A SYSTEM TO PREDICT PHARMACEUTICAL STUDENT PERFORMANCE USING MACHINE LEARNING

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A SYSTEM TO PREDICT PHARMACEUTICAL STUDENT PERFORMANCE USING MACHINE LEARNING

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Thesis submitted in fulfillment of requirements for the award of the degree of Bachelor of Computer Science (Software Engineering)

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ABSTRACT

Recently, pharmacy course is the important course as it involves human lives. Moreover, predicting of student performance is most of higher learning institutions in Malaysia. The main objective of this paper is to provide an overview on the Machine Learning technique that has been used to propose to improve student achievement and to predict the pharmacy student will be quit or graduate of a University. There are three reasons why this is happening relate in the problem statement. Firstly is the lack of pharmacy student in the sector in the pharmaceutical industry. Second is increase the number of student from local IPT to offer a pharmacy programed and lastly is the result of pharmacist shortage that student needed. As well know, if they take the pharmaceutical subject whether they have basic or not in the pharmaceutical, the result will display many pharmacy students is failed. This is because, they still don't know that they still suitable with the course or not. Here, the research is very important and suitable to needs to implement a system to predict pharmaceutical student performance using machine learning. This paper also focuses on how prediction uses Machine Learning classifier and finalized model to make a prediction on new data before the student registering the pharmaceutical course from WEKA to Java code. It could bring the benefit and impact to the student. This study proposes a Machine Learning technique to predict either the pharmacy student will be quit or graduate. The classifiers are multilayer perceptron (MLP) to predict pharmaceutical student performance. Among the MLP classifier, the outstanding outcome acquire is the MLP, which achieves through 80% accuracy. Based on result from the simulation used to display the train use test with cross validation is 10 fold in MLP is 29 for 63% in correctly classified instances (true positive rate for graduate) and 17 for 36% in incorrectly classified instances (false negative rate for quit).

ABSTRAK

Baru-baru ini, kursus farmasi adalah kursus penting kerana ia melibatkan kehidupan manusia. Selain itu, meramalkan prestasi pelajar adalah kebanyakan institusi pengajian tinggi di Malaysia. Objektif utama ini adalah untuk memberikan gambaran mengenai teknik Pembelajaran Mesin yang telah digunakan untuk mencadangkan untuk meningkatkan pencapaian pelajar dan untuk meramalkan bahawa pelajar farmasi akan berhenti atau lulus dari Universiti. Terdapat tiga sebab mengapa ini berlaku berkaitan dengan pernyataan masalah. Pertama adalah kekurangan pelajar farmasi dalam sektor industri farmaseutikal. Kedua adalah meningkatkan jumlah pelajar dari IPT tempatan untuk menawarkan program farmasi dan akhirnya adalah hasil kekurangan ahli farmasi yang diperlukan oleh pelajar. Serta tahu, jika mereka mengambil subjek farmaseutikal sama ada mereka mempunyai asas atau tidak dalam farmaseutikal, hasilnya akan memaparkan banyak pelajar farmasi gagal. Ini kerana, mereka masih tidak tahu bahawa mereka masih sesuai dengan kursus atau tidak. Di sini, penyelidikan sangat penting dan sesuai untuk keperluan untuk melaksanakan sistem untuk meramalkan prestasi pelajar farmaseutikal menggunakan pembelajaran mesin. Makalah ini juga menumpukan pada bagaimana ramalan menggunakan pengeluar Pembelajaran Mesin dan model yang telah diselesaikan untuk membuat ramalan pada data baru sebelum pelajar mendaftar kursus farmaseutikal dari WEKA ke kod Java. Ia boleh membawa manfaat dan impak kepada pelajar. Kajian ini mencadangkan teknik Pembelajaran Mesin untuk meramalkan sama ada pelajar farmasi akan berhenti atau lulus. Pengelas adalah perceptron multilayer (MLP) untuk meramalkan prestasi pelajar farmaseutikal. Di antara pengelas MLP, hasil yang cemerlang diperoleh adalah MLP, yang mencapai ketepatan 80%. Berdasarkan keputusan dari simulasi yang digunakan untuk memaparkan ujian penggunaan kereta api dengan pengesahan silang adalah 10 kali lipat dalam MLP adalah 29 untuk 63% dalam keadaan yang diklasifikasikan dengan benar (tingkat positif untuk lulusan) dan 17 untuk 36% dalam keadaan yang tidak benar (kadar negatif palsu untuk berhenti).

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LIST OF ABBREVIATION

MLP	Multilayer Perceptron
ML	Machine Learning
PC-SAS	Personal Computer Statistical Analysis Software
URL	Uniform Resource Locator

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Nowadays, the growth of information technology has ensured that matching performance to aims has become more complex and highly competitive in the environment. It is undeniable that the Institute of Higher Learning has an effective wardrobe, the professional instructors, the latest teaching and learning facilities will be more competitive in the face of increasingly challenging global competition.

Generally, student performance is most of higher learning institutions in Malaysia. This is because one of the criteria of higher learning institution that suitable based on the previous literature. Although, the student performance has good basic and knowledge, some researchers want to predicting student performance by using machine learning to evaluate and predict student performance to know the status that suitable if the pharmacy student whether quit or graduated at the University that they studied. So, they can predict themselves when they know the result, it is not impossible that they can improve their learning and get the best result, no matter where they come from groups before they registering the pharmaceutical course.

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Therefore, there are many techniques to evaluate student performance by using various machine learning techniques classifier that are appropriate for educational purposes. One of them is to identify every student either in high risk status or not. For example, they predict student performance through existing data set. This is because they can also be the way they want to identify whether these characteristics can affect the students' performance [1].

1.2 PROBLEM STATEMENT

Nowadays, the level of learning and performance of graduates in Higher Institutions such as STPM, Diploma and degree level is particularly alarming. However, after they have finished studying, their latest results determine their performance from the University to real-world employment.

The pharmaceutical course is the most important and to evaluate for pharmaceutical studies is important to maintain the student performance and effectiveness of the learning process. Firstly, the problem statement related to the case study is the lack of pharmacy student in the sector in the pharmaceutical industry. However, they have a problem is exceeding difficult with the contribution of Saudi pharmacist to local the pharmaceutical industry is very useful and important has affected the sector in the pharmaceutical industry.

Besides, secondly is, the student still does not know why will be learning the subject because increasing the number of students from local IPT University who wish to offer a pharmacy program dramatically. They do not have the flexibility to choose the tutors who are teaching the subject. They just don't know how to predict on themselves when they know the result; it is not impossible that they can improve in the pharmaceutical course

Lastly, achieving the high learning in performance is crucial attracting the result of this serious pharmacist shortage which is the pharmacy student is needed. Based on the Medical and Health field plans a great opportunity for career opportunities in the private sector. For example, latest for the case study that happens in area Malaysia such as there have a job vacancy to anyone want to apply as Lecturer University at UMP in major pharmaceutical such as pharmaceutical formulation or pharmaceutical manufacturing, technology and so on. This is because there is the best platform provided for gathering the student to apply for the job. (Refer Appendix A).

1.3 OBJECTIVE

The goals to be achieved in this research are the following:

i. To study and analyse the performance of the student in Pharmaceutical course

ii. To design and develop a system (prototype) using WEKA technique in JAVA programming codes.

iii. To apply the finalized model to make prediction on new data before the student registering the pharmaceutical course whether quit or graduated.

iv. To evaluate the machine learning classifier to detect the pharmaceutical of student performance.

1.4 SCOPE

The scope of this research is discussing are described as follow:

i. Scope - User friendly and feasibility
   - Can load your finalized model and use it tom make prediction new data
   - To train to test the dataset for your machine learning model from WEKA in the JAVA programming

ii. User – Student
   - All student takes subject in pharmaceutical course.

1.5 THESIS ORGANIZATION

This thesis consists of five chapters including chapter one until chapter five. Based on chapter 1, we shall discuss an introduction to the project to describe briefly about the project related to the issues. The next part is we shall discuss the problem statement related to the suitable issue before you trying to solve the problem. Next part is we shall discuss the objective to be achieved with the goal of the project. Another part is we shall discuss the scope which is the boundary of the research and users. Then lastly part is thesis organization to the summary of each chapter.

Based on chapter 2, we shall discuss the literature review. We must make reviews and explain this system. This chapter is to explain in details and make a comparison between the techniques or method or hardware or technologies which are suitable to be adapted into the research, and also discuss related works such as a domain, technique, methods and framework.

Based on chapter 3, we shall discuss the methodology. This chapter is to discuss the overall approach to covering the method, technique to be used. Therefore, the project implementation will be shown including system flow.

Based on chapter 4, we shall discuss result and discussion. This chapter is to discuss the development process between the data collection and analysis phase. This part can perform testing on every module and carried the result and knowledge analysis including development process, data collection that used to prediction, results from the output from WEKA to Java highlights, test use specification will be explained more details include with result and discussion.

Based on chapter 5, we shall discuss the final conclusion for the research. This chapter is to discuss concerning overall conclusion concerning this research. The outline can conclude the benefits and quality of the research.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

Machine Learning is a set of techniques used to apply the machine learning algorithm to predict the performances of students before registering the pharmaceutical course. The most important factors are to identify for predicting of pharmaceutical student performance as well as we know more considerable interest to pharmacy educator [2].

The prediction method to predict student performance must use the several machine learning algorithms that has three types such as classification, regression, and category. It seems to be mostly as chosen as a classification that suitable to apply the machine learning algorithm [3]. There are several method algorithms will use that have been applied to predict student performance using Machine Learning is Multilayer Perceptron (MLP).

