



Pan-European Community of Practice  
towards standardisation for:

“Digitalisation in inspection,  
monitoring and maintenance  
of transport infrastructures”



**IM-SAFE<sup>.EU</sup>**

## Session 2



## › GET READY !

- Good afternoon and warm welcome to this online symposium!
- When joining, please mute your microphone and switch off your webcam.
- This online session is recorded.
- For questions, please use the Chat function in Zoom.



# › AGENDA

Moderator: Rizal Sebastian (TNO, NL)		Activities	Guest speakers and panellists
13:00 – 13:10	Opening	<ul style="list-style-type: none"> <li>Welcome and opening words</li> <li>Objective and agenda</li> </ul>	Machteld de Kroon (TNO, NL) Rizal Sebastian (TNO, NL)
13:10 – 13:55	Session 1: Smart Sensing and Imaging	<ul style="list-style-type: none"> <li>Session introduction</li> <li>Best practice example from INSITU, ES</li> <li>Short technical presentation by SACERTIS, IT</li> <li>Panel discussion &amp; questions from online audience</li> </ul>	Isabelle Alovisi (SACERTIS, IT) René Schumann (HOCHTIEF ViCon, DE) Sara Cuerva Navas (FERROVIAL, ES) Sverre Kjetil Rød (Norwegian Public Road Authority, NO) Diego Allaix (TNO, NL)
13:55 – 14:05	10-minute break		
14:05 – 14:50	Session 2: Artificial Intelligence	<ul style="list-style-type: none"> <li>Session introduction</li> <li>Best practice example from IBM Research, CH</li> <li>Short technical presentation by IBM Research, CH</li> <li>Panel discussion &amp; questions from online audience</li> </ul>	Ioana Giurgiu & Cristiano Malossi (IBM Research, CH) Meenagi Venkat (CEO   KNOWCE, IT) Arnwald Janssen (Rijkswaterstaat/Ministry of Infrastructure, NL)
14:50 – 15:00	10-minute break		
15:00 – 15:45	Session 3: Data interoperability	<ul style="list-style-type: none"> <li>Session introduction</li> <li>Best practice example from TNO, NL &amp; AEC3, DE</li> <li>Short technical presentation by AEC3, DE</li> <li>Panel discussion &amp; questions from online audience</li> </ul>	Matthias Weise (AEC3, DE) Raimar Scherer (TU Dresden, DE) Frank Opitz (Deutsche Bahn, DE) Michel Böhms (TNO, NL) Sanne Jansweijer (NEN, NL)
15:45 – 16:00	Conclusion	<ul style="list-style-type: none"> <li>EC policy initiatives in digitalization and transport infrastructure</li> <li>Concluding remarks</li> </ul>	Rafal Stanecki (European Commission, DG MOVE) Konstantinos Gkoumas (European Commission, JRC) Agnieszka Bigaj-van Vliet (TNO, NL)

## › **SESSION 2 “ARTIFICIAL INTELLIGENCE”**

### **AGENDA FOR 14:05 – 14:50**

- Session introduction (Rizal Sebastian, TNO)
  - Multiple use possibilities for AI, such as ML (Machine Learning) for data mining, validation and analytics
  - AI challenge for standardisation: workflows and designs of cloud-based AI platforms
- Best practice example from IBM Research, CH
- Short technical presentation by IBM Research, CH (Ioana Giurgiu)
- Panel discussion & questions from online audience

