Asset condition Toolkit

1st Open Workshop
Brussels (Belgium) 16.11.2016

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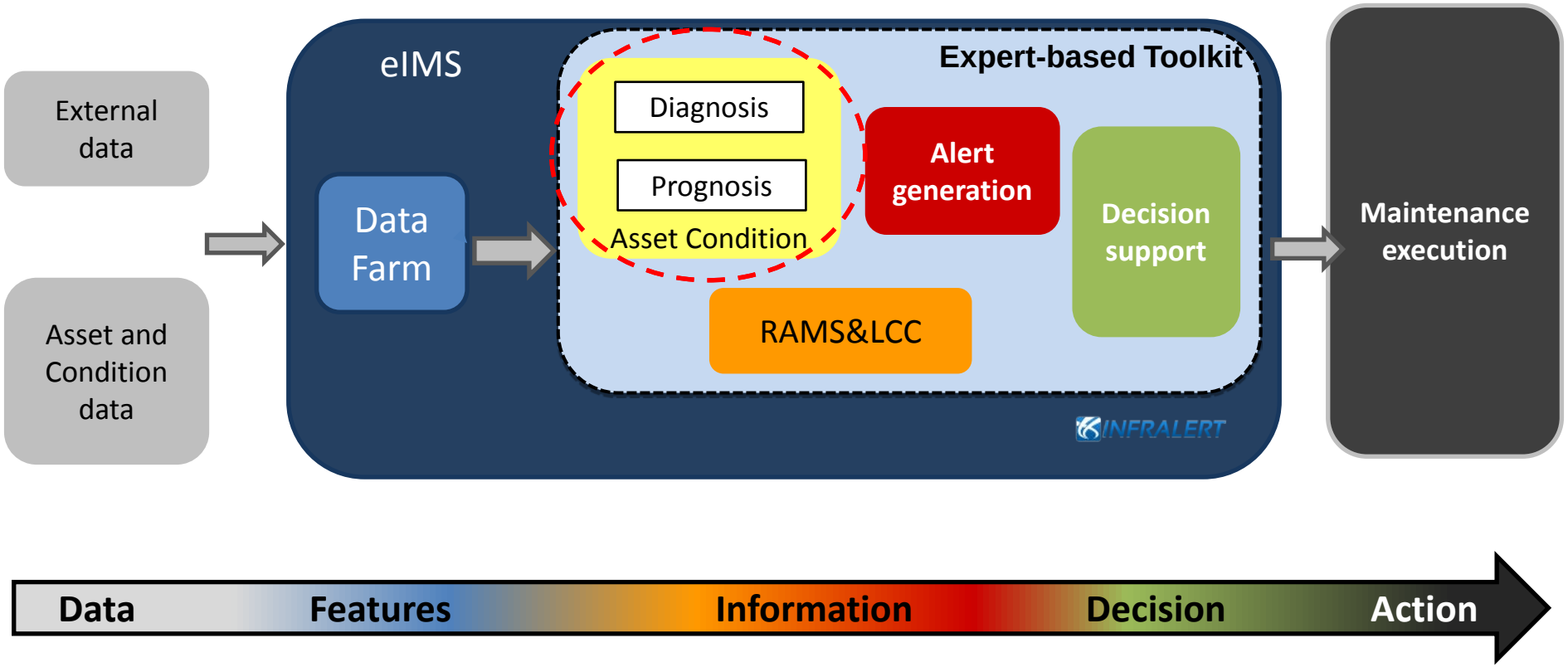
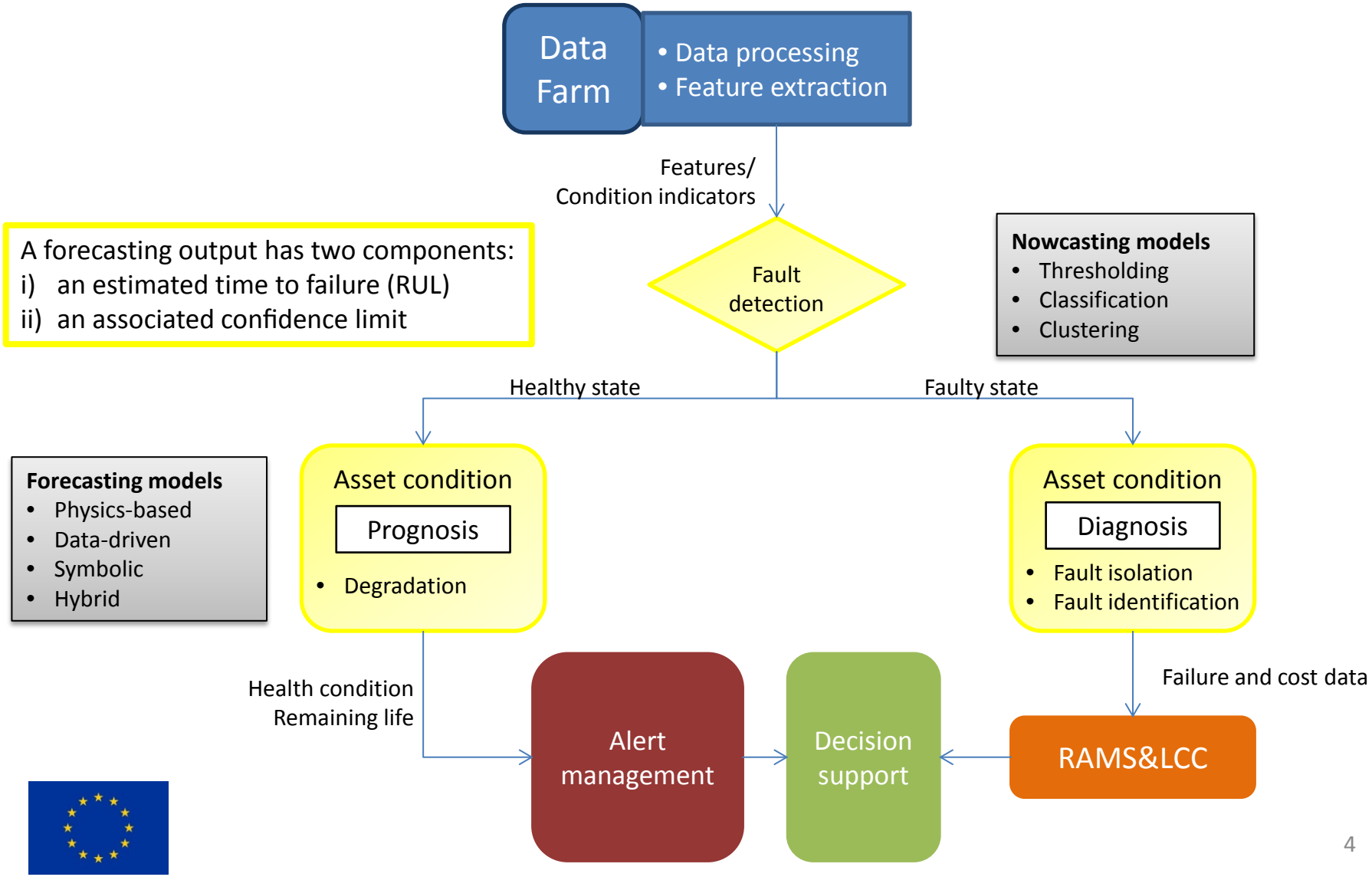
Agenda

