**UNIVERSITY OF BUEA**

**FACULTY OF SCIENCE DEPARTMENT OF COMPUTER SCIENCE**

**DEVELOPMENT OF A DEGREE PROGRAM RECOMMENDATION SYSTEM FOR RECOMMENDING DEGREE PROGRAMS TO STUDENTS DURING REGISTRATION INTO THE UNIVERSITY OF BUEA USING MACHINE LEARNING TECHNIQUES AND THE STREAMLIT FRAMEWORK**

**By**

MBOULAYE **ROMIEN**

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# Dedication

To my son Romien Merci and my late Parents – Mboulaye Martin and Mboulaye Ophilia.

# Acknowledgment

I want to acknowledge the contributions and unwavering support of the following personalities to the completion of this work; Dr. Nkweteyim Denis my Lecturer and Supervisor, Dr. Madeleine Nyamsi my Lecturer, and Dr. Tchapga my Lecturer.

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# Abstract

In today's vast and ever-expanding educational landscape, selecting the right courses can be daunting for students wanting a place in the University of Buea or any other University. With numerous options available across diverse disciplines, identifying courses that align with one's academic interests, career goals, and prior learning experiences is often challenging. To address this challenge, I propose a personalized degree program recommendation system that not only assists the incoming University of Buea students in making informed degree program selections but also recommends programs that former University Students with similar Profiles as theirs have excelled in. The proposed system employs a collaborative filtering technique to analyse real world data from the University of Buea to suggest courses with the best performance to a target student based on profile similarities with other students.

The successful implementation of this system will significantly benefit incoming students by streamlining the degree program selection process, enhancing academic decision-making, and fostering a more personalized and engaging learning experience, and increasing job satisfaction.

This thesis aims to develop a novel degree program recommendation system based on learning outcomes and student performance in High School. The system uses data mining and machine learning techniques to recommend the most appropriate degree program for the student. The main contributions of this thesis are (1) a comprehensive analysis of the existing course recommendation systems and their limitations; (2) a novel course recommendation model that integrates learning outcomes, student performance, and other factors; (3) a prototype implementation and evaluation of the proposed system using real data from a university; (4) a systematic review and research perspective on recommender systems (Deepjyoti Roy and Mala Dutta, 2022); and (4) a discussion of the ethical and social implications of the system. The results show that the proposed system can effectively recommend degree programs that match students’ needs and expectations, and improve their academic performance and satisfaction.

[Keywords: course recommendation system, learning outcomes, student performance, data mining, machine learning](https://www.scribbr.com/dissertation/abstract/), collaborative filtering, degree program.

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# Chapter 1

# General Introduction

# Background and Context of the Study

According to a survey conducted by the Council of Scientific and Industrial Research (CSIR), about 40% of students are confused about their career options, leading to wrong career selection and then working in a field which was not meant for them, thus increasing job dissatisfaction and reducing the productivity of human resource (Nikita Gorad, 2017).

In today's vast and ever-expanding educational landscape with enormous number of courses available, selecting the right courses can be daunting for students wanting a place in the University of Buea or any other University. With numerous options available across diverse disciplines, identifying courses that align with one's academic interests, career goals, and prior learning experiences is often challenging.

Despite the great importance of selecting the right course, most students are facing a lot of problems when it comes to deciding which course to choose. This problem is also partially due to many courses existing in universities today, which confuses students. Due to digitalization, most Universities open their admissions, and the student is required to apply online. Within this process, students have no guidance and yes, have inadequate knowledge about the courses. Besides, some of the existing course selection procedures and instructions given by the universities cannot meet the students’ needs. Yet, course selection is an essential part of the successful completion of their studies (N D Lynn and A W R Emmanuel, 2021). (Nikita Gorad, 2017) explains that the reasons for this confusion could be unawareness of self-talent and self-personality traits, unawareness of the various options available, equal interests in multiple fields, less exposure, market boom, assumed social life, peer pressure, etc. Nikita continues to say that it is quite important to make the right decision regarding one’s career at an appropriate age to prevent the consequences that result from wrong career selection.

