# COMPUTER VISION FOR AUTONOMOUS DRIVING

Intro

# Project Overview

This presentation delineates an approach to detect lanes on roads using advanced computer vision techniques. Our goal is to provide a detailed walkthrough of the methods employed from camera calibration to the final visual display of lane boundaries and numerical estimation of lane curvature and vehicle position.

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Chapter 1

# Camera Calibration

The dataset was calibrated using the chessboard images.

Steps involved:

- Convert to grayscale
- Find chessboard corners with OpenCV's findChessboardCorners() function, assuming a 9x6 board

After the above steps were executed for all calibration images, OpenCV's calibrateCamera() function was used to calculate the distortion matrices. Using the distortion matrices, images were made distortion-free using OpenCV's undistort() function.

Chapter 2

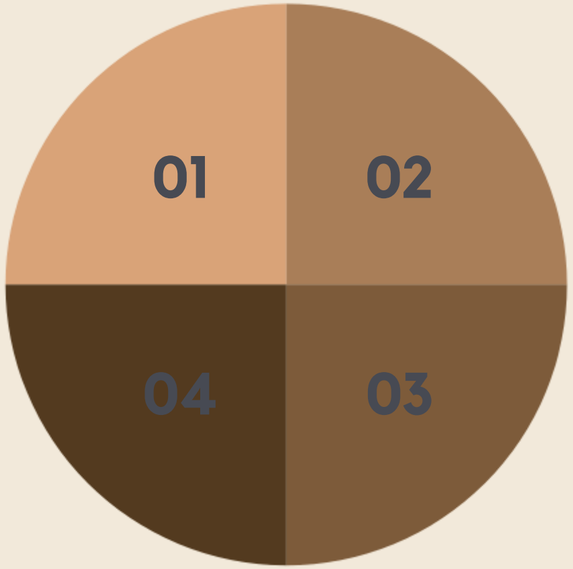
# Pipeline

## Undistort Image

Using camera calibration matrices, undistort the input image to correct distortions.

## Polynomial Fit

Fit a second order polynomial to both left and right lane lines based on detected pixels.




## Thresholded Binary Image

Apply multiple filters and thresholding to create a binary image highlighting potential lane lines.

## Perspective Transform

Transform the binary image to a bird's eye view, facilitating the fitting of a curved line to lane lines.

Chapter 3

# Enhancement & Performance

### Temporal Correlation

Using previous video frames to enhance detection accuracy and speed using a quick search method and smoothening polynomial fit parameters.

### Radius of Curvature & Vehicle Offset

Calculating the lane's curvature and vehicle's position relative to the lane center, improving the detector's accuracy for real-world applications.

Chapter 4

# Demo & Discussion

The culmination of the lane detection process involves annotating the original image with the detected lane area. This includes drawing estimated lane lines, filling the lane area, unwarping the image to align with the original perspective, and overlaying annotations to display lane curvature and vehicle offset.

# References

We have examined 25 research papers to support our demonstration of findings for the autonomous driving car project.

# Conclusion

While this approach demonstrates the potential of computer vision in autonomous driving, challenges remain, particularly in scenarios with road anomalies or other vehicles that could interfere with detection. Further enhancements are anticipated, such as deep-learning-based semantic segmentation, to improve the robustness and reliability of the lane detector.