- General overview
- Asset Condition Toolkit
  - Overview
  - Objectives
- Linear assets
  - Condition indicators
  - Segmentation
- Nowcasting
- Forecasting
- Summary

General Overview



Asset Condition toolkit

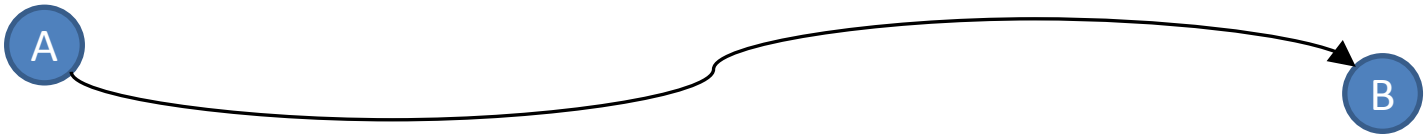


Asset Condition Toolkit

Objectives

1. To identify and segregate hierarchy of conditional information for linear asset with identification of end users for both nowcasting and forecasting
2. To integrate the asset condition of component level with physical models for extraction of threshold limits of current asset condition (nowcasting) and effect of degradation mechanisms for forecasting.
3. To integrate the experience operation and maintenance knowledge and extraction of health indicators for nowcasting and forecasting.
4. To develop hybrid methods by integrating data-driven, symbolic and physical models from component to system level for estimating nowcasting and forecasting.

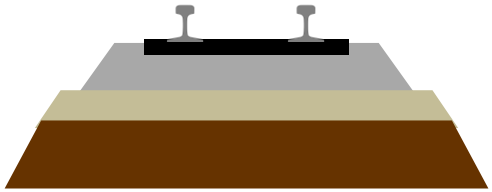
Linear assets – Condition indicators



Road

- Functional condition
  - Macro texture
  - Mega texture
  - Longitudinal unevenness
- Structural condition
  - Transversal unevenness
  - Bearing capacity (deflection)
  - Surface defects and cracking

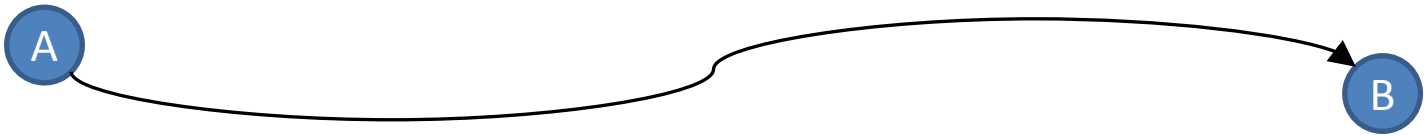
Railway



- Rail condition
- Ballast condition
  - Composition
  - Contamination
  - Moisture content
- Track deflection
- Track geometry
  - Gauge
  - Cross level (Alignment)
  - Cant
  - Longitudinal level
  - Twist

Railway corridor, Iron Ore Line in Malmbannan in northern Sweden, managed by Trafikverket

