

ESCORT - NATURAL LANGUAGE PROCESSING BASED UNIVERSITY STUDENTS' GUIDANCE SYSTEM

Recommending Solutions for Psychological Issues

2022-179

Final Report – Individual

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September 2020

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DECLARATION

I declare that this is my own work and this dissertation does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other university or Institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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The above candidate is carrying out research for the undergraduate Dissertation under my supervision

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(Signature of the supervisor)

ABSTRACT

Being in a good mental state is very important to university students because university life impacts students' careers and happiness. Many university students are having issues related to psychology, nowadays. There are a lot of reasons for psychological issues. Several students work as part-time employees and interns. The workload in studies and the workplace, family problems, misunderstandings, physical diseases, and fear are some examples of the causes of psychological issues such as stress, hostility, depression, hopelessness, and job control. Covid 19 also leads to many psychological issues these days. Especially it can be observed that the number of psychological issues and suicides increased during the lockdown period. Further, many university students have difficulties in communication because of a lack of language skills. Several students are not feeling comfortable expressing their issues in person to psychiatrists, counsellors, family, and friends. Also, some prefer their native languages to explain the issues. Therefore, there is a need for a software system to provide solutions for psychological issues in the preferred language of university students. The proposed system recommends some activities to university students as a solution for their issues, using Natural Language Processing.

Keywords: Psychology, Covid 19, Natural Language Processing

ACKNOWLEDGEMENT

First of all, my deepest gratitude should offer to our supervisor Miss. Hansi De Silva, co-supervisor Dr Dharshana Kasthurirathna and external supervisor Miss. Archchana Kugathanan for their great support. Without their proper guidance and intensity, this research would not have been a success. Also, Dr Gadambanathan Thanabalasingam, The District Consultant Psychiatrist, Batticaloa was the other person who helped me to find solutions to psychological issues. Then I would like to offer my appreciative thanks to my research team for supporting me and finishing the research successfully.

Finally, I would like to acknowledge all the lecturers and colleagues of the Sri Lanka Institute of Information Technology who have supported me from the beginning of this research. Without any of their single guidance and suggestions, it would have been complicated to achieve my research goals.

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LIST OF ABBREVIATIONS

NLP	Natural Language Processing
SLIIT	Sri Lanka Institute of Information Technology
PSS	Perceive Stress Scale

1. INTRODUCTION

Although universities play a significant role in students' careers, universities provide various opportunities to develop skills and knowledge. Many university students are having psychological issues, nowadays. It is evidenced that mental issues start at the beginning of university life and decrease throughout the studies [1], [2]. The increment and reach of common psychological issues including stress, hostility, depression, and anxiety peak around age 25 [3].

The students are affected mentally because of the disability to manage both studies and work simultaneously. Issues in universities such as academic and non-academic issues, bullying, and misunderstandings with family, friends, lecturers, and other students impact the mental state of students. Family problems are one of the main reasons for psychological issues because it is the place where not only university students but also people of all age groups find love, care, and peace. Lack of income, budget, savings, too much debt and unexpected expenses are some examples of the causes of psychological issues. Further, quite a lot of students are feeling nervous to explain their issues in person to psychiatrists, counsellors, family, and friends. Numerous students have difficulties in communication because of a lack of language skills. Also, some prefer their native languages to discuss the issues comfortably.

The main reason for conducting this research is to provide simple and effective solutions for the psychological issues of university students without any communication and language issues. In this research, recommendation systems for psychological issues are implemented with a high accuracy rate. Also, the Perceived Stress Scale (PSS) feature which is a method to identify the stress level of a person is implemented. Students can predict their stress levels by answering the given questions without consulting psychiatrists.

1.1. Background Literature

1.1.1. Background

An evaluation of research from the previous thirty years establishes mental issues of university students worldwide. Lesser educational results and challenging behaviours are combined with psychological issues of students, and these varied suggestions conjointly highlight the requirement for acceptable strategies and facilities to support students throughout difficult times.

The additional evaluation has known varied socio-demographic, situational and educational aspects as possible bases for mental problems of students. Unquestionably, the uneasiness of the university way characteristically affects mental health. [5]. University students had additional negative feelings, psychological symptoms, and economic/social issues than the general population due to educational delays, the economic effects of the pandemic, and its effects on their standard of living [6]. The scholars also practiced serious mental issues like depression, anxiety, alexithymia, stress, and posttraumatic stress disorder [7], [8].

Lack of communication is one of the main issues that university students face. Also, students do have not enough time to consult psychiatrists and counsellors physically. The main reason for conducting this research is to provide better solutions for the psychological issues of university students without communication issues and delays.

1.1.2. Literature Review

The expertise of important stages of mental health problems is the biggest issue for several university students. However, it is combined by its association with alternative food habits, behaviours and weaknesses in studies, and an analysis representing the associations among these issues and mental health issues are given [5]. In addition to students' retrospective self-ratings of impairment, the impacts of psychological issues on university outcomes have conjointly been incontestable lengthwise [9]. For instance, students' levels of psychological issues at mid-course have foreseen decreases in test performance from the first to the second year, even when dominant for previous performance [10].

