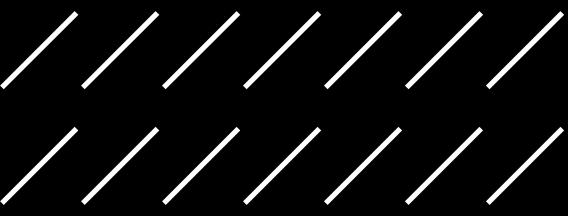




SYNTH VISION - FOG

Team LogicCrafters

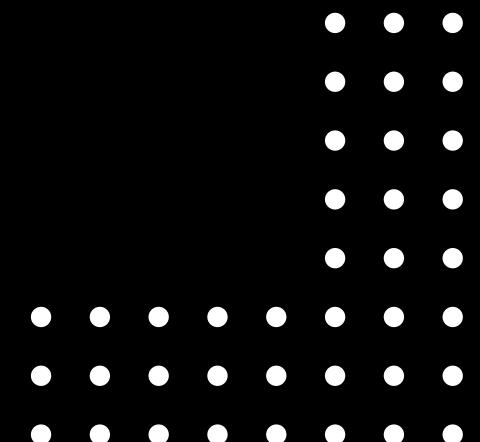


SOURCE

We have used BDD100k: A large-scale Diverse Driving Image Database, designed for Computer Vision and self driving research.

Resolution: ~1280 x 720

Provides object detection, multiple object classification, and annotation



PROBLEM WE'RE SOLVING

INTEGRATING FOG TO THE IMAGES

We are using BDD dataset with open-cv library to create noise data on the top layer of the image as fog

FINAL IMAGE = CLEAR IMAGE (BDD) + FOG LAYER (SYNTHETIC)

GENERATE OBJECT DETECTION

PIPELINE

1

INPUT & PREPROCESSING:

load the clear BDD image and normalize to [0,1].

2

FOG MAP CONSTRUCTION:

Create depth map + edge map + smooth noise, then combine them into a single fog-intensity map

3

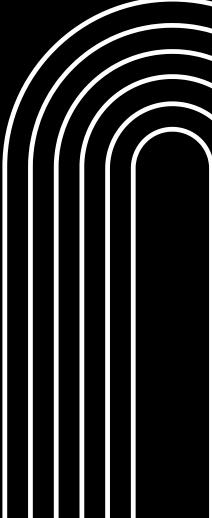
ATMOSPHERIC SCATTERING MODEL:

Compute transmission map and blend image with atmospheric light A to simulate visibility loss

4

SPATIAL BLUR & OUTPUT:

Apply distance-based Gaussian blur (and glow for high fog) and save as low/medium/high fog images



OUR APPROACH

Layered Fog Modelling

$$\text{Foggy Image} = I(x) \cdot t(x) + A \cdot (1 - t(x))$$

Where:

- $I(x)$ = original clear image
 - $t(x)$ = transmission map (visibility at each pixel)
 - A = atmospheric light (sky brightness)

Depth aware Fog Distribution:

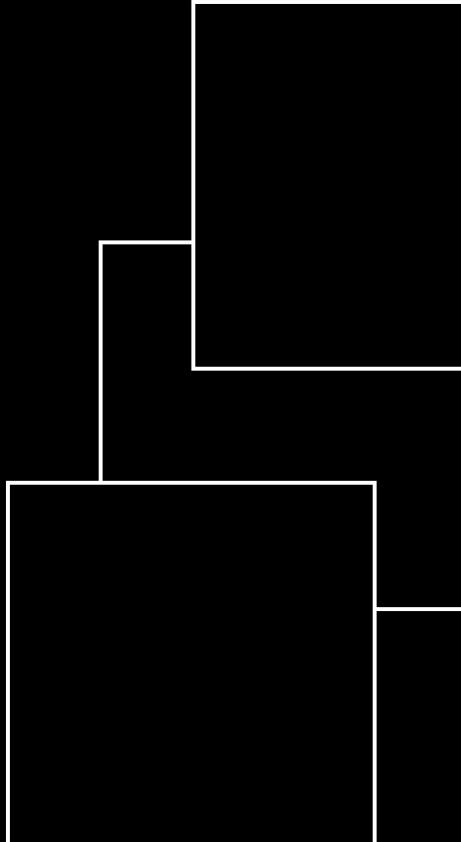
```
y = np.linspace(1, 0, h)  
depth = np.tile(y[:, None], (1, w))
```

