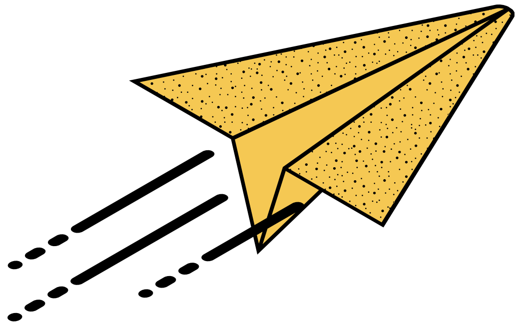
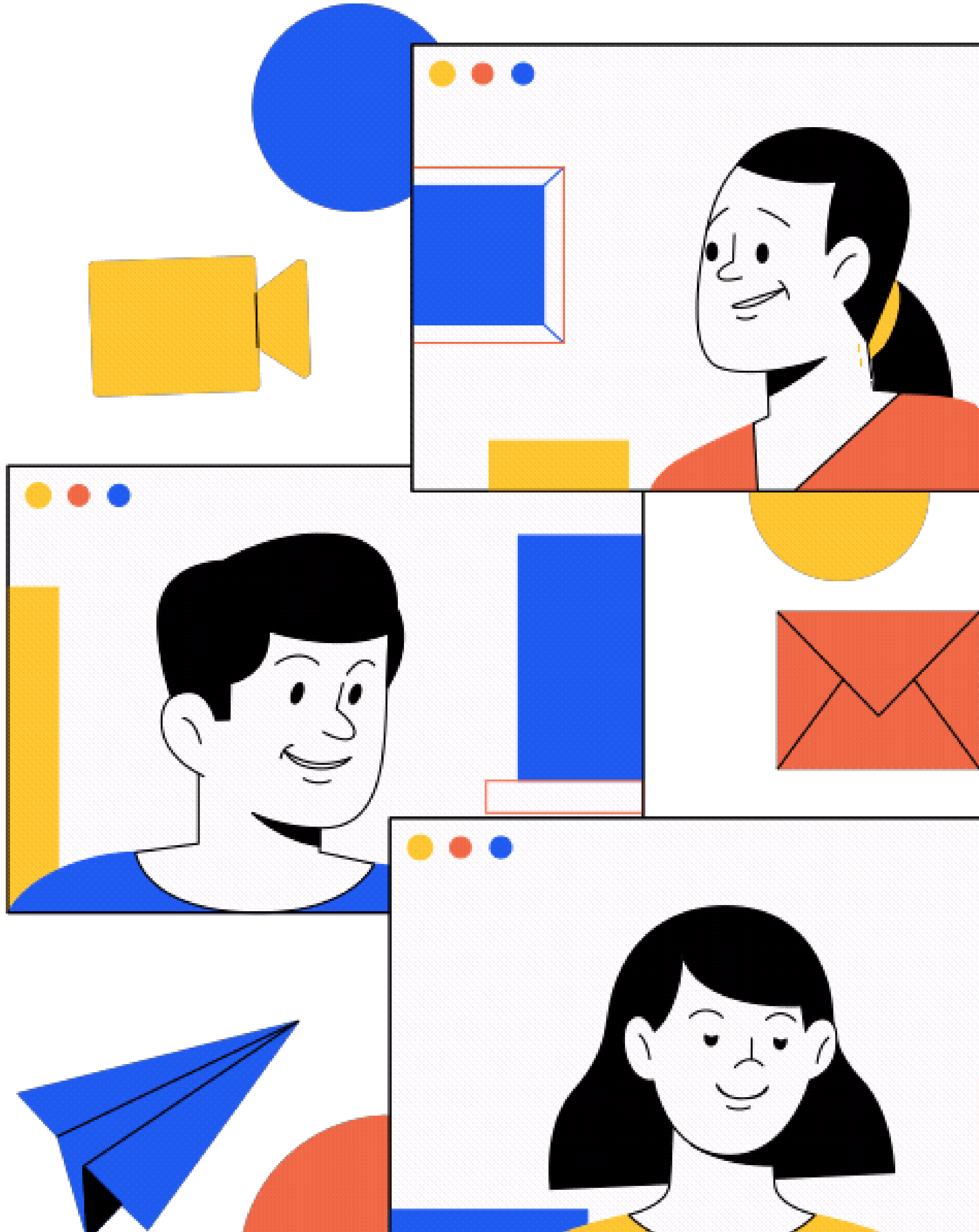
Anamika, Dhruv, Gayatri



