

**PREDICTING FOREIGN LANGUAGE ANXIETY USING MACHINE  
LEARNING ALGORITHM**

**BY**

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This Report Presented in Partial Fulfillment of the Requirements for the  
Masters of Science in Computer Science and Engineering

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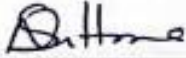
This thesis titled “Predicting Foreign Language Anxiety Using Machine Learning Algorithms”, submitted by Mohamed Abdikafi Abdullahi ID No: 221-25-093 to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the Degree of M.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 17-01-2023.

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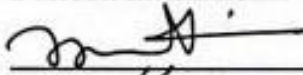
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## **ABSTRACT**

The number of journeys people take to change their lives is rising, and in order for a person to be able to adapt to this openness and realize the value of his travels, it is crucial that he learn a language other than his native tongue. However, learning a new language can be very stressful, and this stress frequently prevents the person from continuing to learn the new foreign language. The numerous types of stress and anxiety are presently paying a lot of attention to this sort of anxiety. Foreign language anxiety can be detected using different scales and measures but this type of detection is not only difficult for the teachers and time consuming but also its very traditional, in addition, there aren't many research that predict second language anxiety using contemporary technologies. To fill in this gap, we proposed a foreign language anxiety prediction model base on machine learning approach which enables prediction of the second language stress with an accuracy of 100%. In this study, 214 Somali students who are studying in Bangladesh were surveyed using the most famous and reliable Foreign Language Classroom Anxiety Scale (FLCAS) to find out if the student is dealing with foreign language anxiety. Six different machine learning classifiers (Naive Bayes NB, Support Vector Machine SVM, Decision Tree DT, Logistic Regression LR, Random Forest RF, and K-Nearest Neighbor KNN) were utilized in order to achieve the best result. Findings show that Logistic Regression perform better than the others with 100% accuracy.

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## LIST OF ABBREVIATIONS

ABBREVIATIONS	FULL FORM
L2	Second Language
AI	Artificial Intelligence
ML	Machine Learning
FLCAS	Foreign Language Classroom Anxiety Scale
NB	Naïve Bayes
DT	Decision Tree
LR	Logistic Regression
RF	Random Forest
SVM	Support Vector Machine
KNN	K-Nearest Neighbor
EFL	Englis as Foreign Language
FLA	Foreign Language Anxiety
PSCAS	Public Speaking Class Anxiety Scale
CNN	Convolution Neural Network
TP	True Positive
FN	False Negative
FP	False Positive
TN	True Negative

# CHAPTER 1

## INTRODUCTION

### 1.1 INTRODUCTION

Anxiety and all of the studies and researches related to it has become very increased over the past three decades. Anxiety is a feeling of disquiet and unnormality that can be between a range from higher to lower or from minor to severe, and it also includes worry and fear. Most of us experiences some way or other some anxious symptoms, for instance you might have worry anxiety before an exam, a medical test or may your first job interview. Feeling apprehensive and anxious at these times is quite normal.

Feelings and the emotions of worry and unfavorable fear linked to learning or speaking to a language that is not your first or native language are collectively referred to as Language anxiety [1]. Learning more than your mother language has become more crucial for your own development as a result of globalization, at the time you learning a new language, language learners commonly and frequently display worry, shy, trepidation, and anxiousness. Language stress can be caused by difficulties with language adaptation, differences in learner's and target language cultures and scenarios. Discrepancies in speakers and interlocutors social positions. And the worry and the fear of not finding one's own identities. A language teacher or instructor must be considered language students' anxiety emotions and stress in order to help them achieve the prescribed performance goals in the target language [2]. Second language stress is a situation-specific anxiety worry that is not linked to other anxiety forms. The authors described the second language anxiety "as a separate big collection of self-perceptions, attitudes, feelings and behaviors related to language acquisition in the classroom that result from uniqueness of the language studying process.[3]

Anxiety as its many types have general symptoms like psychological signs, so looking deeply to these symptoms it becomes possible to predict whether the person is dealing with

anxiety or even the level of anxiety. Emotional response to learning a foreign language or a second language experienced by all foreign language learners regardless of their proficiency level, location (high school, small colleges, large major universities), learning language (German, Somali or Bangali), or age (Freshman or graduate learners). “In the life imagination more than 35% of students who are studying or trying to learn a second language report is dealing at least an average level of foreign language anxiety”, this is from several papers done in the language schools. [3].

Nowadays, stress related to the second language learners has become one of the leading causes of Depression, stress and even more comparing other life-threatening diseases, to treat and deal with this major problem, Different machine learning (ML) methods and algorithms like Decision Tree (DT) Bein used by the academics, also researchers trying to use algorithms like Naïve Bias (NB), Support Vector Machine(SVM) and others to predict the language anxiety in a proper way using its general symptoms and common tested well known scales.

## **1.2 RATIONAL OF THE STUDY.**

Most of the studies involving language and affective characteristics in relation to foreign language achievement and proficiency have drawn criticism since they typically use traditional ways of studying. To ascertain students’ levels of worry about learning a foreign language as well as their level of success and proficiency, researchers who specialize in foreign language perform longitudinal studies.

To my knowledge no studies have examined the level of foreign language anxiety with the case study of Somali students in Dhaka Bangladesh using Machine Language Algorithm Approach. In this study I will predict the level of second language anxiety using FLCAS Scale with scientific way of Predicting by Machine Language algorithms although its very power for prediction and guessing the right circumstances.

### **1.3 AIMS AND OBJECTIVES**

This study aims to investigate level of foreign language anxiety among Somalian students studying In Dhaka Bangladesh using scientific technology specially machine learning approach. This broad aim can be separated into

1. To predict foreign language anxiety among Somalian students using machine learning algorithms
2. To apply different machine learning algorithms for the predicting of language anxiety and find appropriate high accuracy
3. To Prepare the best model that predicts the foreign language anxiety using trusted and well-known scale with high accuracy.

### **1.4 RESEARCH QUESTION**

As the research question is the question that our research will focus to answer it is the time to settle down the research questions that leads to this work

- 1) What is the best model to predict the level of foreign language anxiety of Somali students who studies in Dhaka Bangladesh?

### **1.5 CONCLUSION**

The preceding chapter in this research have presented the best available knowledge of the foreign language anxiety and anxiety its self, some of the main symptoms of second language anxiety were defined and explained, furthermore we denoted the aims and the objectives of the study. The chapter also presented the key question of the study, in addition the chapter draws the rational of this study and its reasons of conducting while defining the anxiety its also mentioned how it can be predicted by machine learning algorithms.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 INTRODUCTION**

Second language (L2) researchers have long been interested in the impact of anxiety in learning foreign or second language beginning in the 70s, of past century a decade in which research on the learner, anxiety and other personal issues increased. The major advancement in the theory and assessment of foreign language related anxiety over the past twenty years have led to a noticeable increase in the number of studies addressing anxiety in the foreign language.

Since the start of language anxiety researches and studies different researchers and scholars have made attempts to establish a solid framework for defining the concept of anxiety related to learning and dealing with a foreign language, its emergence and maintenance as well as its dimensions. Many others developed instruments and scales to measure general and skill specific typed of foreign language learn anxiety. This chapter prefaces the best knowns definitions measures and review been made by foreign language anxiety as well as defining the gap and important points to fill. Also, it includes the theoretical background of the study also an overview of various approaches that have been used in the study of anxiety in second language learning and summary of previous research work.

