

## Face Detection

The purpose of this assignment is to provide students with the opportunity to implement and experiment with using an accumulator methods, like the Generalized Hough Transform, for **detecting objects (e.g., faces) in images**. Students must implement a face detector using the Generalized Hough Transform that is capable detecting faces.

Algorithms should be implemented in Python. **Moreover, students should specify and study the effect of two or more imaging conditions and/or algorithm parameters, including, but not limited to, perspective invariance, scale, image/accumulator noise, etc.**

In this assignment, you need write the following subroutines:

- buildRtable() --- a subroutine that computes the R-Table for a set of reference images
- genAccumulator() --- a subroutine that generates the accumulator using the R-Table and a given test image.
- getPeaks() --- a subroutine that returns a set of maxima locations from the accumulator.
- displayResult() --- a subroutine that draws a *fixed size* rectangle on top detected faces (**you may use OpenCV for this part**) in test images.

Use **ALL** of the following reference images to construct the R-Table for the face detection model. **Hint:** *You may use the same reference point for all images, since the faces have already been aligned and cropped.*

### **\*\*ADDITIONAL HINTS and OPTIONS\*\***

1. You are allowed to use OpenCV canny edge detector
  2. Use quantized gradient angles (e.g., 4, 8, or more directions) to index R-Table
  3. Consider using weighted displacement voting
  4. Optional: consider patch similarity indexing (similar to the cow example from class) instead of gradient angle indexing
  5. Optional: consider effects of scraping additional headshots from for building R-Table for face detection
- [ref\\_img001.png](#)
  - [ref\\_img002.png](#)
  - [ref\\_img003.png](#)

Using the constructed R-Table, perform face detection **ALL** of the following images. For debugging and sanity checks, you should be able one of the reference images as a test image.

- [test\\_img001.png](#)
- [test\\_img002.png](#)
- [test\\_img003.png](#)