S.No	Authors & Year	Identified Research Gaps	Dataset Used	Method/Model Used	Performance Metrics	Limitations
1	Tang et al. (2025)	Computational inefficiency in YOLO; poor small-object detection	VOC2007 + GRDDC2020	PD-YOLO + DCNBottleneck 2 + DCSP	79.2% Prec, 73.1% mAP, 282 FPS	Complex architecture
2	Zhong et al. (2025)	Lack of 3D boundary extraction; poor RGB-depth fusion	Custom RGB + Point clouds	Point cloud feature extraction & segmentation	95.8% Prec, 93.3% Recall	Requires specialized depth sensors
3	Qiao et al. (2025)	Poor detection in non-motorized corridors; sensor imbalance	E-bike accelerometer data	Wavelet denoising + SMOTE + ANN	97.02% Accuracy	Limited to specific vehicle types
4	Rasee et al. (2025)	Class imbalance; inconsistent annotation standards	4,681 images (70/20/10 split)	CNN-YOLOv8 hybrid + 2-fold CV	97.28% Prec, 97.89% F1	Performance drops with water/occlusion
5	Sivanraj et al. (2024/25)	Lack of traffic-aware maintenance prioritization	Custom images + traffic API	YOLOv11-s + traffic volume integration	0.851 Prec, 0.802 mAP@0.5	Lower recall; requires continuous API
6	Saluky et al. (2025)	Poor robustness in urban environments (shadows/occlusions)	Custom urban dataset	YOLO-NAS + adaptive augmentation	85.4% mAP (12% improvement)	Higher computational cost
7	Meshram et al. (2025)	Poor cross-environment generalization; inefficient scheduling	Urban, suburban, rural, highway	SSMT transformers + GAT-XGBoost + SAC-BO	>20% mAP improvement; <52ms latency	High GPU memory (10.5-11.2GB)
8	Patawar et al. (2024/25)	Single-modality limitations (vision vs. vibration)	Custom dataset + inertial sensors	Ensemble: YOLOS + YOLOv8 + Accel fusion	97.34% mAP@0.50	Larger model size (75.5MB)

9	Thamizharasi et al. (2024/25)	Privacy concerns; edge device latency	3,204 images / 12 edge clients	Federated learning (TF Lite) + FedAvg	96% Accuracy; 19.1ms/image	Communication overhead
10	Jenefa et al. (2025)	Computational inefficiency for real-time monitoring	Custom dataset	EfficientDet with BiFPN fusion	Competitive mAP vs. YOLO	Limited comparative analysis
11	Sreenivasa Reddy et al. (2025)	Manual inspection inefficiencies; lack of real-time	Kaggle highway + muddy roads	VGG19, ResNet50, YOLO	VGG19: 97% (highway), 98% (muddy)	Poor motion blur robustness
12	Todkar et al. (2025)	Manual reporting; lack of citizen engagement	User-submitted mobile images	Web-based reporting + backend processing	Usability-focused	Relies on human reporting
13	Alshami et al. (2025)	Imprecise boundary delineation; lack of dimensions	Urban road images	Otsu's thresholding + Canny edge	Boundary precision focus	Struggles with lighting/weather
14	Faisal et al. (2025)	High cost of LiDAR; unclear minimum point density	Alberta LiDAR data	Spatial thinning + ANOVA validation	Accuracy held at 205 points/m²	Requires expensive LiDAR
15	Premjeet Singha et al. (2024)	Subjective bias; lack of size estimation	Field trials (9 potholes)	IoT accelerometers on UGVs	100% detection rate	Vibration-dependent
16	Tian Guan et al. (2024)	Lack of distance estimation for AVs	6,848 road images	GASB-ShuffleNetv2 + Binocular vision	High precision classification	Requires calibrated stereo cameras
17	Mario Roman-Garaya et al. (2024)	Lack of repair urgency assessment	2D images + 3D point clouds	Segformer + Fuzzy Logic	Recall: 90.87%; 5.94mm depth error	Rules need expert calibration
18	Joseph Meier et al. (2024/25)	Limited aerial detection in adverse weather	UAV thermal imagery (various angles)	Mask R-CNN, YOLOX, YOLOv8	YOLOX: 70.3% mAP50	Thermal limitations at specific angles

19	Paramarthalingam et al. (2024)	Accessibility for visually impaired	9,240 images total	YOLOv5/YOLOv8 + Attention	Best results with YOLOv5 variant	Limited user testing
20	Jakubec et al. (2023)	Poor performance in adverse weather	Clear, rain, sunset, night	R-CNN family vs. YOLOv3–v7	YOLOv7: 55.6% Mean_mAP (Best)	Significant night performance drop
21	Yashar Safyari et al. (2024)	Fragmented literature; lack of standards	100+ studies (RDD2020, etc.)	Systematic review	Multi-environment benchmarking	No novel implementation
22	Aparna et al. (2022)	Vision fails in fog/rain; no all-weather	4,904 thermal images	ResNet101 Transfer Learning	97.08% Accuracy	Expensive thermal hardware
23	Salaudeen & Çelebi et al. (2022)	Poor small/low-resolution detection	CCSAD, PNW, Japan datasets	ESRGAN + YOLOv5/EfficientDet	97.60% Prec (on low-res images)	Computationally intensive
24	Maros Jakubec et al. (2024)	Poor detection under fog/rain/night	Roboflow AllFog + Custom	MUNIT GAN + YOLOv8 (ViT)	Significant mAP improvement	Synthetic-to-real domain gap
25	Jinesh Mehta et al. (2024)	High-cost sensor systems	Real-world road segments	Ultrasonic + Accel + Arduino	80% Accuracy	Environmental noise susceptibility
26	Zhen Zhang et al. (2025)	Material degradation mechanisms	Pavement samples	Porosimetry + Ultrasonic + Thermal	Material characterization focus	Not a detection system