# › **BEST PRACTICE EXAMPLE FROM IBM RESEARCH ZÜRICH, CH**

Session 2 video 1

# › **SHORT TECHNICAL PRESENTATION**

**IOANA GIURGIU – IBM RESEARCH ZÜRICH, SWITZERLAND**



# Artificial Intelligence for Visual Inspection of Civil Infrastructures

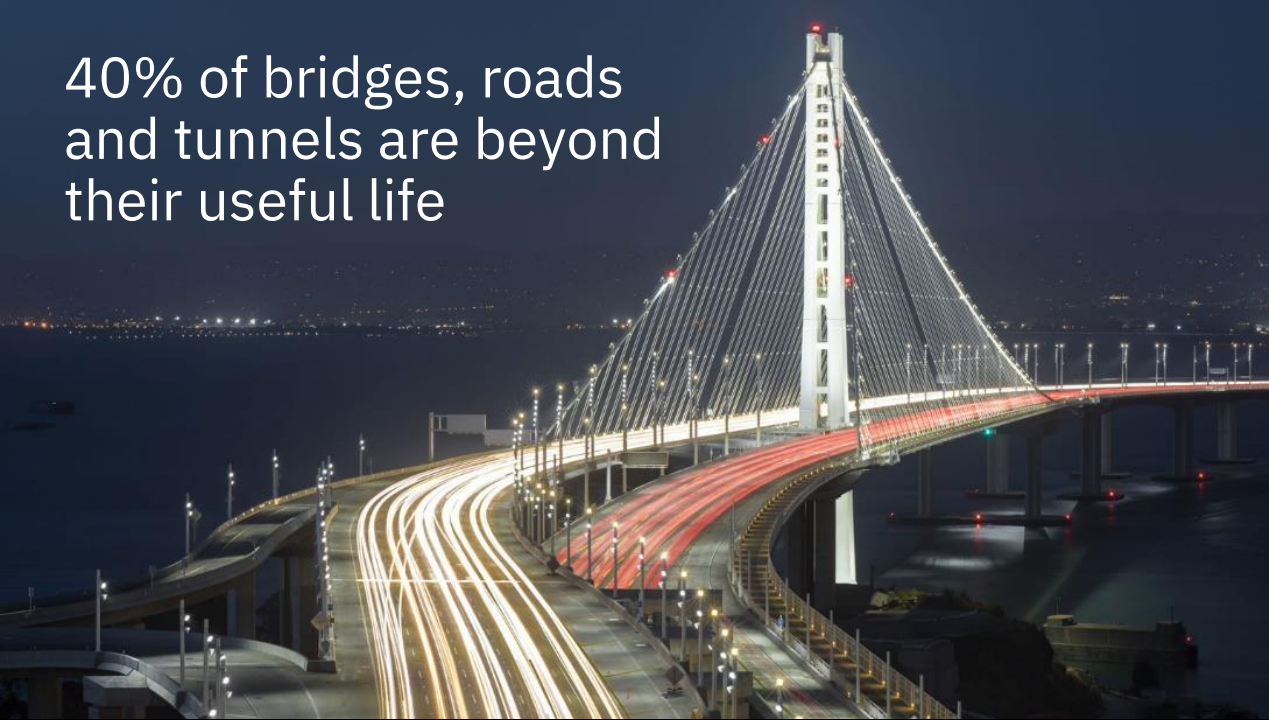


Feb 24<sup>th</sup>, 2022  
Presented by: Ioana Giurgiu, IBM Research Zürich





40% of bridges, roads  
and tunnels are beyond  
their useful life



\$50 Billion and 2 Billion man-hours  
spent on manual inspection of bridges



Bridges and Tunnels are complex structures that  
move and change constantly



One failure can shutdown critical arteries





# Inspections in the past.....





# Inspections today



- Typically, thousands of high-resolution images generated
- Each image > 6k x 4k pixels (10 MB)



# Drone/Robots visual inspection pipeline for civil infrastructures

Automated acquisition of thousands high-resolution images with repeatable drones and robots missions

## Visual inspection pipeline



High-quality data acquisition

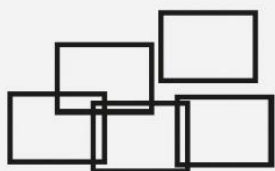
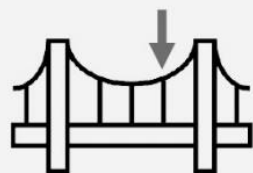
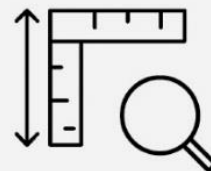