#### **2.2 DEFINITION OF FOREIGN LANGUAGE ANXIETY.**

In this literature of past work review offers a number of definitions of Linguistic anxiety, second language anxiety or foreign language anxiety. In terms of Ortega [5] the two well know definitions of language anxiety and advanced our understanding of the disease were developed by Horwitz et al. [6] and MacIntyre. “Foreign language anxiety a distinct complex of self-perceptions, believes, feelings and behaviors related to classroom language learning coming and arising from the uniqueness of the language learning procedure and process”. Similarly, MacIntyre explains and defines that “Language Anxiety as a feeling

of stress nervousness, emotional reaction and worry that linked to second or foreign language”.

To completely and fully understand foreign language anxiety it's very important to look the numerous components and categories of anxiety. There are three different and distinct psychological subtypes of anxiety: Trait Anxiety, State Anxiety and Situation-Specific Anxiety. Are the three different types of anxiety. The distinctive viewpoint is when a person consistently wants to be anxious [8]. It's a consistent aspect of personality that exists in all situations. According to Sieber, O'Neil, and Tobias [10] Trait anxiety is an indication of “Stable personality differences in anxiety proneness.” This feature of anxiety does not alter or deal with over time because it is a part of person's nature. Eysenck [11] asserts that Trait anxiety can affect cognitive functioning and impair memory.

An emotional state is what is meant by the state perspective. According to Spielberger (p. 12), anxiety is "the emotional reaction or pattern of response that happens in an individual who views a specific circumstance as personally hazardous or threatening, regardless of the presence or absence of objective danger" (p.489). Another way to describe the condition of anxiety is as a persistent, varying level of anxiousness. [13] Examination anxiety is a clear example of the stage of anxiety in which pupils feel anxious about a certain test, albeit this sensation might vary over time. Anxiety has an impact on a person's feelings, thoughts, and behaviors.

A specific situation results in the context-specific perspective at a specific time. Spielberger. [12] According to MacIntyre and Gardner [6], scenario-specific anxiety is a special type of anxiety that manifests itself consistently throughout time in a particular situation. Although it is persistent over time, it is intimately tied to certain circumstances where one condition differs from another. Situational fears include those related to math and language. Language studies claim that situation-Specific anxiety is associated with specific situations, as opposed to trait anxiety, which is stable trait that cause anxiety emotions to arise in most situations. For this issue, studying a foreign Language is associated with Situation Specific Anxiety but not trait anxiety. Oxford and

Ehram[14], same to MacIntyre and Gardner [6] argue that a situation-specific viewpoint is the best research and studying tool for examining foreign language anxiety, because language learners face concerns in variety of settings and choices in a language class. This type of anxiety which is situation-specific anxiety focuses on the distinct kinds of anxiety that occur frequently across time.

Debilitating, (damaging) and facilitating (useful) anxiety are the two distinct categories for language anxiety [15]. Alpert & Haber Most studies concentrate on Crippling anxiety, which harms Students and has a negative impact on their performance [6]. The effect might be noticeable right away and immediate such as a decrease or drop in student attendance, or they could be more subdued such as uneasiness, resentment and worry [14]. On the other hand, fostering anxiety benefits language learners in a certain way that enable and allows them to directly thrive in the language. The idea of facilitating anxiety and predicting it has undergone some modifications, which may be a quality or feature that helps students overcome anxiety.

### **2.3 MODELS THAT EXPLAIN LANGUAGE ANXIETY**

To know, predict or recognize language anxiety there is some theories and researches of second language emotions that gives out very important ideas and provides insights into this situation. The incoming models of foreign language anxiety are negotiated by: Krashen's Affective Filter Hypothesis [17] Horwitz, Horwitz and Cope's theory of Foreign Language acquisition and anxiety.

#### **2.3.1 Krashen's study of second language acquisition**

The affective filter hypothesis, found and developed by Krashen, is crucial theory in the study of foreign language anxiety [17]. With this method the connection between emotive components and second language acquisition is emphasized. Krashen claims that the affective aspects are emotional elements that fall into three categories Anxiety, Self-confidence and motivation. These factors may impact learning indirectly by preventing input from getting to the brain's language acquisition device. To be more precise, this theory explains how emotional elements affects if someone is successful at dealing,



learning and studying a foreign or second language or not. For example, when the affective filter develops learners may detect tension, anxiety and poor self-confidence which impedes growth in addition on the other hand, low filters do not make people anxious, which makes it simpler for language learners to understand the input. The significance of this hypothesis in education is how a language instructor is presented by the concept of an affective filter. A good learning environment can be created by language teachers who affectively and smoothly facilitate input and make it feelable in a calm environment.

To put in other way, a language instructor can help their students feel less anxious by developing and employing certain strategies like emphasizing the message rather than the form and delaying the need for early production until they feel their students are ready. It is believed that English will improve by putting this concept into practice since more input will be received the filter will be lower and students will be less reluctant to discuss tasks in the class.

### **2.3.2 Horwitz, Horwitz and Cope's Theory of Foreign Language Anxiety**

The anxiety from second foreign language is “a separate complex of construct of self-perceptions, attitudes and actions associated to classroom language learning emerging from the uniqueness of language learning process “this definition is developed by Horwitz, and Cope [7]. Through the common study belongs to them. Emotions and worry related to a foreign language arises from the particularities of doing so and is not a generic concern that has been transferred to doing so. By observing language students as they are being taught in language classes and courses and receiving input from thirty language students who are also enrolled in language classes, they demonstrate their theory.

This idea says and suggest that this form of anxiety is distinct from other academic concerns because all issues from the academics of study do not have equal and the same level of pressure and self-concepts as studying a second language. When studying a second language some students who excel and mix with other disciplines face worry. This model had been checked by many investigations, and each one offered some supporting data and others. For instance, MacIntyre and Gardner [6] tested the relationship between anxiety

dimensions and other learning metrics using nine anxiety scales. they found that foreign language anxiety is highly connected with foreign language proficiency in contract to general anxiety. Similar to this Chen and Chan [18] think that anxiety related to learning a second language is a form of situational anxiety. Foreign language anxiety is a distinct sort of anxiety because neither test features nor academic learning history were discovered to be factors in their article. These results confirmed the hypothesis that anxiety related to learning a foreign language is a particular form of anxiety caused by the particularities of doing so.

The Foreign Language Classroom Anxiety Scale (FLCAS), which assesses levels of anxiety as indicated by unfavorable attitudes, subjective perceptions, believes and feelings regarding second language classes, is another significant contribution of this approach. And the scale will be used in this prediction research. The FLCAS is a self-report tool with 33 items that measures a learner's level of language anxiety and determines whether or not language anxiety is a particular form a language learning.

## **2.4 ANXIETY, SELF-CONFIDENCE AND MOTIVATION**

When you look it from many different angles and read a lot of research you will see the main areas that foreign language affects are anxiety self-confidence and motivation when learning and trying to speak a second language not the mother tongue.

### **2.4.1 Anxiety**

Anxiety here is a state or tension that a person feels when speaking a foreign language that anxiety is limited when speaking or conveying a message in a language other than his mother tongue. Such tension or anxiety is the reason that the person forgets the words he was going to speak, that he/she shy or too afraid to stop talking and also sometimes the person's feelings change from time to time such as crying or feeling very depressed and lack of knowledge. This recurring anxiety causes the student to become frustrated with learning and speaking the new language, also there is a decrease in the presence and learning of the language in addition the person's interest in the new language generally disappear. Going far away from the effects of this anxiety on academic life It is possible

that this stress can make it difficult for a person to cope local life, social understanding and also to be aware of health conditions that may cause life-threatening conditions. In general, symptoms include slurring speech, looking at the sides and the tension that he/she feels at the time of speaking a foreign language and sometimes sweating and shaking shows that the person or student is facing the Anxiety of the Foreign Language.