The demand and the need for recommendation systems are increasing nowadays. People prefer recommendation systems in almost every situation [11]. It is established that psychological issues affecting university students worldwide from the literature review of the past 30 years [5]. The trend of greater numbers of students with psychological issues continues to be true as reported by 93.7% of directors [12]. Even though there are many psychiatrists available, students face some difficulties in contact physically. Students have no time to consult psychiatrists or go to counselling for treatments because students are far away from home and continue university academic activities [5].

Lack of communication is one of the critical issues for university students. Some students are not fluent in English, and some are unable to describe the issues clearly in English [13]. 19.1% of students experience more than two mental issues. It was revealed by the Logistic regression models that female students over 21 years, non-heterosexual students, and students from lower socioeconomic backgrounds were more probable to have psychological and behavioural problems. Even though 10% of students received treatment for psychological issues, 22.3% of students did not seek solutions for their issues [14].

1.2. Research Gap

Psychology-related problems are common nowadays. Thus, there is a demand for solutions for psychological issues. Even though there are some other applications available, people face some difficulties because everyone is not familiar with English to express what exactly they feel. Also, those available applications are not specific to university students as designed for common users [15].

Further, unlike directly providing the exact problem and finding solutions, this application gives chance to find out the solution simply by describing how they feel if the university students are unable to diagnose the psychological issues they have [16]. Also, this recommendation system recommends solutions such as simple activities and exercises which can be manageable with students' studies and work. This recommendation system is an easily accessible and user-friendly web application which is available 24/7 in English, Tamil, Sinhala and Thanglish for university students.

Table 1: Comparison Table

Features	University students	English	Tamil	Sinhala
Diagnose all the psychological issues	✗	✗	✗	✓
Language selection	✗	✗	✗	✓
Behavioral, Emotional issues	✗	✓	✓	✓
Behavioral, substance abuse issues	✗	✗	✗	✓
Simple activities	✓	✗	✓	✓

1.3.Research Problem

Psychological issues are the most common problem for everyone, especially university students. These issues are very dangerous if they are not treated at an early stage as it affects mental health. Many people do not aware of psychological issues. Even though the students identify the development of mental issues, the students do not have enough time to consult psychiatrists or counsellors for treatment because of the heavy schedule of studies, assignments and exams. Some students do not consider these psychological issues a serious problem.

Some students use their own methods to get rid of the psychological issues temporary. Even though these methods reduce mental disorders in some students, those methods might not be effective for numerous students because of behaviours, habits and daily routines of the students. This recommendation system would support the users to recognize the psychological issues and the stress level of the students and recommend solutions which are effective and manageable.

1.4. Research Objectives

1.4.1. Main Objective

- ❖ The main objective is to provide a better solution for the issues in psychology, to the university students in their preferred language without any delays.

1.4.2. Sub Objective

- ❖ Implement a Web Application for all university students.
 - ✓ Web applications are preferred by people more than mobile applications and are easy to use access.
- ❖ Provide a useful and reliable system to university students in their preferred language.
 - ✓ This web application provides a user-friendly and reliable environment to university students in English, Tamil, Sinhala and Thanglish.
- ❖ Make the system more efficient.
 - ✓ This web application is more efficient and effective with high accuracy level.
- ❖ Achieve a better knowledge of Natural Language Processing.
 - ✓ High techniques in Natural Language Processing are used to develop this recommendation system.

2. METHODOLOGY

2.1. Methodology

Natural Language Processing permits computers to recognize the natural language such as people do. Not only the language is spoken but also written, Natural Language Processing utilizes many techniques to involve the inputs related to natural languages, progress those inputs, and be of it in an exceeding manner a system will perceive [4]. For some purpose in the process, the input is regenerated to code that the computer will perceive [16].

2.1.1. Dataset collection

A questionnaire was prepared and distributed among the students at the Sri Lanka Institute of Information Technology (SLIIT). The questionnaire contained multiple choice questions and short answer questions to identify the mental issues, reasons, behaviours, and mental stages of the students. The responses were collected and analyzed to identify the psychological issues and the causes of those issues.

The image is a screenshot of a web-based questionnaire. At the top, the title 'Escort' is displayed in a large, bold, black font. Below the title, there is a line of text that appears to be a URL or a link, which is partially obscured by a watermark. Below this, there is a section labeled 'Required' in red text. The main question is 'Are you a university student?'. Below the question, there are two radio button options: 'Yes' and 'No'. The 'Yes' option is selected, indicated by a filled circle next to it. The 'No' option is unselected, indicated by an empty circle next to it.

Figure 1: Questionnaire first question

Please select your current residence! *

☐ Home

☐ Hostel

☐ Boarding

☐ Other

Figure 2: Questionnaire second question

Please state your level of agreement for the following! *

	Excellent	Good	Average	Poor	Very poor
Work load	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Education	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Family and relationships	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Health issues	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Finance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Figure 3: Questionnaire third question

Where is the pain from the following?

☐ I have psychological issues

☐ I am facing physical health issues

☐ I do not have any psychological issues

Figure 4: Questionnaire fourth question

How important are the following in your life?

