: Buffering around job seeker.

The Table(9) shows the distribution of companies in the Saudi regions. The results of the Nearest Neighbor Analysis take a Clustered pattern of 0.00 and this means less than 1. This indicates that the distribution of companies by region is dispersed.

TABLE 9: SUMMARY FOR NEAREST NEIGHBOR ANALYSIS FOR COMPANIES

Summary for Nearest Neighbor Analysis	
Observed Mean Distance:	0.0
Expected Mean Distance:	0.34405990171
Nearest Neighbor index:	0.0
Number of points:	399
z-score:	-38.2135452162

V. CONCLUSION

In this study, we obtained a number of results that can be summarized as follows:

1. The distribution of companies is based on the regions that have residential density, such as Riyadh, Makkah and Ash Sharqiyah, although the need to be distributed at the level of the regions of the country as a whole.
2. Although there are many companies in these regions, they still suffer from an increase in the number of IT job seekers due to the increase in the population in these regions.
3. The total number of Saudi IT jobseekers was 354, of whom 81 were male, 332 of whom were females, 80.4% were females and 19.06% were male.
4. It showed that the highest percentage of Saudis IT jobseekers was in the age class (25-30) years, by 51.1%.
5. It showed that most IT jobseekers have a bachelor's degree (85.7%) of the total number of Saudis looking for work, followed by those with a master's degree or diploma certificate (8%). While the doctoral degree is the lowest rate (0.2%).
6. It also revealed that the IT job seekers rate was the highest in Riyadh region (53%) followed by the Makkah and Asir regions where the rate (11%).
7. Most Saudi universities are in the Middle and West sides. We conclude that the number of graduates in these areas more than others will increase the number of job seekers in these areas. The percentage of universities in the central and western regions is 70% of the universities.
8. Job seekers cover 92% of Saudi Arabia.
9. The distribution of companies to regions in Saudi Arabia is random distribution so that the location of companies that can be created in the future cannot be expected.

With technical progress and rapid development of useful sciences that facilitate human life and help them to make the right decisions. This acceleration in technology has led to create a spatial analysis that is an important in an individual's life. Our study focused on helping Saudi IT

professionals in terms of knowing their jobs vacancies in Saudi Arabia regions. This work contributes to reducing the unemployment rate in IT specialization through helping companies to know the places of people who have this specialization, which may lead to the opening of the company's branches in these locations. It also helps the unemployed to find out the places of vacancies that help him to submit to it. So, we conduct our study to reach the information what we need in short time with less effort.

In this research we collected the information through the statistical survey and questionnaire that help us to know the places of both unemployed and employees in this specialization.

In our study we performed spatial analysis and used GIS-based tools and techniques such as Density analysis, mean center and standard distance analysis, Mean center and standard distance analysis, Buffer Analysis and Nearest Neighbor Analysis for company.

We have encountered difficulties and problems in this work, such as the lack of geographical research in Saudi Arabia regions on the subject of unemployment also we did not find statistics on the specialization of information technology, which led us to establish survey and contact with different department such as General Organization for Statistics, Arabian Sea Company and Taqat to identify and know more unemployed places and where is the location of IT jobs, therefore this method of data collection required extended time.

REFERENCES

- [1] P.L.N. Raju, "SPATIAL DATA ANALYSIS" Geoinformatics Division Indian Institute of Remote Sensing, Dehra Dun.
- [2] P. Netrdová and V. Nosek, "Spatial patterns of unemployment in Central Europe: emerging development axes beyond the Blue Banana", *Journal of Maps*, vol. 12, no. 4, pp. 701-706, 2015. Available: 10.1080/17445647.2015.1063467.
- [3] K. Lewandowska-Gwarda, "Female unemployment and its determinants in Poland in 2016 from the spatial perspective", *OeconomiaCopernicana*, vol. 9, no. 2, pp. 183-204, 2018. Available: 10.24136/10.24136/oc.2018.010.
- [4] D. Webber and G. Pacheco, "Changes in intra-city employment patterns: a spatial analysis", *International Journal of Social Economics*, vol. 43, no. 3, pp. 263-283, 2016. Available: 10.1108/ijse-02-2014-0027.
- [5] E. Zolnik, "A Spatial Analysis of Male and Female Unemployment in the USA", *International Journal of Applied Geospatial Research*, vol. 4, no. 4, pp. 76-87, 2013. Available: 10.4018/jagr.2013100105.