

# TECHNOLOGICAL IMPACT OF EMPLOYMENT WEB SITES IN CAUCASUS REGION

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## ABSTRACT

*This research conducts the web statistics of the employment web sites with the technological impact on the macroeconomics. The statistical information gathered from web-o-metrics of the Caucasus region job seeking web sites like the number of visitors, Facebook likes or shares, twitter messages about web site, number of back links counted by google, bing or Alexa. On the other hand, the macroeconomic and demographic facts like the population, unemployment rate, median age or migration rate. The*

**Key Words :** Unemployment, Job Market, Cross-Country Market, Data Mining, Time Series Analysis, Macro Economy, Demography

**JEL Classification:** M15, M16, M5

## 1. INTRODUCTION

This study is built on web statistics of employment web sites and the unemployment rates of the Caucasus region countries which are Georgia, Armania and Azarbajian. On the other hand, macroeconomic facts like population, unemployment rate, median age or migration rate are collected for each of the countries from the public data published by (Trading Economics, 2014).

**Figure-1. Overview of Study**

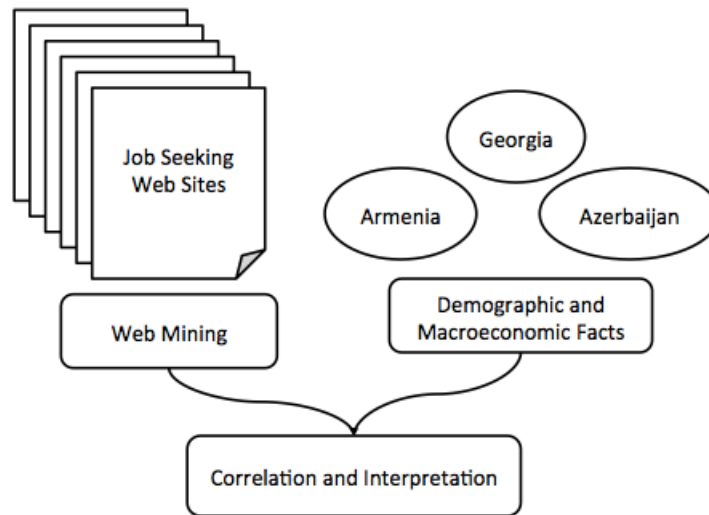


Figure 1 demonstrates the overview of the study. On one hand, we collect the web statistics of the employment sites. On the other hand we collect the demographic and macroeconomic facts. Finally we investigate the correlation between those two statistical values. Then, the results gathered from the data mining step are interpreted. Please note that the above diagram holds the study for only one of the countries. The study is repeated for 3 countries of Caucasus region.

This paper starts with the problem statement and the background of the macroeconomic paramters and job market studies. We also propose the data mining methodology and the evaluation of data sets on the following sections. Finally the correlation between the job searching web sites and unemployment rates are interpreted and also the correlation between some countries are underlined.

## **2. BACKGROUND**

Since employment web sites have recently become focal points of job seekers, their quantity and impact have increased. These websites are not only first venue for job seekers to attract (Carlson, Connerley, and Mecham, 2002), but also economic and convenient tool of recruiting for companies, reducing the cost per hire (Galanaki, 2002). Delving into the question of how the Internet has impacted job search behavior, Stevenson (2008) found that job search behavior became more extensive and search methods used by the unemployed varied. Likewise Bagues and Labini (2007) found a similar correlation between Internet data and labor market outcomes.

The relation between data flow of the Internet and structural changes in the labor market have been subject to numerous studies. Especially search engine data has been used as an indicator of economy. For instance Askitas and Zimmermann (2009), using Google search data, found correlations between keywords used in searches and unemployment rates of Germany. While D'Amuri (2009) used Google Index to predict quarterly unemployment rates of Italy, McLaren and Shanbhogue (2011) analyzed the relation between search behaviors of users and labor markets in UK. A study by Ettredge, Gerdes and Karuga found positive and significant association between job search data and the official unemployment data of US. Finally, Choi and Varian (2011) showed that search data could be used to forecast automobile sales, unemployment claims, travel destination planning, and consumer confidence.

To our best knowledge, there is no study to look for a relation between website traffic and unemployment. This study is first to do so. Although the relation between any data flow of the Internet and labor market outcomes should be treated cautiously, this study as a cross-country comparison gives a meaningful result that there could be a correlation between web site traffic and unemployment rates.

A very similar previous study is done for the European job market (M. L. Arslan and S.E. Seker, 2013) and previous studies on online reputation management for universities (M. L. Arslan and S.E. Seker, 2014) and XU30 companies may guide about the topic (Kizil C, 2013).