	Not at all important	Slightly important	Moderately important	Very important	Extremely important
Fun and enjoyment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Responsibility	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Respect	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Belonging	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Kindness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Security	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Organic healthy nutritious food	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Self respect	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Stress free life	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Peace	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Figure 5: Questionnaire fifth question

Please mark onto the following scale in a circle: **1** **2** **3** **4** **5**

	Always	Most of the time	About half the time	Once in a while	Never
I have much less energy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel tired all day	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't enjoy my assignment or class	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't enjoy meeting with my friends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I get too much to do and no time to get it done	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am unable to concentrate on my studies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I meet new people	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I get angry for silly reasons	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't get angry	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I get appreciated	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I conceal my feelings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel lonely	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel depressed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have nobody I could trust	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have good friends to trust	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Figure 6: Questionnaire sixth question

How true are you?

	Definitely true	Most likely true	Probably true	Not true but not false	False
I don't have enough resources to take decisions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't like the course when I'm studying	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't have time to relax	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't solve my problems	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I'm shy person	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I'm a shy person	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I get nervous while I'm singing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I get along with everyone	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can easily control my anger	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I easily become both mentally	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Figure 7: Questionnaire seventh question

When do you have stress? *

☐ Always

☐ Often

☐ Sometimes

☐ Seldom

☐ Never

Figure 8: Questionnaire eighth question

How do you manage stress? *

Your answer:

Figure 9: Questionnaire ninth question

Did you feel stress during the lockdown period? *

☐ Yes

☐ No

Figure 10: Questionnaire tenth question

Do you have any thing that you are proud of. Tell us what you have? *

Your answer:

Figure 11: Questionnaire last question

2.1.2. Data Preprocessing

Data preprocessing involves getting ready and cleaning text information for machines to be ready to analyze it. Preprocessing puts information in the executable type associated highlights options within the text that an algorithmic program will work with [9], [10].

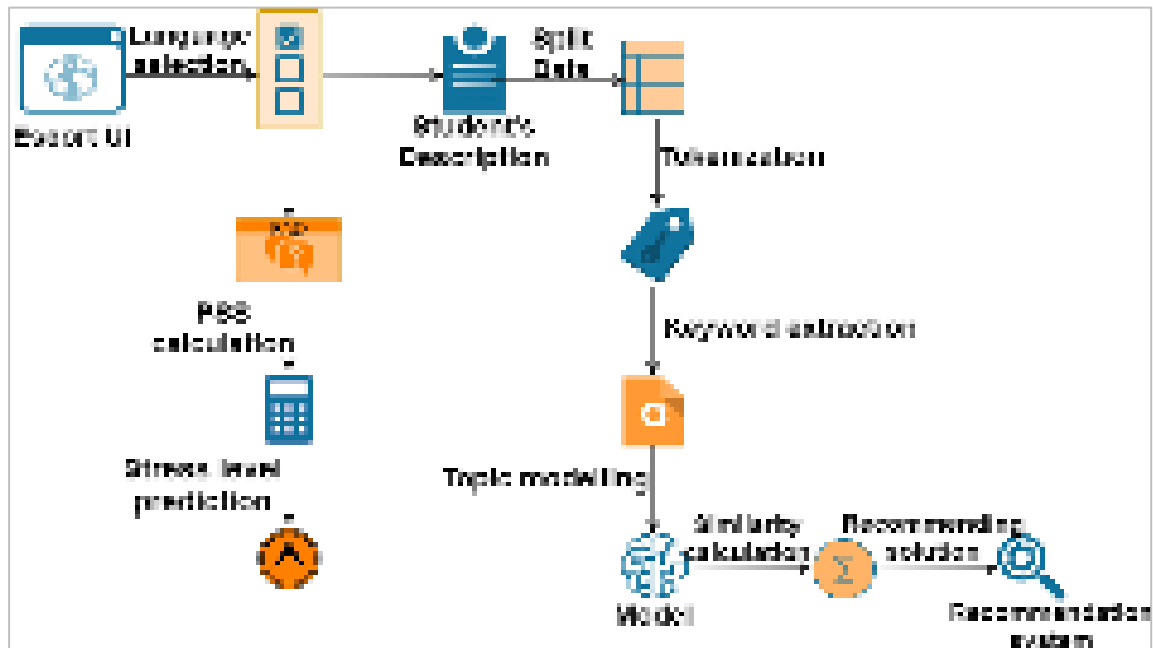


Figure 12: System Overview Diagram

First, the university students are instructed to select the language among English, Tamil, Sinhala and Thanglish. Students' issues are typed by the students in the given text box. The description of students is split and listed down the words and sentences. Then it is tokenized using the Natural Language Tool Kit (NLTK). NLTK was developed in conjunction with a computational linguistics course at the University of Pennsylvania in 2001 [17]. There is a function called tokenize in NLTK which classifies the words and sentences.

2.1.3. Algorithm development

Once the data has been preprocessed, an algorithmic program is developed to process it [4]. There are many alternative Natural Language Process algorithms. However, 2 main varieties are usually used:

- ❖ Rules-based system - This technique uses fastidiously designed linguistic rules. This approach was used timely within the development of NLP and remains used.
- ❖ Machine learning-based system - Machine learning algorithms use statistical methods. These algorithms learn to perform tasks that supported the training data they are fed, and change the methods as a lot of information is processed. Using a combination of machine learning, deep learning and neural networks, NLP algorithms provide rules through the perennial process and learning [18]. This is used in this research.