#### **2.4.2 Self-confidence**

Self-confidence is commonly measure or defined as “an attitude about your skill and abilities”. It means you accept and trust yourself and have a sense of control in your lie. You know your strength and weaknesses well and have a positive view of yourself. By looking to this explanation and compare to it how the Foreign Language Anxiety affects this area of the person’s self-confidence we can say that when speaking the first thing you need is to have confidence about what you are saying and to feel that saying this is normal, lack of self-confidence causes the person to worry more than usual about the words he speaks whether the are right or not and if the will accepted by the listeners or not this worry comes from lack of the self-confidence while speaking a foreign language. Feeling a lot of fear and not being able to understand or suspect that the words coming out of his/her mouth are correct or that you are not saying them correctly is a sign that this person has lost self-confidence when speaking I a foreign language. This lack of confidence is often the cause of misinterpretation of people’s actions while speaking for example, if people lough while he/she is talking, it means that the people being laughed at them even if they say words that can be laughed or its reasonable that the individual thinks too much of being laughed at. A person who is seen with such symptoms shows that he is dealing with a lack of self-confidence in speaking a foreign language.

#### **2.4.3 Motivation**

Motivation is the energy that pushes the individual to do and try new things. For instance, motivation is what pushes you to answer and try the questions asked by the teacher during classes, foreign language anxiety causes lack of this motivation for the second language learners, the student is reluctant to answer questions from the teacher or anyone else for fear of not being understood even if its correct, it is also difficult for that student to

participate in different class activities without having the courage to mingle with the students. Sometimes the student does not express his feelings as if he understood the lesson or if he used to the class or not which shows that this individual is not motivated to learn this new language and to interact with students and society.

## 2.5 SUMMARY OF PREVIOUS LITERATURE

Table 1: Summary of importance related anxiety studies

Title	Objectives	Methods	Finding	Conclusion	Ref
Examination of Horwitz, Horwitz, and Cope's Construct of Foreign Language Anxiety: The Case study of students of Japanese	The study explores and defines the links and the relationships between studying or learning Japanese and linguistic depression. It employs Horwitz, Horwitz, and Cope's theoretical framework for this paper that concentrated on anxiety-related concerns in learning and studying Japanese	The study employs the FLCA measure to look at the anxiety about learning and studying Japanese. 96 students took part in the study. An anxiety and depression were calculated by adding up the respondent's rating for the FLCAS's 33 item, each of which must be answered on Five-Point Likert scale for each subject item.	The results and the findings from this study are quite comparable to those of Horwitz (23) who used first year Spanish students. One way ANOVA revealed significant difference in the rate of anxiety across students who had visited Japan and those who had never gone. Exposure to Japanese culture and people may be a contributing cause for this group	Future researchers have a lot to research and investigate because there hasn't been much study done on foreign language issues. We shall have a deeper knowledge of language acquisition from the learner's sight as a result of the papers studying the link between anxiety and the aforementioned learner characteristics. The key reducing classroom tension and anxiety and fostering a welcoming	[21]

			<p>difference, wince individuals with experience in Japan had much lower levels of anxiety in the class than those without.</p>	<p>encouraging environment that can help individuals feel less embarrassed to make mistakes in front of their classmates lies with power and responsibility of the teachers and the way they are dealing with the students</p>	
<p>Factor analysis of the foreign language classroom anxiety scale in Korean learners of English as a foreign language</p>	<p>The paper of the study utilized two separate teams of Korean English language students to evaluate the latent components of the language anxiety</p>	<p>Straight obliging rotation and Maximum likelihood exploratory factor analysis were both conducted on groups of 2017 and 244 individuals</p>	<p>Interestingly, the current study discovered that communication apprehension and confidence were two basic FLCAS components that were highly connected with one another.</p>	<p>The current study discovered two underlying FLCAS components communication apprehension and confidence that were highly associated with one another. Wariness in scenarios involving conversation is known as speaking anxiety.</p>	<p>[22]</p>
<p>Foreign language anxiety in higher education practical frame for reducing</p>	<p>The study's objectives included determining Saudi English significant students' levels of worry and</p>	<p>Questionnaire two 373 students majoring in English were given a redesigned FLCAS.</p>	<p>Individuals in Saudi specially students those studying and majoring in English</p>	<p>The EFL measuring model suggest live approaches before during and after instruction in light of the</p>	<p>[23]</p>

<p>foreign language anxiety</p>	<p>anxiety related to learning a second language and the points or factors influencing their worry and anxiety as well as the effects of gender and academic standing. It also checked the link across linguistic competence and worry in the Saudi frame of reference.</p>		<p>showed a average level of stress, according to the results worrying about the repercussions of failing forgetting what they already know, and feeling uncomfortable while language examination is in were the main sources of pupil's anxiety stress of second language. The result of the analysis of the factors that affect language anxiety in foreign language contexts showed a substantial inverse relationship linkage between language anxiety and language competence</p>	<p>analysis. The model addresses the origins of stress from second language learning and provides suggestions for removing its affects. It's advised that the EFL measure from this paper be used in classes to look at its impact on students' stress and worry about learning and studying a non-mother language. The discovery can lead to further recommendations and consequences for teaching EFL students to oppose their fear of learning a second language L2.</p>	
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<p>Foreign language anxiety understanding its status and insiders, awareness and attitudes</p>	<p>The purpose of this study qualitative research paper was to determine how much knowledge there is about the FLA phenomenon and how instructors and pupils feel about it</p>	<p>8 English as a foreign language professor and 419 quasi primary undergraduates who were enrolled in a university in Vietnam and Pursuing a variety of majors took part in the paper. It was decided by the authors to use systemic review redundancy which involves collecting information through interviews, questionnaire and student diaries.</p>	<p>According to the research almost two thirds of the students took a part of the study had foreign language anxiety to some different levels but it seems that the teachers did not give it enough attention</p>	<p>According to the report, foreign language anxiety affects most and majority of the students and teachers, professors and instructors should reflect this one in their instruction</p>	<p>[24]</p>
<p>Investigating students' foreign language anxiety</p>	<p>This review essay looks into the fear of learning a second language among Indonesian students. It aims to identify the many forms of stress of foreign language</p>	<p>Data in this research were gathered using questionnaire using a Likert scaling ranking from Disagree to agree.</p>	<p>The result of the study after deep analysis showed that most students regardless of their gender or level had various types of foreign language anxiety. Many of</p>	<p>Ultimately, despite however this survey only included a limited number of participants and was completed quickly, the results and findings nonetheless offer some and</p>	<p>[25]</p>

