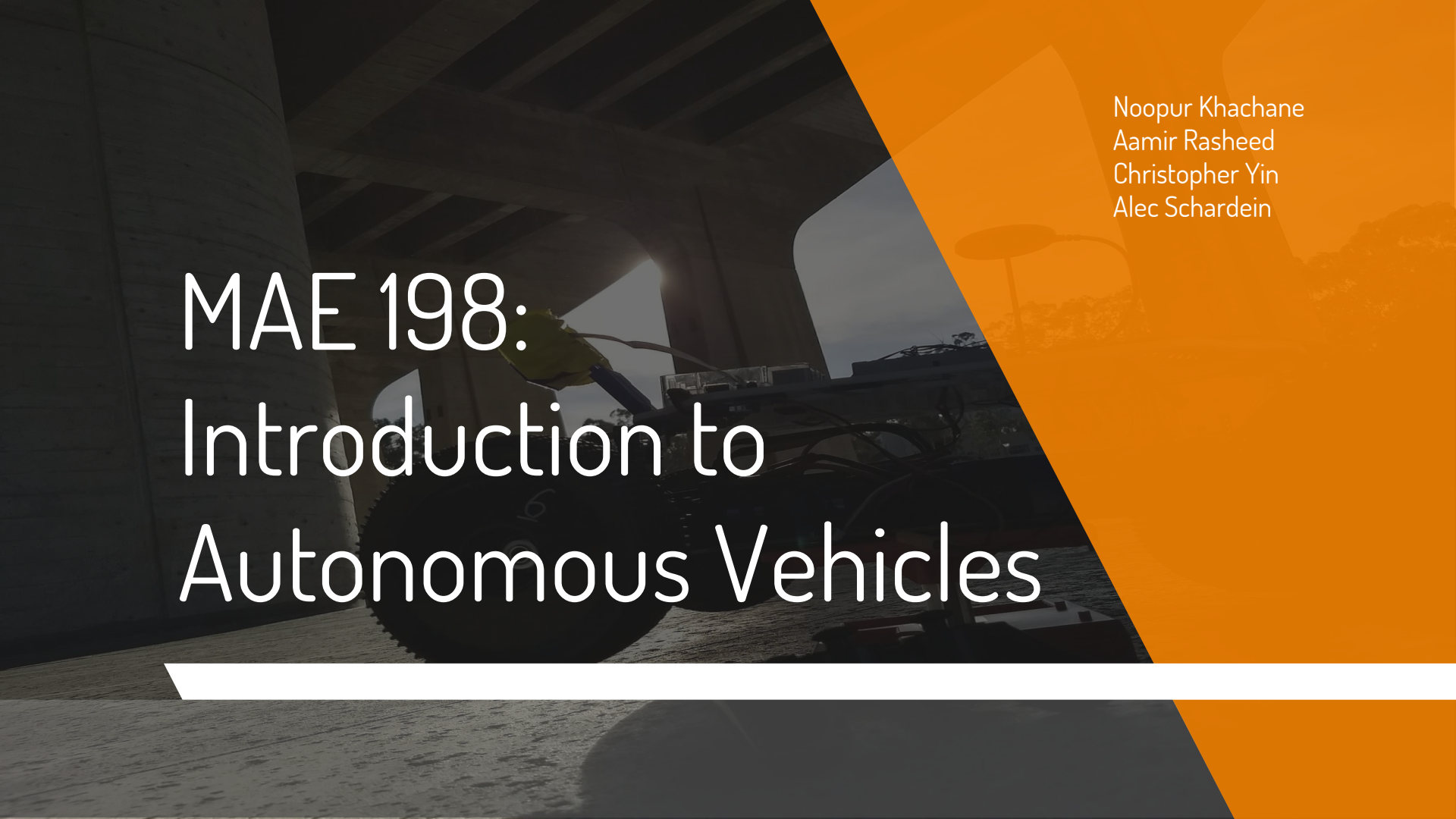

# MAE 198: Introduction to Autonomous Vehicles

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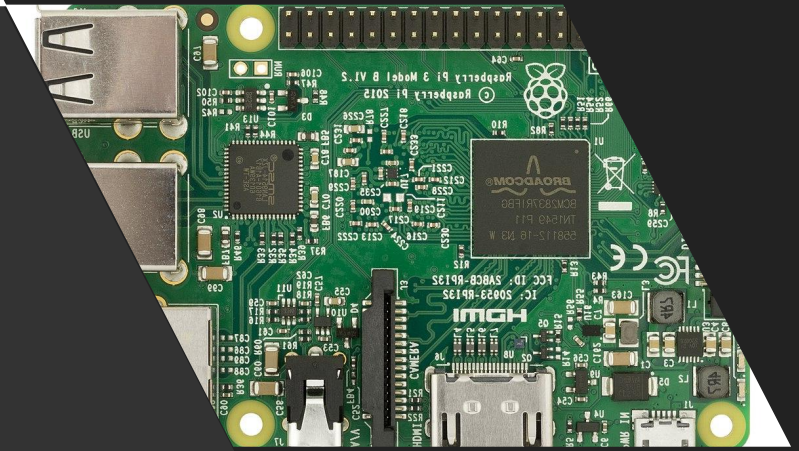


# System 1 : RPi with DonkeyCar

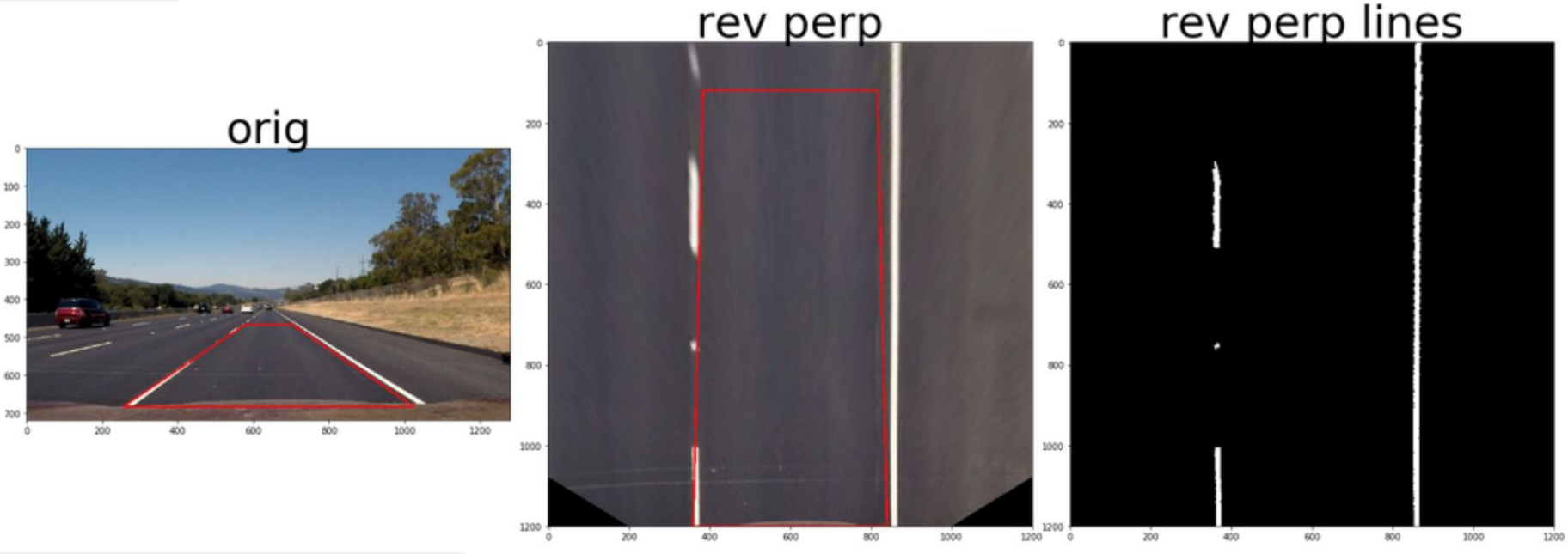
# Method 1: Stock Donkeycar

- Performed well except when high reflection
- Solution: implement polarized lens
- Spoiler: no significant improvement

# Method 2: OpenCV Image Perspective Transform

- Step 1: Undistort Image
  - Image is from fisheye lens
- Step 2: Transform perspective
  - Examples shown on next slide
- Step 3: Train Network on New Images

