

EE5179: Deep Learning for Imaging

[KLA Project Statement]

Image Restoration from Noisy & Blur Images while Preserving Defects of Interest

Introduction

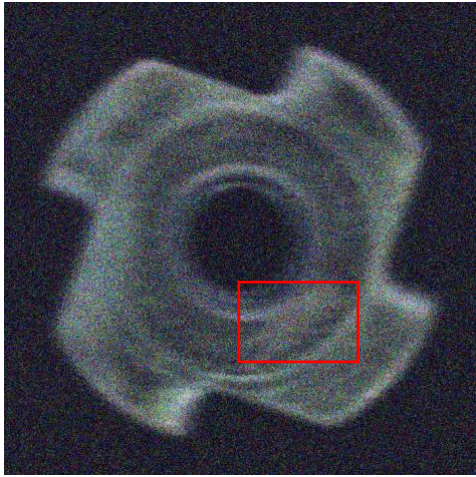
In manufacturing industries, image restoration is critical for quality control and defect analysis, as images often degrade due to noise and blur. This project aims to develop a deep learning or Vision Transformer-based algorithm to restore such images without obscuring defects of interest. The performance of the algorithm will be benchmarked using a validation dataset, with metrics like Peak Signal-to-Noise Ratio (PSNR) and Structural Similarity Index (SSIM). Iterative refinement will be conducted based on evaluation results to improve image clarity and defect detection accuracy.

Objectives

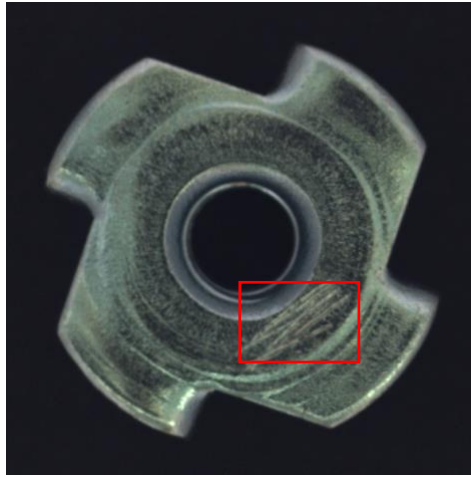
- Develop an algorithm (DL/Vision Transformer) to restore images degraded by noise and blur while preserving critical defects of interest.
- Ensure that the restored images maintain the visibility and accurate annotation of defects after restoration.
- Benchmark the algorithm's performance using validation metrics: PSNR and SSIM.

Dataset

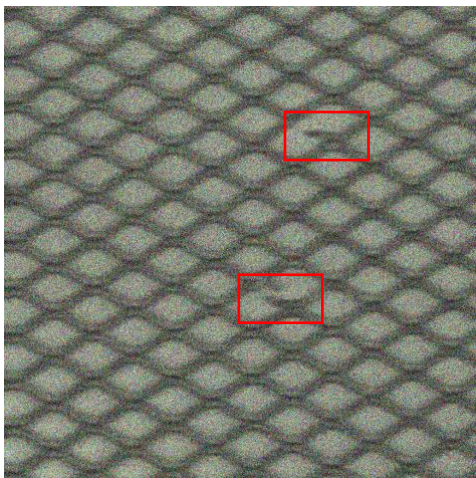
The **MVTec Anomaly Detection (AD) dataset** is widely used for benchmarking image anomaly detection tasks. For this project, we have introduced noise and blur to degrade the images in the dataset, and your model will use these degraded images as input. Let's see some images (with defects highlighted in red bounding-box)



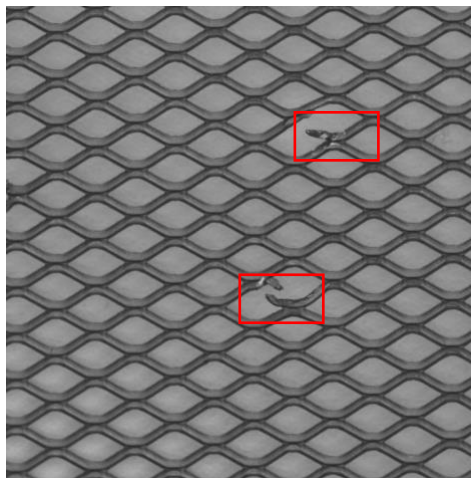
Degraded Image



Ground-Truth (Clean Image)



Degraded Image



Ground-Truth (Clean Image)

Dataset Structure:

- **Training & Validation Data:**
 - Degraded image
 - Ground-truth clean image
 - Defect mask
- **Test Data:**
 - Degraded image (used only for evaluation)

Make sure to use the training data for training and validating your model.