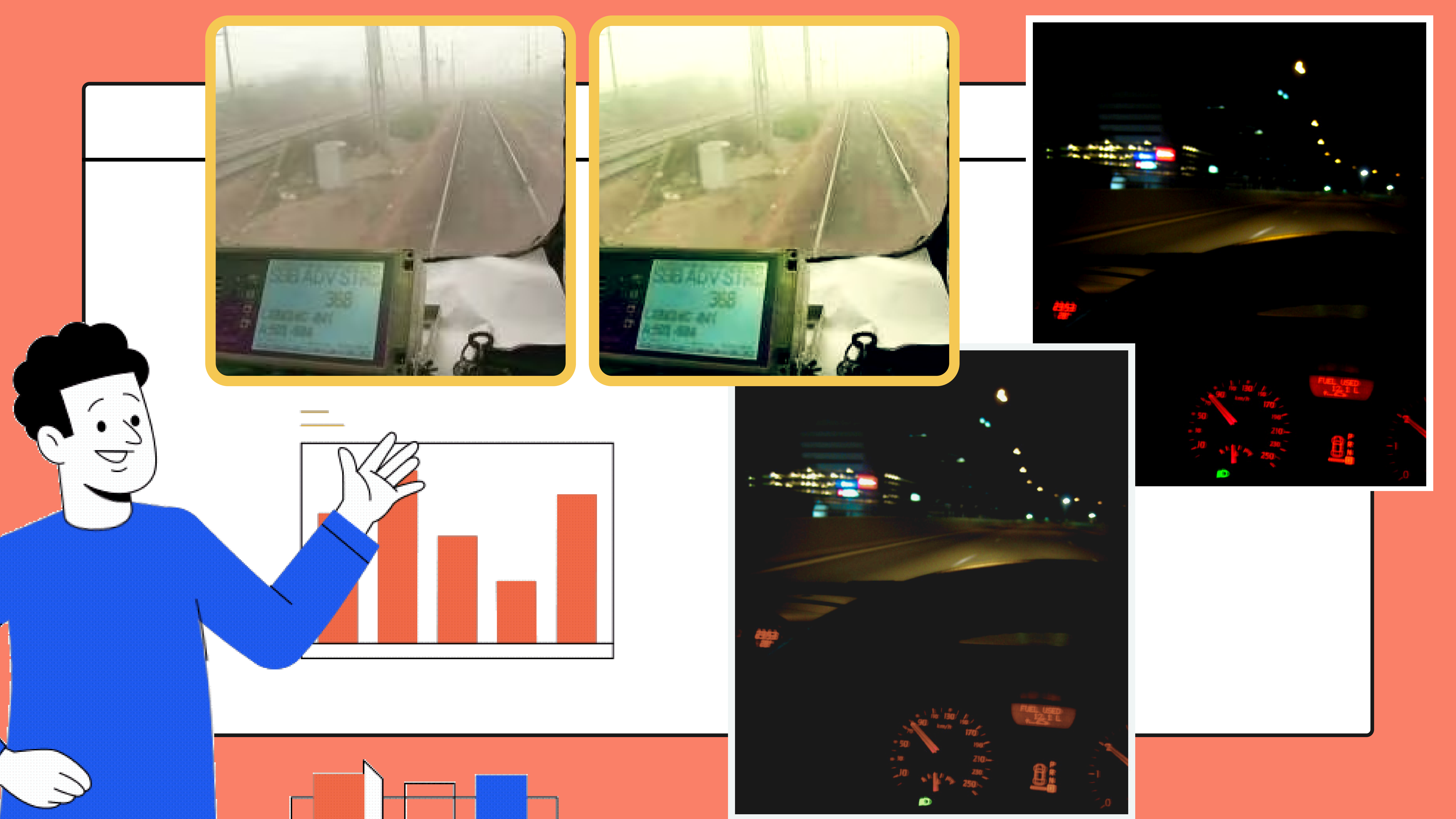
TEAM HACKAHOLICS

on the track of open innovation



PROBLEM STATEMENT

Locomotive pilots, vehicle drivers encounter safety hazards due to poor visibility caused by fog, haze, and low-light conditions during rail operations and driving.



OUR SOLUTION