Linear assets - Segmentation



Road

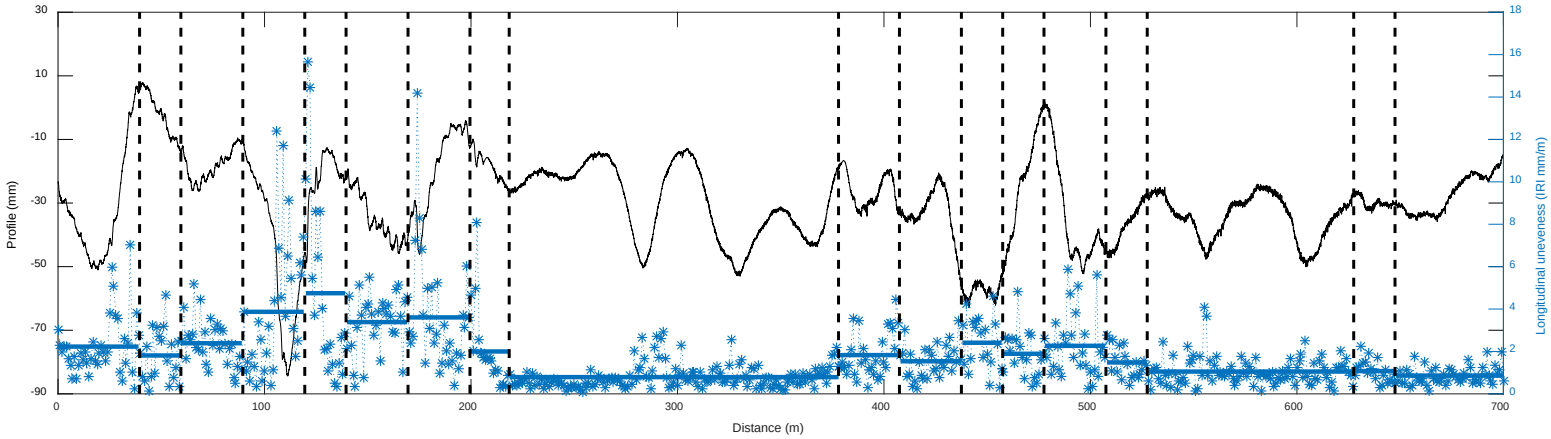
Functional condition

- Macro texture
- Mega texture
- Longitudinal unevenness

Pavement
Base

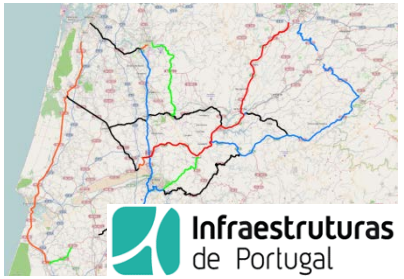
Subbase

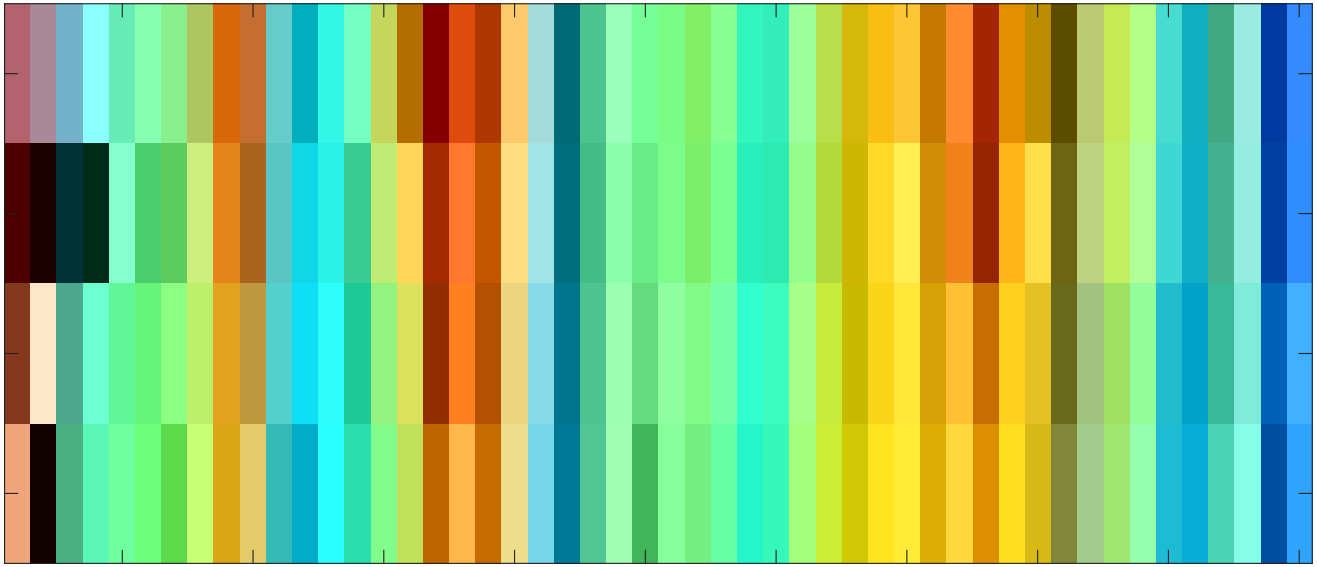
Subgrade



Nowcasting – Road case

- Longitudinal unevenness
  - International roughness index (IRI)
  - Average over fixed window of 100 m





