ADVANCED OBJECT IDENTIFICATION IN IMAGES

Solution By

Team

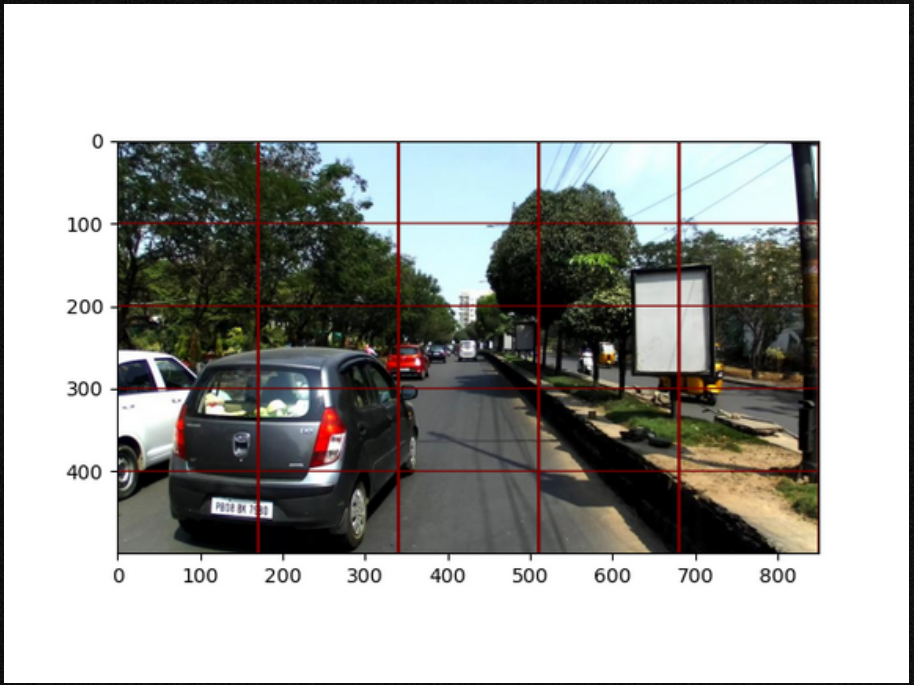
CODERS++

Gayatri Vidya Parishad College of Engineering(A)