SAFEFRAME technologies

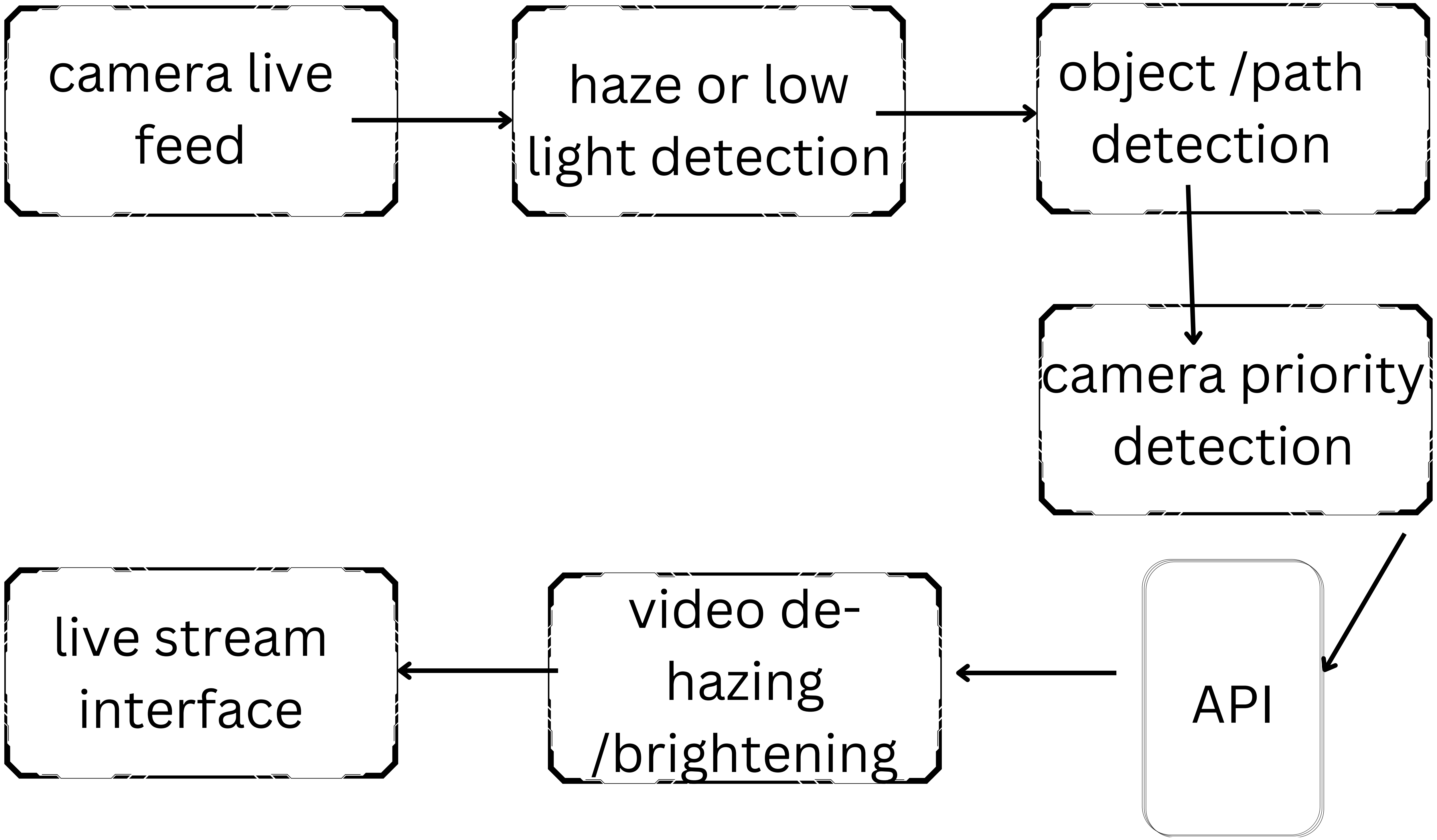
efficient and real-time image amd video processing solution to mitigate these challenges, ensuring the safety of loco pilots and drivers by enhancing visibility in adverse weather and low-light environments, ultimately improving the reliability

