Internship Proposal: Region Prediction towards anomaly detection in sparse images of non-uniform background with interpretability.

In the context of sparse images of degraded automotive parts, the objective of this internship is to address below fundamental research areas:

* 1. Formalize Techniques to detect image specific and spatially varying region of interest with sparse references available for degraded and clean samples.
  2. How do we formalize the representations of visually appearing anomaly to its mathematical translations? What could be the key differentiators across images? Can the local and global features be used for predictive analysis?
  3. Define and formalize Image processing and AI/ML based model approach with attentive region of interest knowledge distillation and demonstrate its efficiency.
  4. How do we validate and evaluate the efficacy of region detection and prediction approaches? What would be the formal methods used for ablation analysis and visualizations?

# Domain for Illustration – Automotive Domain Body Parts

Given a set of images from multitude of automotive body part assemblies, the formalized image processing tasks such as detection, segmentation and representation can be leveraged to predict visually appearing anomalies. This would enable categorization and identification of irregularities due to wear and tear and help generate field validation reports.

# Deliverables

The internship is expected to result in following deliverables

1. Tool for predicting region of interest in images towards detection of anomalies.
2. List of formalized algorithms and representation techniques towards segmentation of the images and prediction of region of interests that confine the anomalies. The representations need to be optimal in terms of the feature-vector dimensions.
3. The algorithms should be demonstrated and interpreted for proof-of-scale and proof-of-variability validations, catering to moment based invariants of various image degradations and distortions.
4. Identification of efficacy measures that can be used for evaluating and comparing the predicted region of interests.

# Internship Request Details:

1. Number of Interns : 2
2. Preferred Educational Qualifications : Final year Masters Students or Early PhD Students
3. Expected Skills : AI/ML, Image processing, Python, MATLAB