2.1.3.1.Model

The models which contain the dataset for English, Tamil, Sinhala and Thanglish are trained using Gensim [19]. Gensim is a fast, data streaming and open-source python library to train models.

2.1.3.2.Keyword Extraction

The important word(s) that are psychological issues and the reasons for those issues are extracted. Keyword extraction is a technique that automatically identifies a set of terms that best describe the subject [20]. The steps of keyword extraction are

1. Load dataset
2. Identify text which will be going to analyze

3. List all the stop words
4. Preprocess for getting cleaned and normalized text
5. Extract the most frequent keyword
6. List the top keywords

2.1.3.3.Similarity Calculation and solution recommendation

The extracted keywords are compared with the trained models and calculated the similarity. The solutions which have the top 5 accuracy rates will be identified and stored in an array. The solution which has the highest accuracy rate is recommended as a solution to students. The number of activities in the solutions will be changed based on the psychological issues. The recommendation systems for English, Tamil and Sinhala are developed and Thanglish is in the process of development.

2.1.3.4.Perceived Stress Scale

Another feature, Perceived Stress Scale (PSS) is implemented to predict the stress level of the students. There are 10 multiple-choice questions and 5 choices with different points. Each point range has different stress levels Low, Medium, and High. Students have to select the answers and the system calculates the stress level according to the response to the given questions.

2.2.Commercialization aspects of the product

Escort which is having a higher commercial value provides a perfect solution for psychological issues, which have been faced by many university students all over the island. In addition, many students are very nervous to consult psychiatrists or counsellors or share with friends and family about their issues. Therefore, this recommendation system will very helpful to those kinds of university students. Also, the language selection feature adds more value to this system because it has all the languages in Sri Lanka.

This recommendation system for psychological issues for university students is implemented with high accuracy level. Psychological issues of the students are identified and solutions are recommended immediately by this recommendation system. In future, we have decided to provide this web application to many universities in Sri Lanka. As well as I am planning to enhance the system to recommend psychiatrists and counsellors to students.

2.3.Implementation & Testing

2.3.1. Implementation

All the processes to develop the recommendation system to recommend solutions to the psychological issues of university students are implemented in this phase. Gensim is used to train the model in English, Tamil, Sinhala and Thanglish. The frontend of this web application is developed using React and the backend is implemented using Python. In addition, Open CV and Matplotlib are used to develop the Word Embedding Graph of psychological issues.

All the interfaces, functions and logic are implemented in a user-friendly manner. University students can access this recommendation system anytime because it is available 24/7. Also, the solutions are displayed and recommended immediately without any delay.

The following interfaces are developed to recommend solutions to psychological issues.

- Psychological Recommender Home
- Psychological Recommender Home in English
- Psychological Recommender Home in Tamil
- Psychological Recommender Home in Sinhala
- Psychological Recommender Home in Thanglish
- PSS Predictor Questions
- Stress Level

This screen will be displayed when the student selects Psychological Solution in the navigation bar. This is the home screen for the Psychological Solution Recommendation System.



Figure 13: Psychological Recommender Home

This screen will be displayed when the student selects the 'English' button in the Psychological Recommender Home. Students can type their issues in this text box in English and click the 'Search' button. The solution will be recommended in English.



Figure 14: Psychological Recommender Home in English

If the student clicks the FIND YOUR STRESS LEVEL button screen for predicting stress level will be displayed. Here, students can find their stress level by answers to the 10 multiple-choice questions.



Figure 15: Stress Level screen

This screen will be displayed when the student selects the ‘தமிழ்’ button in the Psychological Recommender Home. Students can type their issues in this text box in Tamil and click the ‘தேடு’ button. The solution will be recommended in Tamil.



Figure 16: Psychological Recommender Home in Tamil

This screen will be displayed when the student selects the ‘සිංහල’ button in the Psychological Recommender Home. Students can type their issues in this text box in Sinhala and click the ‘සෙවීම’ button. The solution will be recommended in Sinhala.



Figure 17: Psychological Recommender Home in Sinhala

This screen will be displayed when the student selects the ‘Thanglish’ button in the Psychological Recommender Home. Students can type their issues in this text box in Thanglish and click the ‘Theadu’ button. The solution will be recommended in Thanglish.



Figure 18: Psychological Recommender Home in Thanglish

2.3.2. Testing

Testing is an important phase in software development. According to the development methodology, the crucial to effective testing is, to comprehensive all testing concepts and test framework design before the implementation phase is completed. This recommendation system is tested using unit testing, module testing, integration testing, and system testing.

A. Unit Testing

Here, the whole system is divided into smaller parts or units and tested. Therefore the errors were identified at the early stage and fixed.

B. Module Testing

Each class, record, module or part in the recommendation system is tested in Module testing. The module test was accomplished by a collection area that is not the owner of that module.

C. Integration Testing

All the components or modules, units and the whole web application of Escort are tested using integration testing.

D. System Testing

System testing is used to validate the completed integrated system. The main objective of this testing is to evaluate the end-to-end system specifications.

