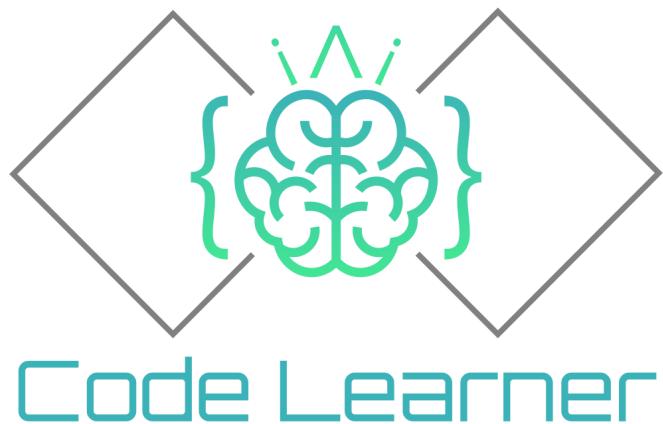


# FINAL SPECIFICATION DOCUMENT



CEN 4010: Principles of Software Engineering  
Computer Science and Engineering  
Florida Atlantic University

**Development Team:**

Beatriz Cangas-Perez

Daniel Franquiz

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Merkure Latortue

Jonathan Rene

Efrem Yohannes-Mason

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### **03. Vision Statement**

Our vision is to educate, equip, and empower every student, especially those from underserved communities, by supporting them with the affordable and convenient tools they need to learn programming confidently.

### **04. Group Members with Titles**

#### **Beatriz Cangas-Perez:** Director of Engineering

*Responsibilities:* Head of Engineering Team. Provides technical expertise to lead and manages the team while contributing to the development process. Architect, oversees long and short-term technology solutions for client and server software.

#### **Efrem Yohannes-Mason:** Senior Software Architect

*Responsibilities:* Collaboration with all team members to determine functional and non-functional system requirements. Support of all team members and roles through the development cycle. Development of high level product specifications with a focus on system integration and feasibility. Ensure SW meets quality, security and adaptability requirements.

#### **Daniel Franquiz:** Senior Software Engineer

*Responsibilities:* Develops information systems by designing, developing, and installing software solutions. Provide ongoing maintenance, support and enhancements in existing systems and platforms. Test software development methodology in an agile environment following the software development lifecycle.

#### **Jonathan Rene:** Lead QA Engineer

*Responsibilities:* Researched the need for the development of the application. Orchestrated a formal approach to usability testing by analyzing tester/user feedback quantitatively.

**Merkure Latortue:** Software Developer

*Responsibilities:* Retrieve, store, and manipulate data to analyze a system's capability and requirements. They maintain the design and maintenance of software system.

**Roods Jacques:** QA Engineer

*Responsibilities:* Inspects and tests materials, equipment, processes, and products to ensure quality specifications.

## 05. Stakeholder Definitions

Stakeholder	Definition
System Owners	Who own the intellectual property rights of the application and decides what it should do.
System Designers, System Managers	Who will design and manage the application Responsible for implementing functionality, fixing errors, updates, maintenance, and all other aspects of design/management.
End Users / Students	Who will work most closely with the application. Who uses the software after it has been fully developed, marketed, and installed.
Project Managers	Who leads a team of software engineers to develop new ideas for software products and services. They are expected to help define best practices and develop strategies to drive high quality execution of the entire development process.
Teachers	Who monitors, assesses and evaluates the progress of the student / end user.
QA Engineers	Who are responsible to execute tests on software usability and to analyze test results on database impacts, errors or bugs, and usability.
Database Analyst	Who maintains data storage and assesses database design. Who also identifies and retrieves students' records.

Parents	Who follow the progress of their own children and the system as a whole.
Communities	Who learn the key information to know about supporting the system's effort to improve students' outcome.
Senior Software Architect	Who tests the final product to ensure it is completely functional and meets requirements. Who guides and assists the development team throughout the process.

## 06. Statement on Developmental Model

For our group project, we decided to apply a hybrid of the “agile” incremental and plan-driven “waterfall” models. We began by incorporating elements of the plan-driven model to partition the project into separate distinct phases, this was beneficial for bringing clarity to the overall vision of our application. Since we planned all of the process activities in advance, we were able to quantify our progress against the original plan and timeline we created. We felt this was best suited for the varying skill levels and capabilities of our team members. Although the plan-driven model worked great for some aspects of our application, our project utilized an agile developmental model for the majority of the developmental process activities. The incremental developmental model worked best for our project for several reasons. The size of our project was small, which agile methods are better suited for in comparison to a more rigid plan-driven approach. We also did not know all the features we were going to implement in our application up front, so the agile method allowed us the flexibility to make changes throughout the development process without significant re-work. Our team size is small, this also played a role in our decision to apply agile techniques to our application development. With a smaller team size it made it simple to keep clear lines of communication open throughout the development process. Since agile is best suited for more experienced developers, and our team consisted of varying skill levels, we decided to apply some paired programming practices to our project. This allowed us to provide our team members with support and check each other's work to maintain good code quality.

## **07. Statement on the Distributed System**

A distributed system is a collection of autonomous computing elements between one or more computers interconnected, that appears to its users as a single coherent system, and our application perfectly reflects this concept. The two-tier client server architecture that our application is based on is Fat Clients, where application processing is done on the client side, meaning that it is locally executed.

Furthermore, the database and data management functions are performed on the server side, which is suitable for newer systems, allowing client side capabilities to be known in advance.

In terms of resource sharing, our main focus would be to ideally expand our project and make it available to many other users and potential clients by providing a larger number and more variety of questions, modules and resources. Additionally, we would ensure that our hardware is powerful enough capable of doing all the data management for the user allowing us to grow and further expand. Our main goal is to be able to move from hard drives and servers to cloud computing in order to be able to enhance performance. This way, the application will not run on the user's computer like older downloaded softwares regularly do, as the computers may not be fast or powerful enough. One way we will share hardware and software resources is by uploading our project into Github. This will make the project open source and free so that they may modify and customize the project however they like. In this way we are sharing the specific files of our projects and we will specify the compilers and software others can use.

The system components were developed independently to accommodate change and integration of new components in a more open way. Each of the components of the system, which include but is not limited to the User Interface, Database, and Email, were made using widely accepted standards by different programmers. By distributing the work, it allowed for all components to be easily integrated into one system and work well together. In terms of concurrency, we would aim to have multiple processors and servers running multiple jobs at once, as scalability would not allow one processor/server to perform all the work for a long time without failing or underperforming.

When it comes to scalability, the system was initially built to accommodate growth and the inclusion of several curriculums. Our future plan involves scaling-up and introducing more functionality as well as programming languages and courses in future releases. Simplicity in structure was a focus to make scaling manageable.

Additionally, in order to carry out and prevent fault tolerance, we intend to scale and prevent failures. We plan to have multiple servers capable of carrying out the same task to prevent crashes once the system is in production. This way, if one of the servers failed, the others would be able to keep our software up and running. This idea would be also carried out across all systems implemented to prevent failures overall. Furthermore, having a server for handling multiple databases and perhaps a diversity of mechanisms that monitor different components to analyze and prevent system failure is part of our primary goal.

## **08. Statement of Security**

The aim of this sector is to keep the user's login information (username & password) user progress data (test scores, and completions) as well as the database login protected. Protecting these assets are crucial because it is possible for the user's data to be compromised by finding a way into their account which can result in data interception, interruption, modification, or fabrication. These events happening severely compromises the security of the system. The measures taken to ensure the security of the user's login is requiring a minimum password length of eight characters, encrypt the users password, and have a way of verifying their identity by sending a token to the users email which allows the user to reset their password. We are protecting the database by allowing the employees to access the database within certain rooms within the facility.

*Security policy:*

- I. Protection
  - a. The first assets to be protected are the user's login info and progress data which is protected by requiring a minimum password of eight characters. This increases the password's complexity, thus making it harder to be cracked.
    - A high level of security is required for these assets

- b. The second data to be protected is access to the database only within a certain room within the facility
  - A high level of security is required for this data due to it containing the information of all of the users.

## II. Duties and Responsibilities

### a. User

- It is encouraged for the user to choose a strong password containing a capital letter, lowercase letter, a symbol, and a number.
- The user is expected to log out of system when leaving their workspace for extended periods of time.
- The user is expected to not write down/store their passwords in a place that is easily accessible.

### b. Employee

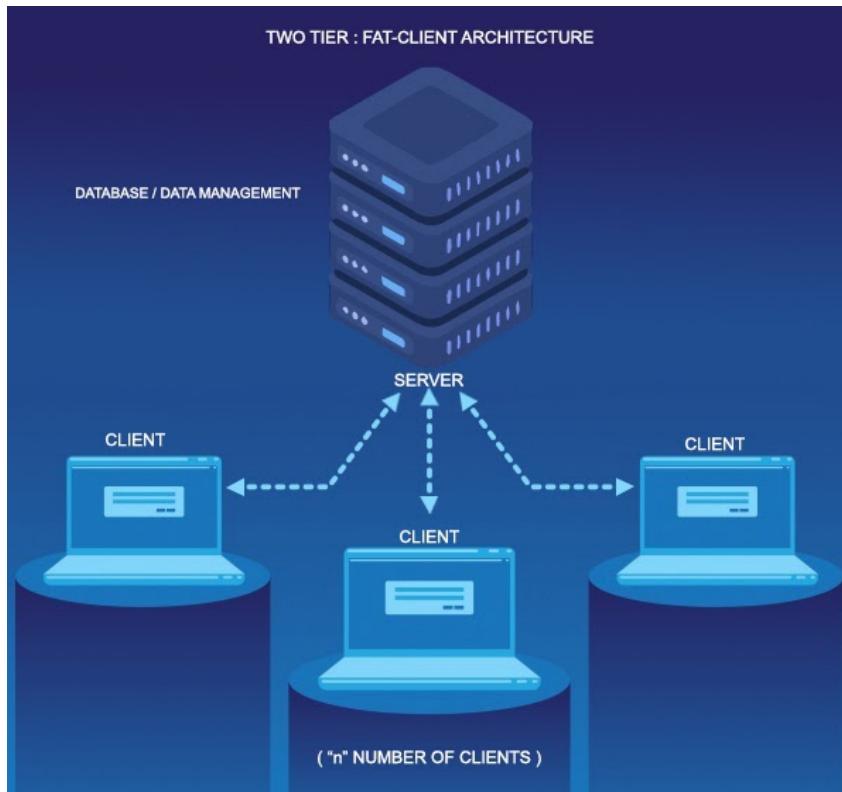
The workers within this company are expected to abide under the responsibilities of The user mentioned above as well as the duties that will be stated below:

- Employees granted access to the database must only access the database within the room chosen to access the database within the working facility.
- Employees must not share passwords or customer data with any persons outside of the workplace and for matters not related to work.

## **09. System Architecture Model**

The model chosen was a two-tier fat-client server architecture. This particular model was chosen because we want all of the application processing to be carried out on the client side. The second reason for our choice of architecture is that our system is implemented as a single logical server which will contain an indefinite number of clients using the software.

## ARCHITECTURAL MODEL:



## 10. User Requirements

- I. The Code Learner application shall be accessible to the user through a PC and internet connection.
  - A. The Code Learner application shall be accessible and run in an executable jar file.
  - B. The Code Learner application shall establish a database connection through a Java Database Connectivity (JDBC) driver manager.
  - C. The Code Learner application establish the database connection from the resource file within the application on first run in order to store the user's data on an external database.
- II. The Code Learner application shall require a user to login with the proper credentials prior to being given access to the applications content. If the user has not yet created an account the Code Learner application shall provide the capability to do so, consisting of a name, username, password and email address of the users choosing.

