KULLIYYAH OF INFORMATION AND COMMUNICATION TECHNOLOGY

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INTELLIGENT SYSTEMS

PROJECT TITLE:

The Psychological Issues Impacted by E-learning Tools on Jordanian University Students during Covid-19 Lockdown

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Group Contributions

Name	Contributions
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Mohamed Moubarak Mohamed Misbahou Mkouboi (1820705)	• Introduction of the project • Literature Review
Muhammad Ihsan bin Ahmad Hanizar (1919939)	• Technical Background • Error Analysis
Muhammad Fahmi Fakhir (1811481)	• Problem Statement • Objectives • Assisting Naqib in creating the models on MS Azure

Abstract

The main objective of this research is to explore on the psychological issues impacted by E-learning tools on Jordanian university students during the Covid-19 lockdown. We prepared two variables in determining whether the students developed psychological issues impacted by E-learning tools during the pandemic period. The variables consist of (i) 5 independent variable(s) and (ii) 1 dependent variable. Using a convenient sampling technique, a total of seven hundred fifty-five (755) students from Jordanian University were asked to fill in survey questionnaire in Microsoft Forms. The first three hundred (300) students were selected as a sample to be tested and analyzed in Microsoft Azure. Multiple Linear Regression and Bayesian Linear Regression are two regression models that were applied and evaluated in Microsoft Azure as well. Based on the evaluation results from the Multiple Linear Regression model, the students agreed that they developed psychological issues during the Covid-19 lockdown ($R^2\ Value$ 0.6639). Similar result was evaluated from the Bayesian Linear Regression model, with a slightly higher $R^2\ Value$ of 0.6651. During the Covid-19 lockdown, where most of the students continued learning remotely, this research showed that the students did not embrace the learning method throughout the pandemic period. It is highly advised to implement psychological treatments for the students in order to improve students' mental health as well as their learning process.

1.0 Introduction

A coronavirus outbreak has swiftly expanded from China to other regions of the world, resulting in severe infectious pneumonia. Individual mental health is a critical public health problem that is likely to be disrupted during pandemics, such as the WHO's current epidemic. A considerable rise in the likelihood of mental health disorders, such as anxiety, sadness, and traumatic stress, occurs with comparable viral epidemics. Artificial intelligence comes in various forms, including machine learning. Based on the data provided, this machine learning system can learn and generate a prediction. The goal of this study is to forecast the likelihood of Jordanian university students developing mental health illnesses. During the Covid-19 lockdown, it attempts to assess students who have psychological disorders that are touched by E-learning technologies. The goal is to see if there is a relation between using E-learners and the number of persons who suffer from mental illnesses.

2.0 Problem Statement

The psychological issues impacted by E-learning on students is a main concern in this research, to ensure students lead a healthy and harmonious life. However, due to the Covid-19 pandemic, the students are not able to engage in their normal physical activities such as going to classes or eating at cafes as most of the students are requested to continue with their studies online and stay at home.

The sudden change in the mode of teaching and learning due to the lockdown, and isolation have increased anxiety level and created extreme stress to the students. This is caused by many things, one of which is tools such as laptops, cellphones, internet, etc. Other than that, depression amongst students not only affect their academic performances but also associated in the increase in suicidal attempts. The researcher has observed many mental health issues impacted on some students as their mental health is slowly deteriorating during the lockdown.

Therefore, we are creating a machine learning program to predict and analyze students that has psychological issues impacted by E-learning tools during the Covid-19 lockdown, and we are implementing and comparing Multiple Linear Regression and Bayesian Linear Regression models on Microsoft Azure.

3.0 Objective

- To collect data about the Jordanian University Students, experience during this pandemic period.
- To know whether the Jordanian University Students' mental health is more critical during the Covid-19 lockdown.
- To predict the likeliness of mental health disorders forming amongst Jordanian University Students during the Covid-19 lockdown.
- To analyze students that has psychological issues impacted by E-learning tools during the Covid-19 lockdown.

4.0 Literature Review

The purpose of the research is to acquire a better understanding of the psychological issues impacted by E-learning on Jordanian university students during Covid-19 lockdown. There is one study. There is one study that discusses on the prevalence of anxiety and depression during COVID-19 pandemic among healthcare students in Jordan and its effect on their learning process by Iman A. Basheti, Qassim N. Mhaidat, Hala N. Mhaidat (2021). As stated before, Iman A. Basheti, Qassim N. Mhaidat, Hala N. Mhaidat (2021) hypothesized that during the COVID-19 epidemic, anxiety and depression levels among Jordanian university healthcare students were found to be significant. The result of their study supports the hypothesis.

