



Linear infrastructure efficiency improvement by automated learning and optimized predictive maintenance techniques

INFRALERT Deliverable D4.3

Summary Sheet

DELIVERABLE TITLE:

D4.3 Methodologies and procedures for inferring three-dimensional alert-severity-intervention pattern space. Supervised and unsupervised approaches

WORK PACKAGE:

WP4. Alert management

- **T4.1.** Implementing an asset's alert level estimator.
- **T4.2.** Developing a supervised/unsupervised alert-time-probability/possibility pattern space
- **T4.3.** Developing a supervised/unsupervised alert-severity-interventions pattern space

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EXECUTIVE SUMMARY:

The INFRALERT project aims to develop an expert-based information system to support and automate linear asset infrastructure management from measurement to maintenance. For this purpose, one of the pillars of the project is WP4, aimed at the development of an alert management system. An alert is generated when the condition of an infrastructure asset crosses a threshold limit value defined by a standard in a specific forecasted scenario. The Alert System will analyse asset condition and operational information to provide alerts whenever the infrastructure reaches, or is close to reaching, a critical level in the present time or in the near future. Therefore, it will be able to combine the current and predicted asset condition with operational and historical maintenance data, to get information about the maintenance tasks that are necessary to avoid later severe degradation or mismatching of safety and/or comfort conditions. All this input information will be available from other WPs in the project. By means of data mining methodologies, this WP will generate a prioritised listing (ranked on severity level) corresponding to the alerts generated by all assets of a linear transport infrastructure, as well as the related historical failures and related historical maintenance interventions.

In a previous document, Deliverable D4.2, the activities developed in task 4.1 "Implementing an asset's alert level estimator" and task 4.2 "Developing a supervised/unsupervised alert-time-probability/possibility pattern space", were presented. The document also contained relevant preliminary information on the methodologies and procedures of task 4.3 "Developing a supervised/unsupervised alert-severity-interventions pattern space"

Deliverable D4.3 reflects the activities developed in task 4.3, and includes the new advances and developments, affecting task T4.2, reached to the date of this document, which complement the

information provided in Deliverable 4.2.

The work contained in this document presents the approach defined and being developed for predicting the required maintenance interventions, to be carried out, on the interested asset of a linear transport infrastructure in forecasted scenarios. Along the document, diverse methodologies, algorithms and techniques are described, detailed and demonstrated.

The first level of relevant developments are collected in Section 5, where the methodologies for estimating alerts based on: i) the information provided by the forecasted evolving behaviour of asset features and, ii) the information recorded in the historical database of conducted maintenance interventions, are used to determine the most probable intervention to be carried out to keep the asset in a safe state.

A second level of relevance is associated to Section 6, where a selection of results proves the capacity of the inferred models to make predictions.

A third level of general relevance is affiliated to Sections 7 and 8. They define probabilistic and deterministic criteria to set a level of severity to any forecasted alert and its recommended maintenance intervention.

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