

Seminar Title	: Surface Defect Detection of Outdoor Insulators in Low-Light Environments
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Abstract	: Outdoor insulators are crucial for maintaining reliable power transmission and distribution. However, inspecting these vital components under low-light conditions is essential to ensure uninterrupted power supply in all weather circumstances. This study employed an image enhancement technique optimized for low-light images and a single-stage object detection model to identify diverse surface defects on insulators. The training dataset comprised 1007 insulator images depicting various surface conditions, including healthy, broken, polluted, and flashed surfaces. As an initial step, a low-light image enhancement method was applied for image pre-processing. Subsequently, the YOLOv9 model was utilized to detect different surface defects. Finally, to facilitate remote application, a web-based app was developed using Gradio, further improving the accessibility and usability of the implemented solution. The results revealed that the YOLOv9c model achieved an impressive mAP@50 of 99.5%. This outstanding performance enables proactive maintenance, minimizes downtime, and enhances power systems' overall security and reliability.