	<p>anxiety learners face as well as the coping mechanisms they employ.</p>		<p>them also used certain coping mechanisms to deal with their foreign language stress. Additionally, data reveals that practice less advanced medium students utilized relaxation, optimistic thinking and group finding and discussion more frequently than more advanced medium students. Group seeking was the most often employed method among below students in grades. Followed by relaxing planning and positive thinking or optimistic, similar to below</p>	<p>more helpful thoughts and information that may become helpful or employed both instructors and the learners to enhance and manage the caliber of their instruction and studies. In conclusion, this paper shows that, although being widespread, foreign language anxiety is a problem that has to be addressed seriously since it may have a detrimental effect on students' ability to study and learn foreign or second language</p>	
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			students by grades higher students most frequently used friend team and peer seeking followed by a positive thinking, relaxation and preparedness		
Is the foreign language classroom anxiety scale measuring anxiety or language skills	In the present paper the authors looked at the correlations between students' responses on the FLCAS, a test for communication apprehension that had given at the conclusion of the first-year language course in ninth grade and their improvement and achievements on tests of their native language ability in middle studies, their linguistic aptitude before starting a course in a different	The study included 54 participants and utilized a variety of assessment methods including native language competency, foreign language proficiency foreign language word decoding, foreign language spelling and foreign language classroom grades.	The extensive reading writing and hearing and speaking portions of the second language competency tests reveals the existence of variance generally across the anxiety groups. Intergroup comparisons revealed that the low anxiety group considerably outperformed the high anxiety group on test of language competency given after two years of	These results that students with the lowest scales of second language stress on the foreign language classroom anxiety demonstrated the highest scores on measures of native language skill, foreign language aptitude, proficiency, word decoding and spelling as well as the highest foreign language grades indicate that native language learning abilities are related to student's	[26]

	tongue and their international conversational fluency at the final moment of a multiple course		language education.	subsequent levels of second language needs skills and classroom achievements and performances.	
A review of Horwitz, and copes foreign language anxiety and the challenges to the theory	In order to better comprehend the theory for individuals who are in love and interested in include foreign language anxiety in their study, this research article analyzes the theory and addresses the objections that the investigators have raised against it	Anxiety arising from the uniqueness of the formal learning of foreign language, not just a copy of general classroom stress being transferred to foreign language classes predicted on their medical knowledge and health experience with second language undergraduates their teaching methods and responses examined from 30 students entering a counselling service for	The ideas and the opinions may be accurate to be a certain situation or extent, but its also right that different researchers may find and interpret same evidence in different ways. This does not make impactable imply that one interpretation is correct and other is incorrect, furthermore its clear that the FLCAS has been widely utilized in language stress research since the time	Linguistic stress studies have greatly benefited by the application of Horwitz, theory of second language anxiety, which served as the theoretical foundation for several investigations, however this does not imply that the theory is flawless because even the most widely accepted working hypothesis them selves may require revision. Second language anxiety has certainly been and will continue to be an important subject of study	[27]

		teaching English	it is developed as a tool of evaluate language stress and anxiety and the issue of inconsistency study findings has been significantly resolved which has enhanced its reliability.	interest due to its intricacy and disagreement	
A measure of EFL public speaking class anxiety scale development and preliminary validation and reliability	The current paper leads to the creation of the public speaking class anxiety scale which will be used to examine and assess anxiety and stress in Thai English foreign language public speaking classes	The foreign language classroom anxiety scale was used as the source for the items, when given to be 76 individuals.	Since the scale was created as a tool for assessing levels of classroom anxiety in second languages, several studies and paper have used it to quantify that stress in variety of studies and projects, however it was pointed that the measure outcomes were complicated. After the	This study's primary goal was to create an English foreign language public speaking anxiety scale that would be used to measure speaking anxiety in an EFL public speaking class for English language learners. Based on critiques of the widely used existing foreign language classroom anxiety scale the PSCAS was created. This measurement	[28]

			<p>administration of 1992 revealed that linguistic depression had a modestly crippling effect on language achievement tests and oral English tests for the students in the college</p>	<p>items were redesigned and adopted with a few wording modifications and verified. After being piloted with 76 participants, the scale showed a construct composition around the speaking components in a public speaking class context. Finally, this measurement may be potentially helpful tool to reflect student's degree of public speaking stress and fear and also feel of anxiety in foreign language classes.</p>	
<p>A foreign language anxiety scale for Hungarian learners of English</p>	<p>This study describes the adaption of a known foreign language anxiety scale for use in Hungarian EFL Context as well as the validation</p>	<p>Samples in the research who were English majors in their initial years of learning was 117 students and participants</p>	<p>All three parts were reflected in the factor solution of both runs supporting Horwitz, three-part which was used to</p>	<p>This paper discussed the validity of the new instrument and how the most popular scale for measuring language anxiety was redesigned and</p>	<p>[29]</p>

	technique used to evaluate the new measurement psychometric qualities		analyze the data from 117 English Majors. The measurement is still good despite the truth that three parts did don't confidently come as three distinct points but rather matched up with to form general foreign language part in the first solution, secondly divided into speaking anxiety and fear of inadequate classroom performance factors with the letter made up of elements of test stress and worry of non-positive evaluation in the second face	modified for the use in a university EFL setting in Hungry. The article served a useful function regarding the previous, it created a widely employed FLA scale in standard Hungarian that is appropriate for evaluating Hungarian Foreign language classroom anxiety has been back translated validated for answer response and concept validity, is trustworthy in terms of its internal consistency and has strong psychometric features	
Affect: the role of language anxiety and	We shall examine the research on linguistic	Although both questionnaire and	The authors discovered a different mechanism	We have to pay close attention to the process of generating	[30]

other emotions in language learning	anxiety before expanding in the topic of emotional variables. We will conclude with some recommendations for future study on the part that emotional variables play in second language acquisition as there is still much to learn about this topic	interview-based research methods are useful, they only provide partial answers, making the unsuitable for investigating ongoing process as they change. The underlying process linking emotion in general or anxiety in particular to language performance.	early in conversation as opposed to midway through when fear increases and WTC decreases. As a result, the decision to commence communication seems to take place in a distinct emotional environment than the decision to continue speaking even if one stumbles over a word	positive emotions as we consider how crucial it is to comprehend both negative and positive impact in the process of learning a second language. People are happier when they form communities' social networks and close connection	
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## 2.6 ANXIETY AND MACHINE LEARNING

Machine learning is “a type of artificial intelligence that allows computers or software applications to become more accurate at predicting outcomes without being explicitly programmed to do so”. Machine learning algorithms use historical data as input to predict new output values. It uses data to predict the outcome easily and it can be used in all life challenges like health, business, social and even environment problems.

Machine learning is one of the many new topics that are being researched regularly as the discipline of computer science is constantly expanding, Machine learning (ML) falls in the sub domain of Artificial intelligence (AI). Machine is given the capacity to reason independently from human interference that means the machine is given the capability to think its own without any human interventions, Machine Learning is based on Algorithms

created especially for computers to train using a number of inputs and statistical analysis to make the output smaller within a predetermined range that the user defines. The primary objectives of machine learning is to closely resemble a human brain, which is the reason all machine learning training is done using many of the same methods and strategies that people use to learn.

Machine learning is very important because it always gives view of trends in different life behaviors and operational patterns as well as supports the development of new studies. It uses different algorithms that are trained on how to generate meaningful output from the data and the accuracy of machine learning depends on the accuracy of the input or trained data.

With machine learning algorithms like the Random Forest (RFT) the Support Vector Machine (SVM) and even the Convolution Neural Network (CNN) for the prediction of neural emotions, many researchers have used and worked on predicting anxiety and depression in many different life sectors in this paper specifically predicts the foreign language anxiety of Somali Students study in Dhaka Bangladesh using best know and most widely used machine learning methods.

## **2.7 STUDY GAPS**

In all of the review and the different culture studies that have been researched it has been discovered that there is a foreign language specially for learners. Many and different studies have explored different aspects of second language anxiety, but most studies used traditional ways to discover and predict the anxiety related to the foreign language learning and they are not specially used the era of Artificial Intelligence and Machine Learning, yet the literature gives limited ways of predicting the anxiety for the teachers and students themselves, this paper will use the machine learning Algorithms to investigate and predict the anxiety of the foreign language accurately without any human interference.

## CHAPTER 3

### METHODOLOGY

#### 3.1 INTRODUCTION

Methodological section of this research enables the reader to evaluate the general validity and dependability of a study critically. Predicting Somali Students' Anxiety about learning a foreign language in Dhaka is the main goal of the current study. To determine the gap in the previous study a substantial literature review was done at the beginning. Significant measuring instrument were found through literature review which assisted to collect relevant data.