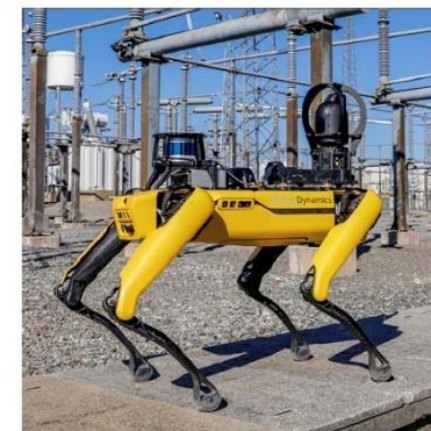
Photo stitching



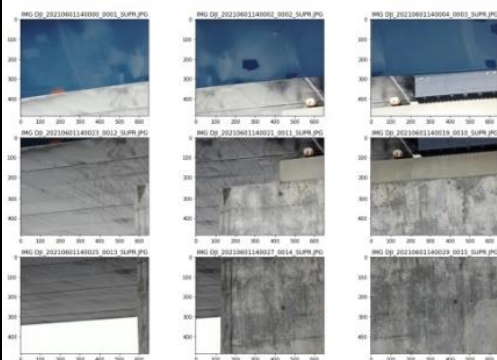
High-resolution detection of defects



Defect measuring



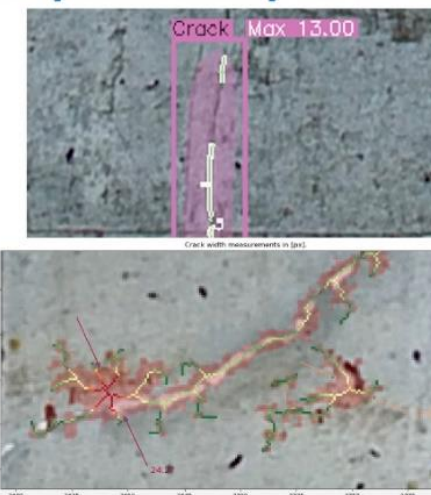
Automated 2D rendering of large elements (pillars, towers, etc.) and defects disambiguation and localization in global coordinate system



Deep learning based computer vision methods to detect tiny and rare defects on each high-res image



Automated extraction of defect properties, such as size, including crack width with precision up to 0.1 mm





# Examples of detected defect types

Crack



Crack with precipitate



Net Crack



Spalling/ casting defects with visible aggregates



Algae



Rust



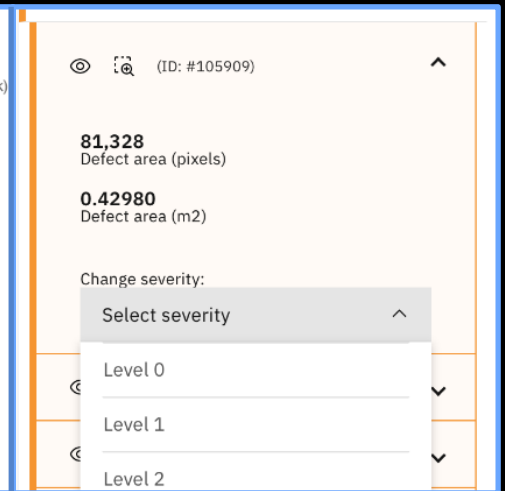
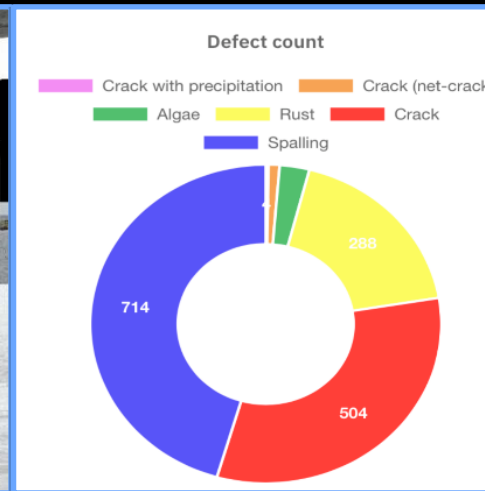
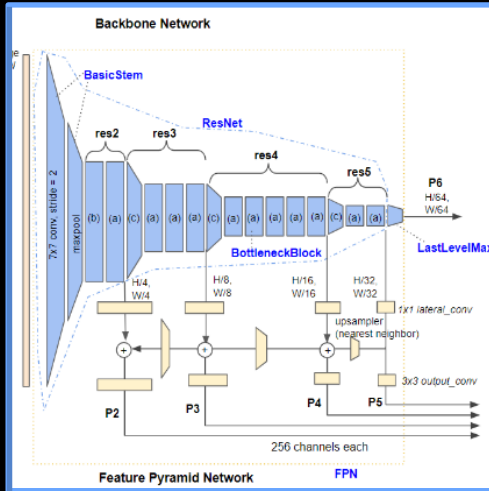
Spalling with corroded rebars (Spalling + Rust)





# One Click Learning – IBM Research Platform

A scalable, cloud based platform to:



Empower Engineers and Infrastructure Managers to use pretrained AI models for everyday inspections