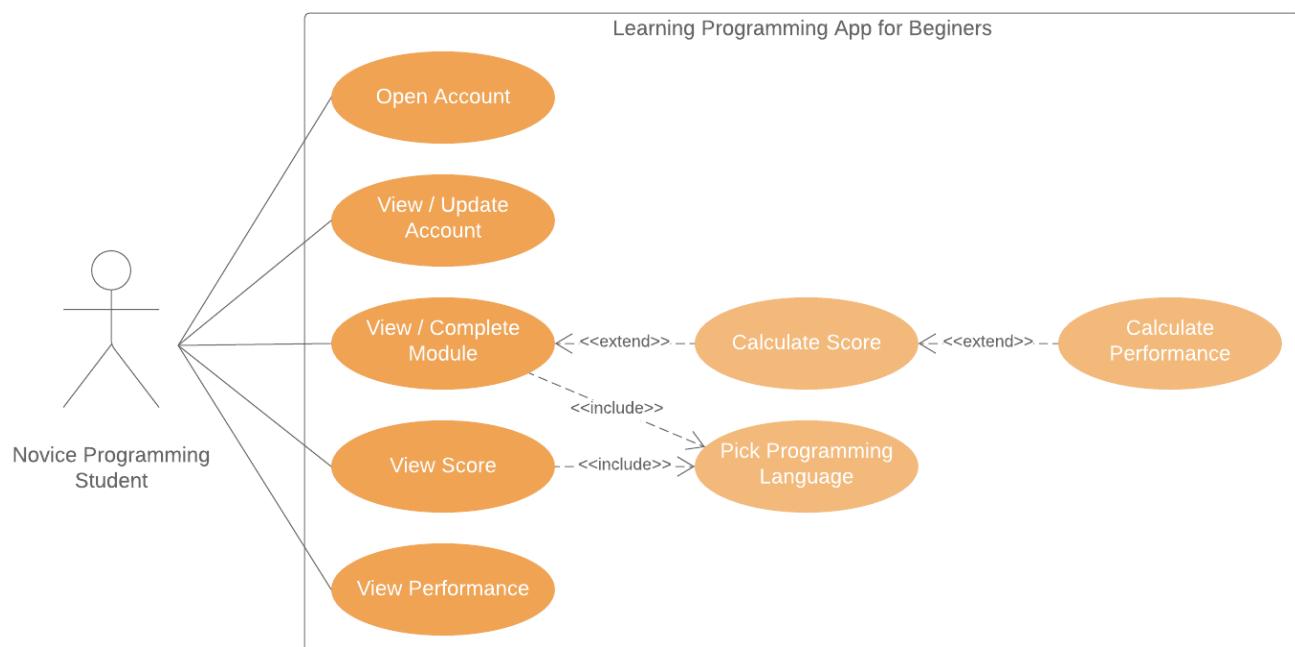
- A. The Code Learner application shall generate a unique key user ID and store it in the database when the user creates a new account.
  - B. The Code Learner application shall store the rest of the user credentials i.e. name, username and email address in the database using the unique key user ID.
  - C. The Code Learner application shall require the user to enter their password twice in order to assure there were not mistakes when entered. If the two passwords do not match the user will be prompted to enter their credentials again.
  - D. The Code Learner application shall require the user to enter a password of an eight character length at minimum.
  - E. The Code Learner application encrypts the user's password in the database.
  - F. If the user enters credentials that are not recognized by the database, the Code Learner application shall notify the user that the credentials are not recognized.
- III. The Code Learner application shall allow the user to retrieve/reset a forgotten password, if a user loses their appropriate credentials.
- A. The Code Learner applications shall replace the stored password inside the database after a reset is completed.
  - B. Upon the user selecting the forgot password tab, a security token shall be generated, and an email shall be sent to the email the user provided while signing up to the application.
  - C. The user shall be able to use this security token to create a new password.
  - D. The user shall enter the new password twice to assure accuracy, as well as copy + paste the token in the prompted screen to regain access to the application.
  - E. If the two passwords do not match, the user will be required to enter their credentials again.
- IV. The Code Learner application shall land on an interactive homepage once successfully logged into the application. The user shall be able to choose from a variety of options via their home page.
- A. The Code Learner application shall store each course in a database.

- B. The Code Learner application shall display several options to the user on their home page i.e. view their account details, scores & performance or a module they would like to complete.
  - C. Upon selection of the “account details” tab the user shall be able to view their account information i.e. their name, username, email address and the date their account was opened via the link to the database which is a unique key user ID.
  - D. The account details page shall provide the user with the opportunity to update their password and/or email address if needed.
  - E. Upon selection of the “scores & performance” tab the user shall be able to view their scores for each module they have completed, and track their overall performance based on the cumulative scores of all completed modules linked to their unique key user ID.
  - F. Upon selection of the “modules” tab the user shall be able to select a module within the course they have selected. Each module is linked to the database using a unique key module ID.
- V. Once a course has been selected the Code Learner application shall provide several modules that pertain to the course of selection. If a course is unavailable, the user should be notified that the course is “under development” and will be available soon.
- A. The Code Learner applications shall store each language in a database accessed by the unique key language ID.
  - B. The Code Learner applications shall store each module in a database accessed by the unique key module ID.
  - C. Each module that is available shall include a test pertaining to the module selected.
  - D. The Code Learner application shall begin a test once the module is selected from the screen.
  - E. Each test inside the module shall access the database through a unique key module ID.
- VI. The Code Learner application shall consist of a short test for every module. Each test should provide a range of 4-10 questions for the user to demonstrate their knowledge of the subject.

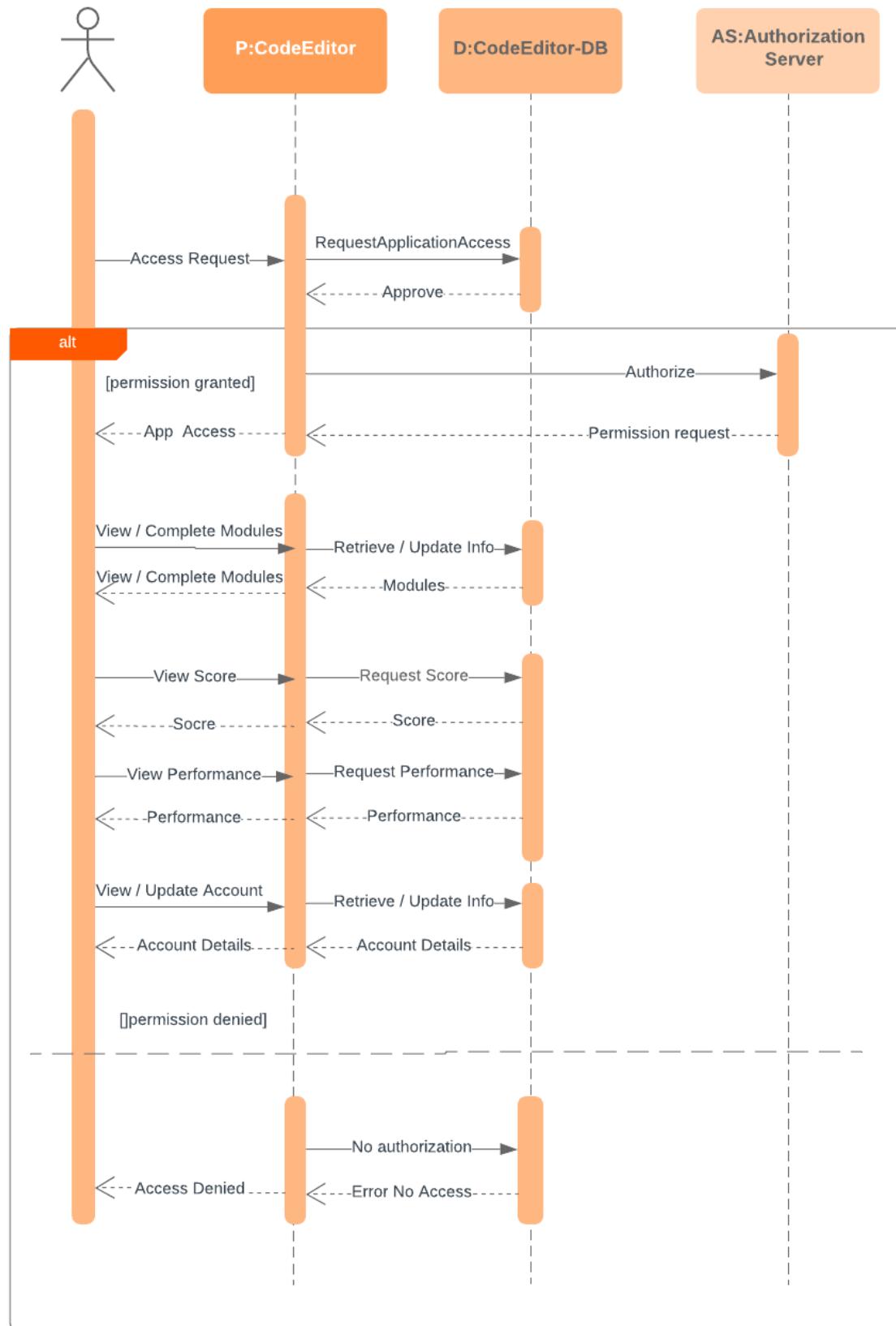
- A. The Code Learner application shall store each test question and the corresponding correct answer in a database.
  - B. Each question shall be assigned a unique key question ID to link it to the Code Learner application inside the appropriate module.
  - C. The Code Learner application shall generate a report after each test allowing the user to view how many questions were answered correct, answered incorrect and their current score.
- VII. The Code Learner application shall be equipped with a range of questions for each module. Questions shall be of the form of True/False or multiple choice.
- A. Each test question shall be linked to the Code Learner application through a unique key question ID.
  - B. True/False and multiple-choice questions shall be answered by the user by selecting a button on the screen, then selecting the next tab to proceed to the next question.
  - C. The Code Learner application shall disable the next button for the last question of each module.
  - D. The Code Learner application shall disable the done button throughout the module test until the last question is reached, at this point the done button is enabled.
- VIII. The Code Learner application shall provide an immediate response to the user after each question. The response shall notify the user if their answer was correct or incorrect for each answered question prior to moving to the next question.
- A. When a user selects an answer within a test, the answer is checked against the correct answer stored in the database using the unique key question ID.
  - B. Whether the answer is correct/incorrect an alert to the screen shall be prompted.
  - C. The message in the alert shall appropriately correspond to the answer whether it be correct or incorrect.
  - D. The alert should display for a short period, then disappear on its own before going to the next question.

- IX. The Code Learner application shall keep track of the users score for every module they have completed. The Code Learner application shall also maintain a cumulative score, denoted as performance, for all the users completed modules.
- The Code Learner applications shall store the users score for each module in a database using the unique keys user ID and module ID.
  - The Code Learner applications shall store the users cumulative score/progress in a database.
  - The Code Learner applications shall always keep the users scores updated and historically accurate in a database.
  - The Code Learner application shall update the users score automatically after each question and module completion.

