1.

## Automated Road Damage Detection for Infrastructure Maintenance

Manual inspection of road conditions is a time-consuming and labor-intensive task, leading to delays in identifying and repairing damaged roads. The goal is to develop a classification model capable of automatically detecting and categorizing road damage from images (captured through CC cameras,phone,etc.), in order to make the maintenance process efficient. The infrastructure management is enhanced by reducing the reliance on manual inspections and enabling timely and targeted repairs to ensure safe and well-maintained road networks.

**Objective:**

- The dataset has images of roads with background. The model should involve object detection to capture only roads (using YOLO or R-CNN or their combination,etc.), followed by classifying the damaged roads.

**Brownie points:**

- Deploy the model (using Firebase)
- View real-time road damage alerts generated by the model.

**Evaluation Metric:** Intersection over Union (IoU)

**References**:

- https://towardsdatascience.com/r-cnn-fast-r-cnn-faster-r-cnn-yolo-object-detection-algorithms-36d53571365e
- https://pyimagesearch.com/2017/09/11/object-detection-with-deep-learning-and-opencv/
- https://ieeexplore.ieee.org/document/10155434

**Dataset links:**

The dataset has images of roads of different countries. The labels are present in annotations as:

D00: Longitudinal Crack, D10: Transverse Crack, D20: Alligator Crack, D40: Pothole

- https://bigdatacup.s3.ap-northeast-1.amazonaws.com/2022/CRDDC2022/RDD2022/Country_Specific_Data_CRDDC2022/RDD2022_Japan.zip
- https://bigdatacup.s3.ap-northeast-1.amazonaws.com/2022/CRDDC2022/RDD2022/Country_Specific_Data_CRDDC2022/RDD2022_India.zip

- https://bigdatacup.s3.ap-northeast-1.amazonaws.com/2022/CRDDC2022/RDD2022/Country_Specific_Data_CRDDC2022/RDD2022_Czech.zip

# 2. Explainable Sexual Harassment Categorization

As sexual harassment becomes more visible, a growing number of courageous victims are stepping forward to tell their stories through online platforms and media outlets. Online platforms offer a powerful tool for raising awareness about sexual harassment, but the current process is often cumbersome for both the readers and victims. Victims often need to manually report these incidents by detailing the occurrences and filling out multiple forms. Readers face an information overload trying to decipher detailed narratives, making it difficult to grasp the nature and severity of incidents quickly. Also, existing methods for processing reports may not effectively categorise and prioritise incidents based on their severity, hindering timely and targeted interventions.

**Objective**

- The main task is to develop a model that categorises various forms of sexual harassment shared on online forums, facilitating a faster response and action by authorities and concerned organisations.
- Given the SafeCity dataset containing narratives of sexual harassment incidents shared on online forums, the model should categorise the various forms of harassment reported in the dataset.
- Implement explainable AI techniques like SHAP or LIME, offering insights into the features driving the model's categorisation decisions and evaluate them using the given evaluation metric.

**Brownie Points**

- The model should be capable of handling all types of textual reports (eg. incidents shared on Twitter, Instagram etc)
- Develop a visualisation module for visualising the key factors leading to particular forms of harassment based on the XAI results.

**Evaluation Metric**

- Hamming Score for the multi-classification model
- Identity, Separability, Similarity and Stability for the XAI model.

**References**

**XAI Evaluation Metrics**
Hamming Score
https://shap.readthedocs.io/en/latest/
https://github.com/marcotcr/lime
https://arxiv.org/pdf/1602.04938v1.pdf

**Dataset -**
https://github.com/swkarlekar/safecity/tree/master/multilabel_classification

## 3. Image Captioning for Remote Sensing Data

**Problem Statement:**
In the realm of computer vision and artificial intelligence, the Remote Sensing Image Captioning Dataset (RSICD) provides a unique challenge for participants to develop state-of-the-art models capable of generating accurate and descriptive captions for remote sensing images.The dataset consists of over 10,000 diverse remotely sensed images from satellites. This dataset presents a variety of scenarios and resolutions, all standardized to 224x224 pixels.. Each image comes with five sentences of descriptive captions, making it a robust foundation for training and evaluating image captioning models.

**Objective:**
Develop an image captioning model that can analyze and comprehend the content of remote sensing images, generating coherent and contextually relevant textual descriptions. The focus is on leveraging the RSICD dataset, with special attention to handling the unique characteristics of remote sensing images.

**Dataset :**
You can download the dataset here

**More about the Dataset :**
The dataset consists of three primary files: `train.csv`, `test.csv`, and `valid.csv`. These files contain information about image filenames and their respective captions. Each file includes multiple captions for each image to support diverse training techniques.

- **train.csv**: This file contains filenames (`filename` column) and their corresponding captions (`captions` column) for training your image captioning model.
- **test.csv**: The test set is included in this file, which contains a similar structure as that of `train.csv`. The purpose of this file is to evaluate your trained models on unseen data.
- **valid.csv**: This validation set provides images with their respective filenames (`filename`) and captions (`captions`). It allows you to fine-tune your models based on performance during evaluation.

**NOTE :** The images are provided in the form of byte-arrays and must first be converted into images before any further application of ML techniques.

**Evaluation Metric :**

The judging criteria for the competition is the BLEU score, which is used to evaluate the quality of the generated captions by comparing them to one or more reference captions

**Brownie Points :**

- Deploy your model as an interactive web-app
- You could choose to use a low-code python framework like Streamlit or Gradio
- You could also alternatively use an extensive framework like Django or Flask

**References -**

**https://github.com/openai/CLIP**
https://arxiv.org/abs/2103.00020