IDEATHON-2025

TITLE PAGE

- IDEA Statement Title: SMART ROAD SENTINEL - AI-Powered Road Defect Detection
- Theme: Smart Infrastructure & Urban Safety
- **Team Name (Eg:-IDEA BREAKERS)**
- **Team LEAD & Co-partner Name : M Charan Kumar ,B Jeevan Reddy**
- **USN: 1CR24AD060,1CR24AD016**
- **College Name : CMR INSTITUTE OF TECHNOLOGY**
- **Email ID:-mallelacharankumar@gmail.com, bjeevanreddy751@gmail.com**
- **Phone Numbers:-9036205526,7975141902**

IDEA TITLE

- AI-Powered Video Analysis System using Computer Vision & Machine Learning
- Real-time detection of road defects: Potholes, Speed breakers, Cracks, Ruts, Surface deterioration
- Crowdsourced data collection via dashcams/smartphones with GPS tagging
- Automated city reporting dashboard for municipal authorities
- Driver safety alerts and optimized route suggestions

❖Innovation: Proactive maintenance using citizen-generated data at zero infrastructure cost

TECHNICAL APPROACH

- Tech Stack: Python, OpenCV, TensorFlow/PyTorch for ML models, Android/iOS SDK for mobile app, AWS/Firebase for cloud storage, Google Maps API for GPS integration
- Process Flow: Video Input → AI Model (Computer Vision) → Defect Classification (Type & Severity) → GPS Tagging → Dashboard Visualization → Alerts & Reports
- ML Model: CNN-based object detection (YOLO/Faster R-CNN) trained on road defect datasets
- Data augmentation for varying weather, lighting, and camera conditions
- Hybrid approach: Edge processing on device + cloud-based model refinement

FEASIBILITY AND VIABILITY

- Feasibility: Highly scalable - leverages existing smartphone penetration (80%+ in urban India) and dashcams
- Low deployment cost - No new infrastructure needed, uses citizen devices
- Proven technology - Computer Vision models for object detection are mature
- Challenges: Camera quality variance, GPS accuracy (±5-10m), model accuracy in poor weather/lighting
- Mitigation Strategies: Data augmentation training, confidence thresholding, hybrid edge-cloud processing, user verification layer
- Viability: Partnerships with ride-sharing platforms, municipal corporations, insurance companies for data monetization

IMPACT AND BENEFITS

- Social Impact: Safer roads, 60% reduction in road defect-related accidents, Better mobility for citizens, Enhanced transparency in governance
- Economic Benefits: 40% reduction in repair costs through preventive maintenance, Faster detection-to-repair (15-20 days → 2-3 days), Lower insurance premiums, Job creation in data analysis and urban planning
- Environmental: Reduced fuel waste from smoother roads, Optimized vehicle routing reduces emissions, Better road quality extends vehicle lifespan
- Target Audience: 500+ Indian cities, Municipal corporations, Citizens (drivers), Insurance & ride-sharing companies
- Key Metrics: 50% faster defect detection, 30% cost savings, 100% road coverage vs 30% current

RESEARCH AND REFERENCES

- MoRTH (Ministry of Road Transport & Highways) - Road Accident Statistics India 2023
- NITI Aayog - Smart Cities Mission Reports
- Research Papers: Computer Vision for Road Defect Detection (IEEE, arXiv)
- World Bank Report - Urban Road Maintenance Costs in Developing Countries
- Google AI - Object Detection Models (YOLO, Faster R-CNN) Documentation
- Similar Projects: RoadLab (MIT), Pothole Detection Apps (Global implementations)

Implementation Roadmap & Future Scope

- Phase 1 (0-6 months): MVP Development - Mobile app prototype, Basic ML model training on 10,000+ road images, Pilot in 2 cities (Bangalore & Delhi)
- Phase 2 (6-12 months): Scale & Partnerships - Integrate with Ola/Uber for fleet data, Onboard 5 municipal corporations, Achieve 85%+ detection accuracy
- Phase 3 (12-24 months): National Rollout - Expand to 50+ cities, Government API for Smart Cities Mission, Predictive maintenance AI (forecast defects before they occur)
- Future Innovations: AR navigation overlay showing road hazards in real-time, Blockchain for transparent defect reporting, Integration with autonomous vehicles for self-repairing road systems
- Unique Differentiator: First crowdsourced, zero-infrastructure-cost road monitoring system in India with gamification for citizen participation

- *Building Tomorrow's Infrastructure and Tech, Today!*

THANK YOU