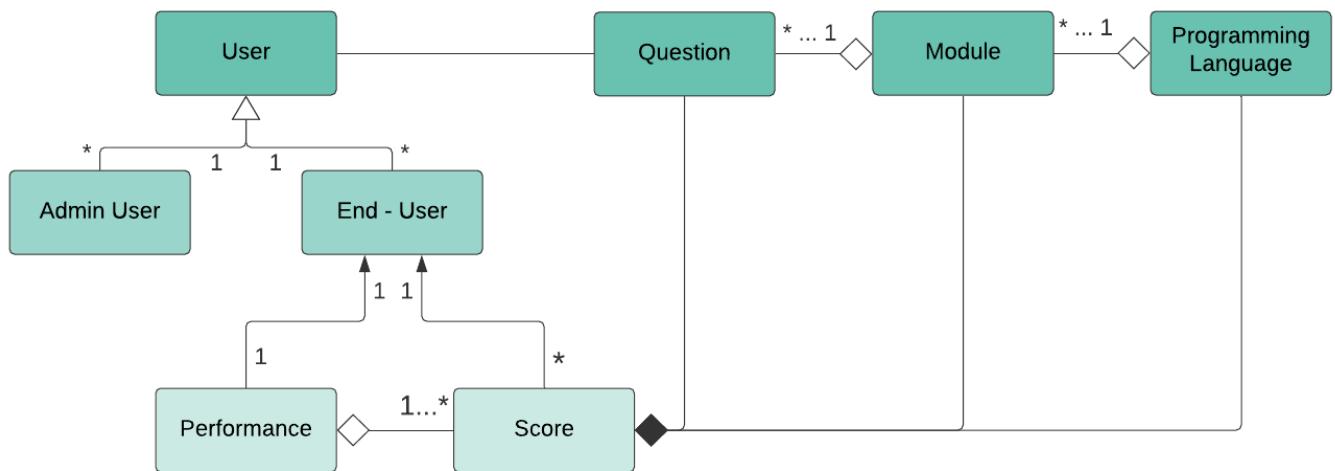
## 11. Use-Case Diagrams



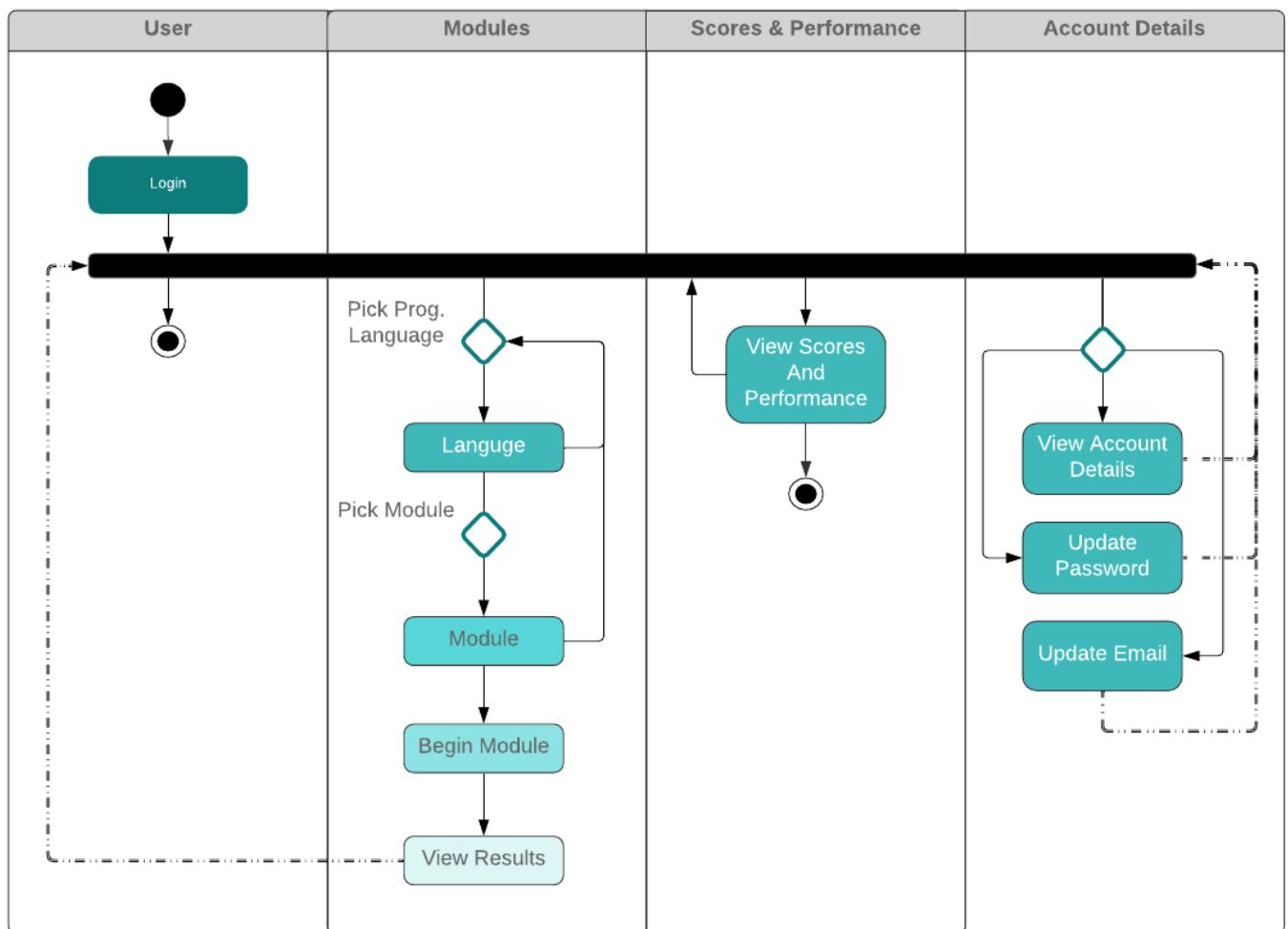
## 12. Sequence Diagrams



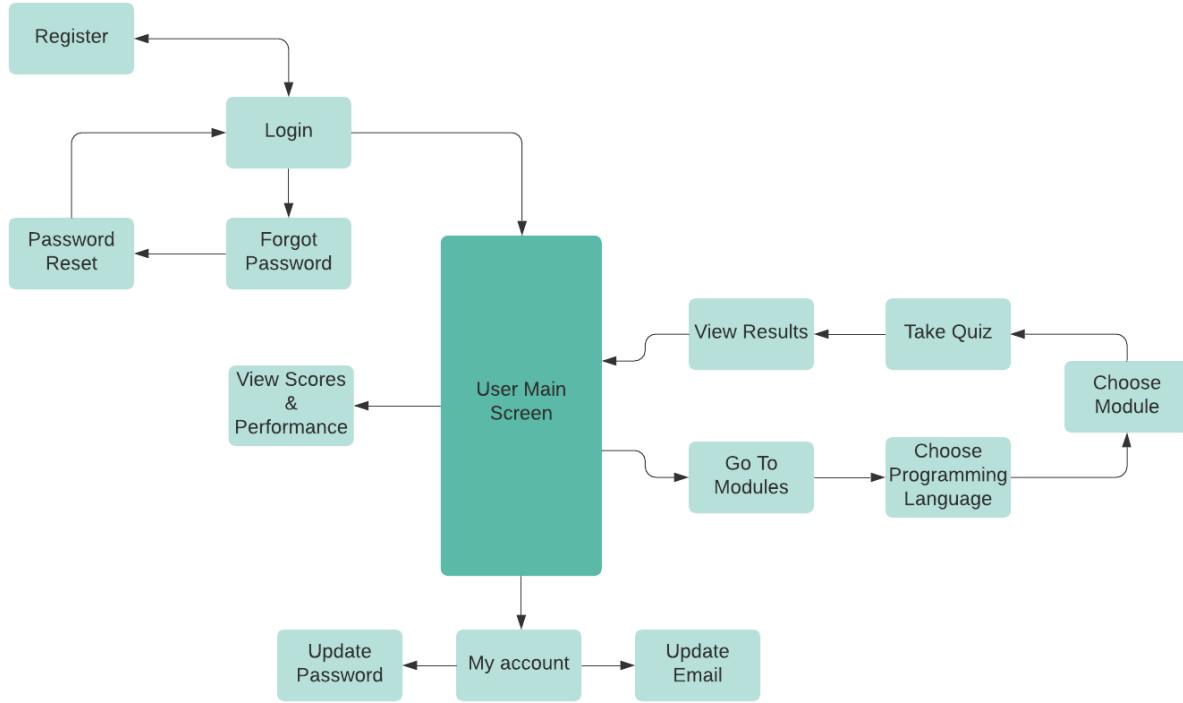
## 13. Class Diagram



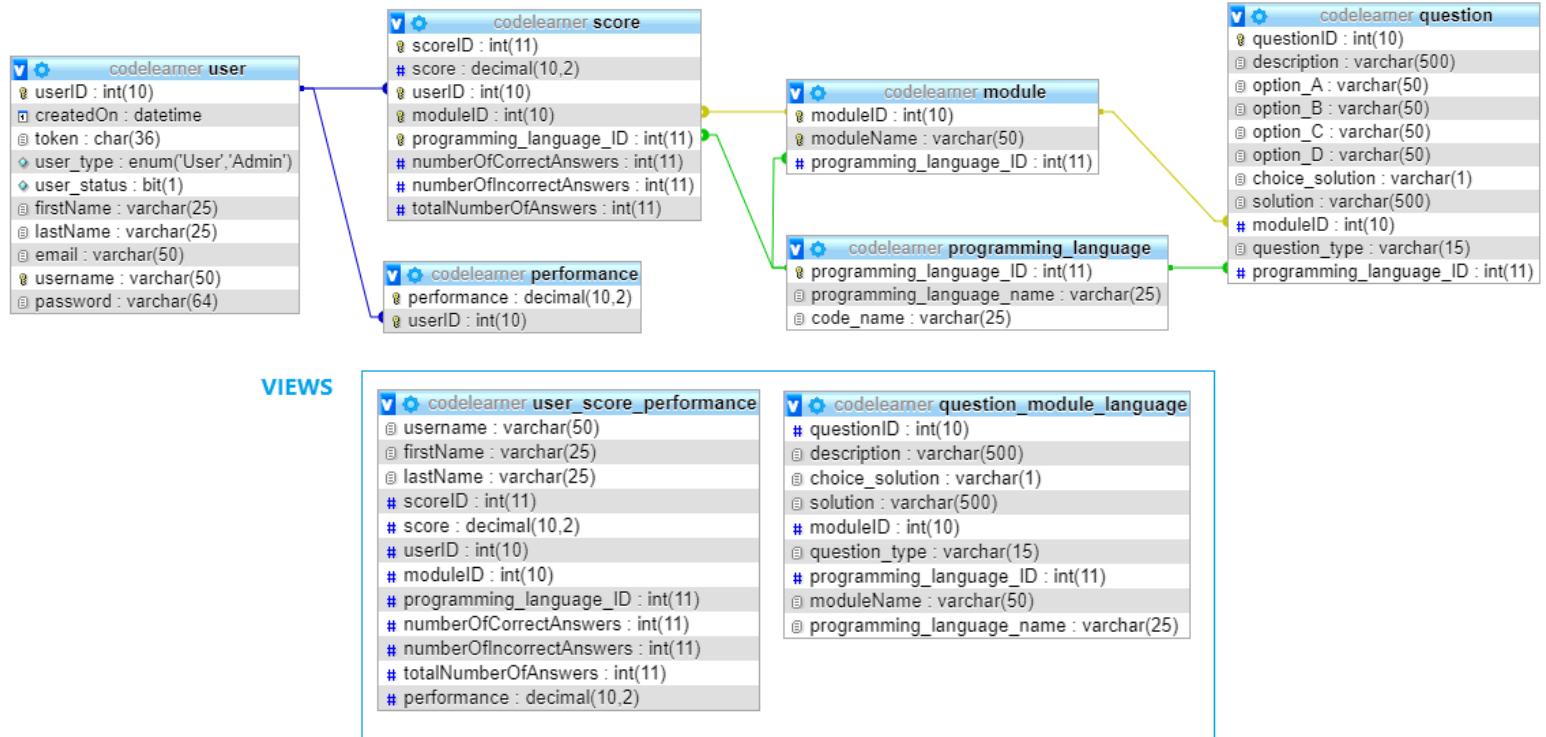
## 14. Activity Diagram



## 15. User Interface Diagrams



## 16. Database Design Diagram



## 17. Glossary

- **.JAR File Format** - A package file format typically used to aggregate many Java class files and associated metadata and resources (text, images, etc.) into one file for distribution.
- **Agile** - Relating to or denoting a method of project management, used especially for software development, that is characterized by the division of tasks into short phases of work and frequent reassessment and adaptation of plans.
- **Application Development** - The process of creating software applications. It includes user interface design, programming, alpha and beta testing and deployment.
- **Application Programming Interface (API)** - A set of functions and procedures allowing the creation of applications that access the features or data of an operating system, application, or other service.
- **Architecture** - The conceptual structure and logical organization of a computer or computer-based system.
- **C++** - A high-level computer programming language originally developed for implementing the UNIX operating system.
- **Capability** - A facility on a computer for performing a specified task.
- **Central Processing Unit** - the part of a computer in which operations are controlled and executed.
- **Character** - A symbol representing a letter or number.
- **Client** - (In a network) a desktop computer or workstation that is capable of obtaining information and applications from a server. A program that is capable of obtaining a service provided by another program.
- **Client-side** - Refers to operations that are performed by the client in a client–server relationship in a computer network.
- **Cloud Computing** - The practice of using a network of remote servers hosted on the Internet to store, manage, and process data, rather than a local server or a personal computer.
- **Coding** - write code for (a computer program).