2.2 EXISTING TECHNOLOGIES USING MACHINE LEARNING

This research to discuss the existing technologies using machine learning for previous studies in technology, literature, there are three examples of existing technologies using machine learning to predict student performance and previous thesis by technologies using Machine Learning

Table 2.1: Previous thesis by different technologies using Machine Learning

Title of Thesis	Criteria	Details	No. References
Predicting Postgraduate Student's Performance	Predict	To predict the final grade of postgraduate students	[2]
	Method	Naïve Bayes and 1-NN	
	Outcomes	Result - total accuracy.	
Using Machine Learning to Predict Student Performance	Predict	To predict the student is successful or not, based on other properties	[4]
	Method	Linear Regression, Decision Tree & Naïve Bayes	
	Outcomes	Result - the effectiveness of different algorithm and method	
Predicting Academic Performance of Pharmacy Students : Demographic Comparisons	Predict	To predict pharmacy student academic performance using many independent variables	[5]
	Method	Data collection (Questionnaire) Data analysis (PC-SAS)	
	Outcomes	Result – Correlation matrix of overall student, correlation analysis academic success demographic	
Predicting of Student Performance using Machine Learning	Predict	To prediction student performance with pharmacy student whether the student is quit or graduate.	[This study]
	Method	Machine Learning Classifier : Multilayer Perceptron	
	Outcomes	Result – Display status prediction (graduated or quit) from loaded model object (WEKA Explorer and JAVA)	

2.3 RELATED WORKS

This thesis briefly to describe the effectiveness of different machine learning algorithm and method will use that have been applied to the prediction of student performance using Machine Learning**.**

2.3.1 Machine Learning Classifier

Machine Learning is a set of techniques used to apply the machine learning algorithm to predict the performances of students in the pharmaceutical course depending on demographic variables. In order, the machine learning algorithm is divided into two learning types are supervised and unsupervised learning.

2.3.1.1 Supervised Learning

Based on the supervised learning, the classification, whereas for each data set of training data are labeled with the category also is known as input data. The task of the algorithm by creating a model, it can predict one property by other properties. After this created, the algorithm can use to process data that has the same class structure as input data [4]

2.3.1.2 Unsupervised Learning

In contrast with supervised learning, the unsupervised learning just test data only demand input data does not have a class structure that has not been labelled, classified or categorized. Instead of the task of the algorithm is to reveal a structure in the data [10]

2.4 PREDICTION USE ALGORITHM /METHOD /TECHNIQUE

In educational by machine learning method, this reason is to predict of the modelling is usually from the student in the pharmaceutical course to make a prediction of student performance [3]. There are types of the method and algorithm that used in prediction of student performance is such as Multilayer Perceptron.

2.4.1 Multilayer Perceptron (MLP)

Some researchers have used this technique because this is suitable for classification functions to study focus on classification based on an algorithm on pharmaceutical's course for student data. Most importantly, when a classification function can be considered a return on prediction, the multilayer perceptron to have a measure of how the relationship between sets with the attribute values can be determined into one or more classes when used in multilayer perceptron to predict student performance [7].

2.5 EXISTING FEATURES

2.5.1 Comparison between existing features of prediction

This section briefly describes the features of student performance in previous work. The purpose of my research the aim is to find the best method and algorithm for make prediction of student performance in the pharmaceutical course [4]. This thesis also consists of many similarities of the previous work a study was made by researchers (See Table 2.2)

2.6 MACHINE LEARNING CLASSIFIER

2.6.1 Example of Machine Learning Classifier

This section briefly describes the comparison between different existing techniques and example of machine learning classifier for prediction of student performance in previous work. This thesis also consists of many similarities of the previous work studies were made by researchers (See Table 2.3).

Table 2.2 Result related the Features of Student Performances

Motivation	List of the Problem	Objectives	Purpose	Result	Authors
Pharmacy student's academic is the most important in the pharmacy programs.	To predict pharmacy students' academic performance using many independent variables	To compare the predictive power of these independent variables and demographic variables	Apply the Data collection such as questionnaire, Demographic variables and Data Analysis – PCSAS (Personal Computer Statistical Analysis Software)	Correlation analysis of academic success by demographics	[5]
In education, the application of machine learning algorithm to predict student performance.	To predict whether the student is successful or not, based on other properties.	To find the best method to evaluate a variable approach for predicting student dropout or performance.	Apply the Machine Learning to predict a student will be successful or not.	To evaluate the effectiveness of different machine learning algorithm and methods	[4]
Pharmacy course is the important course as it involve human lives	Many pharmacy student is failed. Student still don't know that they still suitable with the course or not. In case, many patient increase even the have new technology (Moore' Law)	To identify and make prediction student performance whether the student is quit or graduate.	Apply the Machine Learning the pharmacy student is quit or graduate.	For this result by the accuracy from WEKA's were used. Predict result from WEKA to JAVA code after the loaded model.	[This Study]

Table 2.3 Example for Machine Learning Classifier in the Previous Studies

References	Machine Learning Classifier	Predict Student for	Year of Journal
[1]	Decision Tree (DT), Artificial Neural Network (ANN), Naïve Bayes (NB), Bayesian (B), K--Nearest Neighbor (KNN), Ruler Based Learner (JRIP) & Perceptron based Neutral Network [WINNOW]	Student in Academic Organization	2015
[2]	Naïve Bayes (NB), K-Nearest Network (K-NN), Sequentially Minimal Optimization(SMO), J48, Random Forest (RF), Repeated Incremental Pruning to Produce Error reduction (RIPPER) & Ruler Based Learner (JRIP)	Final grade Postgraduate student	2003 - 2006
[4]	Linear Regression (LR), Decision Tree (DT) & Naïve Bayes (NB)	Student	2017
[This Study]	Multilayer Perceptron (MLP)	Pharmacy Student	2019

CHAPTER 3

METHODOLGY

3.1 INTRODUCTION

This section will be focused on the methodology that suitable to survey in research that related to predicting student performance using machine learning. In other words, this research can show the overall workflow of the study experiment.

In this chapter, it will discuss all the necessary information need in this research. The methodology used in Predicting of Student Performance in WEKA and approach in JAVA development tools will discuss in this chapter. The Gantt chart show the duration and the research phase also present in this chapter.

3.2 RESEARCH METHODOLOGY

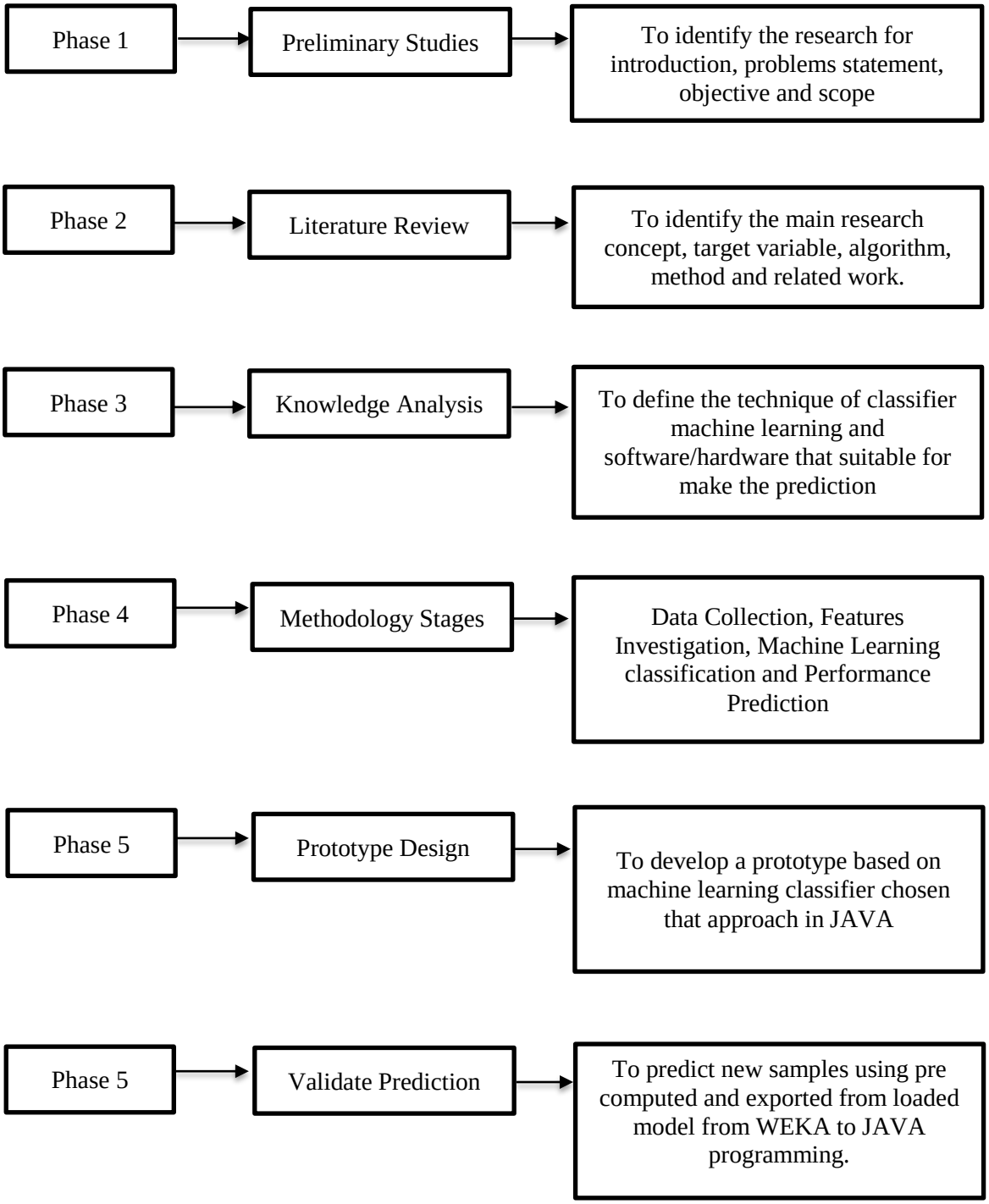


Figure 3.1 Flowchart of Research Methodology

Figure 3.1 shows the research methodology for this research from phase 1 until phase 5. There are preliminary studies performed in Phase 1, literature review that performed in Phase 2, knowledge analysis that performed in Phase 3, methodology stages that performed in Phase 4 and validate prediction that performed in Phase 5. These will discuss in details about it.