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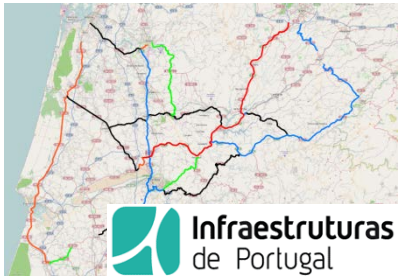
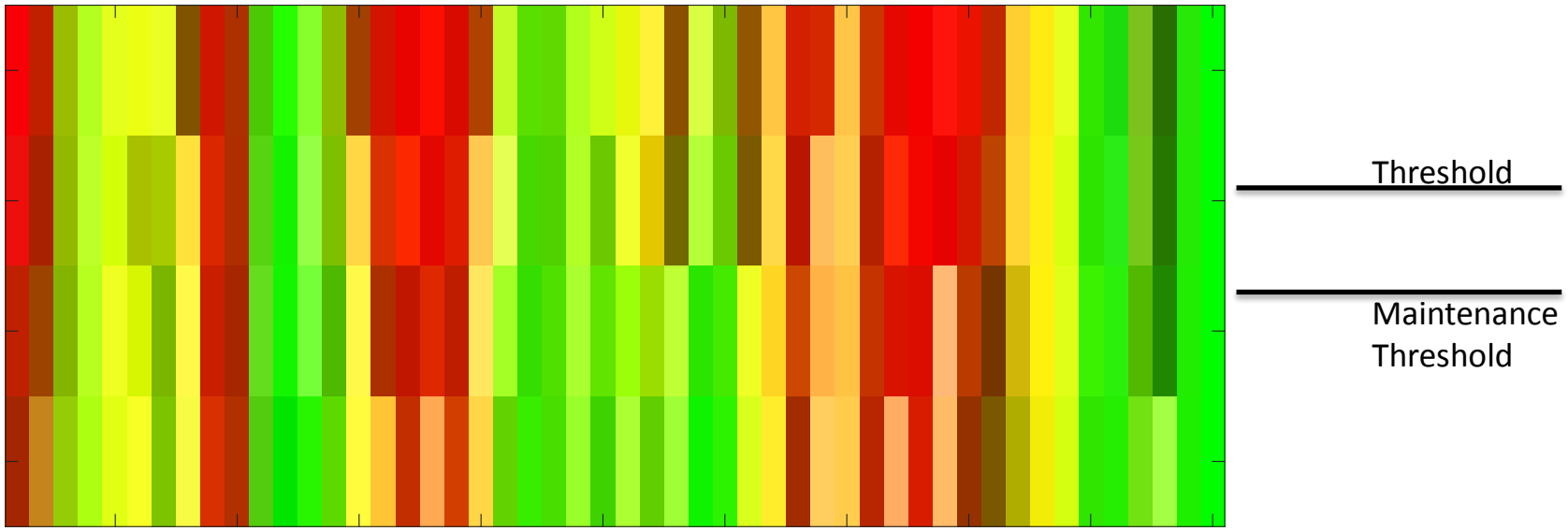
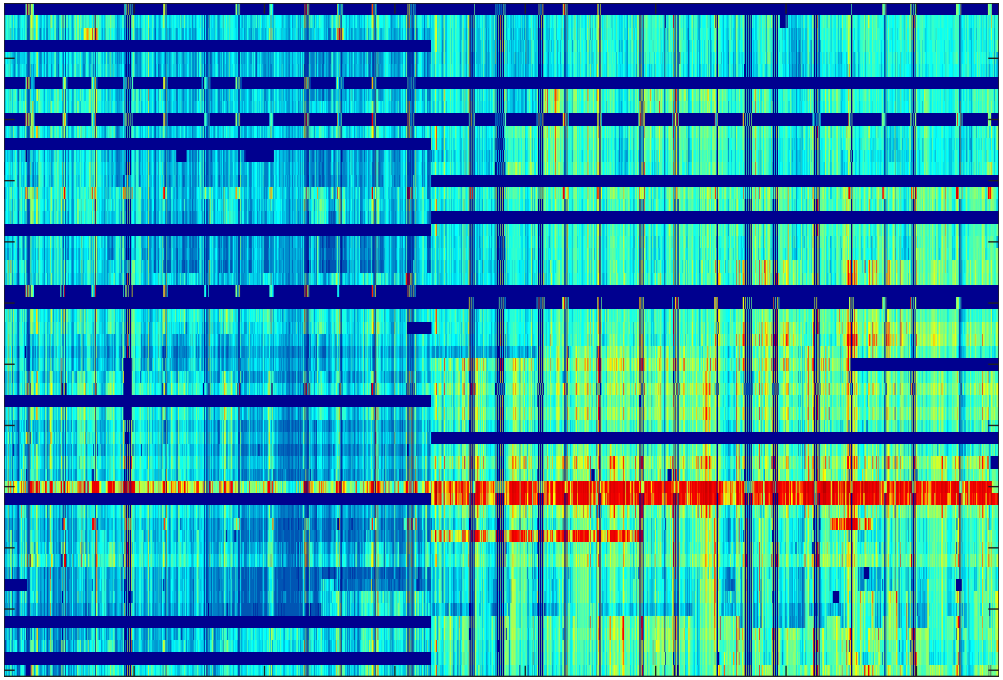