SAFEFRAME

CLEAR VIEW

Navigate with Confidence

working


camera live feed
haze or low light detection
object /path detection
camera priority detection
API
video de-hazing /brightening
live stream interface

Dark Channel Prior (DCP)

The DCP is a powerful prior derived from the characteristic of natural outdoor images. It exploits the fact that in most outdoor scenes, there exists at least one color channel (usually the blue channel) where the intensity value within a local window is close to zero. The DCP helps estimate the transmission (which represents the degree of haze) in an image. By assuming that the dark channel of a hazy image is related to the transmission, we can use it as a guide to enhance visibility. The dark channel is computed as follows: For each pixel, find the minimum intensity value across all color channels within a local window (e.g., a 3x3 or 5x5 window). The resulting dark channel image highlights areas with haze or low visibility.

Atmospheric Light

The atmospheric light represents the intensity of light coming from the sun or other light sources in the scene. It is a critical parameter for dehazing. To estimate the atmospheric light, we exploit the DCP. Specifically, we look for the brightest pixels in the dark channel. These bright pixels correspond to areas where the haze is minimal (e.g., sky regions). The atmospheric light is estimated as the maximum intensity value among these bright pixels.

Transmission Map

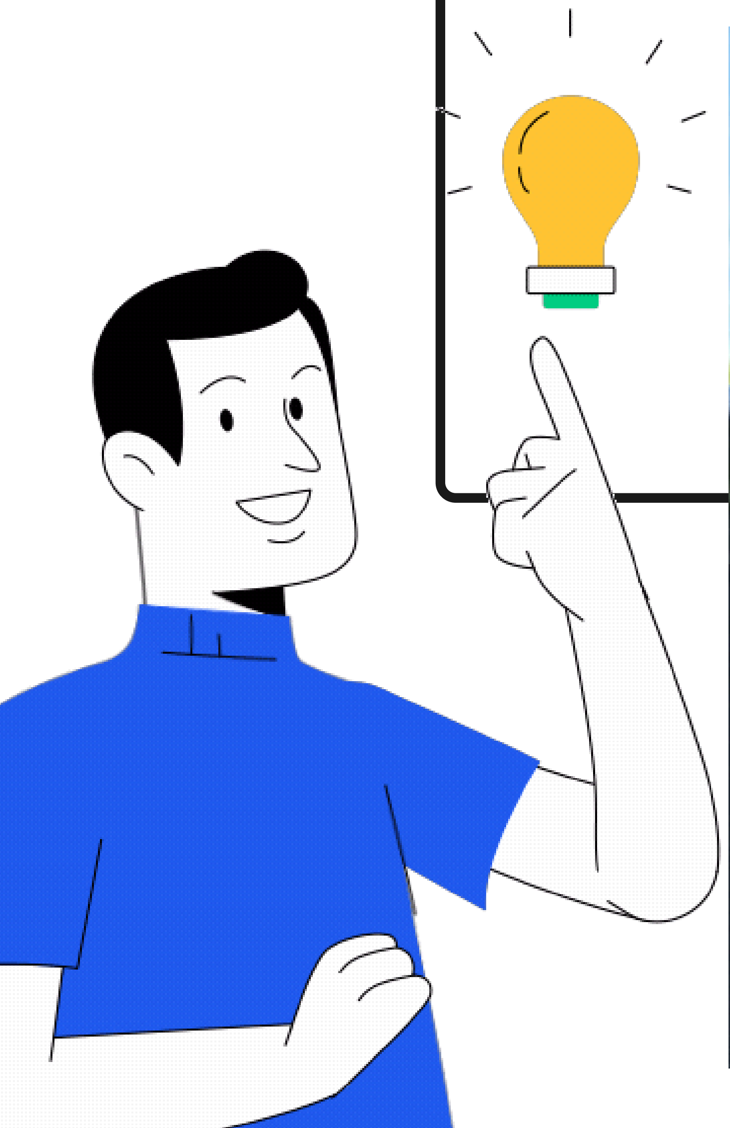
We estimate the transmission using the following equation: [t(x) = 1 - \omega \min(\text{dark channel}(x) / A, 1)] (t(x)) represents the transmission at pixel (x). (\text{dark channel}(x)) is the dark channel value at pixel (x). (A) is the estimated atmospheric light. (\omega) is a constant (usually set to a small value) to avoid division by zero. The transmission map ranges from 0 (fully opaque due to haze) to 1 (completely transparent).

