# Automated Tutor, Online Programming Practical lessons for new Programmers

(Alternative Title) An Intelligent Learning Platform for computer science courses

## Background

Understanding both the theory and practical concepts for Programming, Data structures and Algorithms course units are essential for computer science, software engineering and Electrical Engineering students. However, Currently at Makerere University, there are students known to have exceptional performance in such course units but without knowing how to write optimal code. This arises from giving students too many course works which forces them to only focus on passing instead of grasping the concept.

At times if practical course work with little time to attend to is given to students, they tend to go for plagiarism. Makerere University having Large numbers of students doing these course units, it becomes very hard for a lecturer to detect the act of plagiarism.

## Problem statement

Monitoring each student’s performance in Makerere university’s classrooms is a tiresome task for lecturers. When students are given a programming course work, they expect fair continuous feedbacks from their lecturers in the least time possible. However, at times students are given complex tasks to do as course works. For a lecturer to give reasonable feedback to every student’s course works, he would be required to run the student’s code into IDE’s to correctly analyses their running times and generate a feedback. Besides analyzing code efficiency of students, the lecturer is also subjected to a task of checking for plagiarism among the submitted students’ code. The most prominent solution done to improve on the lecturer’s productivity is grouping students. However, this also has an associated problem. The problem to this solution is that only few students contribute to course works while the rest are just waiting to add their names. Thus, this is also not a permanent solution since only group effort is monitored and not individual.

This project’s intention Is to solve the above problem by creating an online system that will keep track on student’s individual progress in the programming field and monitoring the student’s general performance in the least time possible. With this implemented, Student’s submitted course work will be attended to quickly, plagiarism acts will be detected teachers’ productivity will be improved and above all, student’s passion in programming will be boosted.

## Main objective

The main goal of this project is to create a learning platform that enables lecturers to teach more efficiently, and students to learn more effectively. With the platform in place, lecturers will be able to easily assess their students’ performance and also give more informative notes. The platform will also allow students to learn concepts faster with high retention rates because of the active learning that will be emphasized by the system.

## Specific objectives

The main objective above can realized by achieving the following objectives:

* Create an automatic grader for programming exercises and other kinds of assessments such as objective type questions.
* The overall system should enable lecturers/instructors to easily give assignments that can be assessed by the auto-grader.
* The system should be able to collect data about a student’s performance/progression and provide guidance to students based on this data. This data and the inferences made are also useful for the instructor as they can give him/her insights into how to better teach the course.
* The system should also enable lecturers to give in-class assignments for real-time assessment.

## Scope of project

## Significance of project

The system being proposed is of significance to students, instructors, institutes and universities around Uganda and possibly beyond. It will enable more effective learning and teaching of computer science, engineering and related disciplines. It will also save instructors’ time because of the automated grading of assignments. The practice and feedback oriented paradigm that the project seeks to implement and promote will result in better quality graduates who have mastered concepts taught in class.

## Methodology

The platform is going to have three components: a website, a mobile app and a desktop app.

In order to make use of the website, a user shall have to log in with their account. There will be 2 major types of accounts namely a student account and an instructor account. Users with student accounts will be able to access materials made available by the lecturers and also be able to submit solutions to assignments. The site will provide feedback on the correctness of a particular submission.

The automated grading will be done by comparing the expected solutions to the student’s submission (or program output). In the case of programming assignments, the student’s submitted code shall be run on the server and its output compared to the expected output. The instructor prepares a programming assignment by submitting it to the site with a file containing the problem statement, another containing the input along with the expected output. The only thing visible to the student will be the problem statement and the format for submission.

The mobile application will be used by students to do the in-class exercises. These can be objective type questions or single-response type questions. These exercises can be conducted online or by the lecturer setting up a server on his/her pc (using the desktop app) that the app will connect to.

A lot of data can be collected by monitoring the usage of the system and the data gathered can be used to make recommendations to students. Data can be gathered by monitoring students’ usage of the system. The site can then use item-response theory or machine learning models to determine the student’s ability or how well a course is being taught.