3.2.1 Phase 1: Preliminary Studies

This phase 1 has discussed to identify the research for introduction, problems statement, objective and scope of the study. It also discussed how they predict student performance by using machine learning to evaluate and predict student performance to know the status that suitable if the pharmacy student whether quit or graduated. So, they can predict themselves when they know the result, it is not impossible that they can improve their learning and get the best result, no matter where they come from groups before they registering the pharmaceutical course.

3.2.2 Phase 2: Literature Review

This phase 2 has discussed to identify the main research concept, to analysis and compare the several techniques or method target variable, algorithm, method and related work in predicting student of performance. Next, phase 2 also to study and understand all the previous work studies including all the technique that used in previous work. Lastly, phase 2 is to make a review and analyse existing technologies using Machine Learning and how they work it. Review previous research finding of prediction student performance using Machine Learning still in the literature review phase.

3.2.3 Phase 3: Knowledge Analysis

This phase 3 has discussed to define the technique of classifier machine learning and software or hardware that suitable for making the prediction of student performance. This phase also makes analysis phase which is analysed from WEKA to generate the result that approach in Java Programming which means only one Machine Learning classifier chosen to prove the efficiency

3.2.4 Phase 4: Methodology Phase

This phase 4 has discussed will be focused on the methodology that suitable to survey in research related to predicting student performance using machine learning. In other words, we can show the overall the workflow of the study experiment. There are many stages that used in predicting student performance such as data collection, features investigation, Machine Learning classification and performance prediction to evaluate these characteristics used by the machine learning. The stages of details of the research are described as follows:

i) Data Collection

- It focused on how the classification based on the algorithm on pharmaceutical's course can be used to identify the attributes in student data (dataset).
- A dataset that contains student data and other information just recently in real-world data were collected relate UMP student (FTEK Faculty)

- Selection of student data also is random. It organized into divided into certain types of data structures to help the study experiment which to examine the application.
- Example of data collection is gender, early qualification, gender, state, and result MUET.

ii) Features Investigation

- It focused on the process of selecting the variable to improve data result from the Machine Learning from WEKA to JAVA highlight.
- To optimize the detection to select unique features because they use the features when the Machine Learning makes predicting student performance.
- Example of features investigation is when you set to value 0 for data automatically they will predict as “graduated” and when you set value is 1 for data automatically they will predict as “quit”. This means the features can be done when observing from the output display whether the pharmacy student will be quit or graduate.

3.2.5 Phase 5: Prototype Design

This phase 5 has discussed to develop a prototype based on machine learning classifier was chosen that approach in JAVA programming. During the prototype designing the flow for the algorithm, actually, the research must need to analyse and identify the step by step from the process initial until the process finish. The first step is, getting input from the user and next is generate the resulting output. The prototype design is developed using JAVA programming (NetBeans) and actually WEKA tools also in JAVA language

3.2.6 Phase 6: Validate Prediction

This phase 6 has discussed to predict new samples using pre-computed and exported from a loaded model from WEKA to JAVA programming. The validation process is to evaluate the final result to know the status that suitable if the pharmacy student whether quit or graduated.

3.3 SYSTEM DESIGN FOR MACHINE LEARNING IN WEKA TOOLS

As being we have mentioned in Chapter 3 in performance prediction, WEKA and JAVA are being used for developed and create a prototype. This software is an essential part to proven research to implement from WEKA to Java Programming environment with WEKA to the prototype to show how to store and load model, then manipulate them and use them to evaluate data to make prediction pharmacy student performance. There are the figures of WEKA GUI Chooser as below:

Figure 3.2: WEKA GUI Chooser Interface

Figure 3.2 shows that the interface main for WEKA GUI Chooser. When we open the WEKA, the user is given a small window with four buttons labelled application.

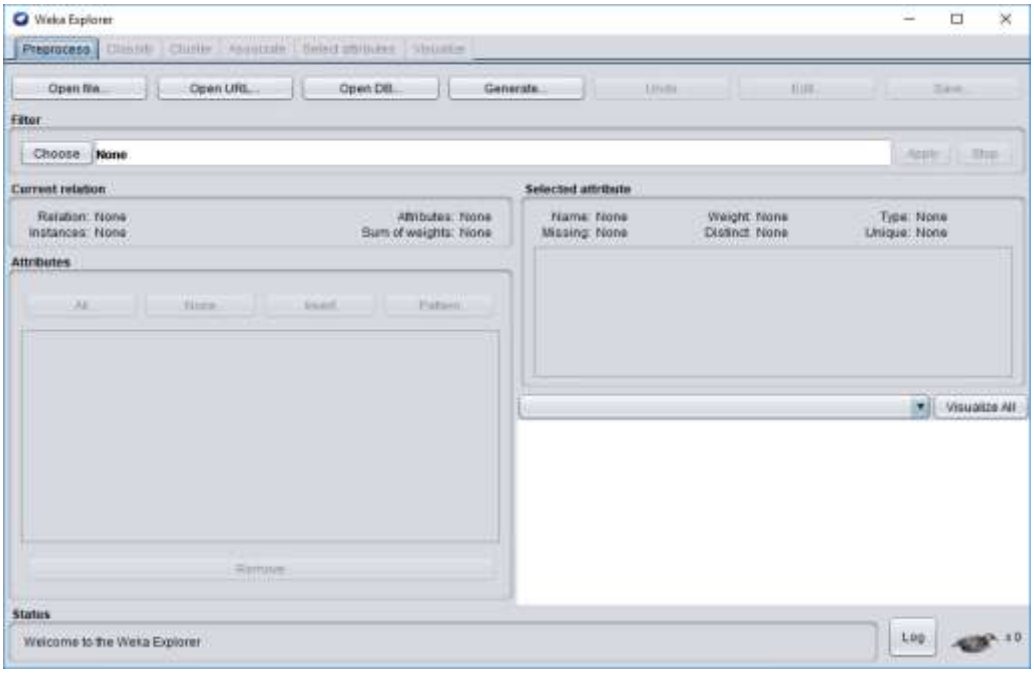


Figure 3.3: The WEKA start up box

Figure 3.3 shows a WEKA interface after the user selecting Explorer to describes the various data modelling process.

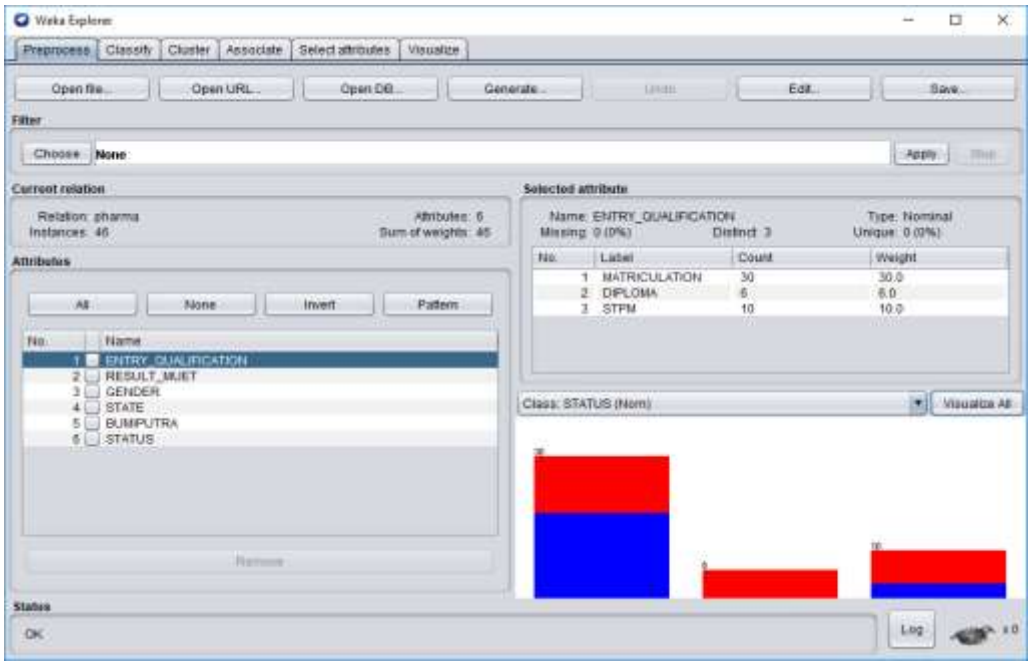


Figure 3.4: Finalize a Machine Learning Model in WEKA

Figure 3.4 WEKA also can read in a variety of file types including CSV files. The pharma student is a dataset that used and available as ARFF file also make the file the current dataset in WEKA. Just only one dataset can be in memory at a time.