#### 3.2 STUDY FRAMEWORK

This figure shows the methodological framework of the study

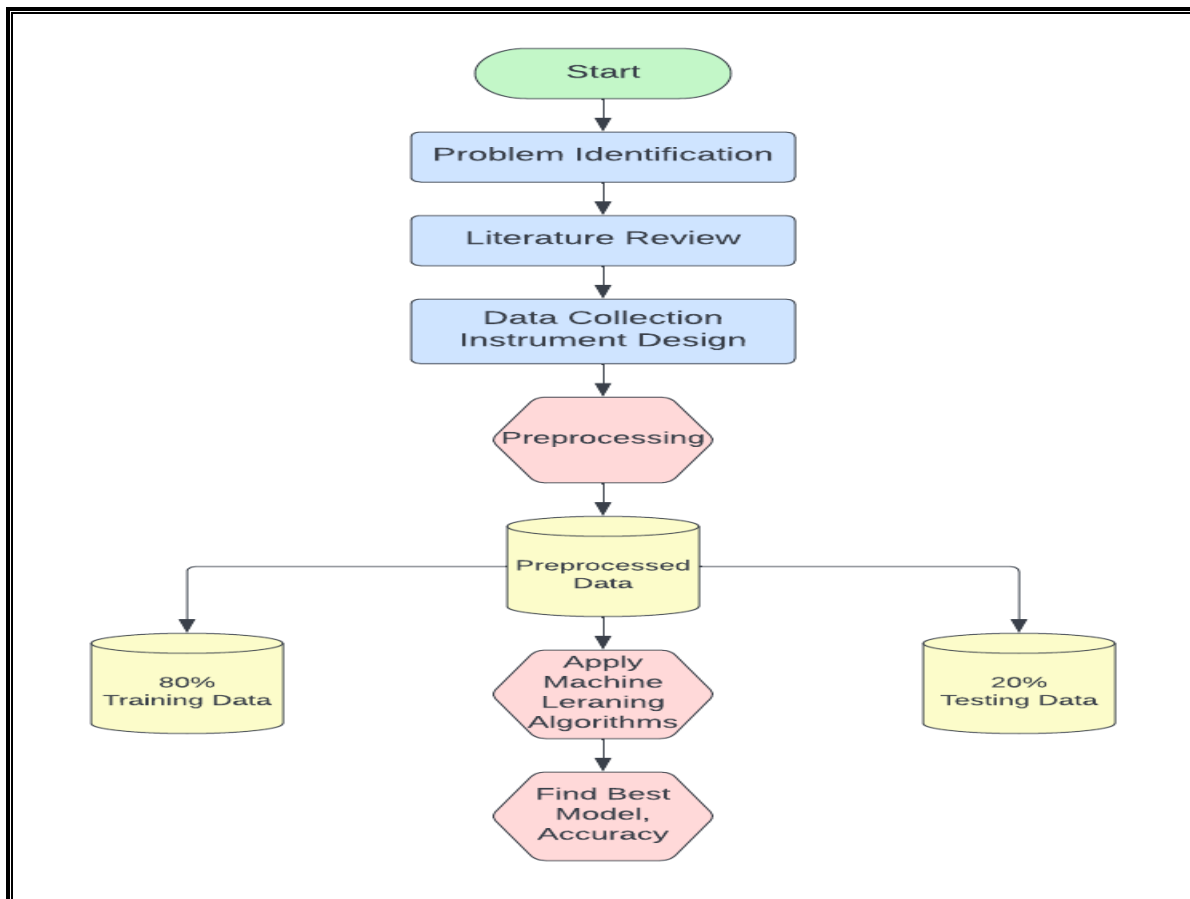


Figure 1: Study Framework



### **3.3 STUDY DESIGN**

To achieve and acquire the objectives of this study the researcher used qualitative study approach

### **3.4 DATA COLLECTION INSTRUMENT**

The data collection methods and instruments used and done by this study was online an questionnaire. The purpose of the questionnaire was to assess students' current level of language related anxiety. To achieve this, this study used most widely used foreign language testing scale named Foreign Language Classroom Anxiety Scale (FLCAS) developed by Horwitz, [7], the FLCAS consist of consist of 33 questions where each of them is rated on a 5-point Likert scale ranging from Strongly agree to Strongly Disagree, by adding up the scores on the 33 items, the new FLCAS scale's main goal was to assess a person's level of anxiety towards a foreign language. By following studies [19] and [20] The class variable is created by classifying into three groups, students scored between 33 and 77 were labeled as dealing with Low Anxiety, students scored between 77 and 121 were labeled as dealing with Average Anxiety and those students scored between 121 and 165 were labeled as having High Anxiety.

### **3.5 PARTICIPANTS**

This study was conducted on a total of 214 individuals with valid records, the respondent's moral considerations have been guaranteeing them that their privacy would be completely protected and kept private secret.

### **3.6 DATA PREPROCESSING**

The dataset was fully handily till inaccurate and partial data and also less important features were eliminated in order to achieve the correct result. To preprocess the row data several python modules were employed. In order to the data with the classifiers we simultaneously transformed the data from normal string dataset values to numerical value.

### **3.7 MODEL SELECTION**

In this paper the actual preprocessed dataset was divided into and split into training data of 80% and test data of 20%. The top six most common and widely used algorithms have been

chosen to investigate the best performance second language anxiety prediction with machine learning.

- a) Naïve Bayes (NB)
- b) Support Vector Machine (SVM)
- c) Decision Tree (DT)
- d) Logistic Regression (LR)
- e) K-Nearest Neighbor (KNN)
- f) Random Forest (RF)

### 3.7.1 Naïve Bayes

It is a classification algorithm built on the Bayes Theorem and predicted on the idea of independence predictor. A Bayes rule-based probabilistic model underlies the NB Classifier. In this study I developed a predictive model using GaussianNB.

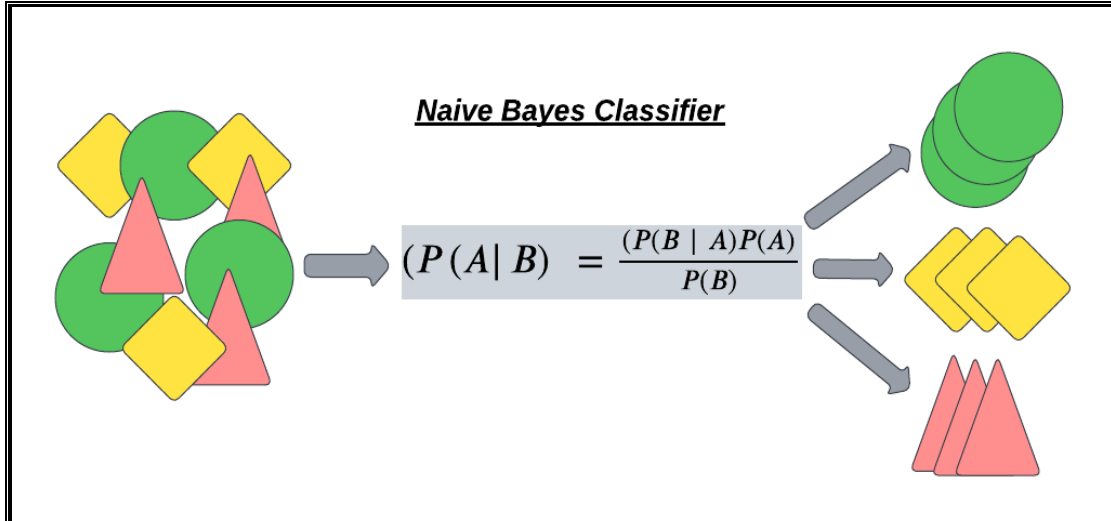


Figure 2: Naïve Bayes Picture

$P(A|B)$  – is the probability of A given that B has already happened.  
 $P(B|A)$  – is the probability of B given that A has already happened.  
 $P(A)$  – is the unconditional probability of A occurring.  
 $P(B)$  – is the unconditional probability of B occurring.