E. Test Cases

Table 2: Test Case 1

Test Case	Test Case 001
Test case description	Recommending solutions for psychological issues in English.
Pre-condition	Browse Escort website
Test procedure	<ol style="list-style-type: none">1. Open the Escort website2. Click “Psychological Solution” from Navigation Bar.3. Click the “English” Button4. Type issues in the text box5. Click the “Search” button
Test input	I am stressed these days because of my heavy schedule.
Expected Result	Balance your studies and work with activities such as chatting with friends, and playing. Make time to exercise every day. Get proper sleep. Listen to some good music. Watching animation movies or cartoons will help to reduce stress.
Actual result	Balance your studies and work with activities such as chatting with friends, and playing. Make time to exercise every day. Get proper sleep. Listen to some good music. Watching animation movies or cartoons will help to reduce stress.
Test Result	Pass

Table 3: Test Case 2

Test Case	Test Case 002
Test case description	The student's description does not contain issues in English
Pre-condition	Browse Escort website
Test procedure	<ol style="list-style-type: none"> 1. Open the Escort website 2. Click "Psychological Solution" from Navigation Bar. 3. Click the "English" Button 4. Type issues in the text box 5. Click the "Search" button
Test input	I am very happy nowadays.
Expected Result	No Result Found
Actual result	No Result Found
Test Result	Pass

Table 4: Test Case 3

Test Case	Test Case 003
Test case description	Recommending solutions for psychological issues in Tamil.
Pre-condition	Browse Escort website
Test procedure	<ol style="list-style-type: none"> 1. Open the Escort website 2. Click “Psychological Solution” from Navigation Bar. 3. Click the “தமிழ்” Button 4. Type issues in the text box 5. Click the “தேடு” button
Test input	சில நாட்களாக நான் மிகவும் மன அழுத்தத்தில் இருக்கிறேன்.
Expected Result	நீங்கள் அனுபவித்து ஈடுபடும் செயல்பாடுகளுடன் (ஓய்வெடுப்பது அல்லது நண்பர்களுடன் நேரத்தை செலவிடுவது போன்றவை) பொறுப்புகளை (பல்கலைக்கழக வேலைகள் போன்றவை) சமநிலைப்படுத்துங்கள். தினமும் உடற்பயிற்சி செய்ய நேரம் ஒதுக்குங்கள். நல்ல இசையைக் கேளுங்கள். கேலிகச் சித்திரங்கள் பார்ப்பதும் மன அழுத்தத்தைக் குறைக்க ஒரு நல்ல வழியாகும்
Actual result	நீங்கள் அனுபவித்து ஈடுபடும் செயல்பாடுகளுடன் (ஓய்வெடுப்பது அல்லது நண்பர்களுடன் நேரத்தை செலவிடுவது போன்றவை) பொறுப்புகளை (பல்கலைக்கழக வேலைகள் போன்றவை) சமநிலைப்படுத்துங்கள். தினமும் உடற்பயிற்சி செய்ய நேரம் ஒதுக்குங்கள். நல்ல இசையைக் கேளுங்கள். கேலிகச் சித்திரங்கள் பார்ப்பதும் மன அழுத்தத்தைக் குறைக்க ஒரு நல்ல வழியாகும்
Test Result	Pass

Table 5: Test Case 4

Test Case	Test Case 004
Test case description	The student's description does not contain issues in Tamil
Pre-condition	Browse Escort website
Test procedure	<ol style="list-style-type: none"> 1. Open the Escort website 2. Click "Psychological Solution" from Navigation Bar. 3. Click the "தமிழ்" Button 4. Type issues in the text box 5. Click the "தேடு" button
Test input	நான் மிகவும் மகிழ்ச்சியாக இருக்கிறேன்
Expected Result	முடிவுகள் எதுவும் இல்லை
Actual result	முடிவுகள் எதுவும் இல்லை
Test Result	Pass

Table 6: Test Case 5

Test Case	Test Case 005
Test case description	Recommending solutions for psychological issues in Sinhala.
Pre-condition	Browse Escort website
Test procedure	<ol style="list-style-type: none"> 1. Open the Escort website 2. Click “Psychological Solution” from Navigation Bar. 3. Click the “සිංහල” Button 4. Type issues in the text box 5. Click the “සෙවීම” button
Test input	මගේ අනාගතය ගැන මට බයයි
Expected Result	ඔබට හැඟෙන ආකාරය සමඟ සැබෑ වන්න. ඔබේ අභිප්‍රාය ගැන දැනුවත් වන්න. ධනාත්මක සිතුවිලි කෙරෙහි අවධානය යොමු කරන්න.
Actual result	ඔබට හැඟෙන ආකාරය සමඟ සැබෑ වන්න. ඔබේ අභිප්‍රාය ගැන දැනුවත් වන්න. ධනාත්මක සිතුවිලි කෙරෙහි අවධානය යොමු කරන්න.
Test Result	Pass