Edge-Aware Haze Effect:

```
x = np.linspace(-1, 1, w)  
edge = np.abs(x)
```

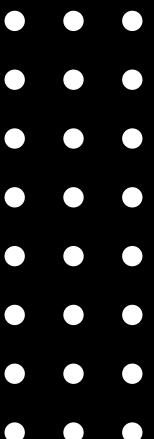
Stochastic (Random) But Controlled Noise

```
noise =  
cv2.GaussianBlur(np.random.rand(h,  
w), (101,101), 0)
```



Intensity Control via Three Modes

Mode	Beta (scattering)	A_val (sky brightness)	Effect
Low	small	lower	mild haze
Medium	moderate	medium	realistic fog
High	large	high	dense fog + glow





OUR ACHIEVEMENTS

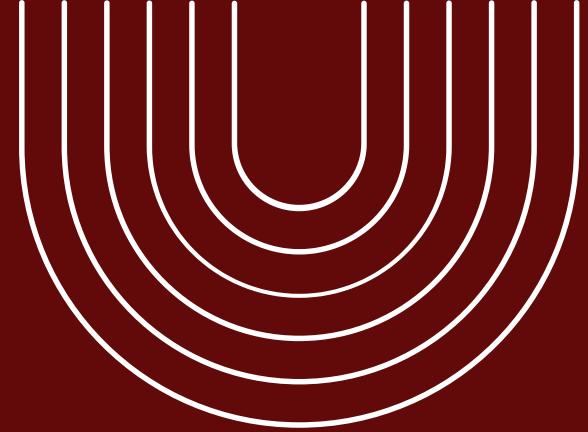
Successful FOG simulation on the images:

- We successfully generated synthetic foggy images from clear BDD100K images using OpenCV.
- The fog is not random noise but follows parameters mentioned in problem statement.

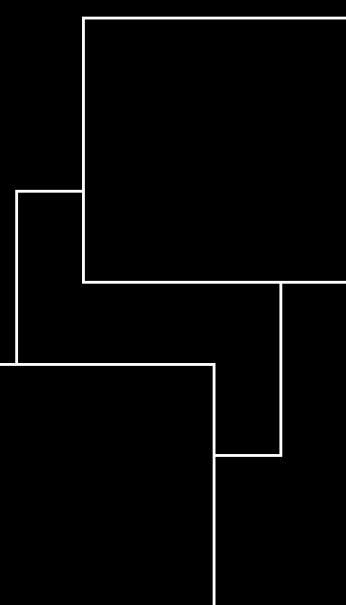
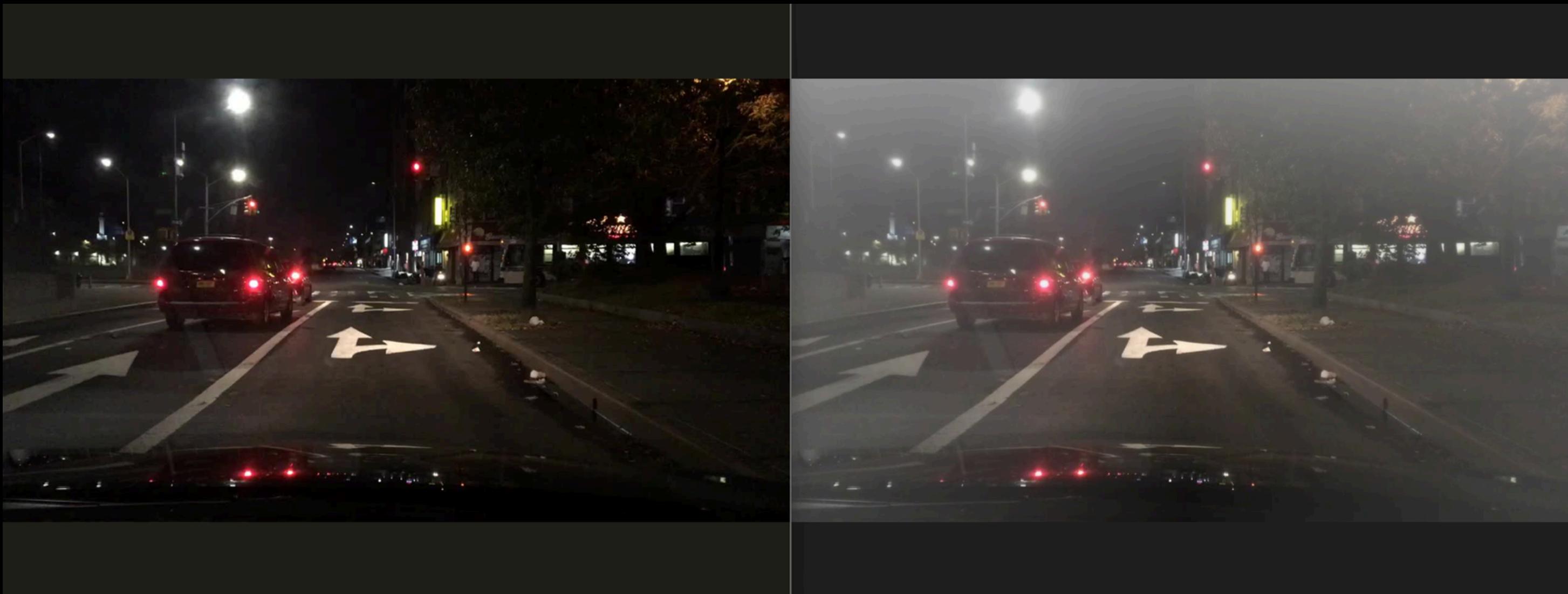
Generation of Multiple Fog Intensities:

