

# Lane line detection using python

Autonomous driving, a leading AI application, depends on robust lane detection for safe navigation. Utilizing deep learning, these systems analyze visual data to identify lane markings. This core functionality, crucial for ADAS and autonomous vehicles, allows for accurate path determination. We will demonstrate how to perform lane detection on video data, outlining the key steps involved.

## 1. Input and Frame Extraction:

-The video is loaded using a video file processing tool. Each video frame is then extracted and converted into a sequence of images.



## 2. Grayscale Conversion:

- To simplify processing, the color images (RGB) are converted to grayscale.
- This reduces the image data to a single channel, speeding up subsequent steps.



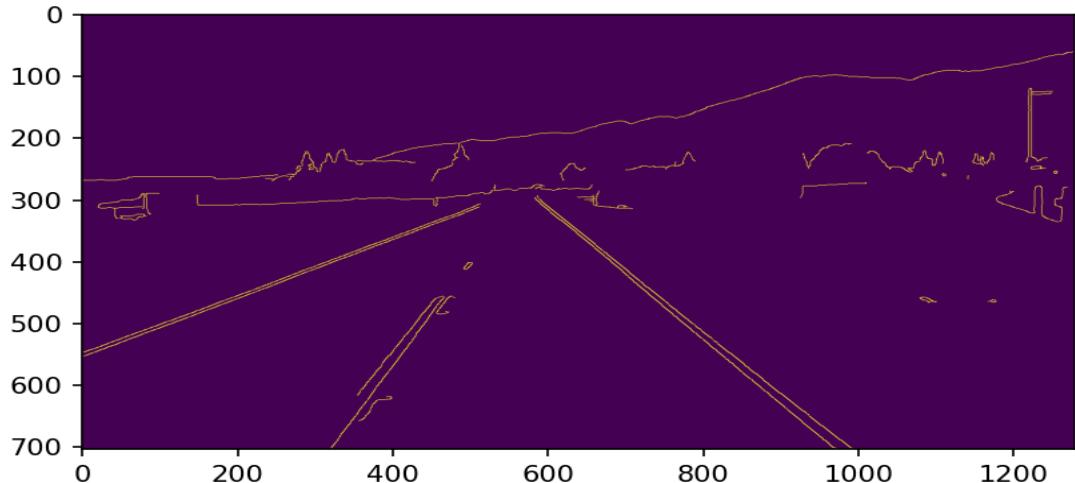
## 3. Noise Reduction (Gaussian Blur):

- To minimize false edge detection, the grayscale image is smoothed using a Gaussian blur. -This technique applies a weighted average to each pixel, effectively reducing noise and enhancing image clarity.



#### 4. Edge Detection (Canny Edge Detector):

- The Canny edge detector is applied to the blurred image.
- This algorithm identifies edges by calculating image gradients and highlighting areas with significant intensity changes.



- T5. Region of Interest (ROI) Selection: to focus on the road lane, a region of interest (ROI) is defined.
- A mask is created to isolate this area, and a bitwise AND operation is performed with the edge-detected image.

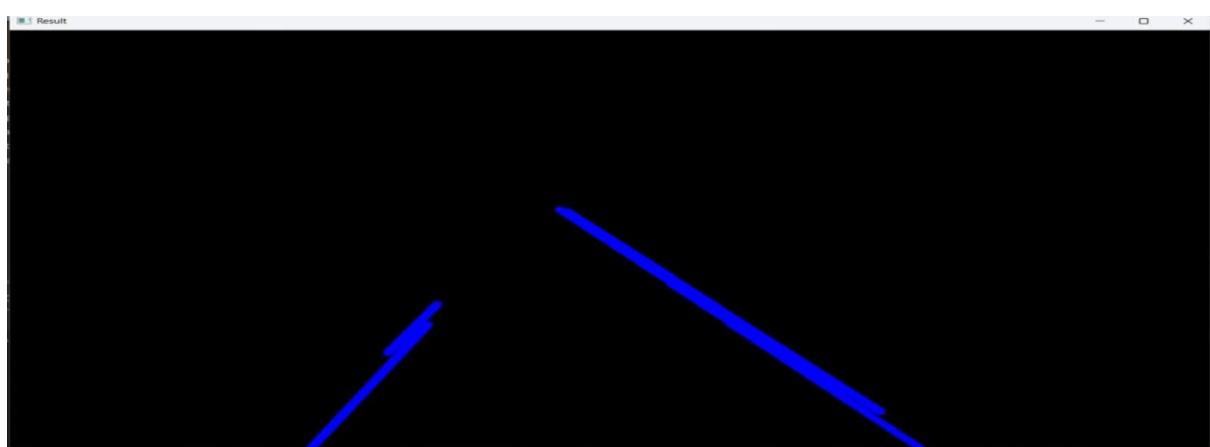
-This step effectively removes irrelevant edges outside the desired road area.