- **Communities** - Individuals who learn the key information to know about supporting the system's effort to improve students' outcome.
- **Compiler** - A program that converts instructions into a machine-code or lower-level form so that they can be read and executed by a computer.
- **Computer** - An electronic device for storing and processing data, typically in binary form, according to instructions given to it in a variable program.
- **Computer Network** - Two or more computers that are connected with one another for the purpose of communicating data electronically.
- **Computer Science** - The study of the principles and use of computers.
- **Concurrency** - The ability of different parts or units of a program, algorithm, or problem to be executed out-of-order or in partial order, without affecting the final outcome.
- **Crash** - (Of a machine, system, or software) fail suddenly.
- **Credentials** - A user's authentication information—typically a password, a token, or a certificate.
- **Database Analyst** - Individuals who maintain data storage and assess the database design. They also identify and retrieve student records.
- **Database** - A structured set of data held in a computer, especially one that is accessible in various ways.
- **Data Management** - An administrative process that includes acquiring, validating, storing, protecting, and processing required data to ensure the accessibility, reliability, and timeliness of the data for its users.
- **Data** - The quantities, characters, or symbols on which operations are performed by a computer, being stored and transmitted in the form of electrical signals and recorded on magnetic, optical, or mechanical recording media.
- **Distributed System** - A number of independent computers linked by a network.
- **Download** - Copy (data) from one computer system to another, typically over the Internet.
- **Driver** - A program that controls the operation of a device such as a printer or scanner.

- **Driver Manager** - A library that manages communication between applications and drivers.
- **Email** - Messages distributed by electronic means from one computer user to one or more recipients via a network.
- **Encryption** - The process of converting information or data into a code, especially to prevent unauthorized access.
- **End Users/Students** - Individuals who will work most closely with the application and use the software after it has been fully developed, marketed, and installed.
- **Engineer** - A person qualified in a branch of engineering, especially as a professional. A skillful contriver or originator of something.
- **Execution** - The performance of an instruction or program.
- **Fat Client** - A computer (clients), in client–server architecture or networks, that typically provides rich functionality independent of the central server.
- **Fault Tolerance** - The property that enables a system to continue operating properly in the event of the failure of (or one or more faults within) some of its components.
- **Files** - A collection of data, programs, etc., stored in a computer's memory or on a storage device under a single identifying name.
- **Functionality** - The range of operations that can be run on a computer or other electronic system.
- **Github** - GitHub, Inc. is a United States-based global company that provides hosting for software development version control using Git.
- **Hardware** - The machines, wiring, and other physical components of a computer or other electronic system.
- **Homepage** - The introductory page of a website, typically serving as a table of contents for the site.
- **Incremental Model** - A method of software development where the product is designed, implemented and tested incrementally (a little more is added each time) until the product is finished.
- **Incremental** - Relating to or denoting an increase or addition, especially one of a series on a fixed scale.

- **Interactive** - Allowing a two-way flow of information between a computer and a computer-user; responding to a user's input.
- **Internet** - A global computer network providing a variety of information and communication facilities, consisting of interconnected networks using standardized communication protocols.
- **Internet Connection/Access** - The ability of individuals and organizations to connect to the Internet using computer terminals, computers, and other devices; and to access services such as email and the World Wide Web.
- **Java Database Connectivity (JDBC)** - An application programming interface (API) for the programming language Java, which defines how a client may access a database. It is a Java-based data access technology used for Java database connectivity.
- **Job** - An operation or group of operations treated as a single and distinct unit.
- **Key** - A field in a record which is used to identify that record uniquely.
- **Library** - A collection of programs and software packages made generally available, often loaded and stored on disk for immediate use.
- **Local** - Denoting a variable or other entity that is only available for use in one part of a program. Denoting a device that can be accessed without the use of a network.
- **Login** - An act of logging in to a computer, database, or system.
- **Memory** - The part of a computer in which data or program instructions can be stored for retrieval.
- **Minority** - A relatively small group of people, especially one commonly discriminated against in a community, society, or nation, differing from others in race, religion, language, or political persuasion.
- **Modules** - Any of a number of distinct but interrelated units from which a program may be built up or into which a complex activity may be analyzed.
- **Officer** - A holder of a post in a society, company, or other organization, especially one who is involved at a senior level in its management.
- **Open Source** - Denoting software for which the original source code is made freely available and may be redistributed and modified.

- **Parents** - Individuals who follow the progress of their own children and the system as a whole.
- **Password** - A string of characters that allows access to a computer system or service.
- **Performance** - The capabilities of a machine, vehicle, or product, and its usefulness, especially when observed under particular conditions.
- **Personal Computer (PC)** - A computer designed for use by one person at a time.
- **Plan-driven Model** - A style of development that attempts to plan for and anticipate up front all of the features a user might want in the end product and to determine how best to build those features.
- **Processor** - A small chip that resides in computers and other electronic devices. Its basic job is to receive input and provide the appropriate output.
- **Programming Language** - A system of precisely defined symbols and rules devised for writing computer programs.
- **Programming** - The action or process of writing computer programs.
- **Project Managers** - Individuals who lead a team of software engineers to develop new ideas for software products and services. They are expected to help define best practices and develop strategies to drive high quality execution of the entire development process.
- **QA Engineers** - Individuals who are responsible to execute tests on software usability and to analyze test results on database impacts, errors or bugs, and usability.
- **Run** - Be in or cause to be in operation; function or cause to function.
- **Scalability** - The ability of a computing process to be used or produced in a range of capabilities.
- **Security Token** - A peripheral device used to gain access to an electronically restricted resource. The token is used in addition to or in place of a password. It acts like an electronic key to access something.
- **Senior Software Architect** - Individuals who test the final product to ensure it is completely functional and meets requirements. They guide and assist the development team throughout the process.

- **Server** - A computer or computer program which manages access to a centralized resource or service in a network.
- **Shared Resource** - A computer resource made available from one host to other hosts on a computer network.
- **Software Application** - Software designed to carry out a specific task other than one relating to the operation of the computer itself; application programs regarded collectively.
- **Software Engineer/Developer** - A software engineer is a person who applies the principles of software engineering to the design, development, maintenance, testing, and evaluation of computer software.
- **Software** - The programs and other operating information used by a computer.
- **Software Quality Assurance (QA)** - A means of monitoring the software engineering processes and methods used to ensure proper quality.
- **STEM** - science, technology, engineering, and mathematics (as an educational category).
- **Syntax** - A set of rules for or an analysis of the syntax of a language.
- **System** - A group of related hardware units or programs or both, especially when dedicated to a single application.
- **System Designers/System Managers** - Individuals who will design and manage the application Responsible for implementing functionality, fixing errors, updates, maintenance, and all other aspects of design/management.
- **System Owners** - Individuals who own the intellectual property rights of the application and decide what it should do.
- **Teachers** - Individuals who monitor, assess and evaluate the progress of the student / end user.
- **Technology** - The branch of knowledge dealing with engineering or applied sciences.
- **Two-Tier Architecture** - A software architecture in which a presentation layer or interface runs on a client, and a data layer or data structure gets stored on a server.

- **User Interface** - The means by which the user and a computer system interact, in particular the use of input devices and software.
- **Username** - An identification used by a person with access to a computer, network, or online service.
- **Waterfall** - Relating to or denoting a method of project management that is characterized by sequential stages and a fixed plan of work.
- **Website** - A location connected to the Internet that maintains one or more pages on the World Wide Web.

## 18. Poster

**FAU** FLORIDA ATLANTIC UNIVERSITY  
COLLEGE OF ENGINEERING AND COMPUTER SCIENCE

**Code Learner**

Department of Computer & Electrical Engineering and Computer Science

Beatriz Cangas-Perez Chief Technology Officer	Daniel Franquiz Senior Software Engineer	Roods Jacques: QA Engineer	Merkure Latortue: Software Developer	Jomathan Rene Lead QA Engineer	Efrem Yohannes-Mason Senior Software Architect
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Principles of Software Engineering (CEN4010)  
Instructor: Dr. Lofton A. Bullard  
Theme: Using Software Engineering Methods to Building Quality Software  
Spring 2020 Term Projects

**Motivation/Purpose**

We envision a future where anyone can succeed by means of a convenient and affordable educational experience. Our goal is to empower those areas of the population that have been underserved and underrepresented with free and open access to our computer science curriculum.

**Development Approach**

For our group project, we decided to apply an "agile" incremental development model because the size of our project was small and it allowed us the flexibility to make changes throughout the development process without significant re-work.

**Functionality**

This application functions as a learning tool for educating users on correct programming syntax, and best practices. The user will have the ability to track progress within modules as well as take exams to put the knowledge obtained to the test. All information will be tracked and saved within their account for easy sign in and continuation.

**Architecture**

The model chosen was a fat-client two tier architecture due to the fact that we want the application processing to happen on the client's side. The other reason is due to us wanting to implement only one server while we have an indefinite amount of clients using the database.

**Security**

Security is maintained by:

- Encrypting the user's password
- Password has to be a minimum length of 8 characters
- Token based reset password process
- Encouraging user to choose a strong password containing a capital letter, lowercase letter, a symbol, number



## 19. Brochure with Team Pictures

*Due to the COVID Pandemic, it was difficult for us to accomplish this task properly. That is the reason why we decided to put something together that could still present who we are as a team.*



Beatriz Cangas - Perez -  
Chief Technology Officer



Merkure Latortue -  
Software Developer



Daniel Franquiz -  
Senior Software Engineer



Jonathan Rene -  
Lead QA Engineer



Roods Jacques -  
QA Engineer

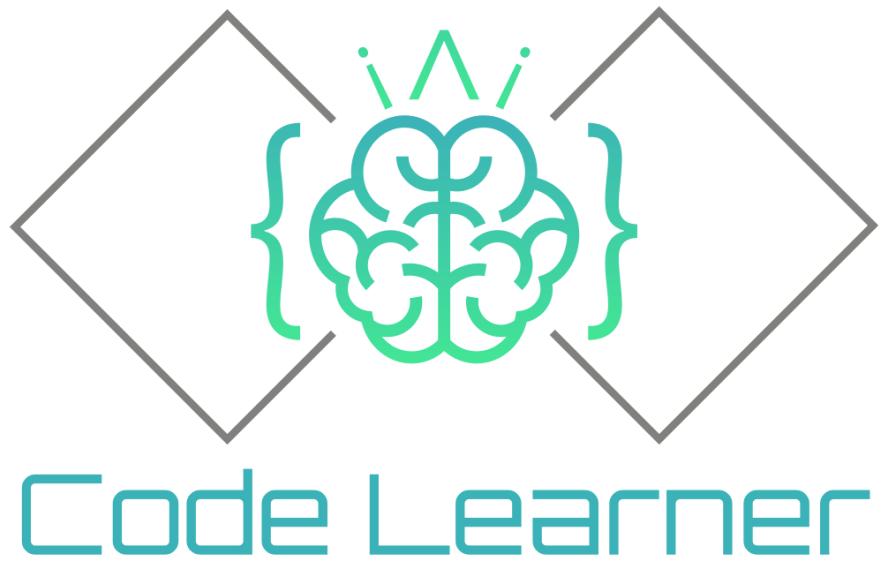


Efrem Yohannes-Mason -  
Senior Software Architect

## 20. User Guide

The following is a copy of our User Guide. The table of contents was not included in this document as it is not applicable.