Visakhapatnam

OBJECTIVE

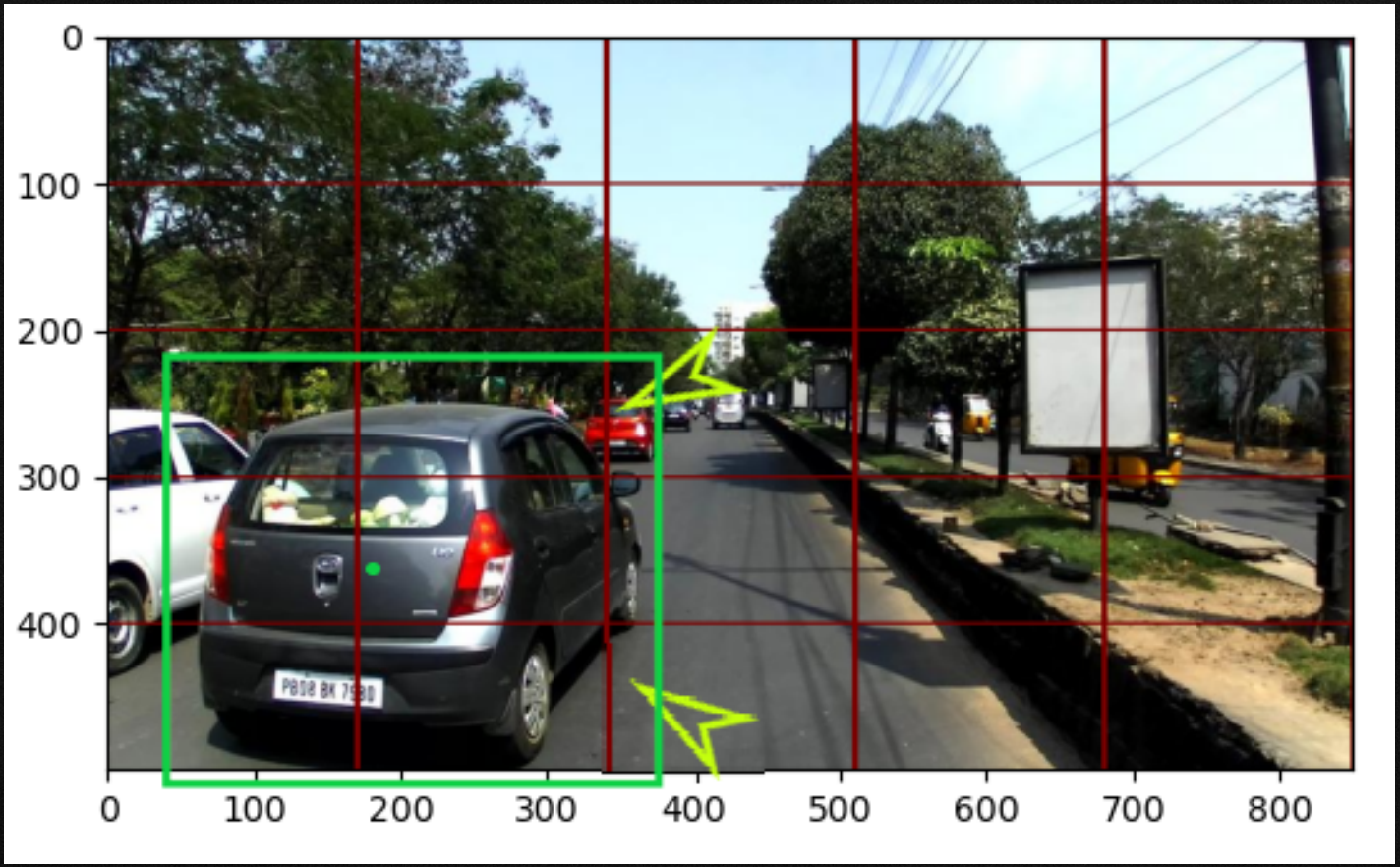
- The primary objective of this problem statement is to accurately identify objects spread out across a grid of images
- Detect the required objects even when the objects to be identified are obscured or partially visible.



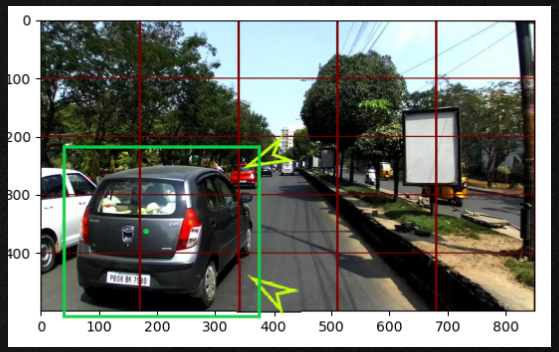
EXISTING WORK

YOLO

This was considered but not chosen because of residual boxes making the object detection difficult in the grid