Dehazing Process

Transmission Refinement: The initial transmission map may contain artifacts. We refine it using techniques like guided filtering or bilateral filtering. Scene Radiance Estimation: We compute the scene radiance (haze-free image) using the following equation: [J(x) = \frac{I(x) - A}{\max(t(x), t_{\text{min}})} + A] (I(x)) is the observed hazy image. (t_{\text{min}}) is a small positive value to prevent division by zero. The dehazed image (J(x)) is obtained by combining the scene radiance with the atmospheric light.

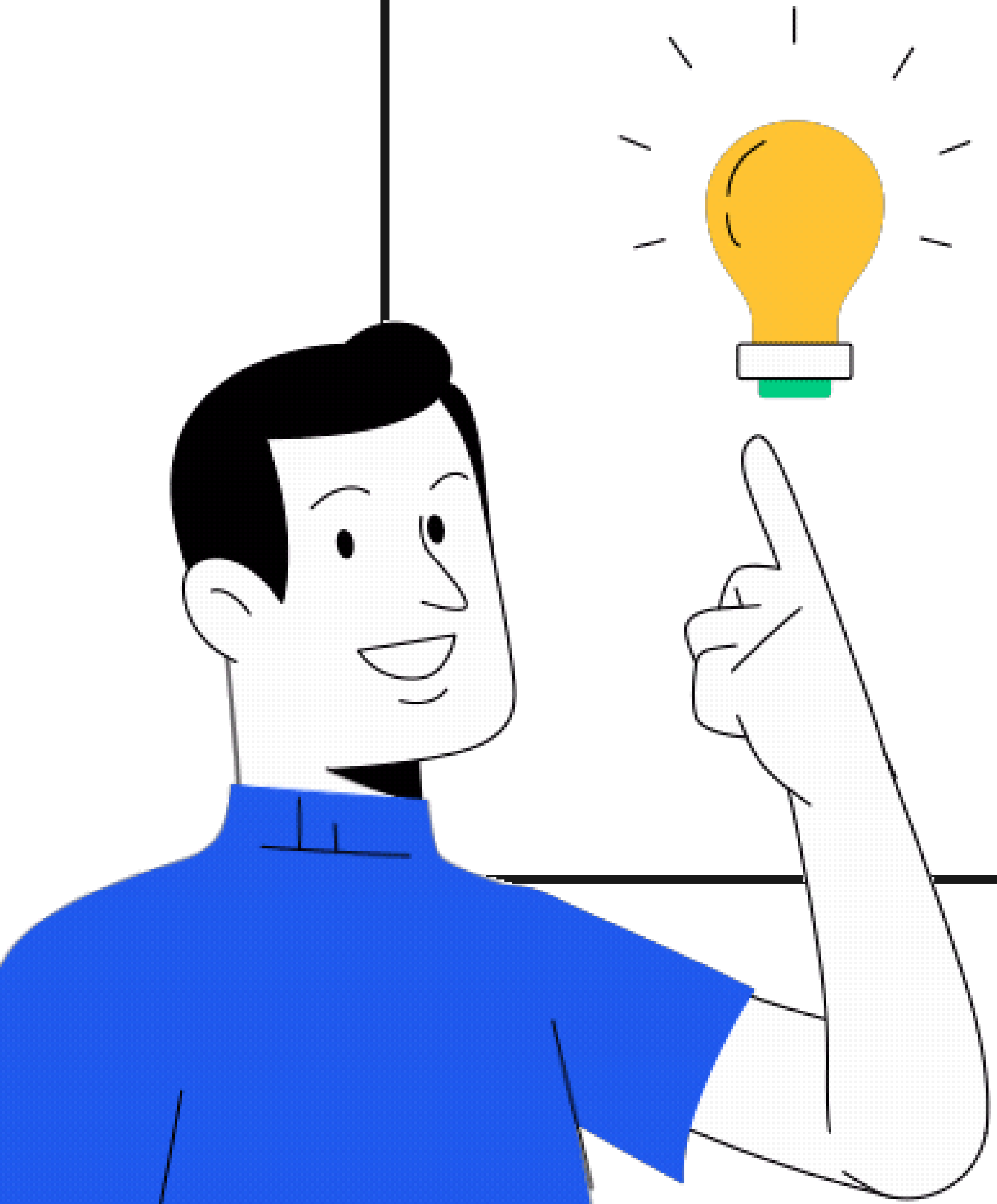
FUTURE PROGRESSION

linking safeframe app with google maps to track the path and provide clear view simultaneously on a surface tab



PROTOTYPE

we have created this prototype on proto.io to show how the final application will look like after including the future progressions too