The User Guide begins on the following page.



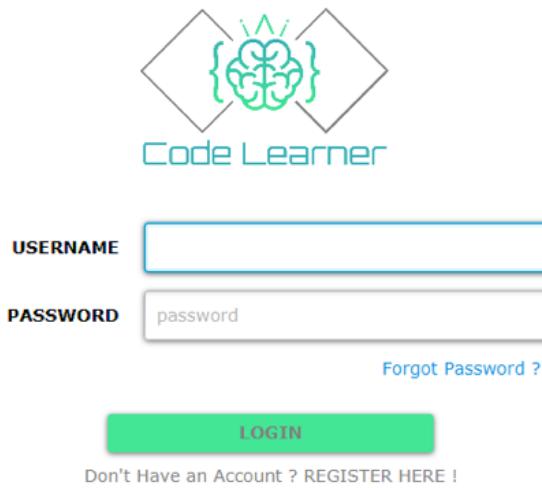
# USER GUIDE

Principles of Software Engineering

Florida Atlantic University

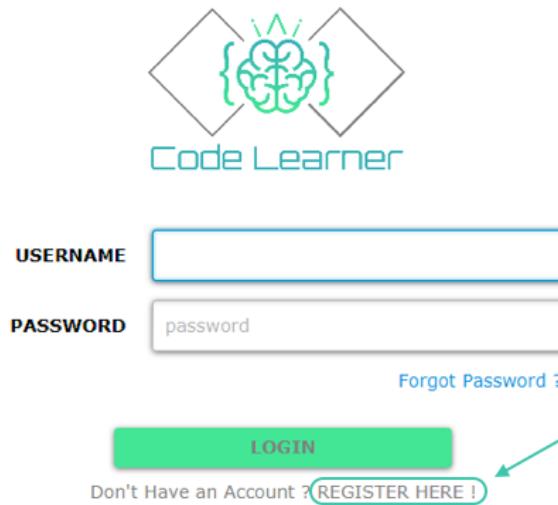
## ● Getting Started

Upon launching Code Learner, you will be presented with the main login menu.



Registering for Code Learner

- I. Click REGISTER HERE at the bottom of the login screen under the green LOGIN button.



- II. On the following screen, enter your first and last name, a valid email address, username, and password. Then click the green CREATE ACCOUNT button at the bottom.

The screenshot shows the 'Code Learner' application's account creation interface. At the top is the 'Code Learner' logo. Below it is a form with the following fields:

- FIRST NAME:** [Text input field]
- LAST NAME:** [Text input field]
- EMAIL ADDRESS:** [Text input field]
- CONFIRM EMAIL:** [Text input field]
- USERNAME:** [Text input field]
- PASSWORD:** [Text input field]
- CONFIRM PASSWORD:** [Text input field]

A note below the fields reads: "We encourage you to choose a strong password containing a capital letter, lowercase letter, a symbol, and a number".

At the bottom left is a "GO BACK" button, and at the bottom right is a large green "CREATE ACCOUNT" button.

Note: Click the GO BACK button at the bottom left corner at anytime to return to main menu

### Logging into Code Learner

- I. Launch the Code Learner application
- II. Enter your username and password in the corresponding dialog boxes on the login screen.
- III. Click the green LOGIN button

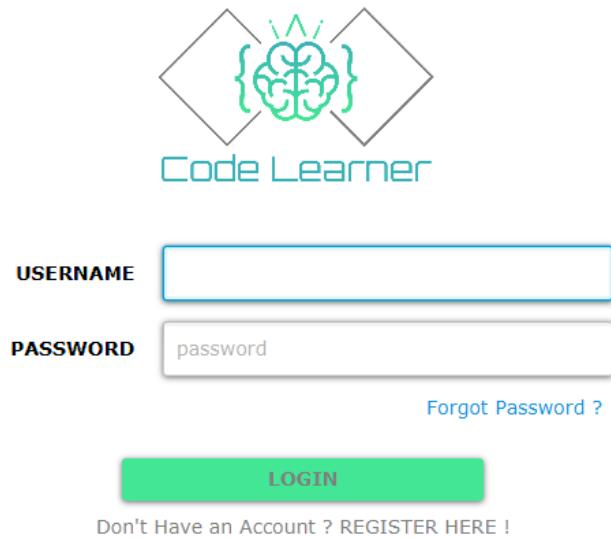
The screenshot shows the 'Code Learner' application's login interface. At the top is the 'Code Learner' logo. Below it is a form with the following fields:

- USERNAME:** [Text input field]
- PASSWORD:** [Text input field]

A blue link labeled "Forgot Password ?" is positioned above the "LOGIN" button. The "LOGIN" button is highlighted with a green oval and a green arrow points to it from the right. At the bottom of the screen is the text "Don't Have an Account ? REGISTER HERE !".

### Password Reset

- I. Launch the Code Learner application
- II. Click the Forgot Password ? button in the login menu (shown below)



- III. Enter your username, email, and confirm your email address. Then click the green CONFIRM EMAIL button.

The image shows the registration interface of the Code Learner application. It features a logo with a stylized brain icon and the text 'Code Learner'. Below the logo are three input fields: 'USERNAME', 'EMAIL', and 'CONFIRM EMAIL'. The 'CONFIRM EMAIL' field is highlighted with a green border. A green arrow points from this highlighted field towards a green 'CONFIRM EMAIL' button at the bottom right. At the bottom left, there is a 'GO BACK' button.

- IV. Enter a new password and token sent by Code Learner to your user email.
- V. Click RESET PASSWORD button



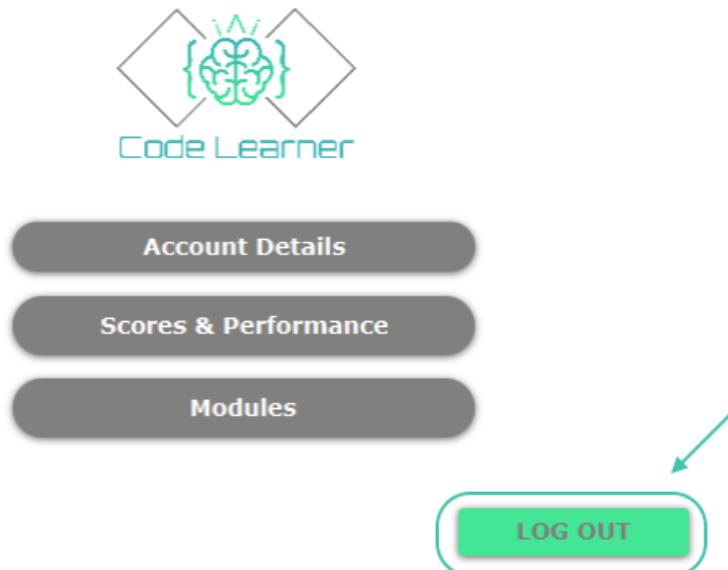
The image shows a user interface for password reset. At the top is the 'Code Learner' logo. Below it is a form with three input fields: 'NEW PASSWORD', 'CONFIRM PASSWORD', and 'TOKEN'. Each field has a placeholder text inside. Below the form are two buttons: 'GO BACK' (grey) and 'RESET PASSWORD' (green). A green arrow points from the top left towards the 'RESET PASSWORD' button.

<b>NEW PASSWORD</b>	<input type="text"/>
<b>CONFIRM PASSWORD</b>	confirm new password
<b>TOKEN</b>	token

**GO BACK**      **RESET PASSWORD**

### Logging Out of Code Learner

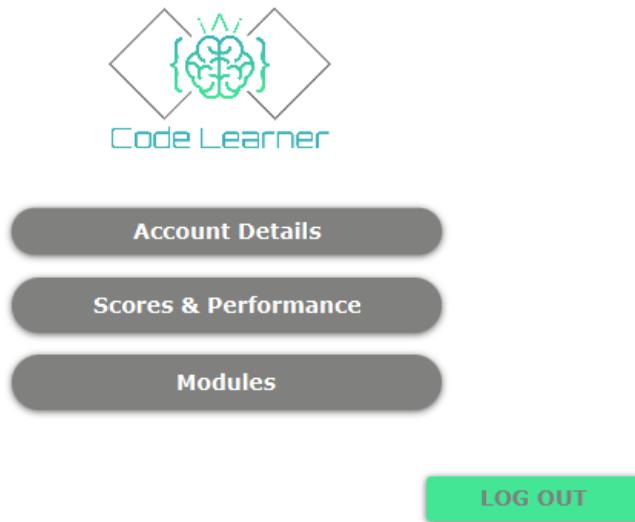
- I. If not already there, click the GO BACK button on the current screen until you've returned to the main user menu.
- II. Click The green logout button at the bottom of the screen.



## **Navigating Code Learner**

### Main User Menu

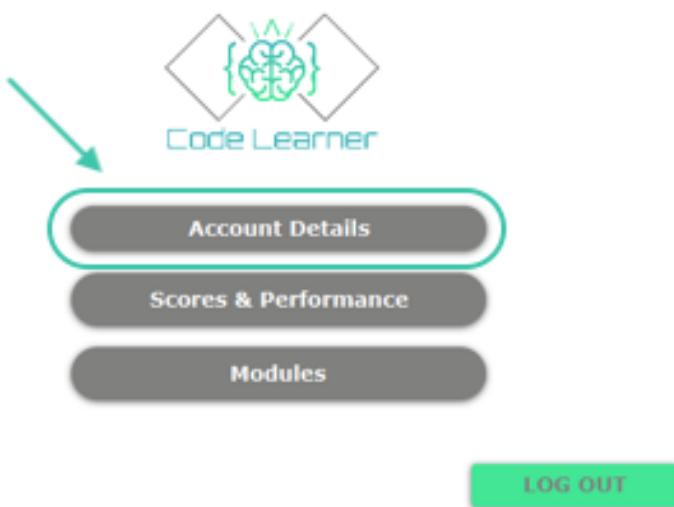
After logging in, you will be presented with the following user menu:



### Account Details

#### Viewing User Account Details

- I. Click Account Details in the main user menu.



- II. Click the Profile tab in the Account Details menu to view user information.

First Name	cool
Last Name	cool
Username	cool
Email	cool@cool.com
Account Open Since	2020-04-23

GO BACK

### Updating Password

- I. Click the Password Update tab in the Account Details menu.
- II. Click the Request Token button
- III. Enter the token sent to your email by Code Learner
- IV. Enter a new password and confirm it. Then click the green CONFIRM button.