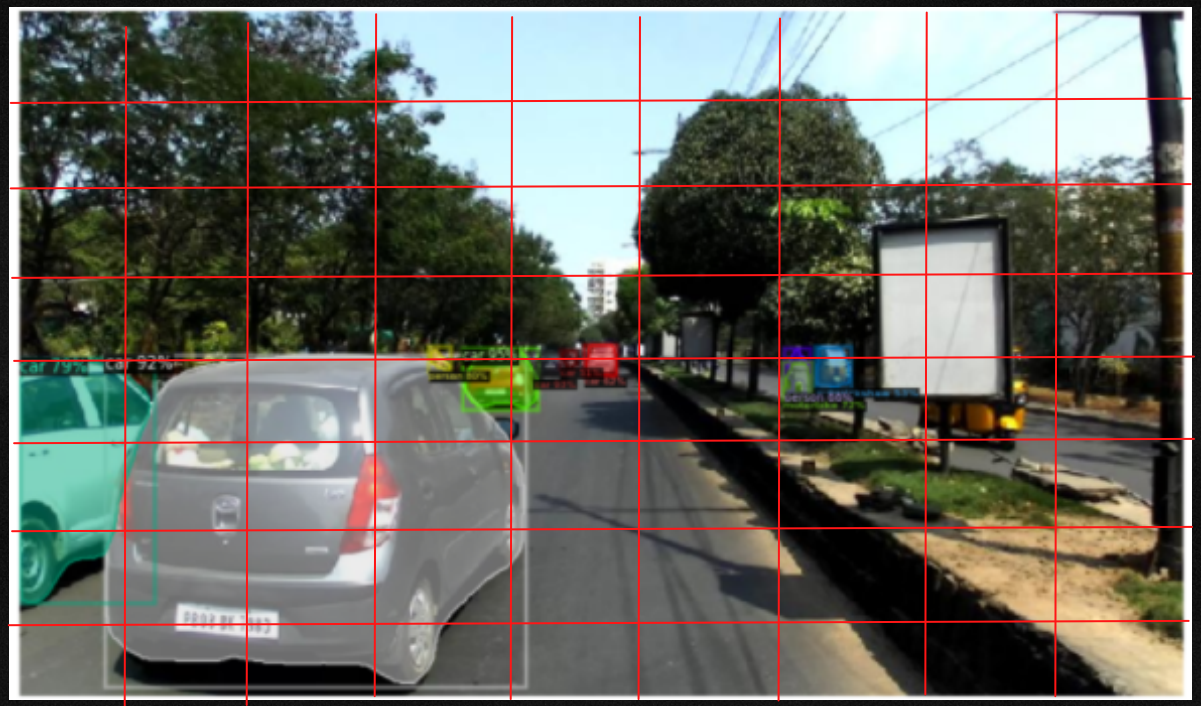


PROPOSED METHOD



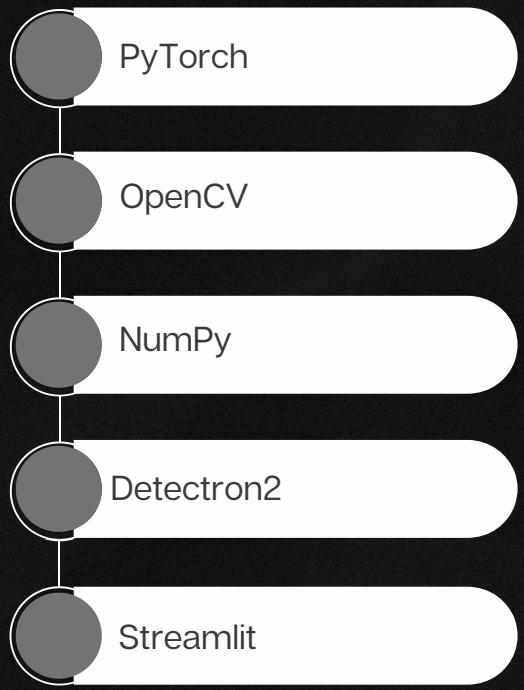
The problem faced with YOLO algorithm can be solved by using Instance Segmentation

Instance Segmentation masks the required objects in the image which can be easily detected