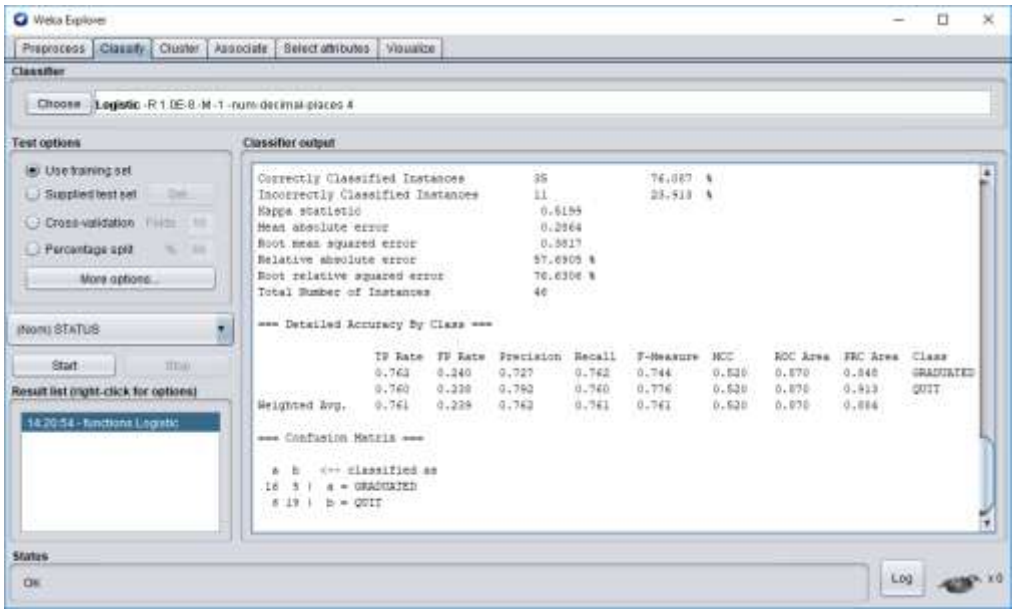


Figure 3.5 starting the modeling process and saving a model

Figure 3.5 show the contents of WEKA once the user makes train initial model use the current dataset and then the user clicks the “Classify” and choose the model type is Logistics and click start to start the modeling the process. Save the model as “data1.model” on your disk.

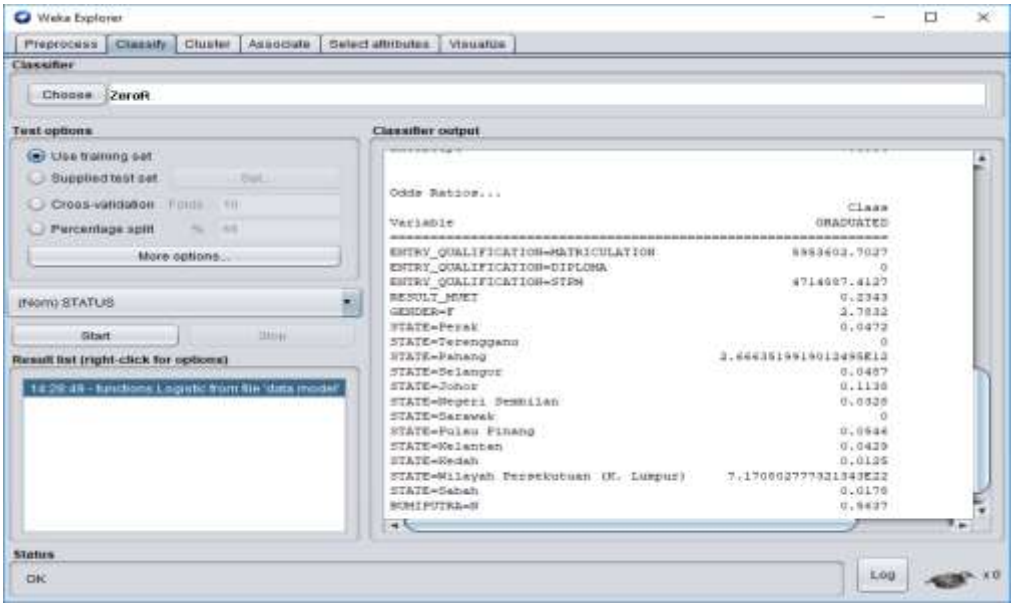


Figure 3.6 WEKA model Load a Finalized Model ready for use

Figure 3.6 shows to load saved WEKA models from your file. We can use the loaded the model to make a prediction for new data. A user just right clicks on the Result List and click “Load Model”, select the model that saved in the previous section as “data1.model.

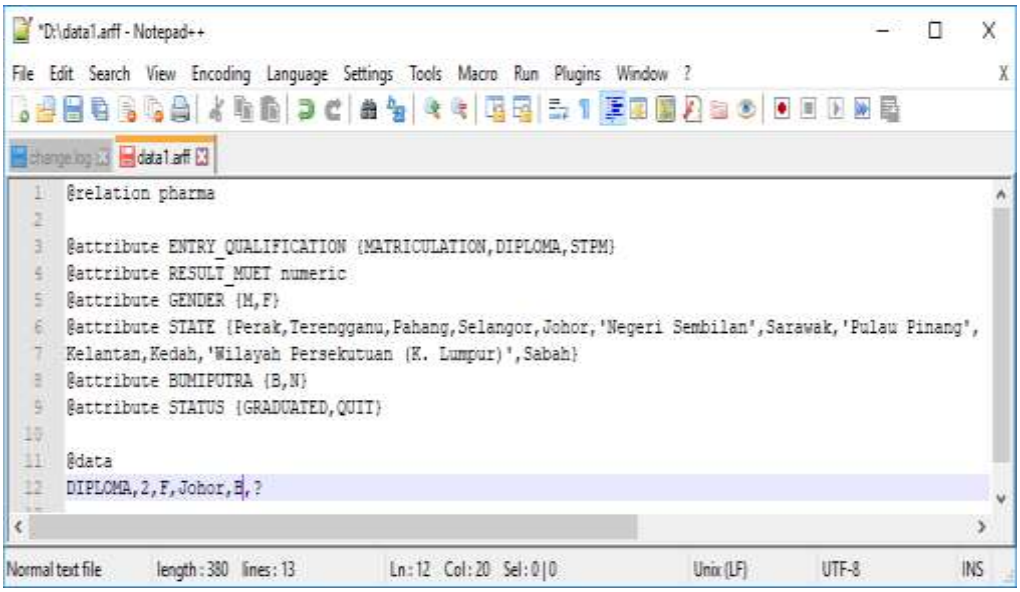


Figure 3.7 WEKA dataset copy with edit Notepad++

Figure 3.7 shows WEKA dataset for making a new prediction on new data using edit Notepad++. Users just keep one record only and move down1lines only. Then the class output (output variable) and replace with a question mark as a symbol (?).

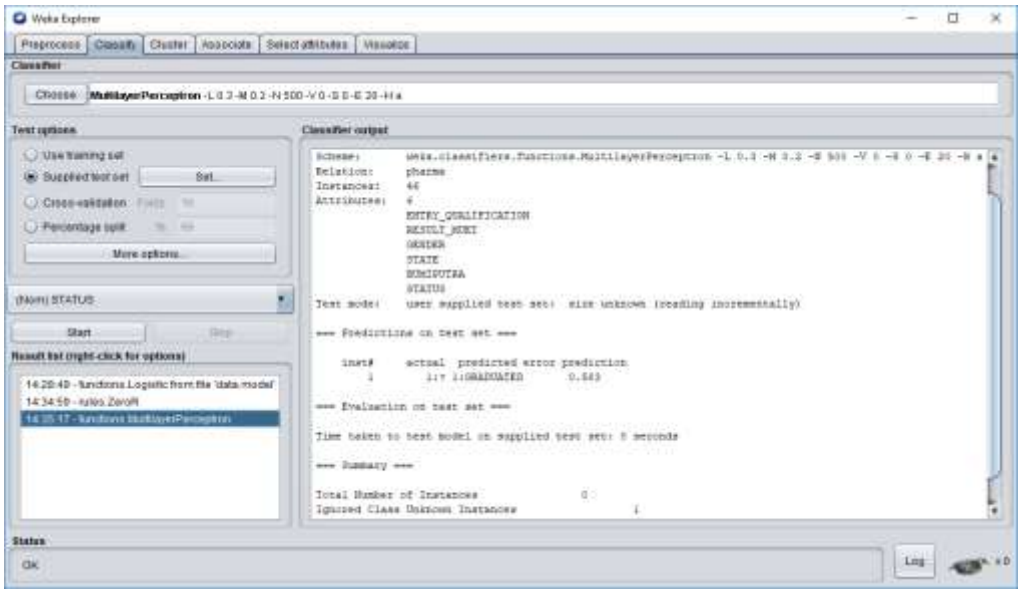


Figure 3.8 WEKA dataset for make prediction on new data by a Loaded Model

Figure 3.7 shows shows WEKA dataset to making new data on “unseen” data with no unknown output to make a prediction. User will select “Supplied Test Set” and click “Open File” to add new dataset with the name “data1.arff” and close. Then, the user must click the “More Option” button to uncheck the information and click OK. So the output displays the predictions for each test instance are then listed in the “Classifier Output” pane

3.4 SYSTEM DESIGN FOR MACHINE LEARNING IN JAVA PROGRAMMING

In this section, we have mentioned in Chapter 3 in performance prediction, Java programming is also being used for developed and create a prototype to make prediction student performance. This software is an essential part to proven research to implement an approach for programming in Java to WEKA environment that used in the research prototype to print out prediction with WEKA in Java Programming such as, train and test the data and predict the new data. There are the figures of a framework for Java programming as below:

