Finding Lane Lines on the Road

1. Describe your pipeline. As part of the description, explain how you modified the draw_lines() function.

The pipeline consists of 6 steps.

- The `cv2.cvtColor` method is used to convert the image to grayscale.
- The `cv2.GaussianBlur` method is used to smooth the image to reduce noise.
- Then the blurred image is passed to `cv2.Canny` with thresholds of 50 and 150 for low and high, respectively. These numbers are choosen via trial and error and these seemed to produce good enough results.
- The `cv2.HoughLinesP` and `cv2.addWeighted` methods, are used for drawing our detected lines onto our image.
- In order to draw a single line on the left and right lanes, I modified the `draw_lines()` function by first using the slope of each line segment to determine which side of the lane it represented. A positive slope indicates a line segment on the left side, while a negative slope indicates a line segment on the right side. When selecting line segments, I only accepted left lane line segments with a slope greater than 0.3 (or less than -0.3 for the right lane) to avoid outliers that may impact our final averaged lane line.
- The selected line segment was then averaged to create what should be the most representative lane line segment. I then extended the line segment through the ordered pair to the bottom and (slightly over) mid-point of the graph.

2. Identify potential shortcomings with your current pipeline

- The pipeline has some shortcomings when it comes to curves. If the lane turns at an angle great enough to move the lane "end" from the center of the graph, the detected lane lines will not align with reality. It's also possible the lane will move outside the "region_of_interest" we have defined.
- Another potential shortcoming is the pre-determined min and max parameters for the hough transformation function. I imagine differences in lane markings, such as the distance between dashed lanes, would impact the pipeline's ability to accurately detect lanes.

3. Suggest possible improvements to your pipeline

If the effect of curvature can be included in the pipeline, we can get better lane detection for our perception stack. I am not sure how it will be included in our current setup.