5.0 Technical Background

5.1 Machine Learning

The term "machine" is a mechanically, electrically, or electronically operated device for performing a task. It is also referring to a literary device or contrivance introduced for dramatic effect. Besides, the word "learning" means the act or experience of one that learns. It is also referring to a knowledge or skill acquired by instruction or study.

Combining these two words, machine learning is the process by which a computer can improve its own performance (as in analyzing image files) by continuously incorporating new data into an existing statistical model. According to some reputable sources, Nvidia defined, "Machine Learning at its most basic is the practice of using algorithms to parse data, learn from it, and then make a determination or prediction about something in the world". McKinsey & Co. also described the terms machine learning which "Machine learning is based on algorithms that can learn from data without relying on rules-based programming".

5.2 Linear Regression

The term "linear" resembles a graph that is a line and especially a straight line. In other words, linear may be a response or output that is directly proportional to the input. The word "regression" in statistics refers to a measure of the relation between the mean value of one variable and corresponding values of other variables.

The terms "Linear Regression" is the process of finding a straight line (as by least squares) that best approximates a set of points on a graph. In the views of Gregory Zuckerman, Quartz (6 Nov. 2019), linear regression defined as "a basic forecasting tool relied on that analyzes the relationships between two sets of data or variables under the assumption those relationships will remain linear".

6.0 Research Methodology

The dataset used adopts a simple quantitative research to explore the psychological issues impacted by E-learning Tools on Jordanian university students during Covid-19 lockdown. The method used in the dataset is survey method. The main source of data includes an online survey questionnaire directed to students from Jordanian university. The questions in the Microsoft Forms were developed by the researcher through review of prior studies and personal observations by the researcher.

The questionnaire is divided into 6 parts. Part 1 collects demographic information. Part 2 collects information on the use of digital tools (mobile phone, laptop, i-pad) by the students before and during Covid-19. Part 3 gather information on the students' sleeping habits. Part 4 collects information on the students' social interaction. Part 5 collects information on the students' psychological state, whereas part 6 collects information on their academic performance. From part 2 to part 6, the responses are arranged into a linear scale with 5 being Strongly Agree and 1 being Strongly Disagree.

The researcher started collecting the data by sending questionnaire through Microsoft Forms to 755 Jordanian University students. The data were then keyed into Excel, analyzed in Excel by the researcher.

7.0 Experimental Setup

7.1 Data Preprocessing

It is common to have incomplete data depending on the dataset. There could also be redundant data, which could degrade the quality of the results. As a result, data preprocessing is critical in order to obtain a quality dataset. Before processing the data, we selected the first 300 of the 755 respondents to be considered in the analysis.

For our dataset on the psychological issues impacted by E-learning tools on students during Covid-19 lockdown, there were originally 775 rows with 32 columns in total. Unused columns are removed, and only the independent and dependent variable columns were not removed. After removing the unused columns, there are 6 columns left with 5 independent variables and 1 dependent variable. Incomplete data is manually filled by using the mean or most probable value. As a result, the number of rows remains the same. The following are the variables that were used in this analysis:

| Independent Variable(s)	Dependent Variable
1. After COVID-19: Prolonged use of digital tools for leaning (mobile, laptop, i-pad) affected my sleeping habits.	Measures of lockdown, closures, and quarantine, brought by COVID-19 caused stress, frustration, and depression.
2. After COVID-19: Continuous exposure to electronic screens in online learning is tiring and exhausting	
3. Prolonged use of e-learning tools often leads to boredom, nervousness, and tension.	
4. Staying home for long periods of time leads to lethargy and laziness.	
5. Some students cannot afford buying all necessary digital tools, which is embarrassing and frustrating.	

7.2 Data Transformation

After finishing with data preprocessing, the data will be transformed, in which the data is split into training set and testing set. In this experiment, the training set accounts for 0.7 of the total datasets, whereas the testing set accounts for 0.3. It is important to divide the data into training and testing sets to obtain high-quality results. The higher the percentage assigned to training set, the higher the percentage of the prediction results. To train the training set, two regression modules were chosen which are Multiple Linear Regression and Bayesian Linear Regression. Linear Regression analysis is recognized for assisting in the understanding of the representation of data points to make better decisions.