3.4.1 Use Training Test

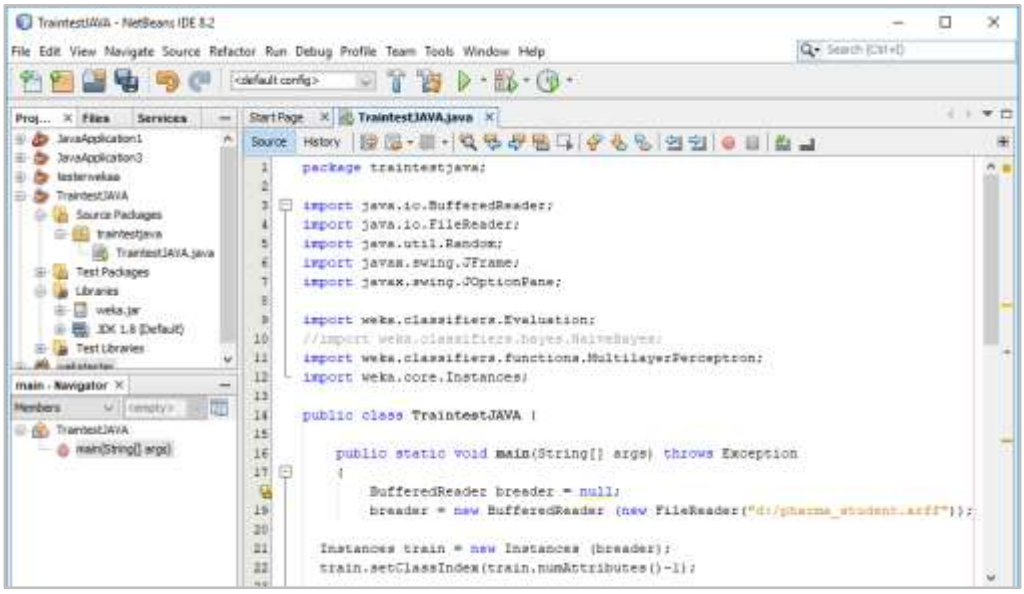


Figure 3.9 (i) Coding for programming in Java to use training set to WEKA

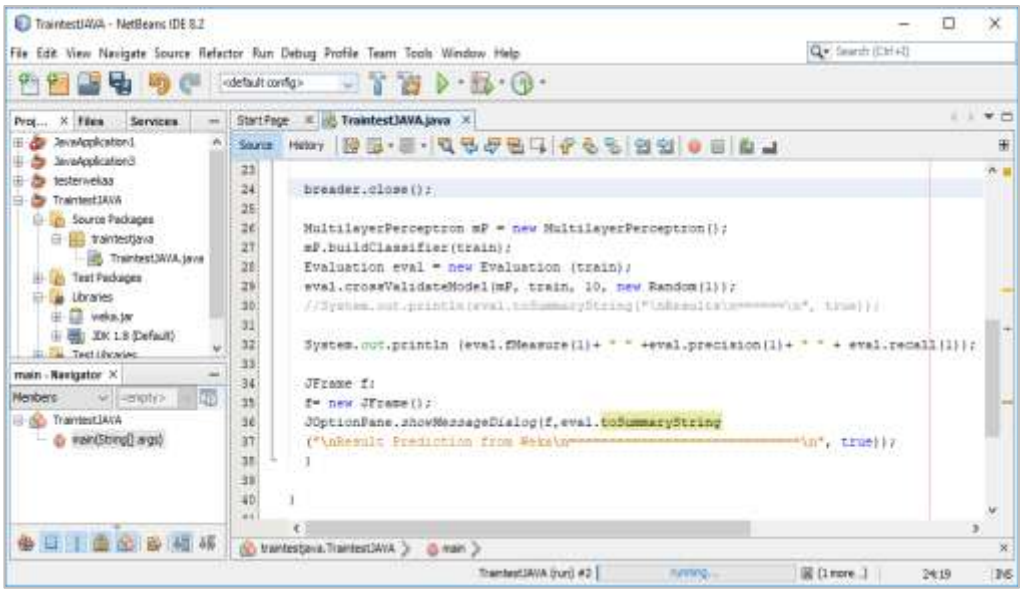


Figure 3.9 (ii) Coding for programming in Java to use training set to WEKA

Figure 3.9 (i) and (ii) shows coding for programming in Java to use the training set to WEKAto know how to interact with the WEKA API for the first time with a simple Java code. In this code, we have loaded an ARFF file called ‘pharma student.arff” and then used Multilayer Perceptron classifier with a 10 fold CV setup. So, we showed the standard output of WEKA on the JAVA output as well as the F-score, precision, and recall of the 10 fold CV.

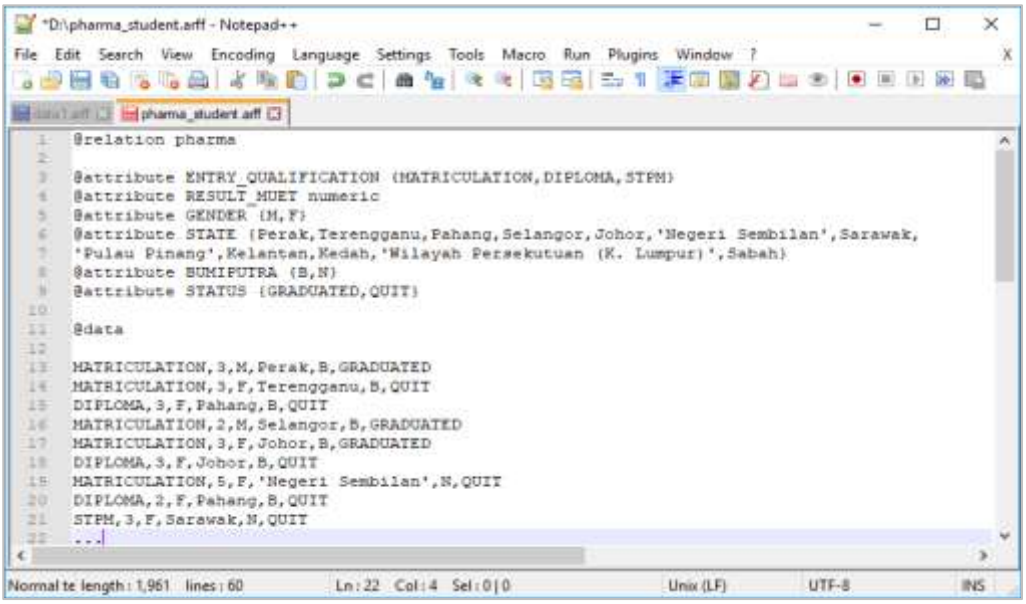


Figure 3.10 Edit with NotePad ++ to Use Training Set

Figure 3.10 shows coding for programming in Java to use the training set to WEKA to know how to interact with the WEKA API for the first time with a simple Java code

3.4.2 Predict New Samples using Exported Model Object

```
package wekatester;
import java.util.ArrayList;
import java.util.List;
import weka.classifiers.Classifier;
import weka.core.Attribute;
import weka.core.DenseInstance;
weka.core.Instances;
```

Figure 3.11 Header files for WEKA in Java script Programming

Figure 3.11 shows the header files for WEKA that used in Javas script programming such as WEKA classifier, WEKA attributes, WEKA dense instance and WEKA instance. User must right click button the “Libraries” from the “Project” and add “JAR/Folder” name as weka.jar.

```
public class Wekatester
{
public static void main(String[] args)
{
    new Wekatester().main();
}
```

Figure 3.12 Class name for WEKA in Java script Programming

Figure 3.12 shows the class name for WEKA that used in Java script programming name as “WekaTester”. So, the package name and the class name is same name variable.

```
public void main()
{
   // we need those for creating new instances later
         final Attribute attributeEntryQualification = new
         Attribute("ENTRYQUALIFICATION");
   final Attribute attributeResultMuet = new
Attribute("RESULTMUET");
   final Attribute attributeGender = new Attribute("GENDER");
   final Attribute attributeState = new Attribute("STATE");
   final Attribute attributeBumiputra= new Attribute("BUMIPUTRA");
   final List<String> status = new ArrayList<String>() {
         {  add("GRADUATED");
            add("QUIT");  }
};
```

Figure 3.13 WEKA attributes in Java script Programming

Figure 3.13 shows the WEKA attributes for WEKA that used in Java script programming. The user make create the new instance or attributes from current dataset such as entry qualification, result MUET, gender, state, “bumiputra” and status

```
// Instances(...) requires ArrayList<> instead of List<>...
ArrayList<Attribute> attributeList = new ArrayList<Attribute>(2){{
        add(attributeEntryQualification);
        add(attributeResultMuet);
        add(attributeGender);
        add(attributeState);
        add(attributeBumiputra);
        Attribute attributeStatus = new Attribute("@@status@@",
        status);
        add(attributeStatus);
       } };
```

Figure 3.14 WEKA [Array List] for each attributes in Java Programming

Figure 3.14 shows the WEKA [arrayList] for each attributes for WEKA that used in Java script programming. The user must added all attribute instances requires to the [arrayList].

.

```
// unpredicted data sets (reference to sample structure for new
instances)
Instances dataUnpredicted = new
Instances("TestInstances",attributeList, 1);

// last feature is target variable
dataUnpredicted.setClassIndex(dataUnpredicted.numAttributes() - 1);
```

Figure 3.15 Unpredicted data sets and last feature in Java Programming

Figure 3.15 shows the unpredicted data sets for reference to sample structure for new instances and last feature (target variable) in Java script Programming.

```
// create new instance: this one should fall into the Pharma Student
domain
DenseInstance newInstanceStatus = new
DenseInstance(dataUnpredicted.numAttributes())
{
        {
        setValue(attributeEntryQualification,0);
        setValue(attributeResultMuet,0);
        setValue(attributeGender,0);
        setValue(attributeState,0);
        setValue(attributeBumiputra,0);
        }
};
```

Figure 3.16 Create new instances from data model in Java Programming

Figure 3.16 shows the user want to create new instances and set value is 0 for each attribute lines. This is because the Java script programming used [numAttributes()].

```
// instance to use in prediction
DenseInstance newInstance = newInstanceStatus;
```

Figure 3.17 Declaration of instance to use in prediction in JAVA

Figure 3.17 shows the declaration of instance to use in prediction and reference to dataset in Java script Programming use import WEKA [DenseInstance] in Java script programming.

```
// reference to dataset
 newInstance.setDataset(dataUnpredicted);
```

Figure 3.18 Declaration of reference to dataset in JAVA

Figure 3.18 shows the declaration of reference to dataset in Java script Programming use import WEKA [NewInstance] and [setDataset] in Java script programming.