Instance Segmentation

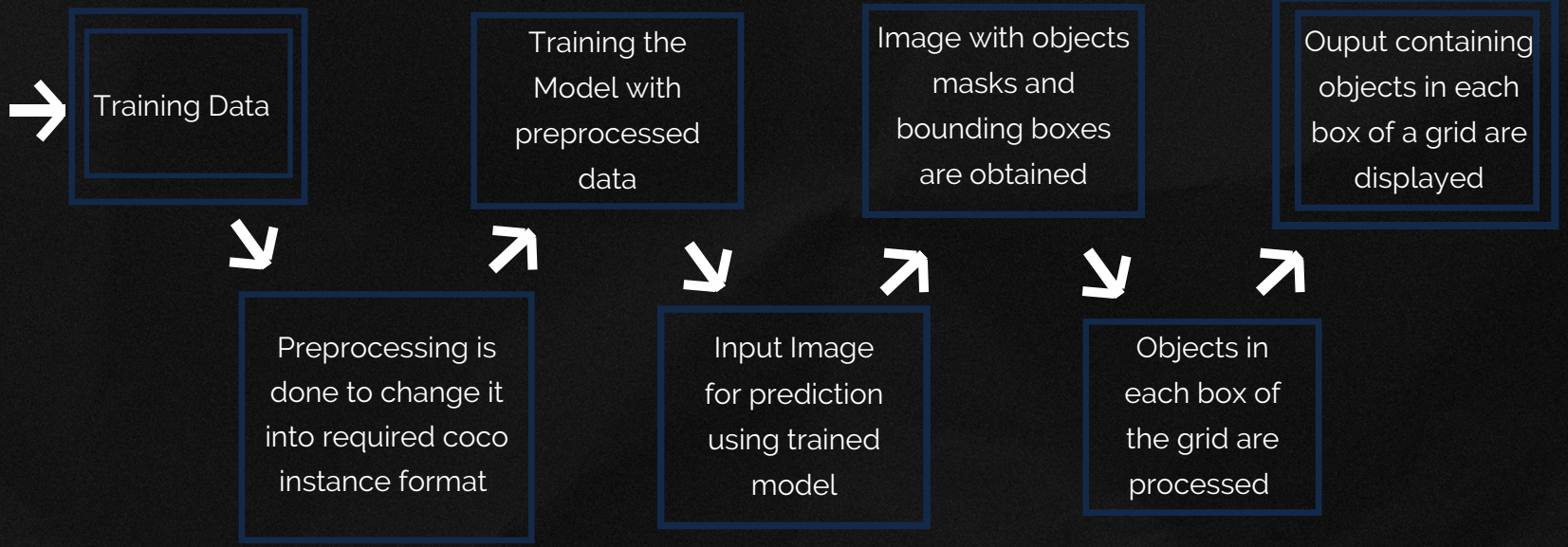
TECH STACK



APPROACH

- Implementing the Mask-RCNN model with ResNet50 architecture as backbone and with PyTorch framework.
- The model is trained our with the dataset from Intel IDD and customized it for the required classes.
- To increase the accuracy model is developed by merging our data and the COCO instance segmentation format .
- The trained model is able to detect obscured objects.
- The image with masked objects and their respective bounding boxes is obtained after predicting with the trained model and is then divided into a grid.
- Object selected by the user is detected in boxes of the grid is displayed as output.