Furthermore, the data is visualized once the testing set has finished learning in the Score Model. Lastly, the data is then visualized using Evaluate Model to check and compare the results of the modules. The following are the steps involved in data transformation for both modules:
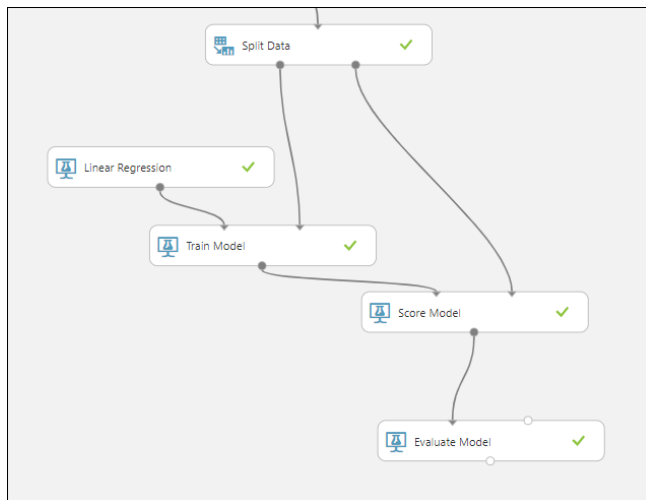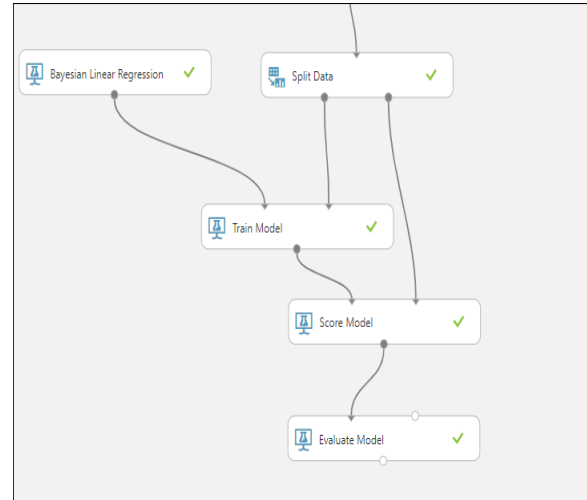
Multiple Linear Regression   **Bayesian Linear Regression**

8.0 Results

The Evaluate Model is used to assess the experiment's outcome. The evaluation metrics for Multiple Linear Regression are made up of five key pieces of information which are the coefficient of determination ($R^2\ value$), mean absolute error (MAE), root mean squared error (RMSE), relative absolute error (RAE), and relative squared error (RSE). However, in Bayesian Linear Regression, the negative log likelihood is computed, resulting in six metrics.

Coefficient of determination or the ($R^2\ value$), indicates how strong of a linear relationship exists between two variables. Thus, the higher the coefficient, the higher percentage of points the line passes through when the data points and line are plotted. A proportion of around 0.6639 is shown for Multiple Linear Regression model, and 0.6651 for Bayesian Linear Regression. The result shows that the Bayesian Linear Regression module achieves a slightly superior coefficient. Other than that, the result also shows that all independent variables for both modules can explain the dependent variable's outcome at a rate of roughly 66% while 34% of the regression remains unexplained. The results for both modules are shown below:

◢ Metrics

Metric	Value
Mean Absolute Error	0.292248
Root Mean Squared Error	0.495091
Relative Absolute Error	0.404236
Relative Squared Error	0.336001
Coefficient of Determination	0.663999

Evaluate Model (Multiple Linear Regression)

← 'Linear Regression [Predictive Exp.]' test returned ["5","5","4","5","5","5","4.81083799002082"]...

Implementation Example (Multiple Linear Regression)

Negative Log Likelihood	Mean Absolute Error	Root Mean Squared Error	Relative Absolute Error	Relative Squared Error	Coefficient of Determination
103.399779	0.292944	0.494269	0.405199	0.334887	0.665113

Evaluate Model (Bayesian Linear Regression)

✔ 'Bayesian Linear Regression [Predictive Exp.]' test returned ["5","5","4","5","5","5","4.80888479317808","0.284507943434859"]...

Implementation Example (Bayesian Linear Regression)

9.0 Error Analysis

In this experiment, Root Mean Squared Error (RMSE) can be used as a metric to calculate the error of the model. Thus, the lower the RMSE, the better the model fits. A proportion of 0.495091 is shown for Multiple Linear Regression model, and 0.494269 for Bayesian Linear Regression. The results show that the Bayesian Linear Regression module has a slightly lower RMSE. Thus, the Bayesian Linear Regression module achieves the best Root Mean Squared Error (RMSE).

10.0 References

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