3.5 HARDWARE AND SOFTWARE DEVELOPMENT

3.5.1 Hardware Development

This thesis will focus about the hardware development used in the research (Refer Table 3.2)

Table 3.2 shows the hardware used in the research

Type of Hardware	Purpose
Personal computer (PC) / Laptop	Device to write the research and develop the system
Printer	Device to print the search paper
Pendrive / Hardisk	Devices to save the journal and research paper

3.5.2 Software Development

This thesis will focus about the software development. There are list of software development that uses in the thesis. (Refer Table 3.3)

Table 3.3 shows the software used in the research

Type of Software	Purpose
Microsoft Office Word 2010	Application to write the research and develop the system
Windows 7 Ultimate	Type of operating system
Microsoft Project 2010	Application to develop the Gantt Chart
Microsoft Excel 2010	Application to collect the student data and other information dataset use number and string
WEKA tools	Application to predict the data
Mendeley Desktop	Application to insert citation to make reference
Grammarly / Grammar Checker Ginger	Application to check grammar in the thesis
Netbeans	Application to make a prototype

3.6 GANTT CHART

The Gantt chart has shown the estimate duration from the research start until the research end. (Refer Appendix B)

CHAPTER 4

RESULT AND DISCUSSION

4.1 INTRODUCTION

Continuously from the previous chapter, this chapter is presented to display the result of the finding based on the prototype like a system to predict student performance to predict a new samples using pre computed and exported model object from WEKA in Java development and testing that have been done to help achieved this research objective. Besides, this research also has a test case specification was conducted on the developed the research prototype

4.2 RESULT OUTPUT PREDICTION

4.2.1 Result Prediction from WEKA Explorer

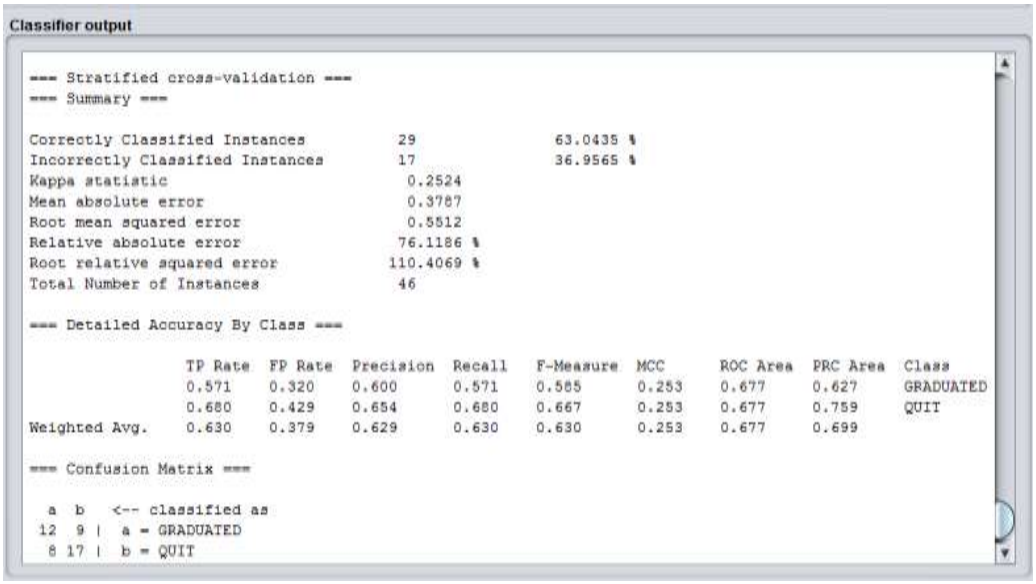


Figure 4.1 Result from use training set use in WEKA

.

Figure 4.1 shows the result from use training set use in WEKA. Actually, the results also display with same result from the WEKA to Java Programming.

4.2.2 Result Prediction in JAVA Programming

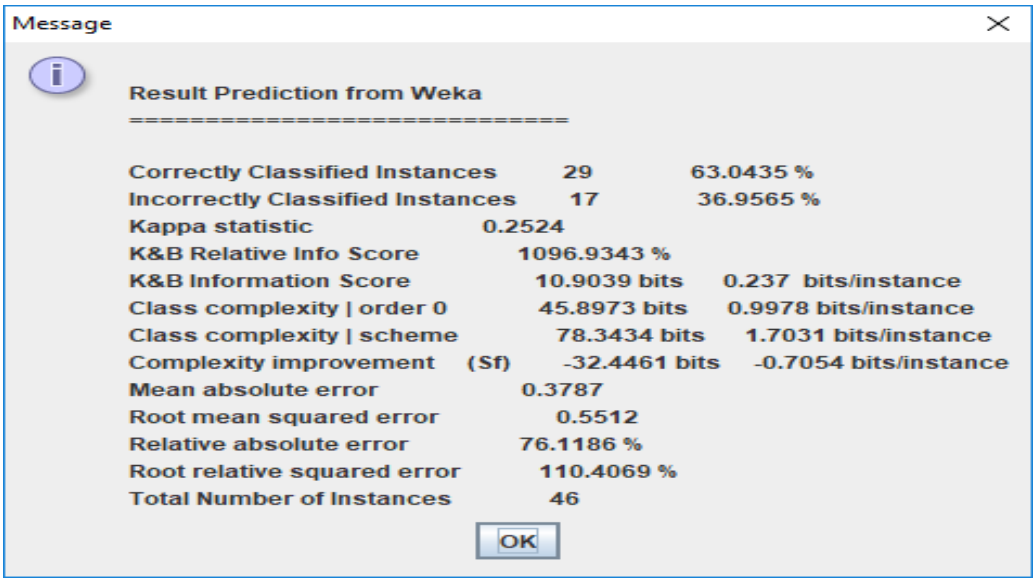


Figure 4.2 Result from use training set use in Java Programming

Figure 4.2 shows the result from use training set use that approach in JAVA programming. Actually, the results also display with same result from the WEKA Explorer.

4.2.3 Result Predict New Sample use the classifier

```
// import ready trained model
Classifier cls = null;
  try {
  cls = (Classifier) weka.core.SerializationHelper.read("d:/new1.model"); }
  catch (Exception e) {
  e.printStackTrace(); }
       if (cls == null)
 return;
```

Figure 4.3 Declaration to ready trained model in JAVA Programming

Figure 4.3 shows the declaration of instance to use in prediction and reference to dataset in JAVA Programming. The following example in JAVA programming has two aspects of this process, such as loading such a model object, how to format a new, yet unclassified instance so that its target variable can be predict using the loaded model

```
// predict new sample
try{
 int result = (int) cls.classifyInstance(newInstanceStatus);
System.out.println("Index of predicted class label: " + result + ", which
corresponds
To status: " + status.get(new Double(result).intValue())); }
catch (Exception e) {
      e.printStackTrace(); }
   }
}
```

.

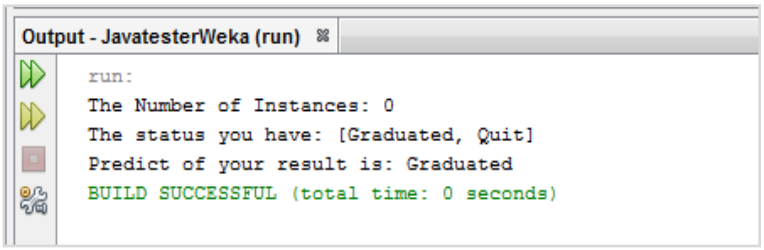
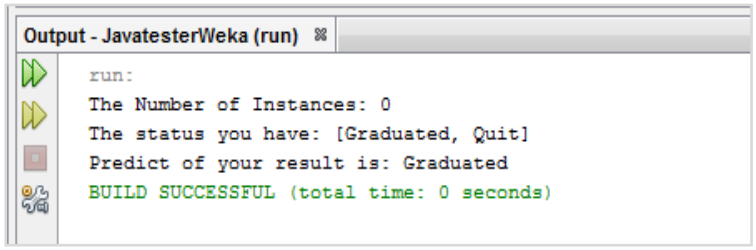
Figure 4.4 Declaration to predict new sample in JAVA Programming

Figure 4.4 shows the declaration to classify the instance after loaded model so that its target variable can be predict using the loaded model in JAVA Programming. The following example in JAVA programming has two aspects of this process, such as loading such a model object and how to format a new sample for the make prediction.

4.2.4 Result Output After Prediction

Table 4.1 shows the result output after make prediction. After the user click the “Run” button, the output display is "Index of predicted class label: 0, which corresponds to status: GRADUATED". The result just displays one lines result because the data model just one keep record only. (Refer table 4.1)

Table 4.1 Declaration to predict new sample in JAVA Programming

First Trial using JAVA	
First Trial using WEKA	=== Predictions on test set === inst# actual predicted error prediction 1 1:? 1:GRADUATED 0.518 === Evaluation on test set ===
Second Trial using JAVA	
Second Trial using WEKA	=== Predictions on test set === inst# actual predicted error prediction 1 1:? 1:GRADUATED 0.583 === Evaluation on test set ===

4.3 TEST CASE SPECIFICATION

This test specification yield the actual result based on WEKA and Java Programming. Table 4.1 shows the list of test case specification of research prototype using WEKA and Java. This software is an essential part to proven research to implement from WEKA to Java Programming environment.

