

## Specification

Submit a zip file containing all the relevant Python code for this assignment.

## Pong

Attached is a bare-bones version of Pong. It's your turn to add some functionality to the game and make it your own. Documentation for the code you've been given is in the `docs.zip` folder. Open the `index.html` file and you will be able to see the docs for the relevant classes.

Currently the game consists of two paddles, complete with a ball. Your job is to create the following game states:

**welcome:** The welcome state is a home screen that has a menu of "1 Player" and "2 Player" options. **serving:** The serving state where each player waits for the server to send the ball in motion. **play:** Plays a volley of pong. **pause:** The player paddles cannot move and the ball freezes in place. Game resumes with all settings when unpaused. **game over:** The game is over.

### Welcome State

Show a menu of "1 player" and "2 player" options. The text appears white but the current selected text is blue. Use the arrow keys to select a mode and the enter key to play that mode of the game. Display the name of the game in a large font.

### Serving State

Display who is currently serving the ball. Player1 serving would send the ball to the right, and Player2 serving would send the ball to the left. You can come up with a random serve speed for the `x` and `y` speed of the ball. I suggest using some average speed plus or minus a speed pulled from a normal distribution. Remember to use deltatime calculations. Player paddles can move in this state. The ball is reset to the center of the screen here. The serving state is entered at the start of a game and after a point is scored. Initially, a random player serves, and after a point is scored, the person scored against serves the ball.

### Play State

Player paddles can move, the ball moves and bounces with walls and paddles. If the ball goes off the screen, award a point and then either go to the serving state or the game over state depending on the number of points awarded. The play state displays each player's score on their side of the screen. Player1 (left) moves using the `w` and `s` keys and Player2 (right) moves using the `UP` and `DOWN` arrow keys. Each bounce of the ball off of a paddle will increase the speed of the ball by a small amount `SPEED_INCREASE` from `settings.py`. Play around with this value to see which number works best. Be sure to clamp the speed of the ball so it doesn't go *too fast*. Too fast would mean the ball actually skips over a paddle in a single frame so you'd miss the collision.

We will use simple collisions here. If the ball hits the top or bottom wall, simply reverse the direction of the **y** speed while keeping the **x** speed the same, and if the ball hits a paddle, reverse the **x** speed while keeping the **y** speed the same. You may change the default values in `settings.py` for your game.

Read the pygame documentation and use the sounds provided for when the ball hits a wall, a paddle, and scores a point.

## The Game Over State

Triggered when a player scores a set amount of points of your choosing, but keep it reasonable (somewhere between 5 and 10).

The game over state shows the winner of the game with a congratulatory message and allow the players to go back to the welcome menu by pressing enter.

## The Pause State

Let users pause and unpause the game by pressing the **p** key. Ball and paddle movement must stop during the pause state. Display a message of "Paused" and tell the player they need to press **p** to continue playing.

## AI Opponent

Implement a mode where the second paddle is controlled by a simple computer player. From the start state press **Enter** to play in 2 player mode but press **Backspace** to enter the game mode against the AI opponent. Your opponent does not need to be sophisticated. Think about how the paddle should move relative to the ball.

## Power-Ups

Implement 3 power-ups that make the game of Pong a bit more interesting. Use your imagination. Some ideas are blocks that speed the ball up, press a button to turn your paddle into the length of the screen for 1 second, press a button to slow your opponent's paddle down, reverse the opponent's controls for a set amount of time, put spin on the ball, etc. Be creative!

## Note About Ball Speed

A common thing to do is to increase the speed of the ball. But you want to be aware that we use AABB collisions. If your ball is moving so fast that it can jump over a paddle in a single frame. Clamp the max speed of the ball so this does not happen. You can figure out this speed by trial and error, or by using math and knowing the framerate of your game and the width of your paddles.