FLOW OF MODEL



PREDICTION USING DEVELOPED MODEL

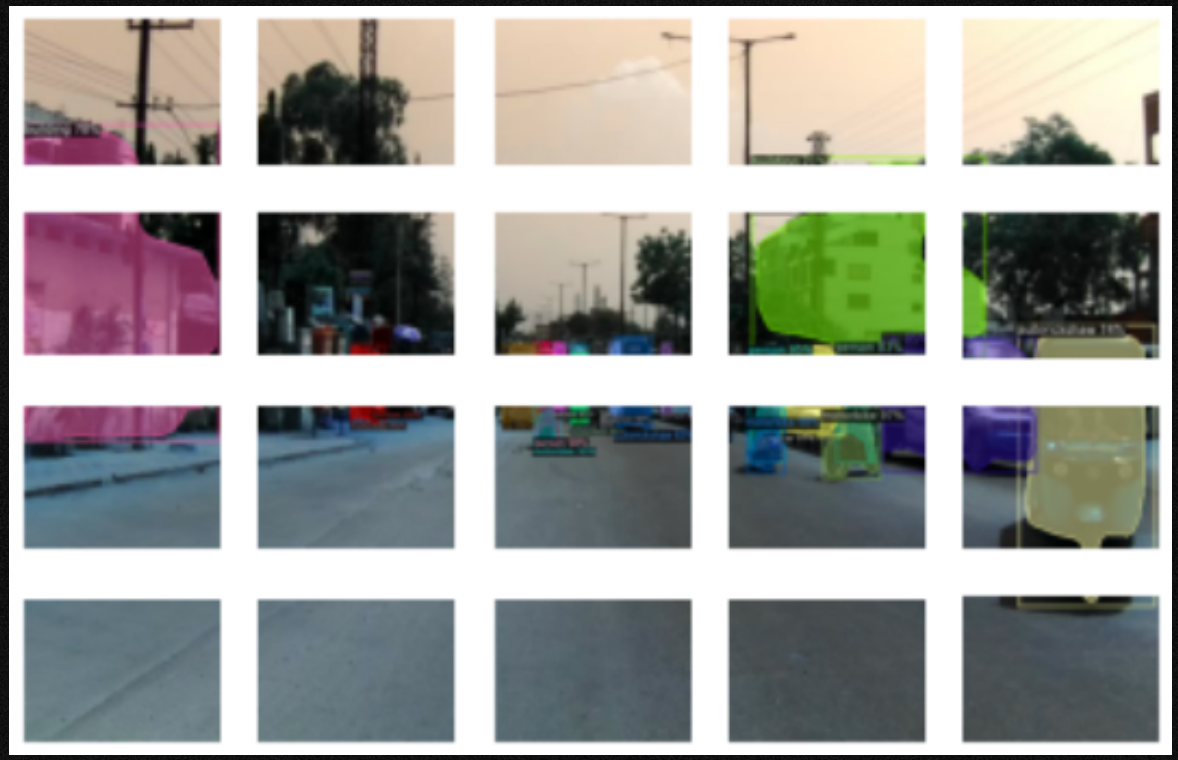
Image given as input to the model

Output Containing object masks and respective bounding boxes

PREDICTION USING DEVELOPED MODEL

Image Containing object masks

Image divided into a grid



PREDICTION USING DEVELOPED MODEL

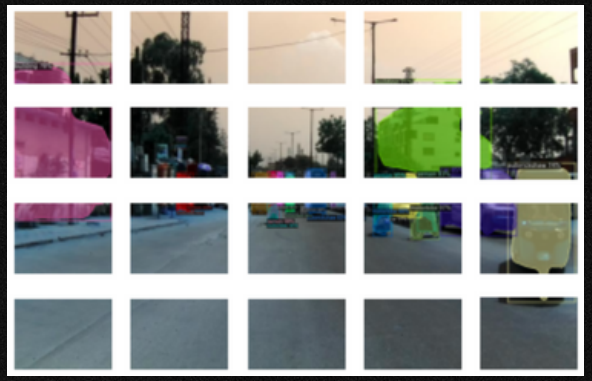
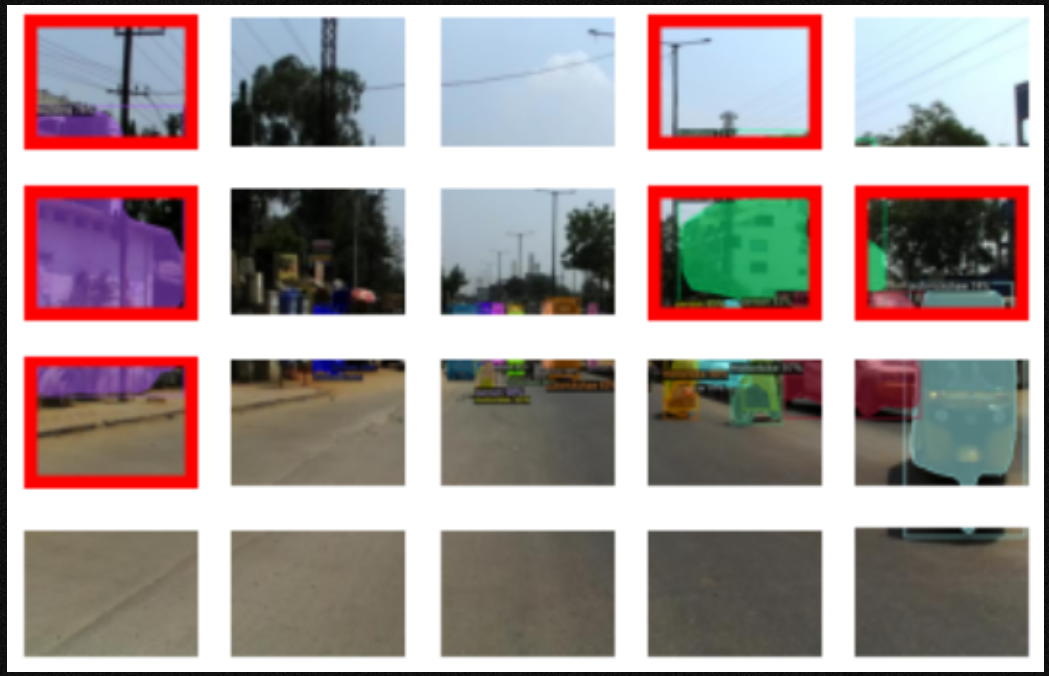


Image divided into a grid

enter object: building



Boxes containing the objects of chosen class are highlighted in the final output

IMPLEMENTED DEVELOPMENTS

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i) Working with low resolution images

- Trained model is able to detect the objects even for low resolution images.
- To improve the results, we have used two preprocessing techniques to upscale the image
  1) Upscaling the dimensions of the image by a factor of 2
  2) Upscaling the image using EDSR x2 (Enhanced Deep Super-Resolution Network) model from OpenCV library.
- Both the techniques got improved results compared to the result obtained from prediction on actual low resolution image.
- Preprocessing done using EDSR x2 have given best results among the others

