Requirements Document

Student Performance Analysis

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Revision history

Version	Date	Notes
v0.1	2/20/17	Format Skeleton
v0.5	2/21/17	sections 1.1 - 2.5 updated
v0.7	2/22/17	section 2.6 updated
v1.0	2/22/17	Revised document after client meeting

1 Introduction

1.1 Purpose

The purpose of this document is to highlight the requirements in terms of features and functions that are expected from the final deliverable that will be a recommender system.

1.2 Scope

The final product will be an Academic Behaviour Recommendation System. The software will use the information gathered from click log files, syllabi and student grades to recommend for a certain student entry in that particular class the behaviours that were generally observed in that class which led to a good grade but were missing from that particular student's behaviour. The information about the behaviours is computed using a log file containing data about websites visited by the student during the course of the semester the class was taken in and does not consider what the student does beyond the web browser.

1.3 Definitions, Acronyms and Abbreviations

- ABRS - Academic Behaviour Recommendation System
- Behaviours - when used in the context of the data means the model in which the data is correlated to resemble a certain behaviour in real life. for instance, a student accessing an assignment link only 1 day before it was due may be a behaviour that may be interesting while correlating to grades.
- Log files - Excel files containing raw data i.e. 'clicks' from student over the course of the semester
- Syllabus - Document entailing details about a certain course. This includes test dates, assignment due dates etc.
- Grades - Lettered grade ranging from A - F where A is the best grade.
- CS - computer science (field of study)
- SWE - software engineering (field of study)

1.4 References

1. IEEE SRS standards guide - `http://www.math.uaa.alaska.edu/~afkjm/cs401/IEEE830.pdf`
2. IEEE SRS LaTeXGuide - `https://github.com/jpeisenbarth/SRS-Tex/blob/master/srs.tex`
3. Requirements document specifications - `http://cs.fit.edu/~pkc/classes/seniorProjects/document.html`

1.5 Overview

The entirety of this document is formatted and authored using the IEEE standards guide as well as the Requirements specified by the Instructor (See 1.4). The remainder of the document contains a detailed description of the project (See 2) and requirements (See 3) categorized by functional and non-functional.

2 Overall Description

2.1 Product Perspective

The product is standalone and is the entirety of the clients proposed system. The goal is for it to work with any kind of inputs that are of the same semantic and syntactical nature as the input provided by the client.

2.1.1 System interfaces

There are no anticipated special interfaces to be needed for the product to execute and the aim is to make it compatible with UNIX based and windows systems.

2.1.2 User Interfaces

1. A web browser for the GUI front end of the recommender system will be required
2. Capabilities to run and install python libraries

2.2 Product functions

The functions can be elaborated as follows:

1. Product will have a set of behaviours and methods to extract them given the required input
2. Product will be able to provide a report of behaviours identified for each student based on the data from log files and syllabi
3. The information as mentioned in the previous point will be correlated to the grades forming the idea of X behaviour correlates to a Good/Bad grade.
4. Provide a user interface that enables user to process the data, and use the information in the recommendation system
5. Recommender system will use the correlated data to compute the missing behaviours for any query student

2.3 User characteristics

There are various aspects that would influence as to who the end user is. Fundamentally the product is aimed at a single client that has very specific and unconventional raw data. The product could be useful for someone that uses the supporting documentation to prepare the input to be used with the product.
In summary any user apart from the intended client would have to have at least preliminary knowledge in the fields of CS or SWE.
Section 3 describe very relaxed requirements about the input which is due to the fact that the input that needs to be worked on is limited to files that will be organized in a set way that will be known as preliminary knowledge.

2.4 Constraints

The data is highly sensitive as it contains private data including grades and browser history. A strict privacy policy with the client eliminates the instance of having the files made available on any network.
With regards to the availability of said data, This kind of data cannot be obtained from a secondary source which limits the existence of any standards that may make the code more reusable.

2.5 Assumptions and dependencies

The code will be designed to work on conventional windows and unix based systems including MAC os. This is contingent on the fact that the computer has capabilities to install packages or have the required packages/tools pre installed.
makefiles and shell scripts will be designed to accommodate all platforms listed in 2.1.

