

Horizon 2020 European Union Funding for Research & Innovation

WP2: Artificial intelligence for rail safety and automation A PoC on Obstacle Detection on Rail Tracks

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RAILS Final Workshop | May 30, 2023

Railway Problem and Motivation



Objective of the PoC

Investigate Potential of: AI for Vision-Based Obstacle Detection Simulators for Synthetic Data Generation

Constraints / Requirements Single Camera Detect Known and Unknown Obstacles

Main Issues and Challenges Data Availability Data Labelling

Key Performance Indicators Detection Coverage Detection Distance Computation Time

Proof-of-Concept as a **Benchmark**

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Al Application Computer Vision

Al Related Disciplines Digital Twins – Mixed Reality

Al Techniques Deep Learning Supervised – Sematic Segmentation Unsupervised – Anomaly Detection Self-Training / Transfer Learning

> Inspiring Solutions Other Railway Solutions Medical Image Analysis Image Anomaly Detection

Datasets RailSem19 (Transfer Learning) Synthetic Data



Developments / Implementations Simulated Scenario in RoadRunner Semi-Automatic Labelling U-Net / SSIM-VQ-VAE

Exploited Software and Framework MathWorks' RoadRunner PyTorch

Hardware Requirements GPU(s) with CUDA cores and min 16GB VRAM

Approach: A Modular Architecture



The Rails-Anomaly Detection Pipeline



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SWOT Analysis of the Investigated Approach



Main Recommendations for Vision-Based Obstacle Detection



Main Recommendations for Vision-Based Obstacle Detection



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Main Recommendations for Vision-Based Obstacle Detection



Thank you for your attention!

- Deliverable D2.1: WP2 Report on case studies and analysis of transferability from other sectors (safety and automation)
- Deliverable D2.2: WP2 Report on AI approaches and models
- Q Deliverable D2.3: WP2 Report on experimentation, analysis, and discussion of results
- *S* Deliverable D2.4: WP2 Report on identification of future innovation needs and recommendations for improvements

Available at: <u>https://rails-project.eu/downloads/deliverables/</u>