Detect and characterize damage size and measure other important attributes

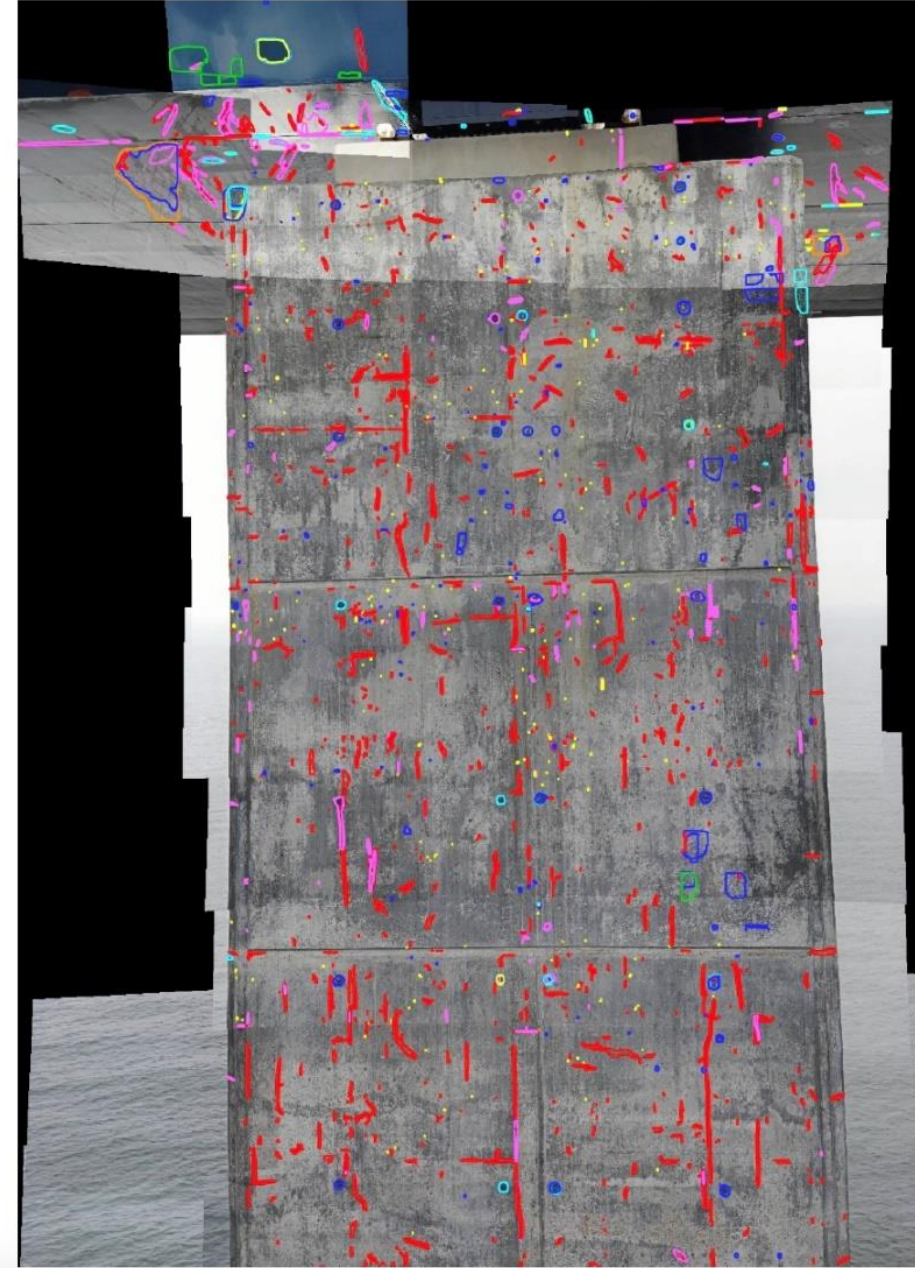
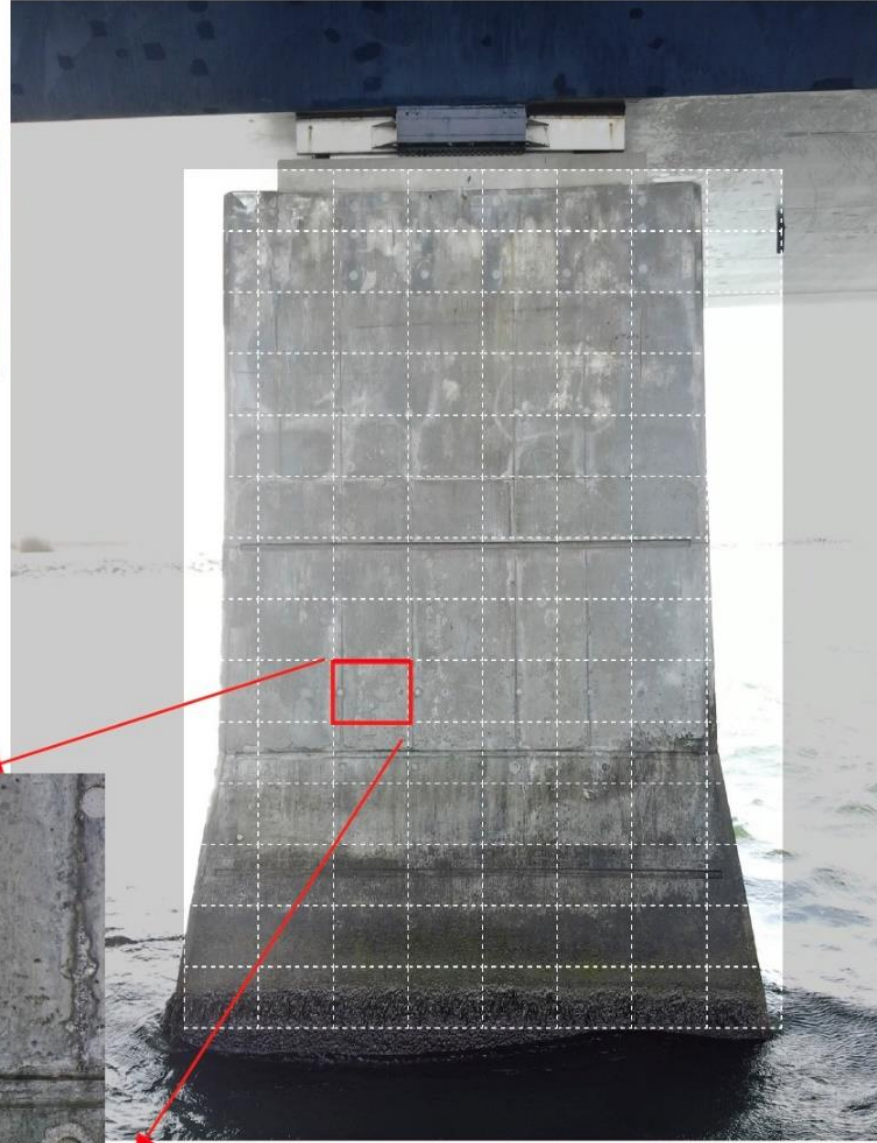
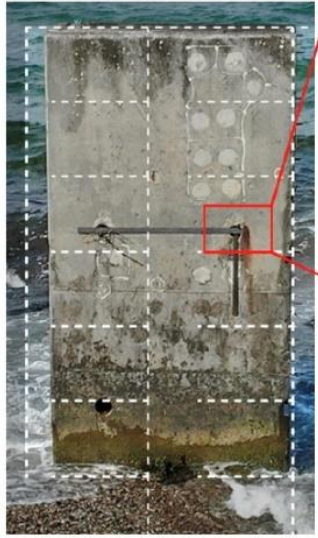
Reconstruct infrastructure elements and locate damages in scene with automated image stitching