Table 4.2 Test Case Specification

Test Case Scenario	Test Case ID	Test Case	Pre - Condition	Test Step	Expected Result	Actual Result	Status
Predict of student performance using WEKA platform	TC01	Check the search functionality when you open file and entered file saved in *.xlsl (excel) or *.txt (text)	Check menu search has been opened in user's desktop	1. Search WEKA GUI Chooser platform 2. Click the "Explorer" 3. Click the open file	Search WEKA functionality should not work when file cannot entered to the WEKA Explorer	Search functionality not work when file cannot entered to the WEKA Explorer	FAILED
	TC02	Check the search functionality when you open file and entered data files in saved in *.arff (Attribute-Relation File Format)		1. Search WEKA GUI Chooser platform 2. Click the "Tool" 3. Click the "ArffViewer" 4. Click "File" and "Open" the dataset. 5. Click "Save as" in arff data files (*.arff)	Search WEKA functionality should can work when data files can entered to the WEKA Explorer	Search functionality can work when data files can entered to the WEKA Explorer	PASS

Test Case Scenario	Test Case ID	Test Case	Pre - Condition	Test Step	Expected Result	Actual Result	Status
Predict of student performance using WEKA platform	TC03	Check the results to be displayed in first predict new sample after load models	Check menu search has been opened in user's desktop	1.Search WEKA GUI Chooser platform. 2.Click the "Explorer" 3.Open files dataset 4. Click the "Classify" 5.Right clicked from the "Result List". Click "Load Model" and add "data.model" 7.Click "Supplied Test Set" and click "Set". Then click "Open File" entered new dataset and close. 8.Click "More Options" and uncheck list a) Output model	Total number of results should be less than 1 line record for first predict new sample in the WEKA platform	Total number of results less than 1 line record for first predict new sample in the WEKA platform	PASS

				b) Output per-class-stats c)Output confusion matrix d)Store prediction for visualization 9.Choose the "Output Predictions" from Null to Plain text. Click OK 10. Click "Start"			
Predict of student performance using JAVA platform	TC04	Check the header files that suitable for the Java script programming	Check menu search has been opened in user's desktop	1.Open a Netbean 2.Not entered keyword for the header files that related to the Javascript programming Keyword = "weka"	The developed prototype should not work on the header files to the Java Script Programming	The developed prototype should not work when header files cannot add keyword to the Java Script Programming	FAILED

Predict of student performance using JAVA platform	TC05	Check the header files that suitable for the Java script programming	Check menu search has been opened in user's desktop	1. Open a Netbean 2.Entered keyword for the header files to the Javascript programming. Keyword = "weka" 3.Right click the "Libraries" and click "JAR/Folder" and choose the "weka.jar" 4. Click OK	The developed prototype should can work on the header files to the Java Script Programming	The developed prototype should can work when header files can add keyword to the Java Script Programming.	PASS
Predict of student performance using JAVA platform	TC06	Check the results to be displayed in predict a new samples using pre computed and exported model object from WEKA in Java.	Check menu search has been opened in user's desktop	1. Add 1 record data only 2.Set value 0 for each attributes 3.Declare the classifier from exported data model	Total number of results should be less than 1 line record for first predict new sample in the prototype (JAVA)	Total number of results less than 1 line record for first predict new sample in the research prototype (JAVA)	PASS

Predict of student performance using JAVA platform	TC07	Check the results to be displayed in predict a new samples using pre computed and exported model object from WEKA in Java.	Check menu search has been opened in user's desktop	1. Add more than one record data. 2.Set value 0 for each attributes 3.Declare the classifier from exported data model	Total number of results should be more than 1 line record for first predict new sample in the research prototype (JAVA)	Total number of results more than 1 line record for first predict new sample in the research prototype (JAVA)	FAILED

Table 4.1 shows the final test case after predict a new samples using pre computed and exported model object from WEKA Explorer in the Java programming on the development and testing that have been done to help achieved this research objective in the developed as prototype name as 'WEKATESTER.java. There are two test case scenarios with seven test cases that have been listed out. Each test case has been provided precondition, test step, expected result and actual result.

:

CHAPTER 5

CONCLUSION

5.1 INTRODUCTION

This chapter discussed that features involve with the methodology stages such as data collection, feature investigation, Machine Learning classification and performance prediction that have been done, conclusion for research work will presented , future suggestion and enhancement of implementing a prototype design using WEKA tools to approach in JAVA highlight..

The aim for the research was to develop a research prototype with implementing using JAVA code from WEKA tool which is the result of prediction is same and both use the classifier to predict of student performance.

Research for the existing tool for the suggestion also helped to develop the prototype for this research. The thesis use multilayer perceptron to make prediction. Then, the thesis also makes many references and the example to know how to save machine learning model and make prediction use WEKA to approach in JAVA programming code

The methodology, system design and implementation of prediction of student performance using machine learning from WEKA tools to JAVA programming code technique in the developed the simple a prototype to prove and predict new sample that used in exported loaded model that already save from WEKA tool to approach in JAVA programming code work as expected in this thesis. The testing includes the machine learning classifier suggestion from the existing tool. As a conclusion as been mentioned from the previous chapter which are literature review such as existing technology in machine learning, comparison between existing use features investigation to prediction of student performance and machine learning classifier that used in the thesis. Lastly, the result obtained show that the JAVA programming code technique was correctly to implement to predict new sample that used in exported loaded model that already save from WEKA tool to approach in JAVA programming.

5.2 RESEARCH CONSTRAINT

A research constraint is Constraints in research are a restriction that defines a project's limit. in other words, the limit of the project. For example, the scope includes one example of the limit in which the thesis expects before implementing the prototype. There are two of research constraint. First constraint for this research is limited time for time constraints. For example, we not enough the time to develop a prototype to link to the GUI (Graphical User Interface). The research takes long time to added linked to the GUI which is have many errors when the prototype wants to runs application. Second constraint for this research is configure the parameter to the JAVA code for reliability of the data. Lastly, all of the constraint for this research will be recommendation for improvement for future work.

5.3 FUTURE WORK

There are part discussion suggestion that can be taken into consideration to enhancement of the research including knowledge and contribution to the University, faculty, society or the researcher throughout the research. There are several enhancements that can be carried out for future improvement of prediction of student performance as follow:

a) Develop in GUI (Graphical User Interface) for software development.

b) Implementing in mobile application. This function is all student from different faculty can access the application every time and everywhere.

c) Create an application to connect with the server CLOUD. This function is can add many data and feature for your future work such as result for another subject. Advantages is safe security and faster

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APPENDICES

APPENDIX A

(Part I)

Universiti Malaysia PAHANG
Engineering • Technology • Creativity

BAHAGIAN PENGURUSAN SUMBER MANUSIA,
JABATAN PENDAFTAR,
UNIVERSITI MALAYSIA PAHANG,
26600 PEKAN,
PAHANG DARUL MAKMUR

Kumpulan Pengurusan dan Profesional

Jumlah Kekosongan Jawatan - **TETAP:** 3

Penempatan Jawatan: FAKULTI TEKNOLOGI KEJURUTERAAN, GAMBANG

PENSYARAH UNIVERSITI GRED DS45/DS51/52/DS53/54/VK7/VK6/VK5

A. PENSYARAH UNIVERSITI GRED DS45 ;
Tangga Gaji RM3,070.00 (minimum) - RM11,095.00 (maksimum)

B. PENSYARAH UNIVERSITI GRED DS51 ;
Tangga Gaji RM5,855.00 (minimum) - RM12,445.00 (maksimum)

C. PROFESOR MADYA GRED DS53 ;
Tangga Gaji RM6,162.00 (minimum) - RM13,235.00 (maksimum)

D. PROFESOR GRED KHAS C (VK7) ;
Tangga Gaji RM7,676.00 (minimum) - RM20,592.00 (maksimum)

APPENDICES

APPENDIX A

(Part II)

Keutamaan kepada calon:

-

Mempunyai kemahiran dalam bidang:
1) Pharmacy

Klasifikasi Bidang:

Syarat Tambahan :

1. Calon mestilah mempunyai Ijazah Doktor Falsafah (PhD) dalam bidang farmasi yang diiktiraf oleh

Kerajaan daripada institusi-institusi pengajian tinggi tempatan atau kelayakan yang diiktiraf setaraf

dengannya serta berdaftar penuh dengan Lembaga Farmasi Malaysia.

2. Calon hendaklah merupakan Ahli Farmasi Berdaftar yang diiktiraf oleh Lembaga Farmasi Malaysia

3. Calon mestilah mempunyai kepakaran dalam bidang berikut:

(i) Drug delivery system;

(ii) Pharmaceutical Formulation;

(iii) Quality Management System;

dan mempunyai sub bidang kepakaran berikut:

(i) Clinical Pharmacy

(ii) Pharmaceutical Manufacturing/ Technology/ Engineering/ Sciences

1. Mempunyai pengalaman dalam industri Farmaseutikal sekurang-kurangnya dua (2) tahun; atau mempunyai pengalaman mengajar di peringkat pengajian tinggi sekurang-kurangnya dua (2) tahun dan ke atas.