Table 7: Test Case 6

Test Case	Test Case 006
Test case description	The student's description does not contain issues in Sinhala
Pre-condition	Browse Escort website
Test procedure	<ol style="list-style-type: none"> 1. Open the Escort website 2. Click "Psychological Solution" from Navigation Bar. 3. Click the "සිංහල" Button 4. Type issues in the text box 5. Click the "සෙවීම" button
Test input	මම ඉතා සතුටුයි
Expected Result	ප්රතිඵල හමු නොවිණි
Actual result	ප්රතිඵල හමු නොවිණි
Test Result	Pass

Table 8: Test Case 7

Test Case	Test Case 007
Test case description	Recommending solutions for psychological issues in Thanglish.
Pre-condition	Browse Escort website
Test procedure	<ol style="list-style-type: none"> 1. Open the Escort website 2. Click “Psychological Solution” from Navigation Bar. 3. Click the “Thanglish” Button 4. Type issues in the text box 5. Click the “Theadu” button
Test input	Enaku mihavum panichchumaiyaka ullathu.
Expected Result	Thodarnthu velai seiyavo padikkavo vendaam. Ovvoru 40 nimidangalukkum siriya idaivelaikalai eduththukkollungal. Nalla isaiyai kelungal
Actual result	Thodarnthu velai seiyavo padikkavo vendaam. Ovvoru 40 nimidangalukkum siriya idaivelaikalai eduththukkollungal. Nalla isaiyai kelungal
Test Result	Pass

Table 9: Test Case 8

Test Case	Test Case 008
Test case description	The student's description does not contain issues in Thanglish
Pre-condition	Browse Escort website
Test procedure	<ol style="list-style-type: none"> 1. Open the Escort website 2. Click "Psychological Solution" from Navigation Bar. 3. Click the "Thanglish" Button 4. Type issues in the text box 5. Click the "Theadu" button
Test input	Naan mihavum makizhchiyaha irukiren
Expected Result	Mudivuhai ethuvum illai.
Actual result	Mudivuhai ethuvum illai.
Test Result	Pass

Table 10: Test Case 9

Test Case	Test Case 009
Test case description	Students search for solutions without typing anything
Pre-condition	Browse Escort website
Test procedure	<ol style="list-style-type: none"> 1. Open the Escort website 2. Click “Psychological Solution” from Navigation Bar. 3. Click the “English” Button 4. Type issues in the text box 5. Click the “Search” button
Test input	-
Expected Result	Please type your issues
Actual result	Please type your issues
Test Result	Pass

Table 11: Test Case 10

Test Case	Test Case 010
Test case description	Students are navigated to find stress level
Pre-condition	Browse Escort website
Test procedure	<ol style="list-style-type: none"> 1. Open the Escort website 2. Click “Psychological Solution” from Navigation Bar. 3. Click the “Find your stress level” Button
Test input	-
Expected Result	Screen for finding stress level page will be displayed
Actual result	Screen for finding stress level page will be displayed
Test Result	Pass

3. RESULTS AND DISCUSSIONS

3.1.Results

This recommendation system is developed in English, Tamil, and Sinhala for university students to get solutions for psychological issues without communication issues. The students are recommended solutions including activities and exercises which saves students time and money. Students can access these recommendation systems at a convenient time. These systems recommend simple, effective, and reliable solutions. The accuracy of the system is 92.37% Also, there is a feature called the Perceived Stress Scale (PSS) which is used to predict the stress level of the students implemented. Apart from the access of students, a word embedding graph is implemented to identify the probability of psychological issues.



Figure 19: Recommending Solution in English



Figure 20: If the student has no issues in English



Figure 21: Recommending Solution - Tamil



Figure 22: If the student has no issues - Tamil



Figure 23: Recommending Solution in Sinhala



Figure 24: If the student has no issues - Sinhala



Figure 25: Recommending Solution in Thanglish



Figure 26: If the student has no issues - Thanglish



Figure 27: Finding Stress Level

3.2.Research Findings

The datasets for each model were evaluated through offline evaluation, user study and online evaluation. 48% of issues were evaluated using offline evaluation, 16% of issues were evaluated through a user study and 36% were evaluated with online evaluation [21]. Mean Absolute Error (MAE) and Root Mean Square Error (RMSE) are the statistical accuracy metrics that are used typically. MAE measures the deviation of recommendation from the value of the user. RMSE excessively corrects large errors as the residual is squared.

Table 12: Comparing other recommendation systems

Error	Movie Recommendation systems	Job Recommending systems	Escort
MAE	0.4	0.7	0.5
RMSE	0.8	0.2	0.3

Word embedding is an approach used to represent words and sentences. It is a dense vector representation for text where words have the same meaning or similar representation. Here, some psychological issues in English are graphed using Word embedding, Gensim, python, Open CV and Matplotlib.