Powerful data exploration of large datasets and large images with corresponding detected damage

Quick extraction of actionable results



# From high-res data acquisition to full pier analysis in one photo





## › **SESSION 2 : PANEL DISCUSSION**

- **Brief introduction of the panellists:**
  - Meenagi Venkat (CEO | KNOWCE, IT)
  - Arnwald Janssen (Rijkswaterstaat/Ministry of Infrastructure, NL)
  - Cristiano Malossi (IBM Research, CH)
- **Sharing the views on ‘artificial intelligence for transport infrastructures’ (short pitches as prelude for discussions):**
  - What are technology implementation and challenges in the real practice? (Meenagi Venkat)
  - What is the AI strategy of a public client and what is its expectation for standardisation? (Arnwald Janssen)
  - What the importance of automation based on AI and digitalisation for predictive maintenance of transport infrastructures? (Cristiano Malossi)
- **Interactive discussion between the panellists & questions from the online audience**



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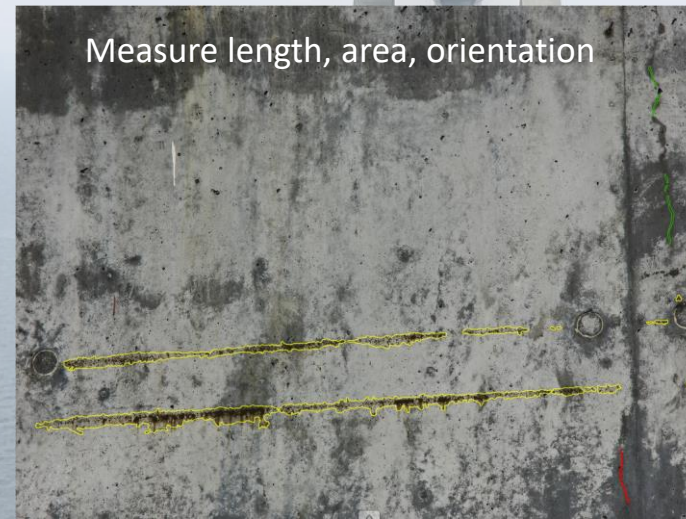
### **MEENAGI VENKAT - CEO | KNOWCE, ITALY**

Please tell us about your company and your work:  
what is your practical experience in this topic?

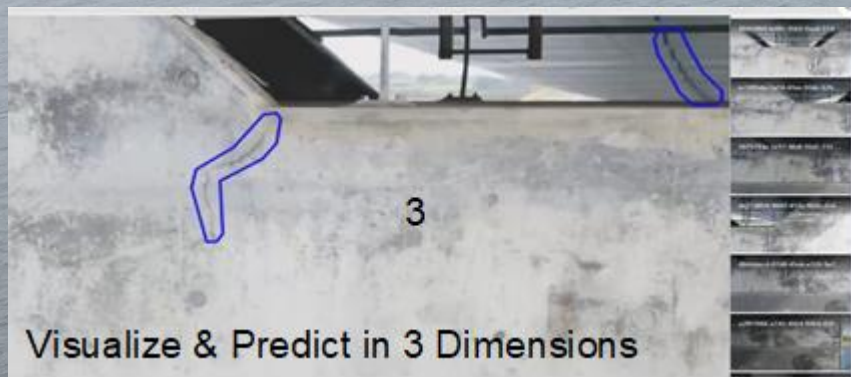
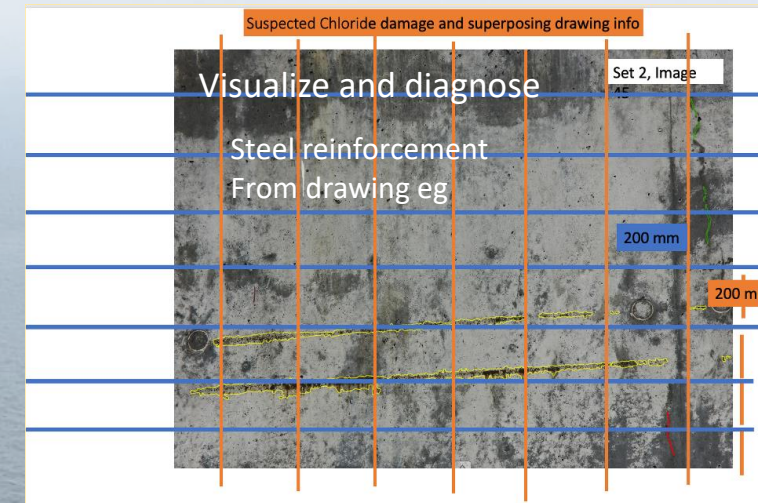
# KnowCE product mission

*Leverage AI Technologies to support civil engineers with defect recognition and diagnostics for extending the life of the structures through predictive maintenance.*

IBM Defect Recognition and Metrics



KnowCE data enrichment and 28 disease screening



## › **SESSION 2 : PANEL DISCUSSION**

### **ARNWALD JANSSEN - RIJKSWATERSTAAT/MINISTRY OF INFRASTRUCTURE, THE NETHERLANDS**

What is the AI strategy of a public client, such as Rijkswaterstaat,  
and what is its expectation for standardisation?

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## › **SESSION 2 : PANEL DISCUSSION**

**CRISTIANO MALOSSÌ - IBM RESEARCH ZÜRICH, SWITZERLAND**

Please tell us about the importance of automation based on AI  
for maintenance of civil infrastructures

## › **SESSION 2 : PANEL DISCUSSION**

**CRISTIANO MALOSSO - IBM RESEARCH ZÜRICH, SWITZERLAND**

Session 2 video 2

## › **SESSION 2 : DISCUSSION WITH ONLINE AUDIENCE**

- Received questions from the online audience:
  - What are the Do's and the Don'ts for predictive maintenance supported by AI?
- More questions: ...

Please ask questions to our panellists via Chat in Zoom

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**End of session 2**