### 3.7.2 Support vector Machine

Support Vector Machine SVM is a biased classifier and linear model used to solve categorical and regression issues. It works very well for different real-world issues and can solve both linear and logistic problems. The SVM concept is straightforward: A line or hyperplane that divides the data into classes is produced by the algorithm

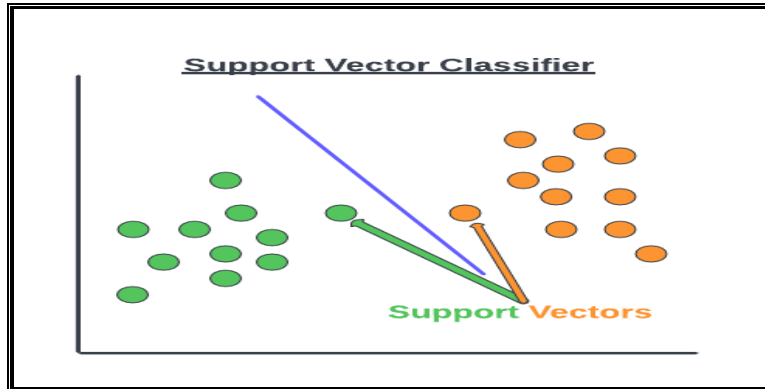


Figure 3: Support Vector Machine Picture

### 3.7.3 Decision Tree

DT is one of the most used classifiers among machine different machine learning algorithms, its works like tree structure. It figures out how much knowledge a feature gives us about a class. It first selects the most important feature and with the largest information gain as a root note then all other feature will become sub nodes.

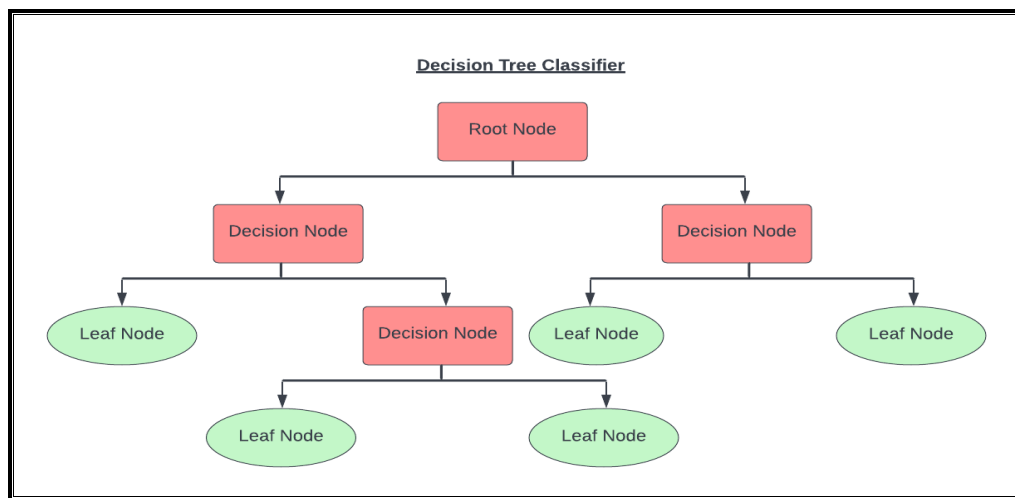


Figure 4: Decision Tree Image

### 3.7.4 Logistic Regression

Logistic regression is one of the most common used classifiers, its mainly used for classification problems. The LR model computes a sum of the input features and calculates the logistic of the result.

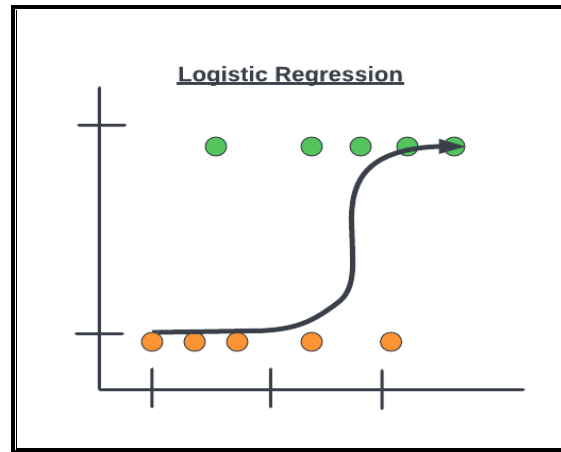


Figure 5: Logistic Regression Picture

### 3.7.5 K-Nearest Neighbor

The K-Nearest Neighbors algorithm, KNN is a supervised learning classifier that employs proximity to produce classification or predictions about the grouping of a single data point. In this classifier its very easy to implement and understand. It groups the nearest data points.

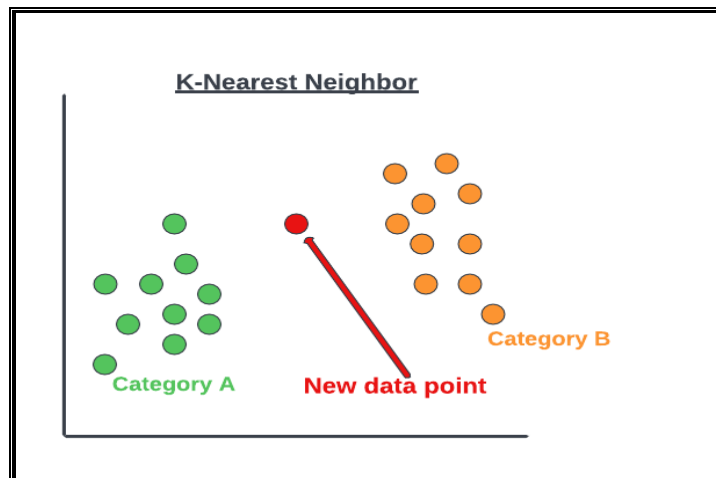


Figure 6: K-Nearest Neighbor Picture

### 3.7.6 Random Forest

It's very used and common algorithms it works like a decision tree but unlike it, it creates more than one tree. It creates random subsets of data and features and we end up building a forest of trees.