# Example of final transformed image

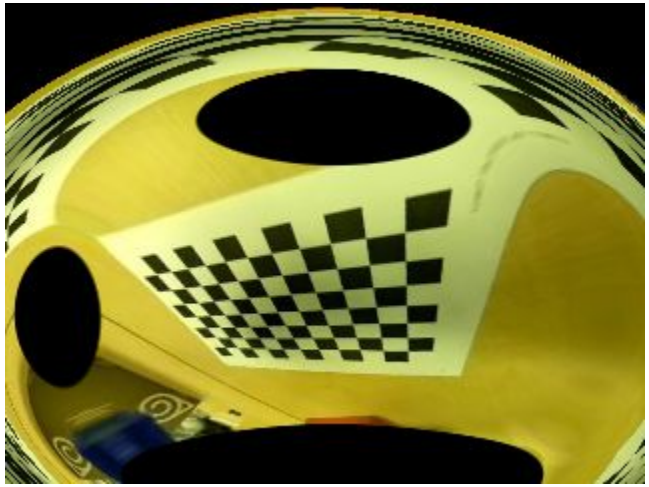


# Undistort Image: Goals

# Undistort Image: Reality

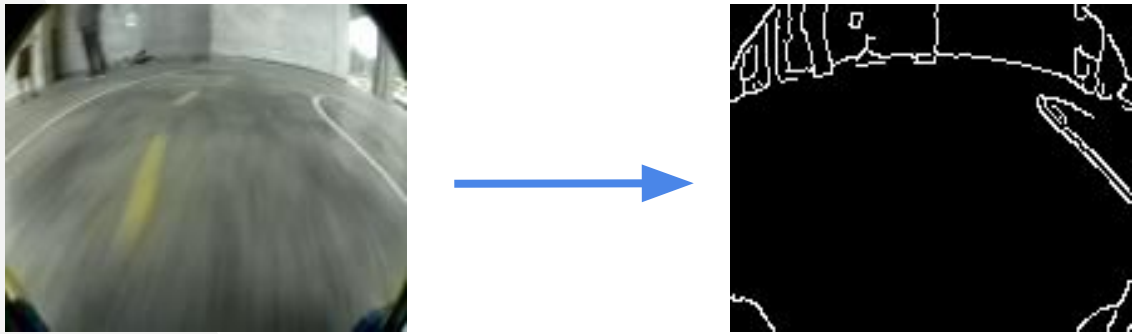
Original Image

“Undistorted” Image



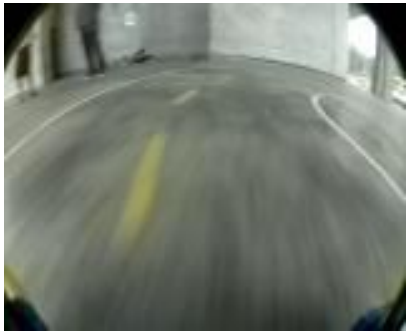
# Method 3: Filtering image – Edge detection

- Reduce extraneous data
- Edges of lane theoretically most relevant information
- Filtered image still has irrelevant information