2.6 Apportioning of requirements

This document will be revised significantly to include precise names of packages/tools used. The specifications have now been v 2.0 (Scheduled now for milestone 2) of the document because there are preliminary steps that need to be taken in order to make the choice for the optimal resources to be used for it.
The specific requirements in v 2.0 will further be classified by each behaviour. v 2.0 will also introduce detailed specification of the UI since that is delayed till later development stages.
A variety of tools are being researched for these purposes. Details can be located in the progress report documentation. Some packages hint that java may be required. If it becomes a requirement in the future the specific requirements may further be classified based on languages being used.

3 Specific Requirements

3.1 Preliminary Requirements [1]

3.1.1 Examine given syllabus and extract information and record it manually

3.1.1.1 Extract assignment due dates
3.1.1.2 Extract test dates
3.1.1.3 Extract quiz dates
3.1.1.4 Extract assigned readings with date assigned
3.1.1.5 TBD ...

3.1.2 Use information available from syllabus and common sense to conceptualize behaviours that can be extracted from the log file

3.1.2.1 Concenptualize at least 10 behaviours that can be modelled from the log file

3.2 Functional Requirements

3.2.1 Shall extract information about behaviours of each student from log file using data mining

3.2.1.1 Shall attempt to extract each conceptualized behavious from each student
3.2.1.2 Shall be able to present the output in form of a report

3.2.1.2.1 Human readable report for any query student listing all the behaviours identified

3.2.1.3 Shall organize output to be used for correlation with grades

3.2.2 Shall extract performance from grade files

3.2.2.1 Shall provide a statistical analysis of grade

3.2.2.1.1 Shall provide class rank
3.2.2.1.2 Shall provide whether student is above or below average

3.2.2.2 Shall present output as a report

3.2.2.2.1 Shall provide report that consists of data from 3.2.2.1, well formatted.

3.2.2.3 Shall prepare data for correlation

3.2.3 Shall correlate behaviors (3.2.1) to performances (3.2.2)

3.2.3.1 Shall use data mining to determine what behaviours lead to a good grade for the particular course

3.2.3.1.1 TBD ...

3.2.3.2 Shall present output as a report

3.2.3.2.1 Shall contain information about behaviours that have strong correlation with good grades

3.2.3.3 Shall prepare information for recommender system

3.2.3.3.1 Shall provide information about performance for every student
3.2.3.3.2 Shall provide information about the correlations formed between grades and behaviors
3.2.3.3.3 Shall provide information about the behaviors exhibited by each student

[1] Not system requirements but requirements for the system

3.2.4 Shall be able to list recommendations for query students

3.2.4.1 Shall provide information about performance and student standing in class
3.2.4.2 Shall provide recommendations by suggesting behaviours that are missing in the query student
3.2.4.3 Shall provide overall report of recommendations if using the instructor interface

3.3 Non-Functional Requirements

3.3.1 Graphical User Interface

3.3.1.1 Splash Welcome screen
3.3.1.2 Login screen

3.3.1.2.1 Shall ask to choose between student and teacher interface
3.3.1.2.2 Shall authenticate based on username and password

3.3.1.3 Teacher interface

3.3.1.3.1 Shall provide interface for manually inputting data from syllabus
3.3.1.3.2 Shall provide interface to upload log file and grade file
3.3.1.3.3 Button to extract behaviors from log file
3.3.1.3.4 Shall present behaviour report (3.2.1) for query student
3.3.1.3.5 Button to extract performance from grade file
3.3.1.3.6 Shall present performance report (3.2.2) for query student
3.3.1.3.7 Button to correlate behaviors and performance
3.3.1.3.8 Shall present a report of the correlations found in behaviors and performance for the class
3.3.1.3.9 Shall present information showing successful behavior for a query student

3.3.1.4 Student interface

3.3.1.4.1 Shall be able to access recommendations
3.3.1.4.2 Recommendations will provide performance information and behaviors that are recommended to be altered in order to gain higher grades.

3.3.2 Security Requirements

3.3.2.1 System shall isolate log file from public networks
3.3.2.2 System shall isolate grade file from public networks