## 6. Line Detection (Probabilistic Hough Line Transform):

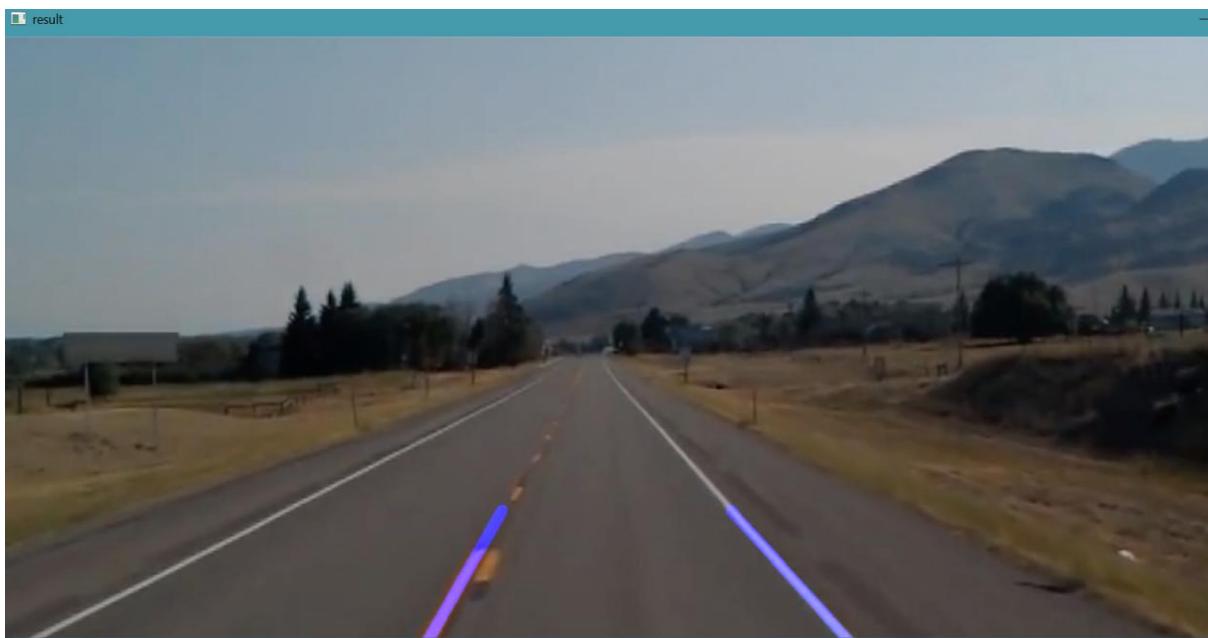
-The probabilistic Hough Line Transform is used to identify lines within the ROI.

-This efficient algorithm detects lines by transforming image space into parameter space and accumulating voting points-It's a probabilistic



## 7. Line Overlay:

-The detected lane lines are then overlaid onto the original video frames. This visual representation highlights the identified lane boundaries



## Conclusion:

We've implemented a practical lane detection algorithm using the Canny edge detector and Hough transform. While this differs from the advanced AI and sensor-driven systems in use by companies like Tesla, it illustrates core concepts. This is a stepping stone.