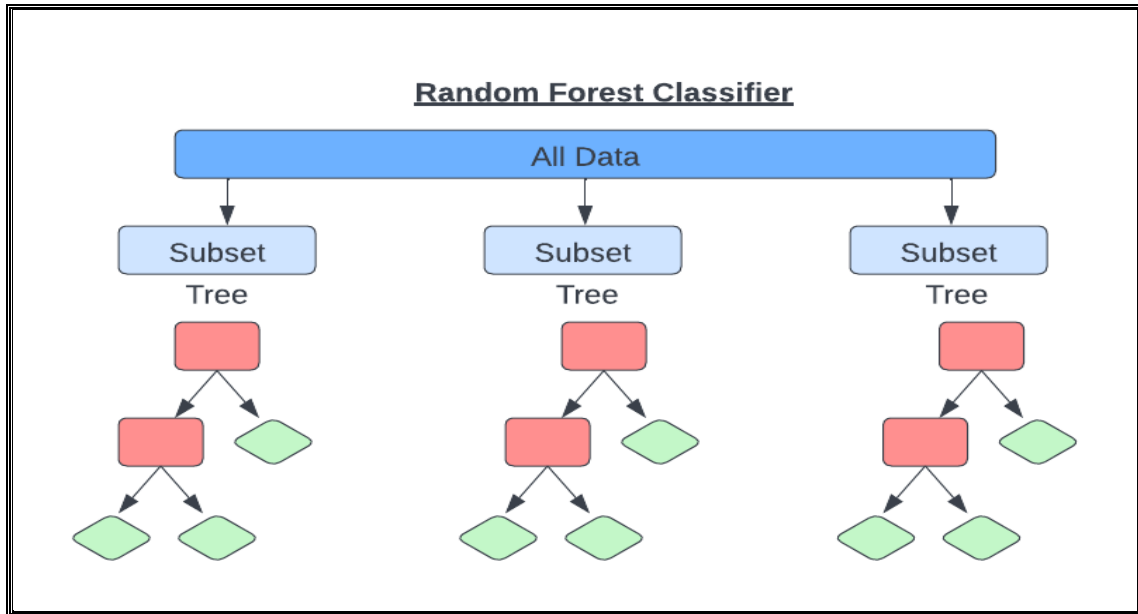


Figure 7: Random Forest Picture

## CHAPTER 4

### RESULTS AND DISCUSSION

The training and testing of all six models Naïve Bayes (NB), Support Vector Machine (SVM), Decision Tree (DT), Logistic Regression (LR), K-Nearest Neighbor (KNN) were all applied to the classes of 2L anxiety. The resulted confusion matrix of the six classifiers is shown in figure 8.

#### 4.1 PERFORMANCE MEASUREMENT OF CLASSIFICATION ALGORITHMS

In order to measure the performance of machine learning classifiers and algorithms we use some terminologies.

##### 4.1.1 Confusion Matrix

Confusion matrix is represented by a table that shows and measures the achievements of all classification models. It mostly uses certain calculations which are (True Positive TP, True Negative TN, False positive FP, and False Negative FN). Its concludes and summarizes each classifier's right and wrong predictions.

In here for this terminologies, True Positive (TP) shows the correctly predicted positive values, True Negative (TN) represents correctly predicted negative values, False Positive (FP) evaluates that the classifier predicted the value as positive but its was false, False Negative (FN) calculates that the model predicted the values as negative but it was false.

##### 4.1.2 Precision

The precision ratio is the number of accurately predicted positive observations to all positive predictions. Each classification model or algorithm with high precision will tend to have few false positives which good the accuracy of the model. Table shows the performance evaluation of all selected classifiers including precision values. Precision (P) =  $TP/(TP+FP)$ .

### 4.1.3 Recall

It knows as sensitivity, demonstrates the ration of correctly predicted positive observations to all observations in the actual classifier. Recall measures what proportion of people that exactly had Language anxiety was detected by the classifier as having language anxiety.

$$\text{Recall} = \text{TP} / (\text{TP} + \text{FN})$$

### 4.1.4 F1-Score

F1-score tells the weighted average of both precision and recall that measures the test's accuracy  $\text{F1-score} = 2 * (\text{Recall} * \text{Precision}) / (\text{Recall} + \text{Precision})$ .

The confusion matrix of all six classifiers used in the study is shown and displayed in figure 8 below.

Also, below table 2 shows the classification report of the six classifiers including the importance terminologies Precision, Recall and F1-score, also it displayed the accuracy of the models and how they are ranked, its shown that most of the models have accuracy higher than 9 which is best for the predicting and the correctness of the model.

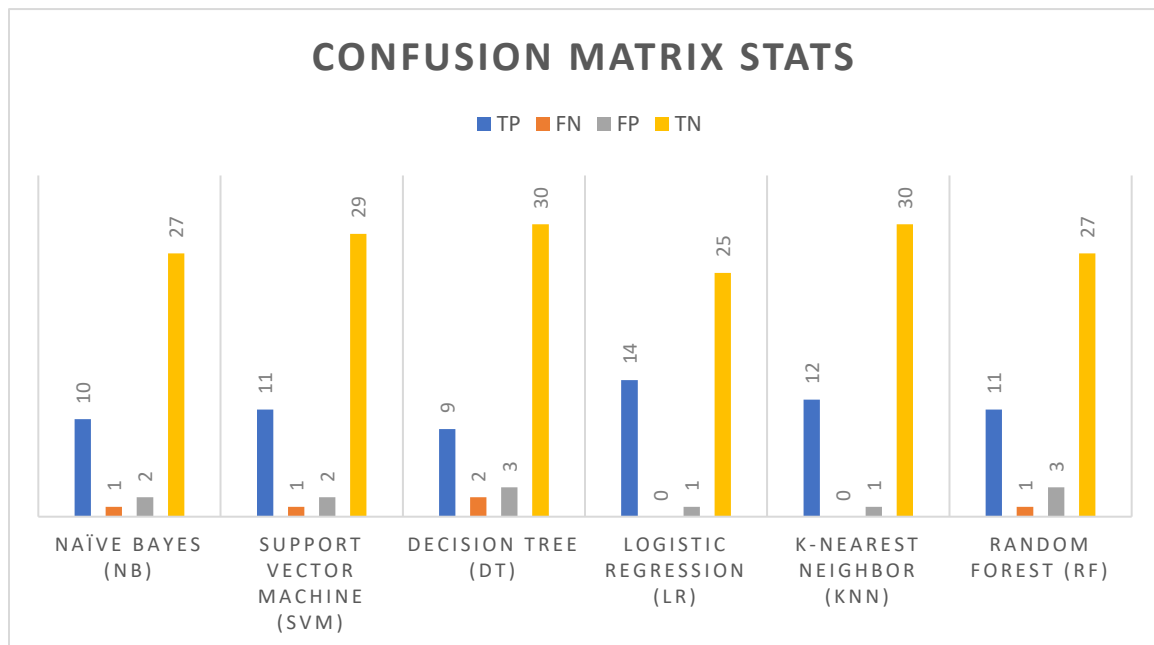


Figure 8: Confusion Matrix Stats

Table 2: Classification report of 6 classifiers

Classifier	Accuracy	Precision	Recall	F1-Score
Naïve Bayes (NB)	93%	0.90	1.0	0.95
Support Vector Machine (SVM)	95%	0.97	1.0	0.99
Decision Tree (DT)	90%	0.93	1.0	0.95
Logistic Regression (LR)	<b>100%</b>	<b>1.0</b>	<b>1.0</b>	<b>1.0</b>
K-Nearest Neighbor (KNN)	95%	0.92	1.0	0.96
Random Forest (RF)	97%	0.97	1.0	0.99

From the data in table 2, Figure 9 shows the bar chart of each model and its accuracy