IMPLEMENTED DEVELOPMENTS

i) Working with low resolution images

Results

Shows result with First Preprocessing Technique

Shows result with second Preprocessing Technique

IMPLEMENTED DEVELOPMENTS

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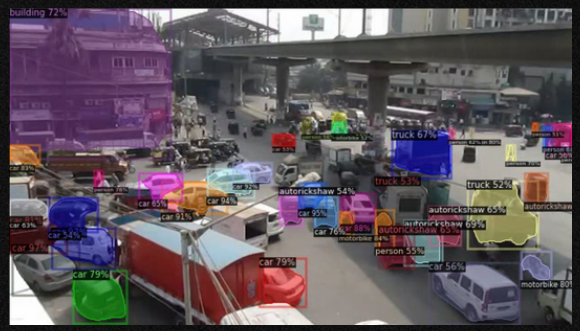
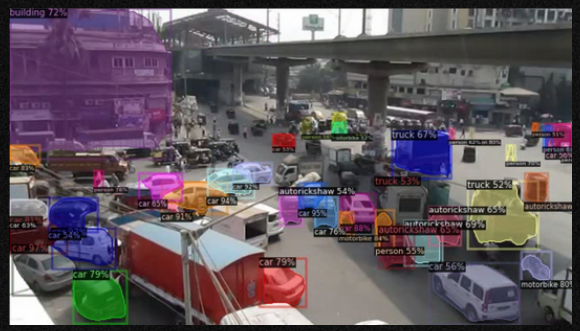
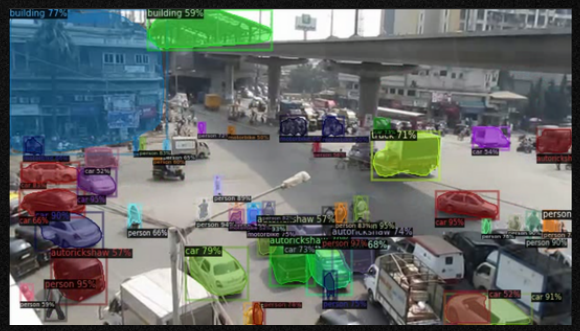
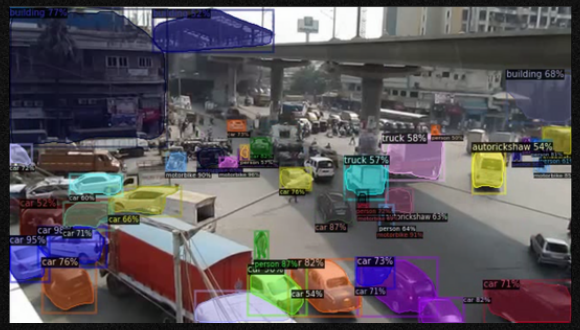
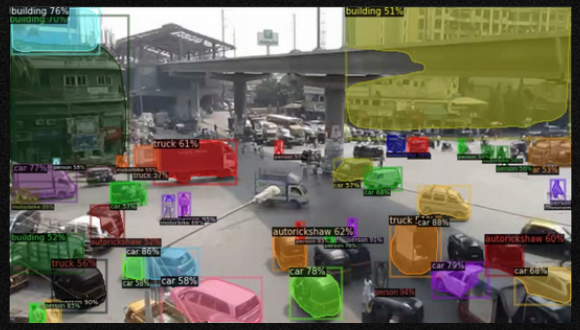
ii) Working with real time input

- Trained model is able to detect the objects in a video.
- This is achieved by dividing the video into number of frames and taking those frames as input for the prediction using the model
- FPS (Frames per Second) rate of the input video is altered accordingly to decrease the time taken to detect the objects in that video

IMPLEMENTED DEVELOPMENTS

ii) Working with real time input

Results


DEMONSTRATION OF THE MODEL WITH UI

- The model is demonstrated with help of the User Interface developed with Streamlit Library

