Identification and Classification of Corrosion Types: A Comprehensive Analysis.

1. **Dataset Description**
   Dataset : https://unhnewhaven-my.sharepoint.com/:f:/g/personal/vswar1_unh_newhaven_edu/EuRUHV4bpD1DncRghBdzXNMBX4SgJQ-et7JCtiihFo2vLQ?e=8MdnUp

- **Dataset Source**: We collected a dataset by photographing samples directly at the university, ensuring a diverse and comprehensive representation of the corrosion types under study.
- **Dataset Composition**: Describe the number of samples, classes, and any unique characteristics (e.g., resolution, formats, or types of data).

  We collected 200 samples and arranged them into 3 classes Crevice Corrosion, Filiform Corrosion, Uniform Corrosion

- **Annotations**: We did Polygon annotation using the Roboflow.
- **Partitioning**: The dataset is partitioned into training, validation, and test sets to facilitate effective model evaluation. Following an 80-10-10 split, the dataset is divided into 80% for training, 10% for validation, and 10% for testing.

2. Methodology

- **Data Normalization**:

  In this project, the images are normalized to pixels with the mean and standard deviation values found in most of the pretrained models: mean = (0.485, 0.456, 0.406), std = (0.229, 0.224, 0.225).

- **Data Transformation**: For this project, albumentations is utilized to handle complex transformations, which include resizing, horizontal flipping, and color normalization.

- **Model Architecture**: We have chosen yolov5 for this project as it works well with object detection tasks. As we have only 3 classes, we have modified the output channels.

. Training Process

- **Minibatch Size**: Mini batch size of 8 was used during training and validation.
- **Training and Validation:** The model was trained on the training set and validated on the validation set. Accuracy and loss were monitored to ensure stable training and to prevent overfitting.

. Evaluation

Two major metrics have been considered in this regard: mean Intersection over Union (mIoU) and mean Average Precision (mAP). mIoU computes the overlap area between predicted and actual polygons in order to give a quantitative score about how well a model is able to correctly outline corrosion regions. mAP tries to find the average precision for different IoU thresholds, reflecting the accuracy of the model with respect to detecting corrosion instances. Together, these metrics provide an assessment of how spatially accurate polygon boundaries are and how precise the detection of corrosion is.

. Conclusion and Future Work

- As off now we did only forward propagation, in future we will perform backward propagation and optimization.

. References

https://github.com/dongjuns/RoadDamageDetector