Phase 1 – Conception Phase

Title: Smart Damage Detection for Logistics Packages using Computer Vision

<u>Abstract</u>

Millions of packages are handled every day in contemporary logistics and e-commerce operations and preserving customer satisfaction and operational effectiveness depend on their safe delivery. Most damage detection are done through manual visual checks which takes lot of time, inconsistent, and human error prone. Existing automated systems such as barcode scanners and simple image recognition software, can identify packages, but not precisely identify, classify, or report damage. This project proposes a smart AI-based computer vision system that can automatically identify and classify package damage in real time. The system will be founded on deep learning as Convolutional Neural Networks (CNNs), which will be enhanced with Explainable AI (XAI) techniques such as GRAD-CAM and SHAP that highlight impacted locations and provide interpretable justification for each prediction. By integrating transparency and trust into AI-powered inspection, the system aims to reduce human workload, decrease financial losses due to misclassified damage, and enhance overall logistics efficiency. The expected result is a smart, transparent, and efficient damage detection system that significantly reduces the efforts of manual inspection, improves accuracy in damage assessment, and maximizes customer satisfaction as well as maximizes the logistics operation while minimizing the financial losses from damaged products.