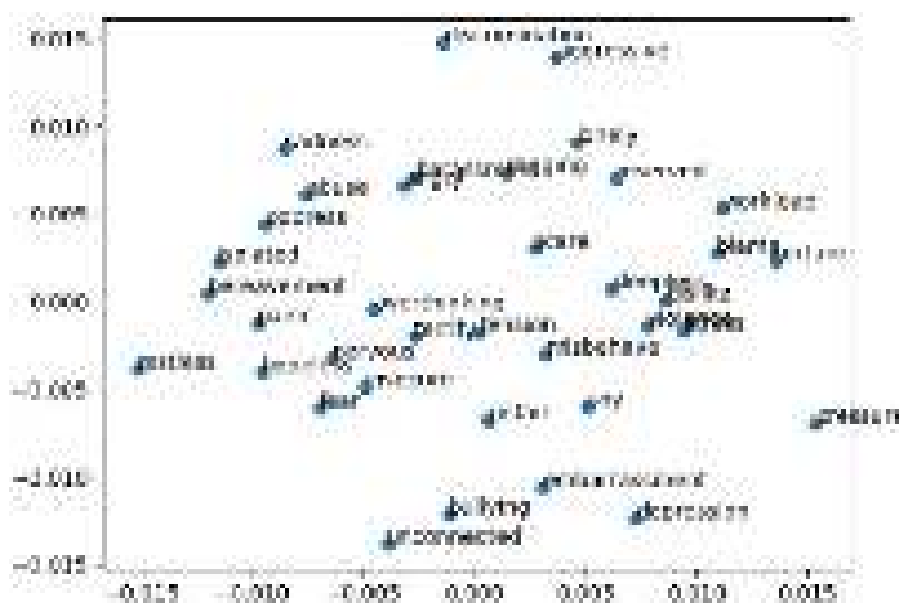


Figure 28: Word embedded graph

3.3.Discussion

The recommendation system for recommending solutions to psychological issues to university students, component of Escort - Natural Language Processing Based University Students' Guidance System is designed and implemented as expected. In this research, functions to identify the psychological issues and recommend solutions were proposed as a main component of Escort - Natural Language Processing Based University Students' Guidance System.

The result gained shows that this recommendation system provides satisfactory accuracy, compared to most of the research that has previously been done. In summary, this recommendation system offers proper solutions for university students to overcome mental health problems.

4. CONCLUSION

The mental health of university students is affected because of workload in studies, family and relationship problems, university problems, financial problems, and behavioural problems. Therefore a recommendation system to provide solutions to psychological issues to improve the mental health of university students. As it has all the languages spoken by Sri Lankans such as English, Tamil, Sinhala and Thanglish, this system is beneficial to all university students. Also, the feature to predict the stress level of the students is integrated with the recommendation system.

In the future, the accuracy of this recommendation system will be enhanced and implemented to recommend the best psychiatrists to the students. Also, live conversations with psychiatrists and counsellors will be included as another feature. Furthermore, our team will contact the university administrations to integrate our web applications with the university website.