link to proto.io

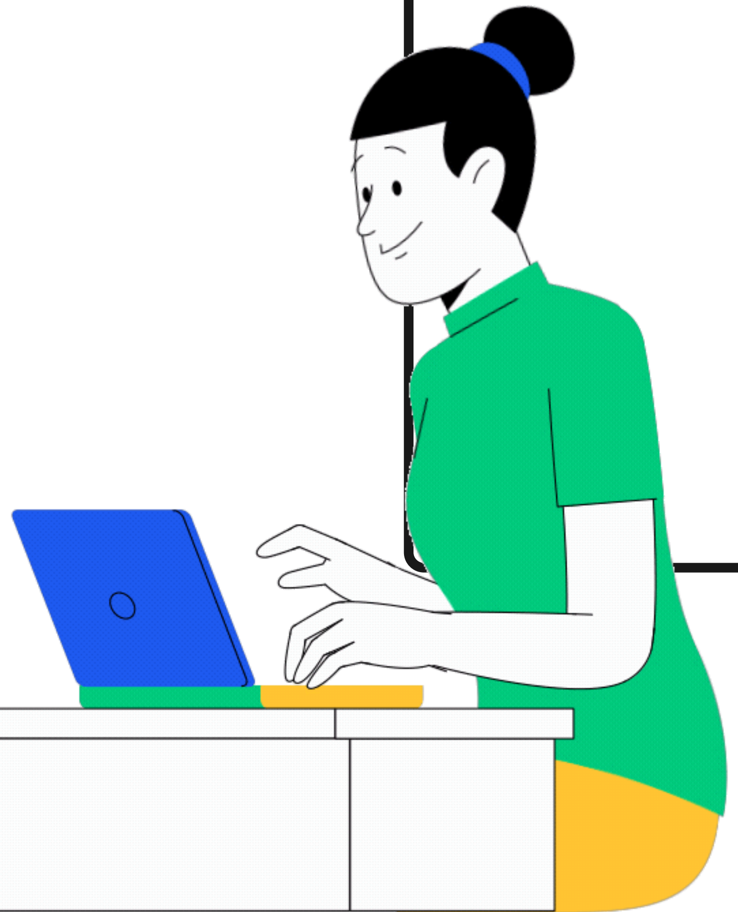
TECH STACKS

Tensorflow python jupyter colab

keras Proto.io

OpenCV

streamlit

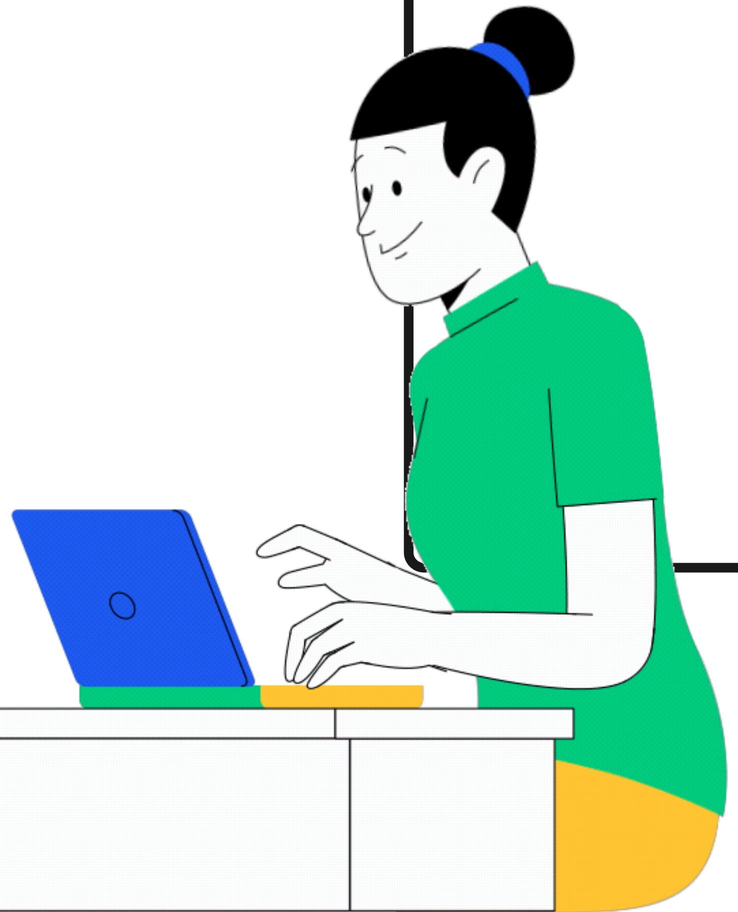


Dataset used for the machine learning model