Nowcasting – Rail case

- Longitudinal level (3-25 m)
  - Standard deviation over a fixed window of 200 m
  - Average of left and right rail

Railway corridor, Iron Ore Line in Malmbannan in northern Sweden, managed by Trafikverket



IAL: Immediate Action

IL: Intervention Limit "high"/"low"

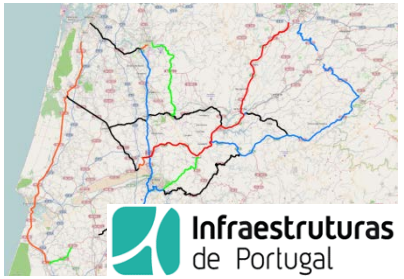
AL: Alert Limit

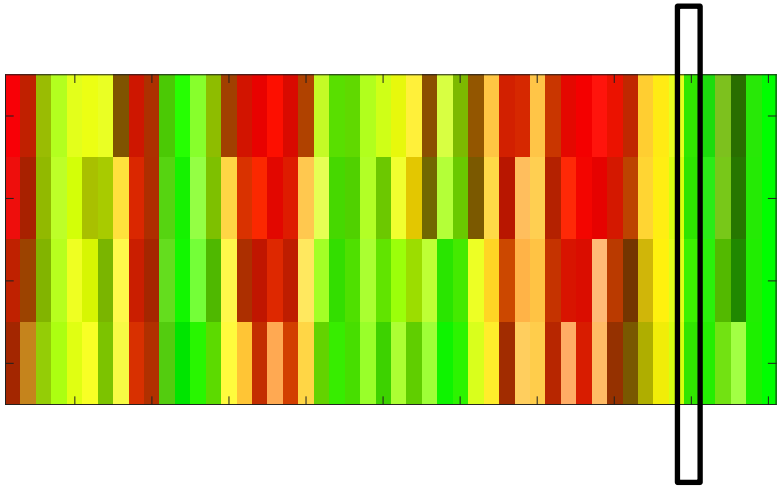
ML: Maintained level

DL: Designed level

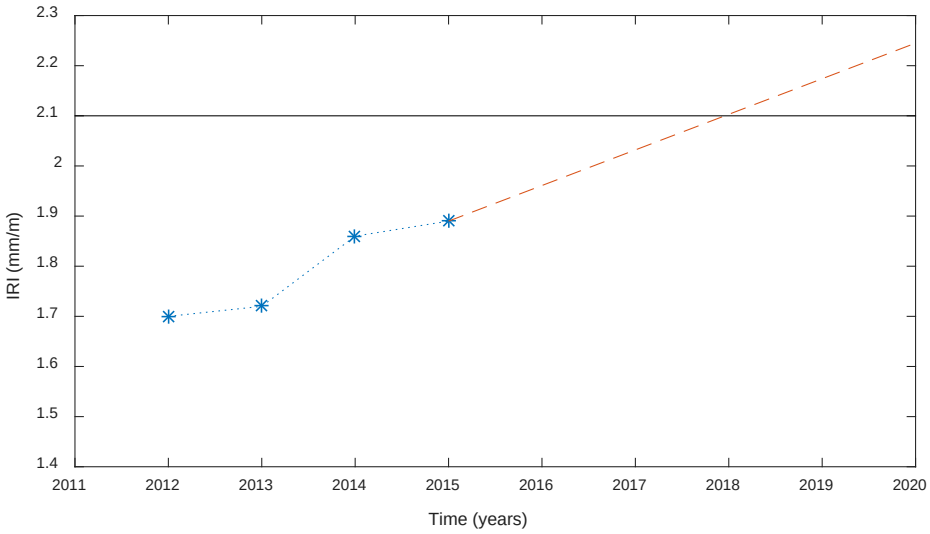
Forecasting - Road case

- Longitudinal unevenness
  - International roughness index (IRI)
  - Average over fixed window of 100 m





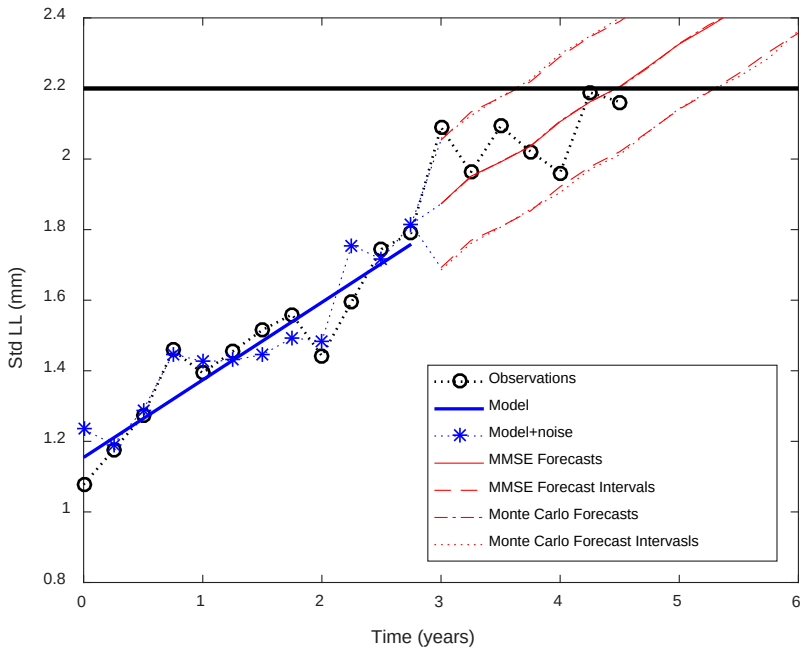
Yearly increment based on regression



Forecasting – Rail case

- Longitudinal level (3-25 m)
- Regression with an noise model
  - Probabilistic Remaining Useful Life calculation
  - Uncertainty modelling is important since the output of the forecasts are used for risk-based maintenance planning

Railway corridor, Iron Ore Line in Malmbannan in northern Sweden, managed by Trafikverket



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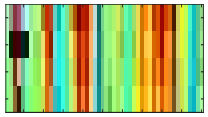
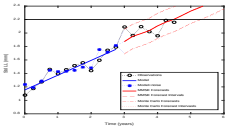


1. Segregation of linear asset information in different hierarchies for nowcasting and forecasting

2-3. Application of physical, data-driven and symbolic models for nowcasting and forecasting



3-4. Hybrid methodology in different asset levels: Contribution to more accurate asset forecasting and nowcasting