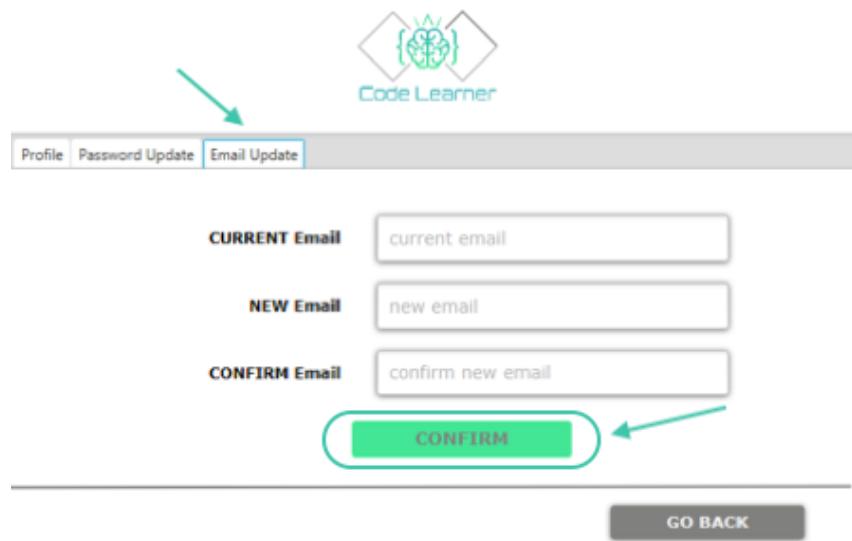
TOKEN	current password
NEW Password	new password
CONFIRM Password	confirm new password

CONFIRM

GO BACK

## Updating Personal Email

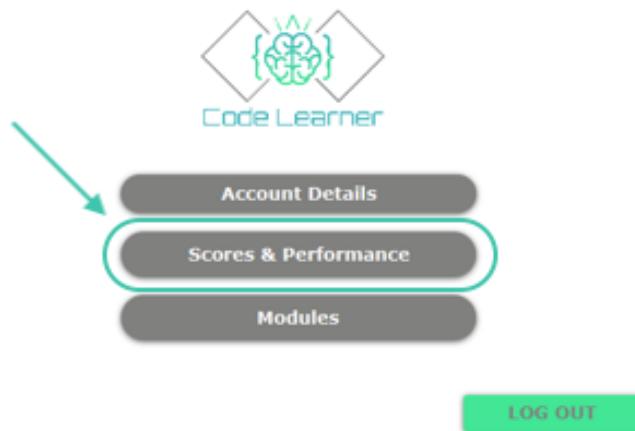
- I. Click the Email Update tab in the Account Details menu.
- II. Enter your current email
- III. Enter your new email. Then Click the green confirm button



## Scores & Performance

View Current Performance on module

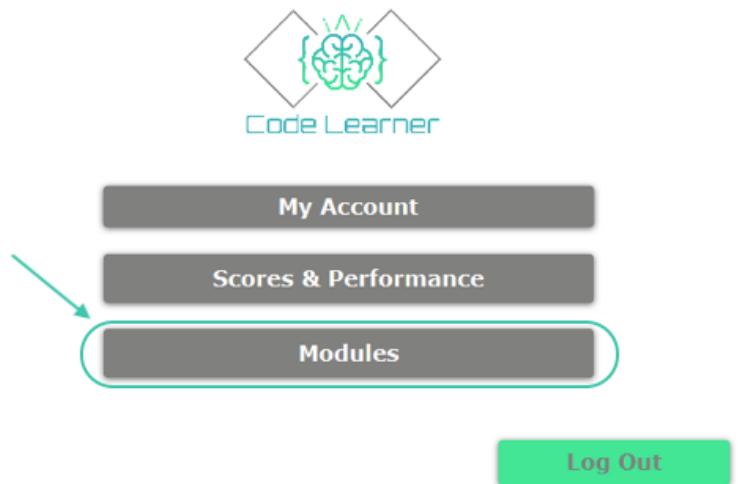
- I. Click Scores & Performance in the main user menu.



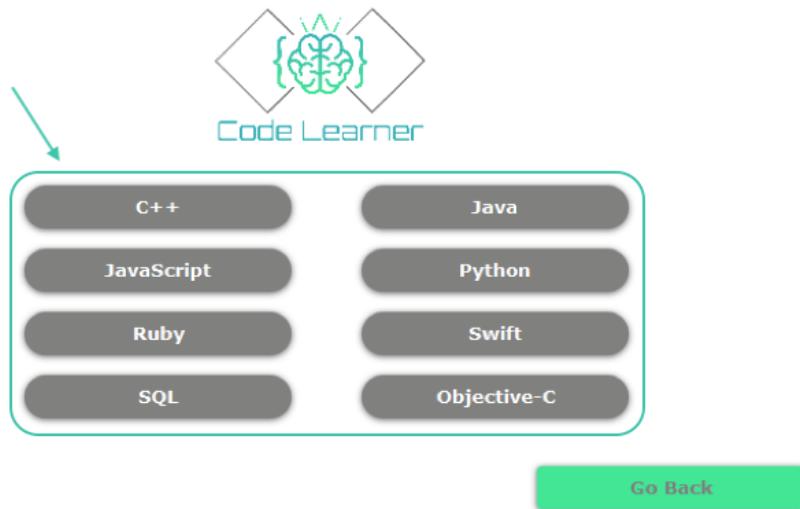
## **Learning with Code Learner**

### Module Selection and Completion

- I. After logging into Code Learner, click Modules on the main user menu.



- II. Select the desired subject from the main modules menu.



- III. Select a desired topic within selected module
- IV. Click the green START button in the bottom right corner to begin.
- V. Answer each question presented. Click NEXT to move forward. Click Done when all questions have been answered to view results.

## 21. Resumes

21420 54th Dr S,  
Boca Raton, FL, 33486  
(561)-843-2502  
bcangas97@gmail.com  
<https://www.linkedin.com/in/beatriz-cangas-perez-480a64156/>

### SUMMARY

Knowledgeable Salesforce Administrator primarily skilled in Java and data processing. Able to work well under pressure and consistently meet deadlines and targets while delivering high quality work.

### EXPERIENCE

#### National Securities Corp | National Holdings Corp.

Salesforce Administrator - Contract

**DEC 16TH, 2019 – PRESENT**

- Developed modifications to existing areas of the system by identifying areas for improvement
- Managed permission sets, license assignments and front-end modifications and updates
- Normalized data and performed data exports from legacy systems using Alteryx and SQL to perform further data analysis
- Performed system imports using Alteryx and SQL into Salesforce from a diverse range of sources
- Provided Training and Support
- Collaborated on all stages of systems development life cycle through Agile methodology, from requirements gathering to production releases

Quality Assurance Tester - Contract

**DEC 17TH, 2018 – DEC 16TH, 2019**

- Analyzed business requirement documents and created test plans and test cases which covered the full scope of the project
- Created Reports and Matrices to keep track of issues and defects as well as the systems' health and testing status
- Implemented Selenium test scripts in Java to identify and document all known defects/issues, while focusing on critical or showstopper level defects
- Participated in the entire development life cycle, including product requirement and design review process

Quality Assurance Tester - Intern

**AUG 14TH, 2018 – DEC 17TH, 2018**

- Analyzed business requirement documents and created test plans and test cases which covered the full scope of the project

- Created Reports and Matrices to keep track of issues and defects as well as the systems' health and testing status
- Stored test results – including screenshots, logs, and reports
- Participated in the entire development life cycle, including product requirement and design review process.

## EDUCATION

**Florida Atlantic University |** Computer Science & Computer Engineering  
Current Undergraduate and Graduate Student (Joint BS/MS Degree Program)

Master of Applied Science, Computer Engineering	<b>JAN 2019 – PRESENT</b>
Double Bachelor of Applied Science - Computer Science and Computer Engineering	<b>BSc, JAN 2018 – PRESENT</b>

<b>Palm Beach State College  </b> Associates of Art Associate of Arts - AA, Computer Science Concentration Cum Laude GPA: 3.4	<b>AUG 2016 – DEC 2017</b>
---	----------------------------

<b>Boynton Beach Community High School  </b> Boynton Beach <ul style="list-style-type: none"> <li>• Graduated Top 3.7% of Boynton Beach Community High School Class of 2016 (15 out of 408 students).</li> <li>• 3rd Place in the Academic Games – 2016.</li> <li>• Academic Student Award in Mathematics – Class of 2016.</li> <li>• Pathfinder Nominee in Mathematics – Class of 2016</li> <li>• Magna Cum Laude GPA: 3.94 (Unweighted GPA)</li> <li>• Weighted GPA: 4.26</li> </ul>	<b>AUG 2014 – DEC 2016</b>
---	----------------------------

## ACADEMIC PROJECTS

**Code Learner:** **JAN 2020 – APR 2020**  
 We designed an open source educational application that tracks your progress, scores and performance as the user completes modules for a variety of programming languages. This application allows users to register, login, and pick the module of their choice to complete. They can also view and update their account and keep track of their scores and overall performance. This application included communication via email as a way to enhance our security measures that allowed users to reset passwords by using a token.

**Tools Used:** IntelliJ, SceneBuilder, GitHub, phpMyAdmin, JavaMail API (SMTP) for Google, Gmail

**Plant Monitor:** **MAY 2019 – AUG 2019**

We designed and created an Embedded System that combined the use of four sensors with C++ Code. The sensors involved were Temperature, Moisture, Humidity and Ph, which took measurements every second on a live plant and displayed it on 20x4 LCD Display.

**Tools Used:** Code Composer Studio, LucidChart, Breadboard, Sensors, LCD Display, Lab kit for Embedded Systems

**Owl Library:** **JAN 2019 – MAY 2019**

We designed an online Library system that allowed users to login, and search for books of their choice to rent. This application included communication via email as a way to enhance our security measures that allowed users to reset passwords by using a token and create accounts as well as to save their addresses for future purchase.

**Tools Used:** IntelliJ, SceneBuilder, GitHub, phpMyAdmin, JavaMail API (SMTP) for Google, Gmail

**Safe Roads:** **JAN 2018 – APR 2018**

We designed and created a GPS based Application for Drunk Driving, using a sensor that detects the alcohol levels of drivers, and sends communication signals back. The design includes an IMX processor, the user's Uber Information and a Communication System that allows the user to ask for help and locate the car the next day.

**Tools Used:** CodeLite, Violet, Google Map, Uber App and Twitter, GitHub

**Oscillator and Dual Counter:** **JAN 2018 – APR 2018**

Designed a breadboard platform with the intention of counting from 0 to 99 up and down. This project involved resistors, capacitors and transistors, NAND chips and a multiplexor.

**Tools Used:** Altera Quartus, breadboard, lab kit for Logic Design

## TECHNICAL SKILLS

**National Securities Corp | National Holdings Corp.**

Salesforce Administrator - Contract

**DEC 16TH, 2019 – PRESENT**

- Languages: Java, Android, C, C++, MATLAB, Java Script, php, Selenium Automation, Assembly
- Databases: SQL / MySQL
- Operating Systems: Windows, OS
- Software: Microsoft Visual Studio, JetBrains IDEs, G-Suite, Android Studio, PhoneGap, Postman, Adobe Creative Cloud, Microsoft Office, CodeLite, Eclipse, Code Blocks, Altera Quartus, Selenium, LucidChart, Violet Atlassian, Smartsheet, Salesforce, iCIMS, Docupace Technologies, WealthScape.
- Concepts: OOA/OOD (UML Diagrams, Design Patterns)

## **OTHER SKILLS**

- Bilingual, fluent in both, Spanish and English.
- Capable of adapting easily to change
- Experienced with POS Terminals and other Business-related machines.
- Tenacious Work Ethic
- Multitasker

## **ACTIVITIES**

### **Florida Atlantic University:**

- Member of a Research group supervised by Maria Larrondo Petrie, Ph.D., that involved projects related to the topics of Logic Design, Microcomputer Applications and Remote Labs.
- Innovation Leadership Honors Program
- National Society of Leadership and Success - member
- Women in Engineering - member

### **Palm Beach State College:**

- Cum Laude Graduate
- Dean's List
- Physics Club Vice President
- Member of the Dr. Floyd F. Koch Honors College

### **Boynton Beach Community High School:**

- Captain of the Academic Team.
- Secretary and Historian of the Hispanic Honor Society.
- Member of the National Hispanic Honors Society.
- Member of the National Honors Society.
- Member of the Science Club
- Member of the Avid Club
- Member of the Varsity Softball, Tennis – MVP Award of the year [2015] and Volleyball teams

# Efrem Yohannes-Mason

Phone: 954-649-6029

Address: 3119 NW 85<sup>th</sup> AVE  
Sunrise, FL 33351

Email: [efremyohannesmason@gmail.com](mailto:efremyohannesmason@gmail.com)

LinkedIn: [linkedin.com/in/efrem-yohannes-mason-a4386716a](https://linkedin.com/in/efrem-yohannes-mason-a4386716a)

## EDUCATION

### B.S. COMPUTER SCIENCE

Florida Atlantic University

Overall GPA 3.97

Expected Graduation

August 2021

### ASSOCIATE IN ARTS

Broward College

Davie, FL.

