**Functionality Requirements**

Face detection:

- Load cascade classifier appropriately
- Use appropriate function for multi scale detection
- Face detection should be fast enough for relatively smooth updates to the PID controller further down the pipeline
- Some false positives are acceptable, but you should try to minimize these
- Likewise, your face detection shouldn't fail to recognize faces often

Visual servoing:

- You need to implement stubbed out helper functions
- PID controller should be properly implemented and updated
- You should have nonzero values for P, I, and D coefficients
    - Windup guard is not required but could be beneficial for tuning
- You need to handle cases where there are zero or multiple faces
- PID controller should be tuned to avoid oscillation
- PID controller should be tuned to avoid excessive overshoot
- PID controller should be responsive (not take too long to move to face)
- PID controller should quickly respond to face movements

**Video Requirements**

- Screen record and video record the robot during visual servoing
    - Highly recommended that you use the recording setup in the classroom for this
- You need to show your program running from initialization
    - Your program cannot be running before you begin recording
- You should show off functionality of your visual servoing program
- You should demonstrate all design decisions including handling multiple faces and zero faces

**Writeup Requirements**

Your writeup should at a minimum include the following:

- Description of how you implemented and tuned face detection
- Justification of your face tuning parameters
- Description and justification of all design decisions made to accomplish visual servoing
    - This includes things like tuning, handling of zero or multiple faces, hysteresis control, etc.
    - Make sure you are detailed in your description and justification of PID parameters
- A description of issues you encountered throughout the project

**Rubric**

Working code (50 points)
- Face detection (20 points)
- Visual servoing (30 points)

Video (20 points)

Writeup (30 points)
- Justification of face detection parameters (5 points)
- Description + justification of visual servoing design decisions and parameters (20 points)
- Description of issues you encountered (5 points)

**Submission Requirements**

Make sure to include the following in a zipped folder:
- Your working code
- A video demonstrating that your code works
- A writeup detailing design decision