5. REFERENCE

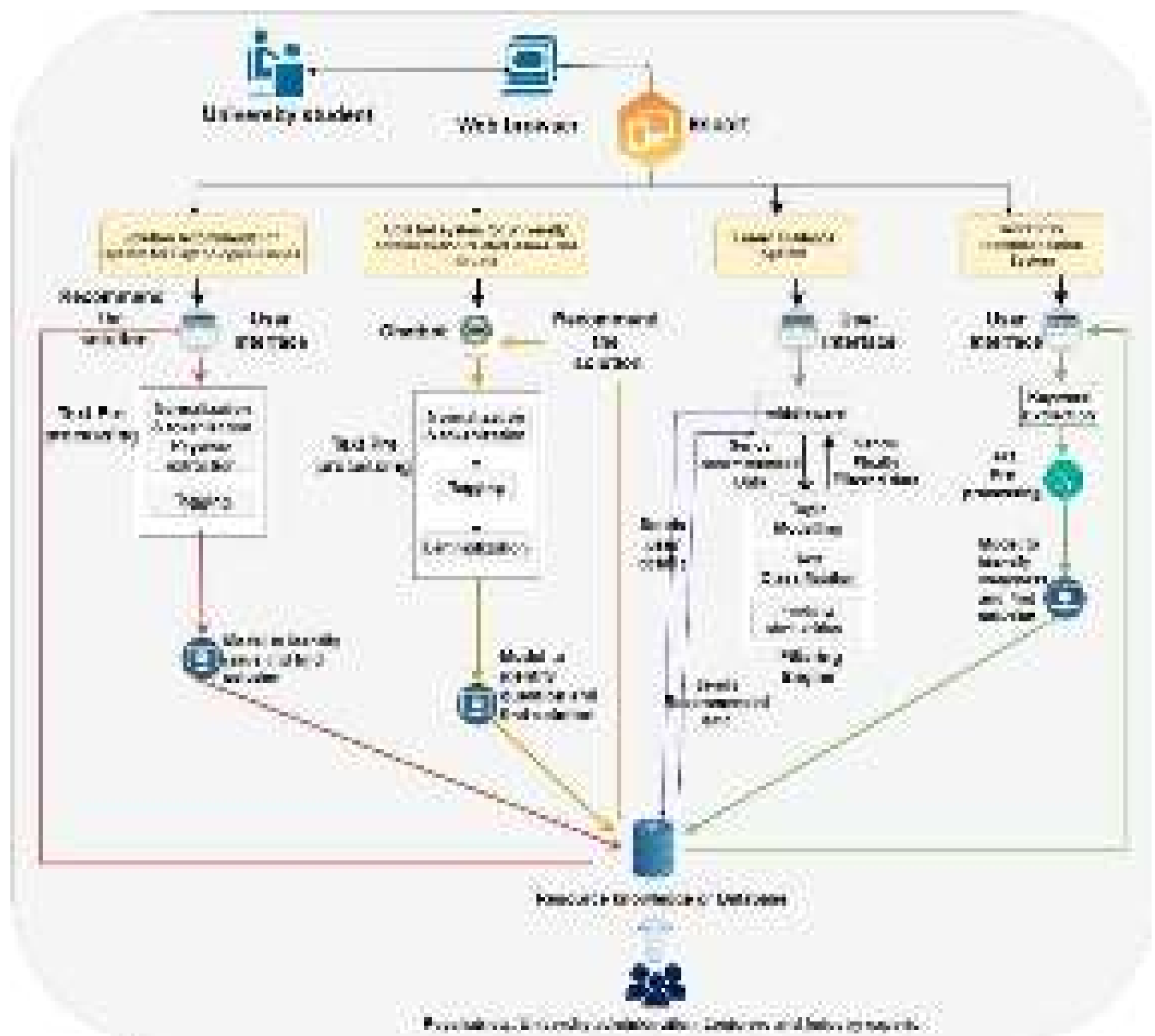
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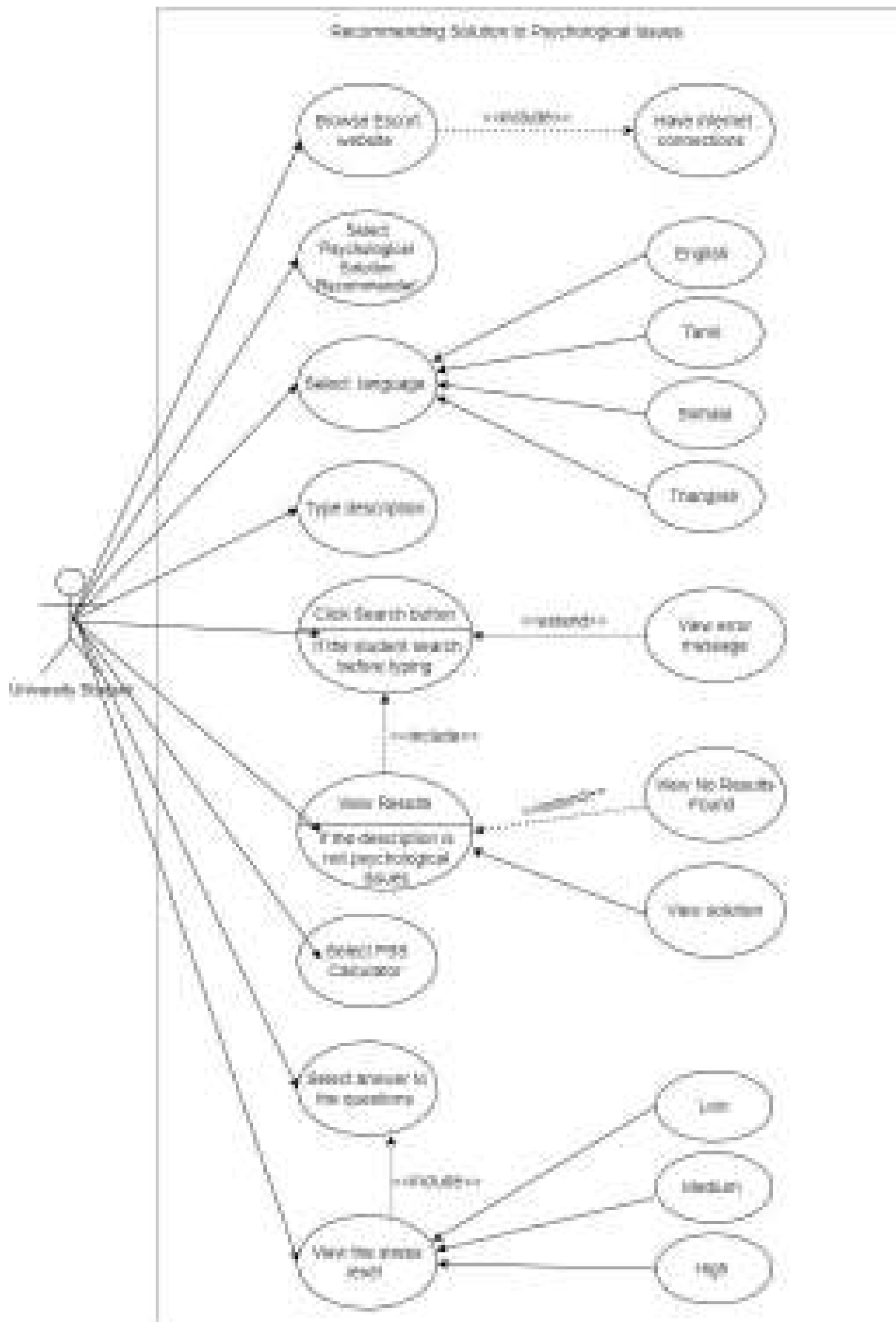
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6. APPENDICES

Appendix I: System Diagram for Escort



Appendix II: Usecase Diagram



Appendix III: Activity Diagram

