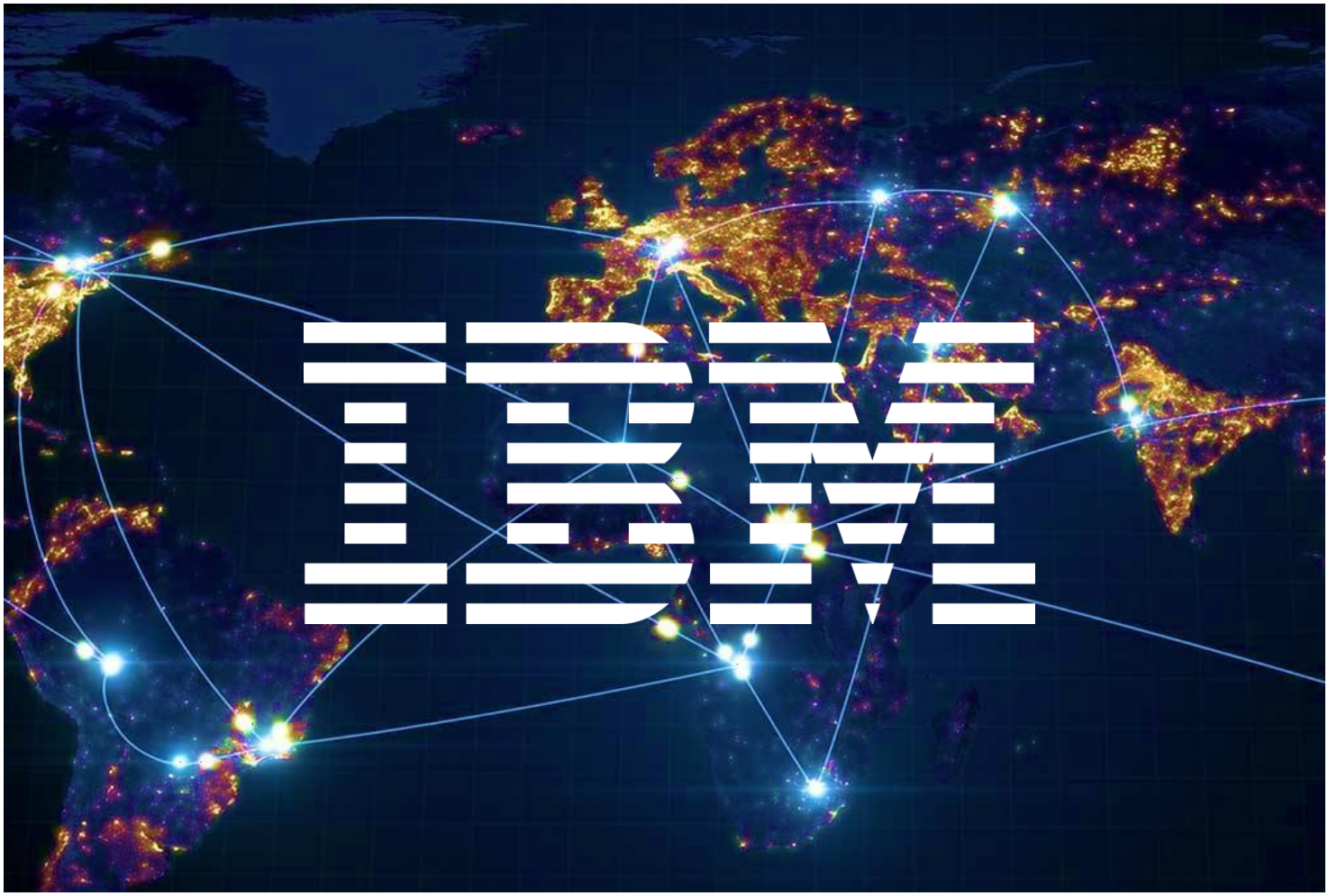
IBM Software
Whitepaper

IBM Watson Solutions

Implementing Watson Visual Recognition & Unmanned Aircraft Systems (UAS) for Rail Safety Monitoring



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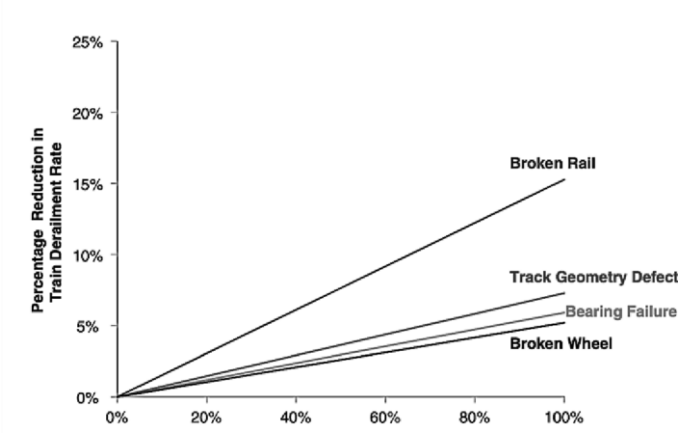
Executive Summary

Due its labor intensive nature, as well as its significance in accident prevention, railway maintenance poses a major challenge to respective companies and the public sector. This white paper discusses an IBM exploratory committee that is conducting a pilot program that uses Watson AI and Unmanned Aircraft Systems (UAS) to help monitor and recognize railways in need of maintenance.

New Pathways Offered by Watson AI

Detecting potentially broken rails, which presently relies mostly on ultrasonic and visual detection, has proven to be the most successful rail accident prevention strategy. By coupling Watson AI with UAVs (Unmanned Aerial Vehicles), a UAS can automate the process and decrease labor requirements while increasing precision. Ultimately, successful implementation could significantly reduce the rate of minor and major derailments and their accompanying monetary, human, and reputational losses.

Effectiveness of Accident Prevention Strategy



Current Infrastructure Maintenance & Accident Prevention Costs

Maintenance-of-way costs, majority of which pertains to track preservation, can compose as much as 11% of overall O&M expenditures for some companies. Barring major labor requirements for visual inspections, ultrasonic testing alone costs on average $900 per mile. Despite the heavy investment, in 2018 1,352 derailment related accidents were reported to the Federal Railroad Administration (FRA). The most prominent cause of derailments was rail defects or failure.

Past Derailments Costs

For companies like Amtrak, past derailment accidents and their high publicity have caused hundreds of millions in damages and intangible losses of brand reputation. The accompanying consequences of derailments can be especially disastrous for freight companies transporting hazardous materials. More crude oil was spilled in U.S. rail incidents in 2013 than was spilled into the environment in the previous thirty-seven years.

Cost of Freight Mainline Derailments (2005-2010)

Country	USA
Number of derailments	11,157
Derailment cost	€ 1,113,502,461
Average cost per derailment	€ 99,803

The Process

A drone will maneuver over the railway tracks and collect videographic data. Afterwards, IBM Watson AI will use the captured and additional visual data to train a classifier to distinguish between healthy and damaged railway conditions. This automates the detection process while reserving valuable time for more pertinent and complex aspects of railway maintenance.

Why IBM?

IBM Watson represents a new class of industry specific analytic solutions that leverages deep content analysis and evidence based reasoning to accelerate and improve decisions, reduce operational costs, and optimize outcomes. It accomplishes this based on a set of transformational technologies which leverage visual recognition and machine learning. It combines these technologies and applies. Watson is about bringing a unique combination of capabilities together in a way that's never been done before resulting in a fundamental change in the way decisions are made. IBM's vision is to define, create, and lead markets