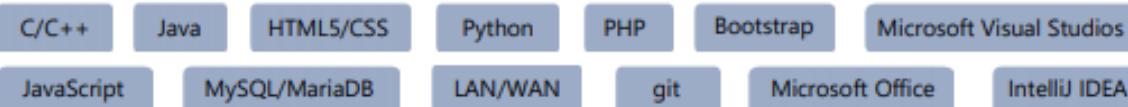
Overall GPA 4.0

August 2018

## RELEVANT CURRICULUM

Introduction to Programming in C, Foundations of Computer Science, Introduction to Internet Computing, Data Structures and Algorithm Analysis, Principles of Software Engineering

## TECHNICAL SKILLS



## ACADEMIC PROJECTS

### Java Application (Principles of SW Engineering, Spring 2020)

Code Learner

- Designed and created an application to aid middle and high school students learn C++. The application contained 6 test modules, tracking the user progress and generating progress reports. All the user credentials, scores and progress were maintained in a local database. Utilized Java, JavaFX, PHP, MySQL, inelliJ IDEA.

### Web Based Applications (Intro to Internet Computing, Summer 2019)

Portfolio of Web Applications

- Portfolio consisted of 6 web-based projects ranging from creating a gym directory, a unit converter and a to-do list application. The projects were brought together into a portfolio that can be seen [here](#). Utilized HTML5, CSS, Bootstrap, JavaScript, jQuery, PHP, mySQL.

## WORK EXPERIENCE

### Memorial Healthcare System

Hollywood, FL

MRI Technologist

03/2014-Present

- Technical support of imaging protocols, often consulting with Radiologists for QA.
- General patient care, training student technologist, workflow coordinator.
- Emergency schedule management, dept. ambassador, lifesaver award recipient.

### Siemens Medical Solutions

San Francisco, CA

(Travel-position)

Clinical Education Specialist

01/2012-02/2014

- Onsight Technical liaison. Managing my own sites, travel, and expenses.
- Assisted facilities across the country to implement new protocols, enhance existing protocols, or start-up after a new install.
- Consulted with administrators, Radiologists, and staff technologist to meet the customer's needs.

# Daniel Franquiz

(561) 504-0158 • dfranquiz561@gmail.com • Boca Raton, FL

## Education

Florida Atlantic University  
Bachelor of Science in Computer Science  
Minor in Business Administration

Boca Raton, FL  
Anticipated Graduation: May 2020

## Technical Skills

Languages: C++ (3 years), Java (2 years), Microsoft SQL Server (2 year), Python (10 months), Go (5 months)

## Personal Projects

- Created a wearable fitness device that keeps track of steps walked, heart rate, humidity, and temperature with data transmission to the cloud. (**C++**)
  - Collaborated in a group of 3 to implement this device and present the final product to a group of judges as participation in the 2019 FAU IoT Hackathon
- Developed a Pac-Man game by learning a new programming language within 3 months and completed it within 4 months (**Go, Linux Terminal**)
- Engineered a smart home/doorbell which used facial recognition to detect visitors and communicated to a users email (**Python, Raspberry Pi 4, OpenCV, Git, Github**) <https://github.com/DanielFranquiz/raspberrypi4-smarthome>
- Implemented a fully functional and visually pleasant to-do list web application (**HTML 5, CSS, JavaScript, jQuery**)
- Developed a currency converter using a publicly available Google API (**HTML, CSS, jQuery, PHP**)

## Work Experience

- National Holdings Corporation, Software Quality Assurance Intern** September 2019 - Present
- Built an event logging environment on a cloud server that was used by a team of 7 developers to log information from REST APIs (**CentOS, Elasticsearch, ELK Stack, Amazon EC2, AWS**)
  - Maintained the implementation and mapping of a critical software product and met a deadline (**Microsoft SQL Server, Java, Selenium**)
  - Developed automated test scripts that saved developers up to 10 hours of regression testing (**Java, Selenium, IntelliJ IDEA**)
- FAU Center for eLearning, Student Intern** July 2016 - September 2019
- Taught a workshop to 15 graduate nursing students on several educational technologies in order to help them achieve success and gain knowledge for an interprofessional graduate course project
  - Collaborated with up to 7 instructional designers to migrate over 300 courses a semester to a new learning management system by acquiring knowledge on 2 software applications within 3 months (Blackboard Learn, Canvas)
  - Facilitated educational multimedia production of up to 500 courses a semester by learning multimedia skills within 1 year (Adobe Creative Cloud Software like Adobe Premiere, Photoshop, InDesign, Illustrator)
- FAU A.D. Henderson University School, Counselor** August 2015 - July 2016
- Educated 8 children from grades K - 12 who were struggling in mathematics and helped them achieve a stronger grasp of the subject which raised their grade by one letter grade
  - Reclaimed control of a classroom of 30 5th graders by instilling new procedures that rewarded respect and good behavior
  - Encouraged interaction between children by having them participate in sporting and game activities

## Volunteer Work

**FAU Student Accessibility Services, Volunteer Notetaker for a fellow student with a disability** Spring 2017 - Present

## Languages

Fluent in the written and oral communication of English and Spanish

# Jonathan Rene

Margate, FL | [jrene2018@fau.edu](mailto:jrene2018@fau.edu) | 954-226-8308  
[www.linkedin.com/in/jonathan-rene-87a531171](https://www.linkedin.com/in/jonathan-rene-87a531171)

## EDUCATION

Florida Atlantic University	Boca Raton, FL
Bachelor of Science in Computer Science	December 2020
GPA	3.9/4.0

## RELEVANT COURSEWORK

Foundations of Computer Science, Introduction to Internet Computing, Data Structures, Introduction to Logic Design, Introduction to Programming in C, Introduction to Microprocessor Systems

## TECHNICAL SKILLS

Languages: C/C++, Python, Visual Studio, SQL

Web Development: HTML

Software: MS Office

## ACADEMIC PROJECTS

### Software Development (Embedded Systems, Summer 2019)

Designed a two-step authentication digital lock box as a final project for Introduction to Embedded Systems. The project was implemented with the use of RFID and ADC technology (key card scan and 4-digit pin).

- Tools used: MSP430 Microcontroller, TI Energia IDE, Code Composer Studio, C Language

### Software Development (FAU Technology & Aerospace Club, Fall 2019)

Currently assisting in the designing and implementation of a Transwing aircraft, courtesy of Pterodynamics, for competing in the AUVSI SUAS Competition.

- Tools used: Python.

## WORK EXPERIENCE

Best Buy	Fort Lauderdale, FL
Computer & Tablet Sales Consultant	April 2019 – Present
<ul style="list-style-type: none"><li>• Provide velocity and solution support to solve customer needs</li><li>• Ensure inventory and merchandising standards are maintained in outlet store area.</li><li>• Implement assigned responsibilities from store leadership in outlet area to engage customers using selling skills to build complete, connected solutions while maintaining a balance of high velocity and high service.</li></ul>	

## LANGUAGES

Fluent in the written and oral communications of English.

Conversational/intermediate speaking skills the languages of Spanish and Haitian Creole.

# Merkure Latortue

lmerkure@gmail.com || Pompano Beach FL 33064 || 954-297-5115

## SKILLS & EXPERIENCE

- HTML, CSS, Bootstrap, PHP, SQL
- Java, C++, Angular, JavaScript, Typescript, NodeJS , npm
- Adobe Photoshop, Illustrator
- Marvel and Sketch UI Prototyping
- Git version control
- Trello Project Management
- Ionic Framework, PhoneGap

## EDUCATION:

### **Florida Atlantic University**

- BS Computer Engineering Program

**Spring 2018 - Fall 2020**

### **Broward College**

- Associates in Arts

**Fall 2015 - Fall 2017**

## PROFESSIONAL EXPERIENCE:

### **Florida Atlantic University**

#### *Mobile Applications Developer/Web Applications Developer*

**March 2019 - Present**

- Design mobile and progressive web app (PWA) prototypes using Sketch and Marvel software
- Use Ionic as the engine of our mobile app
- Work in a team to program in Angular/Typescript and to add backend functionality
- Debug, test and fix software bugs to ensure app functionality
- Utilization of git for version control
- Use of Trello for task management and organization

### **Apple**

#### *Specialist/IS&T and Visual Merchandising*

**November 2017 - November 2019**

- Selected to be on a distinct team for in-store IT troubleshooting/Repairs.
- Selected to be on a distinct team for overnight Visual merchandising and Training
- Convey intricate electronic concepts in manner easier to understand
- Provide customers with the best immediate solutions
- Sell Apple products in a fast paced environment while working in a team setting

### **AMS Distributors**

#### *Web Developer*

**November 2016 - December 2018**

- Make updates to website in HTML/CSS and troubleshoot if necessary
- Design graphics for web and print
- Create graphic content for marketing campaigns

### **Broward College**

#### *Orientation Leader/Graphic designer*

**September 2017 - December 2017**

- Create graphic design content for student life events and ceremonies
- Lead orientation of incoming students and inform them of school policies and guidelines
- Utilized time management to accomplish topics within meeting times
- Oversee student conduct within student life and student recreation centers
- Manage front desk and answer phone calls

# Roods Jacques

5240 Gate Lake Rd   
Tamarac, FL, 33319  
(954)-652-8357   
roodsjacques@gmail.com 

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## Experience

NOVEMBER 2012 – PRESENT

### **Floor Attendant/Count Team Member/Customer Service Representative / Seminole Casino, Coconut Creek**

- Interact with over 50 guests daily to ensure customer satisfaction
- Maintain a clean environment
- Work within a small team of 12 in preparation for the drop
- Counting and recording all transactions and gaming documents in the Count Room
- Maintain and improve quality results by adhering to standards and guidelines
- Identify and assess customers needs to achieve satisfaction
- Build sustainable relationships of trust through open and interactive communication
- Take the extra mile to engage customers
- Operate and troubleshoot the slot machines

DECEMBER 2011 – NOVEMBER 2012

### **Grocery Clerk / The Fresh Market, Coral Springs**

- Ensured proper product rotation and quality
- Created and built product displays
- Assisted in receiving storing and stocking of products
- Maintained a clean, and safe environment
- Facilitate teamwork during high volume shifts through leading by example

MAY 2010 – NOVEMBER 2011

### **Clerk / Broward College, Coconut Creek**

- Arranged and displayed books on shelves and counters

- Attached price tags on books before display
- Oversaw new merchandise shipping and receiving
- Ensured shelves were stocked and maintained a clean, and safe environment
- Maintained knowledge of store merchandise to provide helpful advice to customers

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## Education

JANUARY 2017 - PRESENT

### Bachelor of Computer Engineering / Florida Atlantic University (FAU), Boca Raton

- Current Undergraduate

GRADUATED MAY 2016

### Associate in Arts / Broward College, Coconut Creek

- Associate of Arts toward Computer Engineering

GRADUATED MAY 2011

### Coral Springs High / Coral Springs

- Member of National Honor Society
- Outstanding Achievement in Computer for College and Careers

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## Projects

### Web Development:

- FAU's LAMP server-based website acting as repository for other projects
- A JavaScript unit conversion website that converts temperatures and distance
- A jQuery website with local storage that allows users to dynamically create a to-do list with editing, deletion, and ability to tasks as completed.
- A PHP currency converter website containing 170 different currencies.