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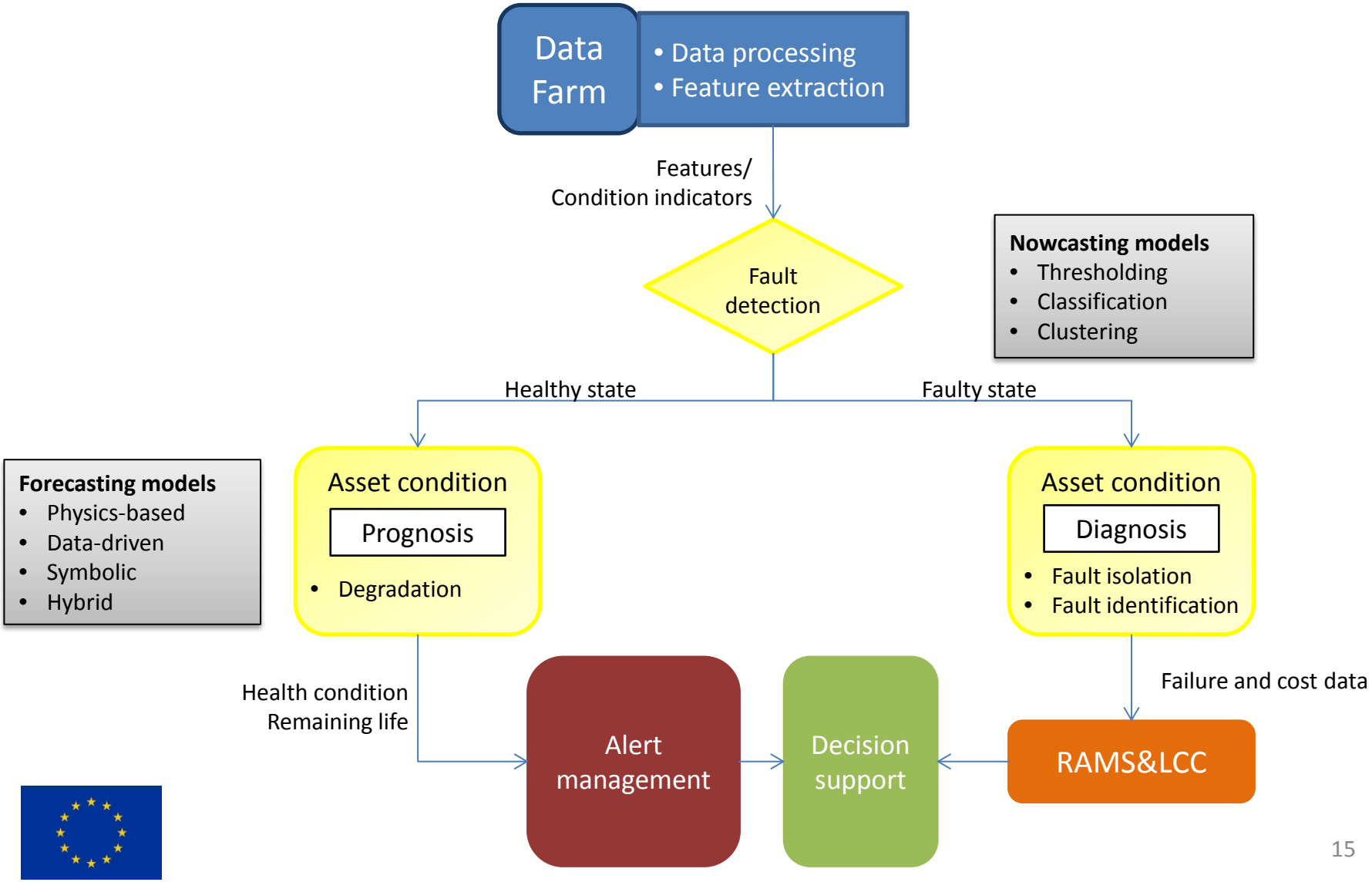

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