Image can be uploaded

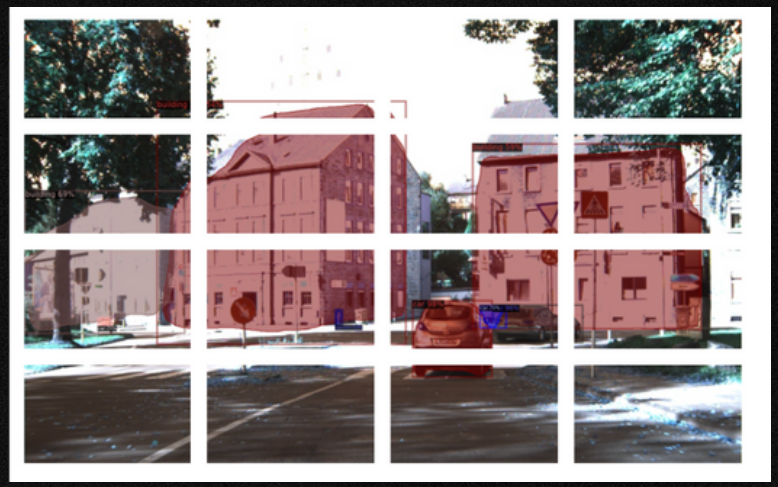
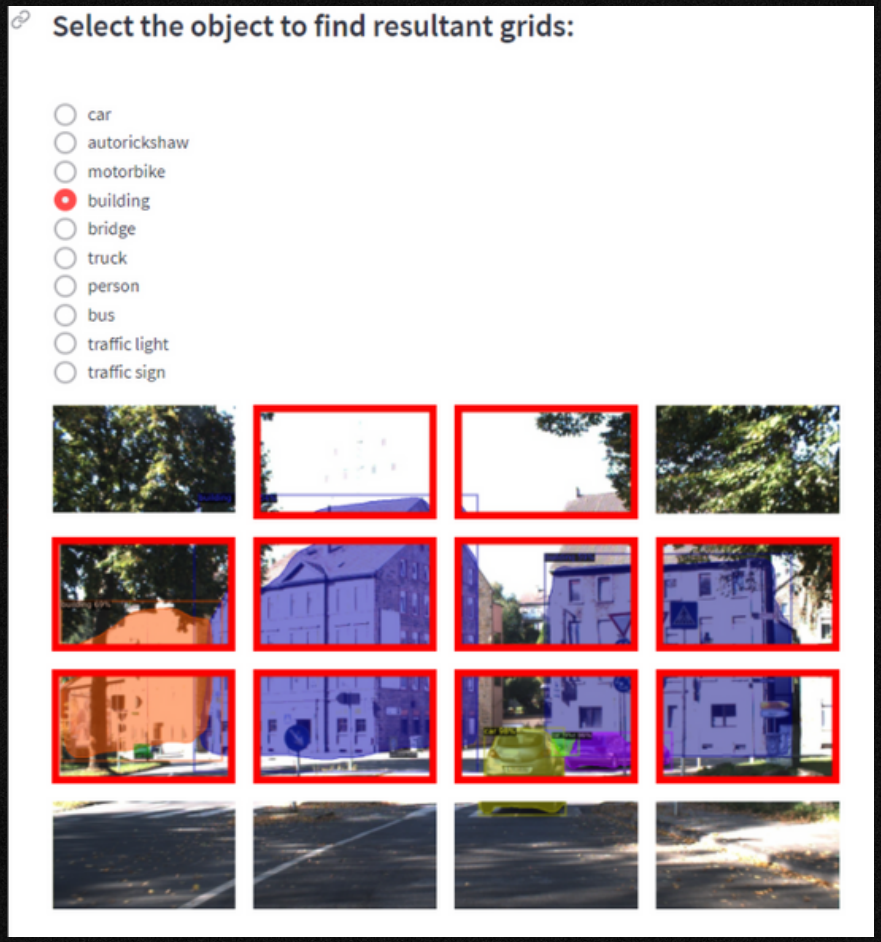


Image is divided to grids is displayed

DEMONSTRATION OF THE MODEL WITH UI



User can select the object to Detect in the image

Boxes containing the selected objects are highlighted

FEATURES OF THE MODEL

- **Scalability** - Easy to retrain the model adding other classes in the dataset to detect others objects
- **Dynamic** - Grid dimensions can be taken from the user prior to division of the image into a grid
- **Low Resolution Inputs** - Trained model is giving the desired results on low resolution inputs preprocessed using EDSR x2 model
- **Real Time Application** - The model is giving good results when tested on the video (10 FPS). So it can be applied for traffic congestion detection.
- **Portable** - This model can be used for transfer learning
- **Wide range of applications** - This model has wide scope of applications when trained using the data annotated for different classes

TEAM MEMBERS

Dr D N D Harini
hod_cse@gvpce.ac.in
Team Mentor

Gandikota Sasi Sekhar
gandikotasasia1@gmail.com
Team Leader

Karusodi Uday Kiran
udayjyo02@gmail.com
Team Member

Gembali Sai Santosh Abhinav
gembaliabhinav@gmail.com
Team Member

Boyina Sai Prasanna
saiprasanna.boyina@gmail.com
Team Member

Angara Sampath Kumar
sampathangara123@gmail.com
Team Member

COLLEGE OF ENGINEERING
(Autonomous)

THANK YOU