## **22. Research Paper**

Florida Atlantic University

Code Learner

Beatriz Cangas-Perez, Daniel Franquiz, Roods Jacques, Merkure Latortue, Jonathan Rene, Efrem

Yohannes-Mason

CEN 4010-001, CEN 4010-002 Principles of Software Engineering

Dr. Lofton Bullard

23 April 2020

## Code Learner

The purpose of this study is to observe and remedy the lack of participation of minority groups in the academic disciplines of science, technology, engineering, and mathematics, also known as STEM. We would like to introduce the lack of diversity in the STEM field and put forth our solution of an educational software application. Our focus will be within the technology and engineering disciplines. We will then provide a background of experienced professionals in the field, who have proven to be authoritative voices in their respective areas of studies and can provide a better insight into the issue in question. Our software application and its relation to the issue presented will be discussed, using as the primary example a beginner's introduction to the C++ programming language. Future implementations and potential additions of new functionality are finally expanded on. We show through various studies and research that our solution is a proven method in drawing interest to the field of STEM.

The topic that was chosen was one that has been the target of some educational educators and institutions—to find a way to break the barriers that surround the pursuit of STEM academic disciplines by underrepresented minority groups (URM). These groups have many hindrances in front of them which make it difficult to dream for the stars while being affected by financial disadvantages. The inception of our group's objective came from seeing the impact that one's childhood could play into choosing a career path and the limitations that surround underrepresented minority groups. Our group consists of six members, each from at least one of these underrepresented groups, who provide some insight on why we have to be a part of the change that reverses the gravity of this social and educational shortcoming.

The solution we bring to the table is a free open source software with the sole intent of educating us all. The release of this software will be used to even the playing field and give an advantage to everyone, regardless of one's economical situation or the school one attends. The only requirements are to have internet access and a working computer. In the event that these core components are not accessible, one solution would be using a public library to access our software. Although minority groups are currently underrepresented in the field of STEM, the universality and easiness of educational software applications will help equip those groups with the cultivation they need to bridge the gap of diversity. There is much more to be done to remedy the limitations that underrepresented minorities face; however, by creating this software we are putting our best foot forward in order to give a voice to those who have been silenced by situations out of their control.

Coding has quickly become a vital skill as technology improves. According to Jennifer Wang, Hai Hong, Jason Ravitz, and Sepehr Hejazi Moghadam, “71 percent of all new STEM jobs are computer-related, yet only 8 percent of STEM graduates are in the Computer Science Industry” (645). This indicates a serious shortage of Computer Science majors. Nowadays most students are unaware of what happens behind their smartphones, laptops, social media networks, and video games. Even though software development is not for everyone, learning programming skills may help sharpen the student’s practical and logical thinking abilities. Furthermore, it could increase the odds for securing a lucrative career in STEM if they were to see fit, especially in a world where “computing jobs are growing at over twice the national average, approximately earning 40 percent more than college graduates average” (Wang, Hong, Ravitz, and Moghadam 645).

Schools should incorporate programming into their curriculum. By teaching students how to code, we would help grow the number of future software and hardware engineers while attempting to meet the high demand for skilled tech workers. Furthermore, introductory programming classes could help children understand the basics of programming structure, logic, and design. This would enhance the student's interaction with the technologies available to them and open their eyes to the infinite possibilities of coding.

Schools must recognize that both technology-related devices and coding are integral parts of our lifestyles, making the incorporation of Computer Science studies into the student's curriculum vital to their future success. This would allow students to not only understand how technology works and how to utilize its potential, but how to possibly explore the opportunity of a future career in digital technology. One of the many educational applications available to students nowadays is SoloLearn, which is a free programming and educational app, designed to teach the basics of software development. SoloLearn makes the process of learning programming quicker and simpler by breaking down concepts into easy and digestible daily lessons, normally a time-consuming and tedious process. SoloLearn also drives collaboration and competition through interactive gameplay, peer-to-peer sharing, and user-generated content. Our purpose is to create a community-driven, free, first approach application where students can learn and practice a new skill of their choice.

The developed application, Code Learner, will be a free, interactive, and educational software tool available for anyone with internet and computer access. Code Learner is a Java-based application that was built using IntelliJ, an open source IDE owned by JetBrains. The application stores all information in a database, from a user's details to questions, modules and

their corresponding scores upon completion. WampServer, a web development platform on Windows that allows users to create dynamic applications with Apache2, PHP, and MySQL was used to mimic our SQL database structure locally by using phpMyAdmin. Additionally, password encryption was put in place to protect the user's information, and an email account was created on its behalf to allow users to reset their passwords securely through the use of a token that is emailed to their accounts.

Although Code Learner is currently only offering a course on the basics of C++, by dividing it into modules, the purpose of the application is to educate its users on a wide variety of subjects within the fields of STEM as more courses are to be added in the future. The wide variety of subjects that will be made available on Code Learner will be made for students at any grade level, from elementary school all the way to the collegiate level. The goal of Code Learner is to diversify the field of STEM by solving some of the many problems that hinder underrepresented minority groups from pursuing a degree within the fields of STEM. Future implementations of Code Learner will include introductions to various other programming languages such as Java, Go, and Python. Posting our project on a web page to host it as a web application would also like to be implemented in the future. If given more time, we would also like to incorporate a more robust progression and scoring system for the user. Other implementations will include learning tutorials through videos, interactive coding games, and projects that will help the user understand what they are doing.

Upon research, it was discovered that one of the main reasons as to why URM students choose not to pursue degrees in STEM is due to lack of STEM education at the K-12 grade level. According to the U.S. Department of Education's Office of Civil Rights, "there are fewer math

and science classes offered at high schools where URMs are the majority” (U.S. Department of Education's Office of Civil Rights 2018). Additionally, it was reported by the Education Commission of the States, that “elementary schools with the lowest incomes do not usually have the resources available to educate its students in math and provide necessary materials to instruct laboratory courses” (Education Commission of the State 2020). At the university level, we see huge disparities among many of the nation's top universities. In 2018, Florida Atlantic University was actually the “the most racially, ethnically and culturally diverse institution in Florida's State University System” (“College Quick Facts”). The University of Florida however, is less diverse. Of the students enrolled in Computer Science at the University of Florida, “36.50 percent were White and only 3.30 percent were Black or African American” (“Enrollment - Institutional Planning and Research - UF”). If one ever wants the students of these demographics to start consistently pursuing degrees in STEM, these students need to start getting exposed to these subjects from early stages, instead of waiting until high school lectures make them available, or even college for some students. As Rose Shumba, Kirsten Ferguson-Boucher, Elizabeth Sweedyk, Carol Taylor, Guy Franklin, Claude Turner, Corrine Sande, Gbemi Cholonu, Rebecca Bace, and Laura Hall state , “the lack of exposure to STEM at an early age causes these students to not be knowledgeable on the opportunities within the STEM fields, and have misconceptions about what it actually is” (12). This ultimately results in a lack of interest in the fields of STEM in later years for these students. Unfortunately, providing the necessary resources needed to these low income communities can be quite difficult. One way to battle this issue is to provide free resources and materials for the students in these communities. With a software application like Code Learner, these students would be able to have access to many learning materials and

resources that they typically would not have access to on a regular basis at school at absolutely no cost. Thus, fixing the issue of the lack of exposure to STEM courses and subjects at early grade levels. Additionally, instructors could easily share Code Learner with their students and somehow implement it as part of their curriculum.

Fortunately, there are URM students that do ultimately decide to pursue a future in STEM. Though many of them do not succeed in their pursuits. A study showed that “more than a third of black (40 percent) and Latino (37 percent) left their respective majors for another before earning a degree as compared with 29 percent of white STEM students, and 26 percent of black STEM students and 20 percent of Latino STEM students dropout of college altogether” (Riegler-Crumb, King, and Irizarry 34). Furthermore, the research in this study also suggests that black and latinos students are more likely to come from low-income families and communities. The academic resources that usually support students in succeeding during their collegiate studies is something that they might not have access to due to the fact that they come from low-income families and communities. This is a problem that Code Leaner will aim to solve by giving students free access to a high quality academic resource to assist them in their studies. Additionally, one study in particular also shows that “there is a significant gap in academic performance and preparedness among URM and non-URM students entering a post-secondary institution” (Eagen, Hurtado, Figueroa, and Hughes 25). This of course plays an important factor in why so many URM students who initially decided to pursue a degree in a STEM field are not likely to complete their degree or drop out entirely. With a software application like Code Learner, the gap in academic performance and preparedness between URM and non-URM

students can be closed by giving them the education tools, materials, and resources they need to succeed at no cost.

For society to meet the expanding need for computer scientists, a significant cultural shift in how we think of the future of Computer Science education will be necessary. With a considerable demand for individuals skilled in the fields of artificial intelligence, data science, internet of things, and cyber security, increasing the diversity across the computer science landscape will have a meaningful influence on whether we can meet the growing reliance of the general public on software systems. Undoubtedly there are many barriers to overcome in achieving this goal of creating a clear pathway into computer science for this underserved portion of the population. This includes individuals of lower socioeconomic status, race other than white or asian, women, and those with lower self-efficacy. A coordinated effort involving Computer Science educators and government resources will need to be implemented to improve the structure of computer science education for millions of underserved students.

As the demand increases for skilled professionals, so does the requirement for the recruitment of more educators in the Computer Science field. Increasing the exposure to computer science at a younger age allows for a greater conceptualization, retainment, and confidence of the material resulting in greater academic performance than those who first encounter these concepts later in undergraduate school. Considerable funding on the state and national level to increase accessibility to the required resources and technology can help support the advancement of computer science education in the places where it is needed the most. One can look at the Switzerland education system to see that “in an effort to mainstream Computer Science education in Switzerland, pre-service elementary school teachers are being required to

take Computer Science classes” (Reprenning, Lamprou, Petralito, and Basawapatna 424). In some cantons of Switzerland, starting from 2017 computer science education has become mandatory rather than elective for students beginning in elementary school. Adoption of progressive initiatives such as the one mentioned above would broaden the reach of the Computer Science curriculum into many untapped school districts across the country.

In order to broaden the inclusiveness of Computer Science programs to consist of more underserved communities perhaps some of the stereotypes need to be addressed as they pertain to computer scientists. There are stigmas of being nerdy or socially awkward which only serves to decrease overall interest for many of these potential students in pursuing a Computer Science education. Although this is majorly out of any one person’s control, as this is a societal issue, widening the perception of Computer Science professionals would help attract new talented students to the classroom. New computer science role models could provide an alternative perception to the status quo, and consequently help integrate a greater diversity of students into the Computer Science field. Once in class, keeping any student's interest may prove to be another task, so incorporating a culturally relevant curriculum has helped many educators keep their classes engaged. As Joanna Goode states, “Mark Guzdial’s Media Computation course is structured so that students encounter computing concepts through the manipulation of media using images of the students' own choosing” (362). Guzdial’s course even incorporates modern social issues while examining parameter selection and other strategies during computational problems.

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