**Project Purpose**

This project implements an automated version of Connect Four, allowing players to practice and play online against an AI Bot or another player.

**Proposed Solution**

This project will develop a compact integrated system to control DC motors, solenoid motors, infrared sensors, a wall power supply, and a web app interface. An online database will be utilized to save and track players' win streaks, usernames, and win percentages.

**Specifications**

Specifications for the Connect Four automated game include:

* Infrared sensor for disc placement detection
* Hopper system to dispense a disc
* DC motor for linear movement for disc dropper
* Solenoid Motor in hopper for disc release
* Record position of dropped disc
* User Interface to show the placement of disc
* LCD screen shows players turn
* Microcontroller send data to server
* Record win streak tracked on the database

**Innovation Strategy**

This project will utilize a Raspberry Pi Pico W, which has not been introduced into the program. Additionally, this project will further explore components that have not been implemented into the program, such as:

* Network Protocols
* 3D Design for loading player chips
* Real-Time Processing

This project will provide individuals to play Connect Four with people online, while also implementing physical hardware for more interactive experience.

**KNOWLEDGE AND SKILL GAPS:**

Familiar Areas includes:

* Solenoids
* Sensors
* Motors

Areas that will require more research are:

* Syncing software and hardware over wireless
* Design of the hopper system
* Power usage
* 3D Design hardware for dropper system
* Calibration of motors and sensors
* Power Options (Battery Option, wall outlet)

The potential concerns throughout this project are:

* Integration between hardware and software components
* Power usage and system calibration
* Reliability of Dropping system for chips

**Resource Requirements**

Components needed for automatic Connect Four games:

* 2x MicroController (Raspberry Pi Pico W)
* 10x Sensors and LEDs (Infrared Sensor)
* 2x DC/Stepper Motor
* 4x Solenoids
* 2x Game Board
* Power Supply
* 3D model for hopper
* 2x LCD screen
* Database
* Web Server with IP or Domain

**Timeline**

| **Week** | **Activity** |
| --- | --- |
| **1** | During weekdays   * Course Introduction * Project idea Exercise |
| **2** | During Weekdays   * Project Proposal Draft * 2 min presentation on this project * Project Proposal submission   During Weekend   * Order Parts * Start to explore the IDEs/Software that are being used * Learn about Communication between micro and server * Learn about IP/MAC/DNS |
| **3** | During Weekdays   * Design motor driver circuits (Main DC Motor) * Add Firmware Feature: Motors and Infrared Sensor * Start building Logic on an “AI bot” to make for the automated Connect Four game * Connect the circuit to check for sensor/motor feedback   During Weekends   * Master the logic of how it will be done through research and understanding * Double-check that all the feedbacks is valid |
| **4** | During Weekdays   * Start to implement logic on the MCU ( on “AI bot”) * Implement the feedback on the MCU (Sensor and motors)   During Weekends   * Do the same work on the MCU   ~ Would not be an easy process so this may take time depending on how easy it would be for us to diversify into different system |
| **5** | During Weekdays   * Add firmware feature: Managing network interface * Add firmware feature: Store system event and sensor data in the database * Testing Communication plus using the feature firmware for storing data   During Weekends   * Progress on what was worked on weekdays * Start the UI web browser (Maybe app Depending on how motivated we are at this time) |
| **6** | During Weekdays   * Checking Communications and test code * Working on the coding and ironing out any errors or holes in the code * Work time |
| **7** | * Work Time * Start to design the structure of the project * Print the 3d model |
| **8** | * Work Time * Debug Any features * Work on SSL/TLS connection and firmware having a dynamic DNS service |
| **9** | * Progress Report Submission * Debug and work on Fixing * Add any other feature/QOL extensions (Work on it if there is time) |
| **10** | * Test system integration * Work on prototype |
| **11** | * Debugs/Adding extension features * Work on prototype |
| **12** | * Debugs/Adding extension features * Work on prototype |
| **13** | * Debugs/Adding extension features * Work on prototype |
| **14** | * Practice presentation/video of it working * Prototype Grading |
| **15** | * Final Technical Report submission * Final presentation rehearsals * Final presentation * Project demonstrations |