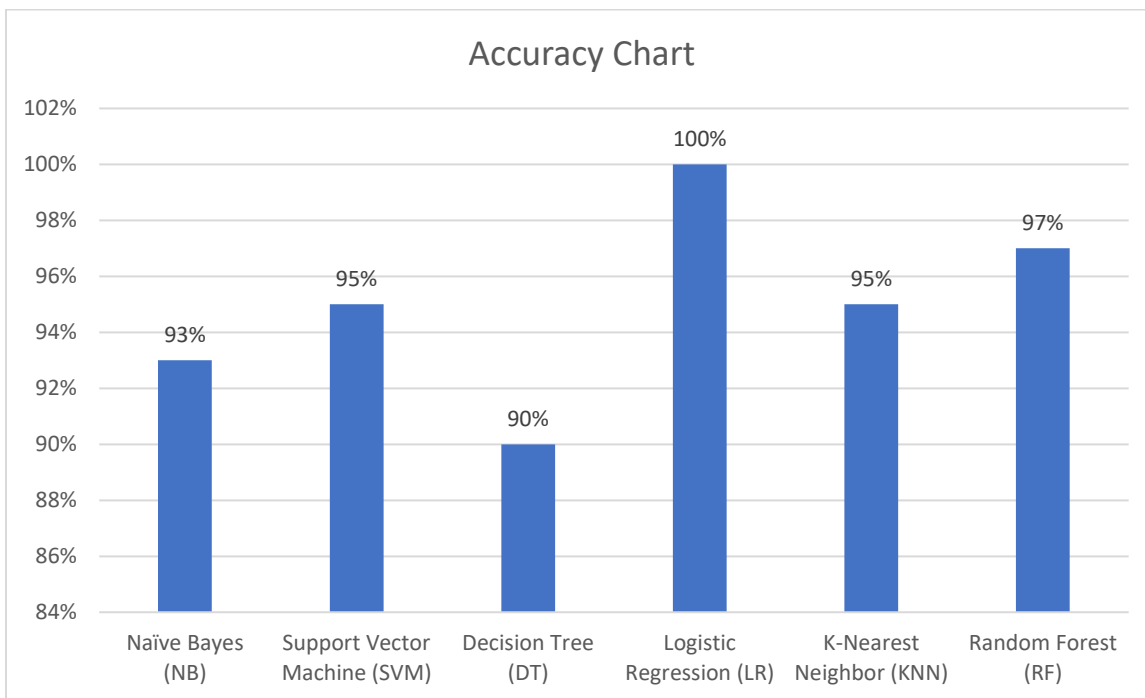


Figure 9: Accuracy Bar Chart



## 4.2 DISCUSSION

Anxiety is psychological disease that is mostly caused by a special situation or accumulation of little things that affects person's life and well-being. Most of the time anxiety have some common symptoms that the person arises whenever he is dealing with it it's kind like stress but different. As anxiety has many different types according to different situation, foreign language anxiety is one of the most common one lately specially when it became more important to learn and study another language rather than your mother tongue. Students are the most victims of this type of anxiety exclusively when they try to study abroad, they have to study foreign language may be one or more regarding to the place, during the process of studying second language they feel much less comfortable lack of motivation and self-confidence which leads to stress and low performance of language engagement and also failing of language classes. This anxiety can be predicted and detected using prepared and tested second language anxiety scales and technology so that when it recognized it will be easy to deal with it and to make the process of learning easy for the students.

Anxiety is typically identified and diagnosed based on the patient's behaviors, outward symptoms, and physical examinations. This sort of prediction and detection cannot be used by everyone because it takes time and effort for the teachers to identify the pupils' linguistic concern. Thus, giving accurate prediction to all language learners has grown to be a significant problem. Finding a quick and efficient approach to predict student's concern about learning a foreign language based on their outward manifestations is the goal of the current study.

The whole and overall study was conducted on 214 Somali students who studies different universities in Dhaka and FLCAS scale is used as tool of questionnaire although it is the best checked and well-known scale of language anxiety till now, six different and machine learning algorithms (Naïve Bayes NB, Support Vector Machine SVM, Decision Tree DT, Logistic Regression LR, K-Nearest Neighbor KNN, and Random Forest RF) were trained and tested to find the best accuracy and result among them. The confusion matrix and the classification report of all classifiers is displayed in figure 8 and table 2. The result shows

that the two models Logistic Regression outperformed all other machine learning classifiers for this study with classification of 100% where Random Forest has 98% of accuracy.

Naïve bayes and k-nearest neighbor have somehow close accuracy of 93% and 95% respectively, away from the accuracy other terminologies like precision, recall and f1-score mention important story about the classifiers and their correctness, the results shows that all the classifiers have very close precision ratios while decision tree and logistic regression have a precision ratio of 1 also the exciting thing is that all the classifiers have a recall ratio of 1.

The f1-score is a harmonic mean of precision and recall, whose value is higher when both precision and recall are higher, and lower when both are lower, furthermore the best model in some cases is the one whose f1-score is higher even if its accuracy is low. In this study the Decision tree and Logistic Regression have actual f1-score of 1 and the other f1-score's is between 0.95 and 0.99 which makes the prediction very accurate and lean. All of the algorithms applied in this study produced highly accurate results and accuracy.

## CHAPTER 5

### CONCLUSION AND FUTURE WORK

Due to its damaging effects, second language anxiety sometimes referred to as foreign language anxiety, has elevated to a serious problem globally. By taking into account a variety of internal and environmental elements it may be recognized or diagnosed using various interventional test.

Predicting foreign language anxiety using Machine Learning is a very rare and uncommon and there are very few studies when it comes to anxiety and machine learning accuracy and not at all in foreign language anxiety. Here in this research study, I proposed a foreign language anxiety prediction model using most common and well-known foreign language anxiety scale which is Foreign Language Classroom Anxiety Scale FLCAS using machine learning algorithms that enables predicting foreign language anxiety with 100% accuracy. During the study in order to obtain the best result and accuracy of correct prediction six different classifiers of machine learning were trained and tested which are (Naïve Bayes NB, Support Vector Machine SVM, Decision Tree DT, K-Nearest Neighbor KNN, Logistic Regression LR, and Random Forest RF. The finding from the six classifier refers that Logistic Regression Outperforms with complete accuracy of 100% and by the way Random Forest Have greater accuracy of 98%.

Since the topic of anxiety as all is very rare topic in the field of papers and researches and specially this type of foreign language anxiety, a lot of future work must be done with this topic, all the scales and different test have done in the late of past century and no more usage of technology when it comes to this topic, by this paper one future work is designing a web-based system for the education institution in order to predict whether the students deal with anxiety or not.

## **APPENDIX**

### **Foreign Language Classroom Anxiety Scale FLCAS**

1. I never feel quite sure of myself when I am speaking in my foreign language class.
2. I don't worry about making mistakes in language class.
3. I tremble when I know that I'm going to be called on in language class.
4. It frightens me when I don't understand what the teacher is saying in the foreign language.
5. It wouldn't bother me at all to take more foreign language classes.
6. During language class, I find myself thinking about things that have nothing to do with the course.
7. I keep thinking that the other students are better at languages than I am.
8. I am usually at ease during tests in my language class.
9. I start to panic when I have to speak without preparation in language class.
10. I worry about the consequences of failing my foreign language class.
11. I don't understand why some people get so upset over foreign language classes.
12. In language class, I can get so nervous I forget things I know.
13. It embarrasses me to volunteer answers in my language class.
14. I would not be nervous speaking the foreign language with native speakers.
15. I get upset when I don't understand what the teacher is correcting.
16. Even if I am well prepared for language class, I feel anxious about it.
17. I often feel like not going to my language class.
18. I feel confident when I speak in foreign language class.

19. I am afraid that my language teacher is ready to correct every mistake I make.
20. I can feel my heart pounding when I'm going to be called on in language class.
21. The more I study for a language test, the more confused I get.
22. I don't feel pressure to prepare very well for language class.
23. I always feel that the other students speak the foreign language better than I do.
24. I feel very self-conscious about speaking the foreign language in front of other students.
25. Language class moves so quickly I worry about getting left behind.
26. I feel more tense and nervous in my language class than in my other classes.
27. I get nervous and confused when I am speaking in my language class.
28. When I'm on my way to language class, I feel very sure and relaxed.
29. I get nervous when I don't understand every word the language teacher says.
30. I feel overwhelmed by the number of rules you have to learn to speak a foreign language.
31. I am afraid that the other students will laugh at me when I speak the foreign language.
32. I would probably feel comfortable around native speakers of the foreign language.
33. I get nervous when the language teacher asks questions which I haven't prepared in advance.

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