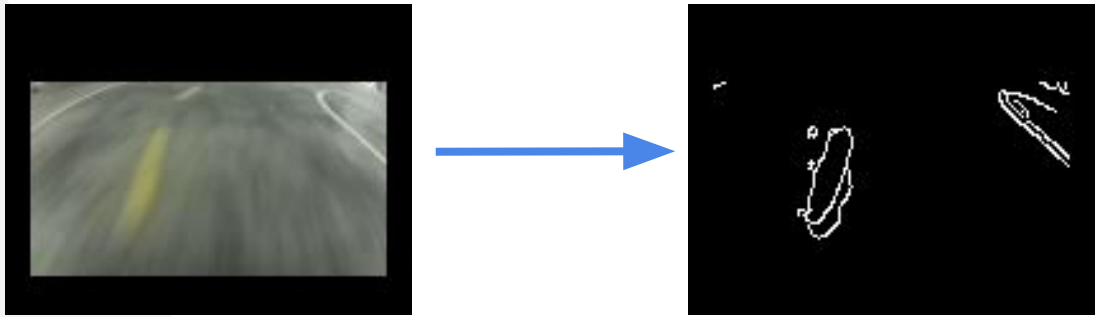
# Filtering image – Cropping

- Crop top of image
- Only road is important



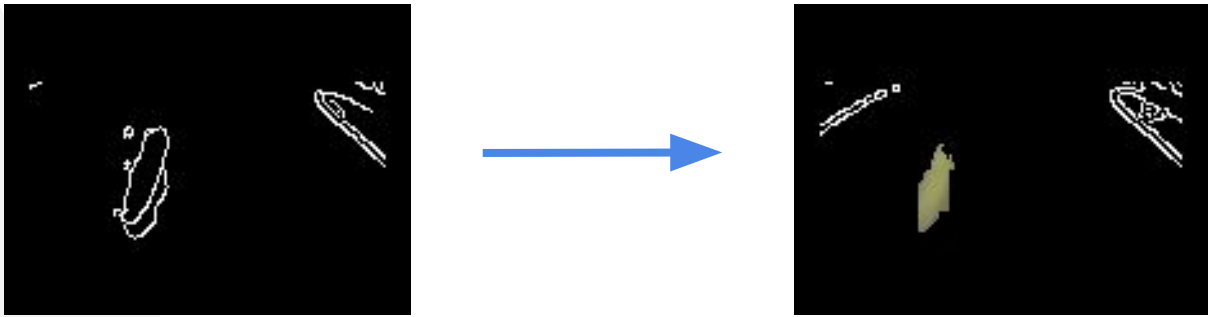
# Filtering image- Extract white and yellow edges

- Not all lane lines are detected
- Implement white + yellow masks
  - Ensure relevant information is included
  - Emphasize edges of lane lines
- Implement edge detection on masked images



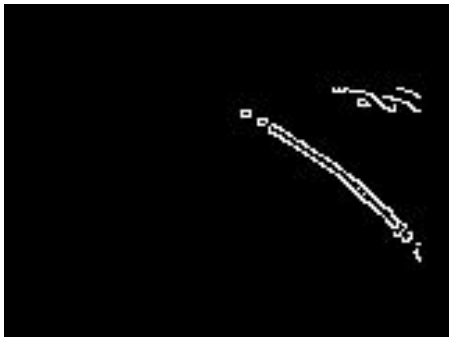
# Filtering image- Extract white edges, yellow lane

- No distinction between center and outer lane
- Highlight center lane to provide more information to net

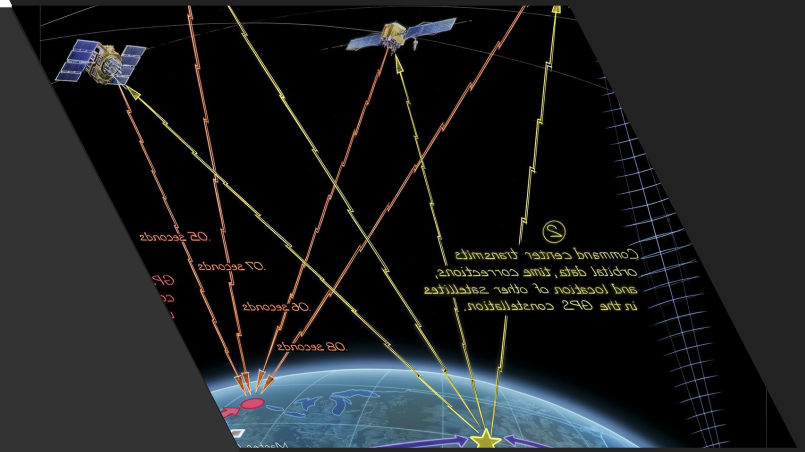


# Filtering image- Extract white edges, yellow lane

- Final filtered training set:
- Problem - bursts of noise



- Potential solutions
  - Adjust values of yellow mask
  - Implement edge detection w/ noise filtering for yellow, convert to colored line
  - Mask in HLS/HSL color space



# System 2 : Pixhawk with GPS

# Pixhawk with GPS

- Initial Problems
  - Steering would work but Throttle was unresponsive.
  - After figuring out that car had not fully armed, some configuration issues required changes.
  - Temporarily disabled safety for car to arm and learned that full arm required GPS lock

# Pixhawk with GPS

- More Problems
  - Throttle would arm, car worked in manual
  - Running auto mode would result in car going in full reverse
  - Recalibrated ESC and R/C Controller
  - Changed throttle cruise setting

# Pixhawk with GPS

- It works!