**Automated Vehicle Damage Detection and Cost Analysis Using Computer Vision**

**Abstract**

This research introduces an advanced system for automated vehicle damage assessment leveraging computer vision and deep learning technologies. The proposed solution addresses the challenges of manual vehicle inspection by implementing a three-stage approach: damage detection, precise segmentation, and automated cost estimation. The system employs state-of-the-art deep learning models for initial damage detection and localization through bounding boxes, followed by detailed damage segmentation at the pixel level. These models work in conjunction to identify various types of vehicle damage including dents, scratches, and structural deformations. The final stage employs a sophisticated cost analysis algorithm that considers damage type, severity, and affected area to generate accurate repair cost estimates. The system's performance was evaluated on a diverse dataset of vehicle damage images, demonstrating high detection accuracy and reliable cost estimations comparable to expert assessments. This automated approach significantly reduces the time and subjectivity associated with traditional damage assessment methods, making it particularly valuable for insurance companies, automotive service centers, and vehicle inspection facilities. The research contributes to the growing field of automated vehicle inspection systems and presents a practical solution for streamlining damage assessment processes.