Consequently, a course recommendation system is necessary if academic institutions have to provide value to their students. According (Sajid, 2023), a recommendation system is an algorithm that uses data analysis and machine learning techniques to suggest relevant information (movies, videos, courses, news, jokes, etc.) from a very large number information to users that they may find interesting. Therefore, if a recommender system is able to recognize the intent and requirements that a user expresses in the form of queries, it can generate more valid recommendations

This section shows an epigrammatic review of some of the relevant work on various approaches of recommender systems.

*[3] (PDF) PCRS: Personalized Course Recommender System Based on Hybrid Approach*. Available from: <https://www.researchgate.net/publication/322346257_PCRS_Personalized_Course_Recommender_System_Based_on_Hybrid_Approach> [accessed Dec 14 20 (Bhaskar Mondal, 2020) proposes a Machine Learning approach to recommend suitable courses to learners based on their learning history and past performance.

# Research Problem

How can machine learning techniques and the Streamlit framework be used to develop a degree program recommendation system that can suggest suitable degree programs to students during registration into the University of Buea based on their preferences, career goals, and academic performance?

To solve this problem, one may need to answer the following problems:

* Review the existing literature on recommendation systems in the e-learning context, especially the ones that use machine learning techniques and the Streamlit framework.
* Identify the features and criteria that are relevant for recommending degree programs to students, such as their interests, abilities, goals, grades, etc.
* Collect and pre-process the data from the University of Buea and other sources that can be used to train and evaluate the recommendation system.
* Select and implement the appropriate machine learning algorithms and techniques that can provide accurate and personalized recommendations to students.
* Develop a user-friendly interface for the recommendation system using the Streamlit framework, which allows users to interact with the system and provide feedback.
* Evaluate the performance and effectiveness of the recommendation system using various metrics, such as accuracy, confidence, support, etc.
* Discuss the limitations, challenges, and implications of the recommendation system for the University of Buea and the e-learning domain.

# Problem Statement and Motivation

Degree program selection is an essential academic task for students. In the University students have many course choices including majors, minors, and electives.

With numerous options available across diverse disciplines, identifying courses that align with one's academic interests, career goals, and prior learning experiences is often challenging.

According to a survey conducted by the Council of Scientific and Industrial Research (CSIR), about 40% of students are confused about their career options, leading to wrong career selection and then working in a field which was not meant for them, thus increasing job dissatisfaction and reducing the productivity of human resource (Nikita Gorad, 2017).

To address this challenge, I propose developing a personalized degree program recommendation system to assist incoming University of Buea students in making informed degree program selections.

# Objectives of the study

# General Objectives

The main objectives of this study are to:

1. Propose a novel degree recommender system for the University of Buea.
2. Reduce the percentage of students making wrong career choices.

# Specific Objectives

To achieve the main objectives, this study has been broken down into various specific objectives:

1. Collect, prepare, and analyze required data from the University of Buea CGCE Board.
2. Explore various types of recommender systems.
3. Choose an appropriate algorithm; KNN.
4. Train a recommender model based on a collaborative filtering technique.
5. Develop an appealing User Interface using the Streamlit Framework.
6. Deploy the system on Streamlit Community Cloud through GitHub.

# Research Questions

The following research questions have been used to guide this study:

1. What are the most important features and criteria for recommending degree programs to students at the University of Buea?
2. What are the main factors that influence learners’ preferences, needs, and goals for course selection?
3. Can the subjects studied in Ordinary and Advanced Levels affect a learner’s performance and duration of studies at the University of Buea?
4. Are there existing data that can be used to answer the questions above?

# Organization of the Report

# Chapter 2

# Literature Review

This chapter presents the state-of-the art of recommendation systems – its various approaches and techniques; Collaborative Filtering, Content-Based Filtering, and the Hybrid Techniques. It also highlights Machine Learning types and concepts as well as the innovative aspects of the approach examined in this thesis.

# References

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