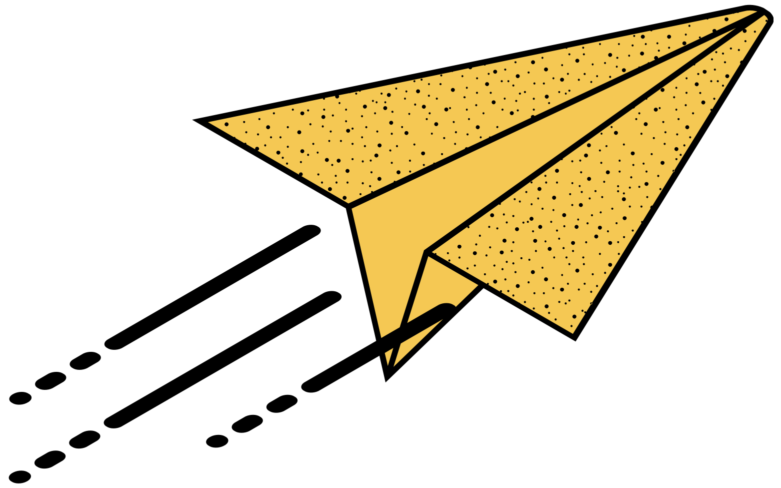
project backend ML

CHALLENGES

the remaining challenge includes to train the model on live videos .



Dataset used for the machine learning model



THANK YOU!