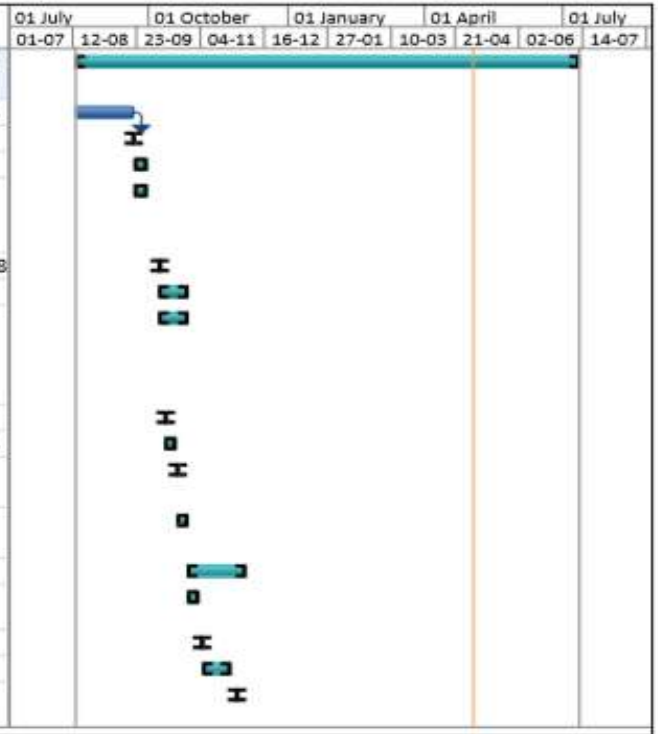
2. Mempunyai kemahiran penyelidikan dan mempunyai rekod penerbitan yang cemerlang

3. Mempunyai kemahiran berkomunikasi yang tinggi

APPENDIX B

(Gantt Chart)

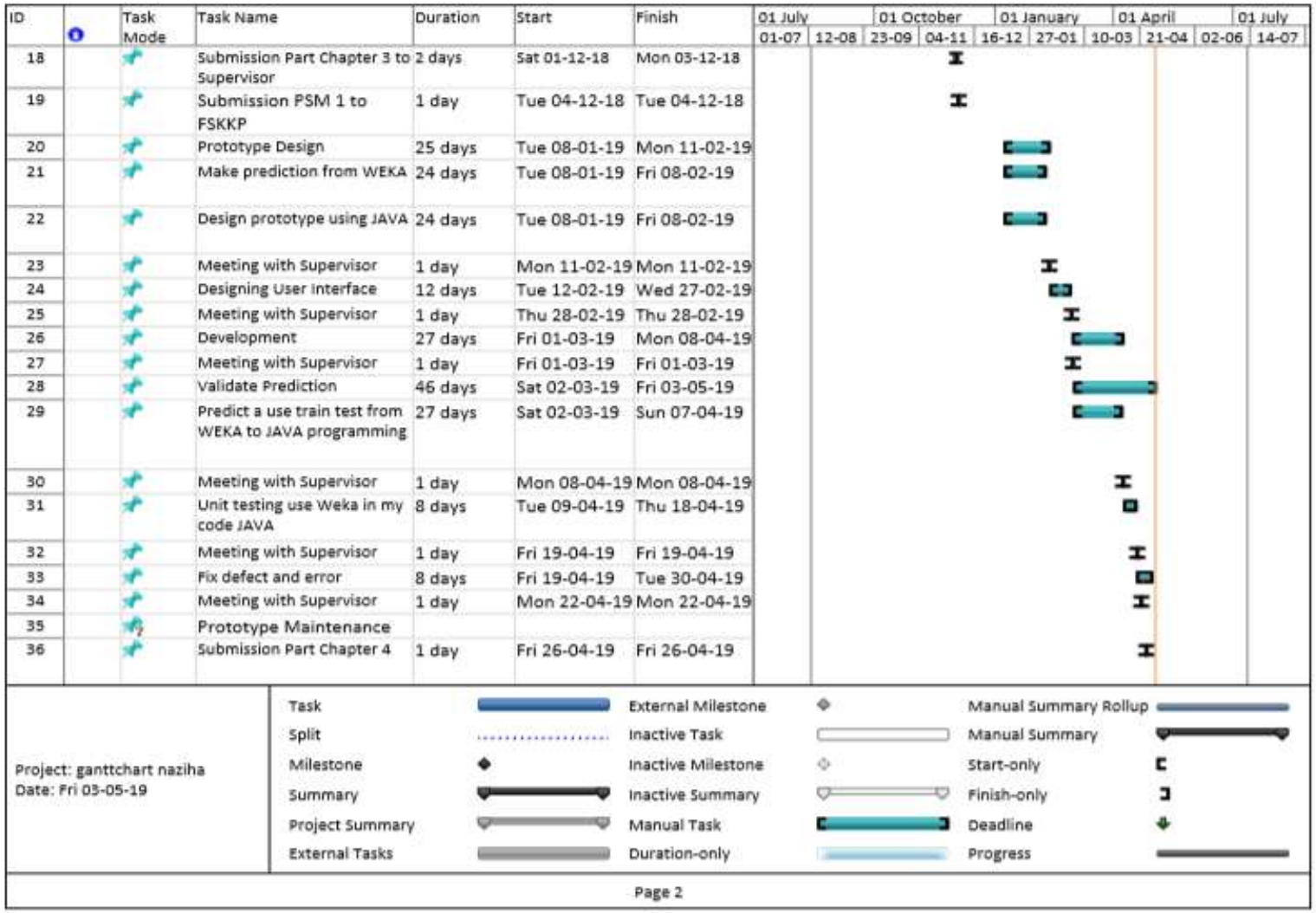
ID	Task Mode	Task Name	Duration	Start	Finish
1		**The Research Methodology**	238 days	Tue 14-08-18	Thu 11-07-19
2		Planning	28 days?	Tue 14-08-18	Thu 20-09-18
3		Meeting wih Supervisor	1 day	Fri 21-09-18	Fri 21-09-18
4		Pleminary Studies	7 days	Sat 22-09-18	Sat 29-09-18
5		Identify introduction, problems statement, objective and scope	7 days	Sat 22-09-18	Sat 29-09-18
6		Meeting with Supervisor	1 day	Mon 08-10-18	Mon 08-10-18
7		Literature Review	15 days	Mon 08-10-18	Fri 26-10-18
8		Identify the main research concept, target variable, algorithm, method and related work.	15 days	Mon 08-10-18	Fri 26-10-18
9		Meeting with Supervisor	1 day	Fri 12-10-18	Fri 12-10-18
10		Review the previous thesis	5 days	Fri 12-10-18	Thu 18-10-18
11		Submission Part Chapter 1 and Chapter 2	1 day	Fri 19-10-18	Sat 20-10-18
12		Correction Chapter 1 and Chapter 2	6 days	Sat 20-10-18	Fri 26-10-18
13		Knowledge Analysis	27 days	Sat 27-10-18	Mon 03-12-18
14		Define the technique of classifier machine learning	6 days	Sat 27-10-18	Fri 02-11-18
15		Meeting with Supervisor	1 day	Mon 05-11-18	Mon 05-11-18
16		Methodology Stages	14 days	Tue 06-11-18	Fri 23-11-18
17		Submission Abstract to Supervisor	1 day	Wed 28-11-18	Wed 28-11-18



Project: ganttchart naziha
Date: Fri 03-05-19

Task
Split
Milestone
Summary
Project Summary
External Tasks
External Milestone
Inactive Task
Inactive Milestone
Inactive Summary
Manual Task
Duration-only
Manual Summary Rollup
Manual Summary
Start-only
Finish-only
Deadline
Progress

Page 1



ID	Task Mode	Task Name	Duration	Start	Finish
18		Submission Part Chapter 3 to Supervisor	2 days	Sat 01-12-18	Mon 03-12-18
19		Submission PSM 1 to FSKKP	1 day	Tue 04-12-18	Tue 04-12-18
20		Prototype Design	25 days	Tue 08-01-19	Mon 11-02-19
21		Make prediction from WEKA	24 days	Tue 08-01-19	Fri 08-02-19
22		Design prototype using JAVA	24 days	Tue 08-01-19	Fri 08-02-19
23		Meeting with Supervisor	1 day	Mon 11-02-19	Mon 11-02-19
24		Designing User Interface	12 days	Tue 12-02-19	Wed 27-02-19
25		Meeting with Supervisor	1 day	Thu 28-02-19	Thu 28-02-19
26		Development	27 days	Fri 01-03-19	Mon 08-04-19
27		Meeting with Supervisor	1 day	Fri 01-03-19	Fri 01-03-19
28		Validate Prediction	46 days	Sat 02-03-19	Fri 03-05-19
29		Predict a use train test from WEKA to JAVA programming	27 days	Sat 02-03-19	Sun 07-04-19
30		Meeting with Supervisor	1 day	Mon 08-04-19	Mon 08-04-19
31		Unit testing use Weka in my code JAVA	8 days	Tue 09-04-19	Thu 18-04-19
32		Meeting with Supervisor	1 day	Fri 19-04-19	Fri 19-04-19
33		Fix defect and error	8 days	Fri 19-04-19	Tue 30-04-19
34		Meeting with Supervisor	1 day	Mon 22-04-19	Mon 22-04-19
35		Prototype Maintenance			
36		Submission Part Chapter 4	1 day	Fri 26-04-19	Fri 26-04-19

Project: ganttchart naziha
Date: Fri 03-05-19

Task
Split
Milestone
Summary
Project Summary
External Tasks
External Milestone
Inactive Task
Inactive Milestone
Inactive Summary
Manual Task
Duration-only
Manual Summary Rollup
Manual Summary
Start-only
Finish-only
Deadline
Progress

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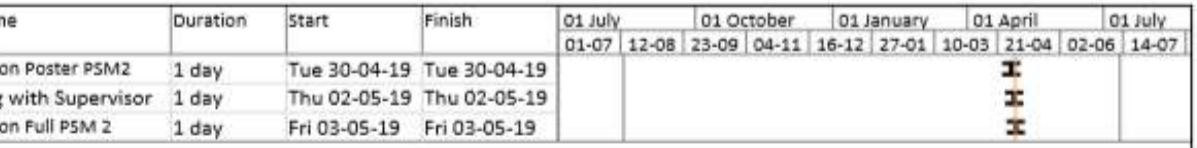
ID	Task Mode	Task Name	Duration	Start	Finish
37		Submission Poster PSM2	1 day	Tue 30-04-19	Tue 30-04-19
38		Meeting with Supervisor	1 day	Thu 02-05-19	Thu 02-05-19
39		Submission Full PSM 2	1 day	Fri 03-05-19	Fri 03-05-19



Project: ganttchart naziha
Date: Fri 03-05-19

Task	External Milestone	Manual Summary Rollup	
Split	Inactive Task	Manual Summary	
Milestone	Inactive Milestone	Start-only	
Summary	Inactive Summary	Finish-only	
Project Summary	Manual Task	Deadline	
External Tasks	Duration-only	Progress	

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