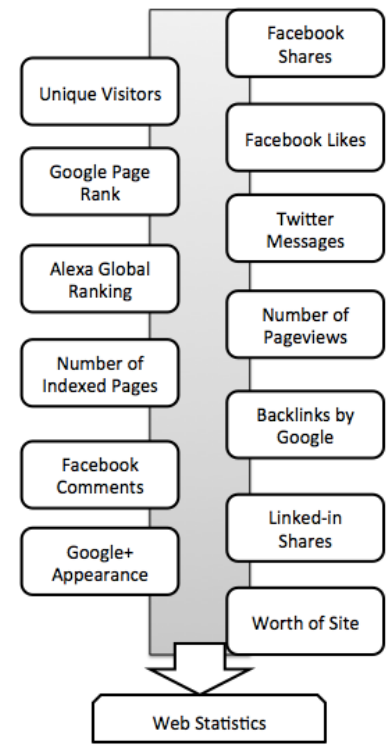
## **3. METHODOLOGY**

This chapter covers the details of web mining and data mining parts of the project. In the web mining phase, the web sites are crawled manually and the required information is collected. Also in the data mining phase, the gaussian processes methodology has been deployed in order to find out the correlation between the unemployment rates and the job related governmental web sites.

### **3.1. WEB MINING**

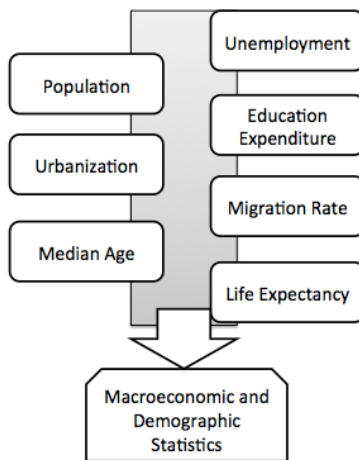
During the web mining phase, the web sites holding the employment information are crawled manually and the information related to the web sites are collected from independent third party organizations like Microsoft search engine Bing, Google search engine, Yahoo search engine, alexa.com ranks, google trends Facebook like counts, Twitter messages or independent web site ranking sites.

**Figure-2. Parameters of Web Statistics**



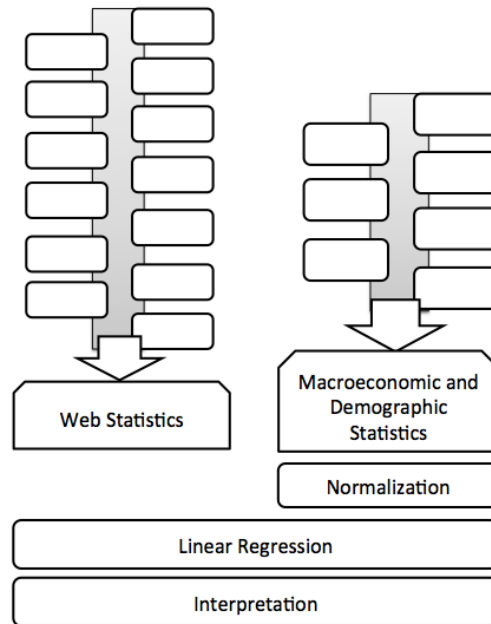
The macroeconomic facts like unemployment rates, median age, urbanization, population, migration rate, education expenditures are collected from the (CIA Fact Book, 2013) and (Trading Economics, 2014).

**Figure-3. Macro Economic Parameters**



For the web statistics part of the study, the web-o-metrics of job seeking web sites are normalized into a single index number. The macroeconomic parameters are involved into the study without any indexing but normalization.

**Figure-4. Correlation between Economic and Web Parameters**



After the data are collected, the macroeconomic and demographic values are normalized into a single value, the normalized are correlated with the values collected from the job seeking web page by using the linear regression analysis. Finally an interpretation will take a place on the final part of this paper.

### 3.2. DATA MINING and RESULTS

During the study, one of the simplest methods, linear regression has showed a great success for the correlation of the parameters. Linear regression can be formulized as below equation:

$$y_i = \beta_1 x_{i1} + \dots + \beta_p x_{ip} + \varepsilon_i = \mathbf{x}_i^T \boldsymbol{\beta} + \varepsilon_i, \quad i = 1, \dots, n,$$

It is also a variation of  $y=ax +b$  linear equation with multiple parameters. All the paremeters in linear regression can be accepted as the features extracted from the web-o-metrics. The tune up of coefficients results the best fit for the feature weights.

The data set collected after the web mining phase, is normalized and collected into a single output. At the end of processing web mined data we end up with two seperate columns. In the first column we collect the normalized score for the web traffic and on the second column we collect the unemployment rate of the country where the site is orginated.

Properties of the data set is provided in Table 1.

Property	Value
Number of Web Sites	32
Number of Parameters from each Web Site	17
Number of web-o-metric value	544
Number of Countries	3
Number of Macroeconomic Parameters	5
Number of Macroeconomic value	15
Number of correlated tuple	160
<b>Correlation Rate</b>	<b>52.49%</b>
RMSE	0.604
RAE	0.931

The RMSE (Ocak and Seker,2013) stands for root mean square error and RAE (Ocak and Seker,2013) stands for root absolute error rates which are given to indicate the error rates on the given data mining study.

#### 4. CONCLUSION

The correlation rate indicates that there is a close correlation between the web site trend and the macro economic parameters of the country where the web page is originated. It is also a two way operator where the correlation can be interpreted as a predictability. So from the macro economic parameters of the country the web traffic of the job oriented web sites can be predicted or vice versa.

Deriving data from 3 countries all job web sites in caucasian region, this study explores the correlation between macro economic parameters and the job web site statistics The results showed that there is a strong correlation between web sites traffic and unemployment rates.

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