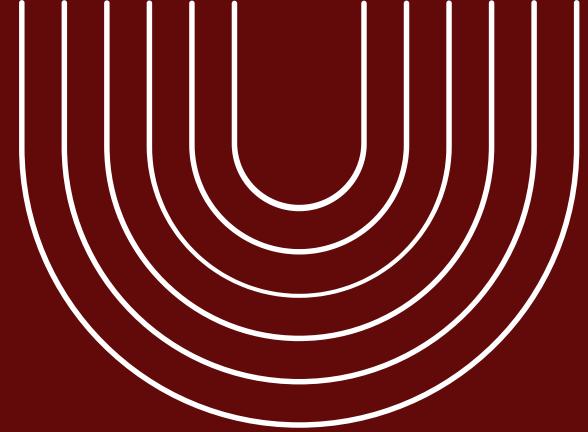
We created three controlled weather conditions from the same dataset:

- Low fog → mild visibility reduction
- Medium fog → balanced degradation
- High fog → heavy haze with glow and blur

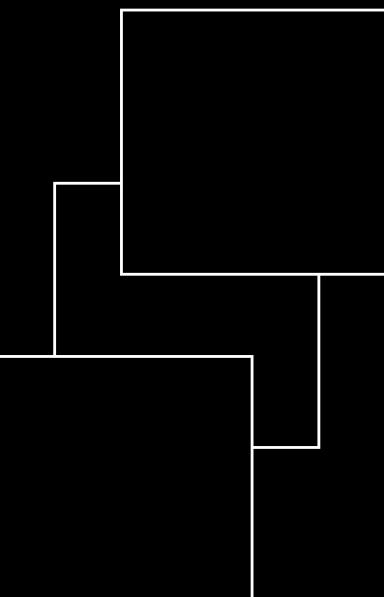


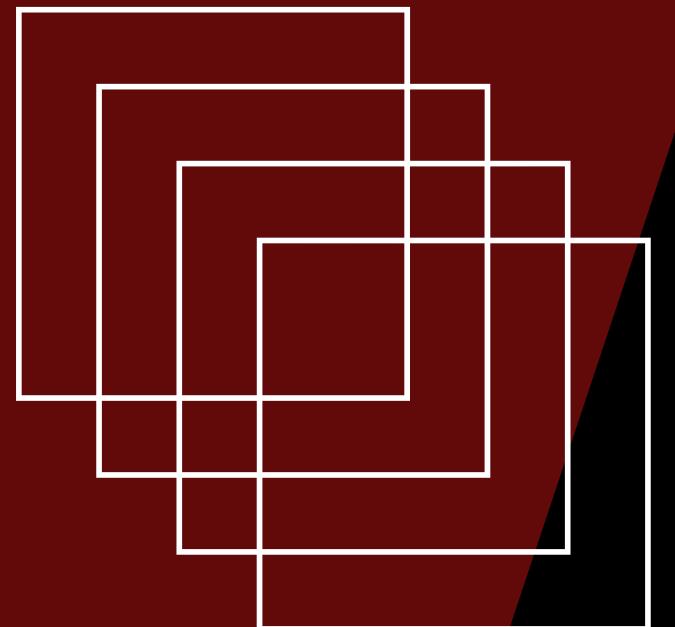
CLEAR IMAGE VS SYNTHETIC FOG IMAGE





ANNOTATED FOG OUTPUT





THANK YOU

