

## TRANSFORMING DATA INTO INSIGHTS DYNAMIC RISK'S INSIGHT HUB FOR OPERATORS

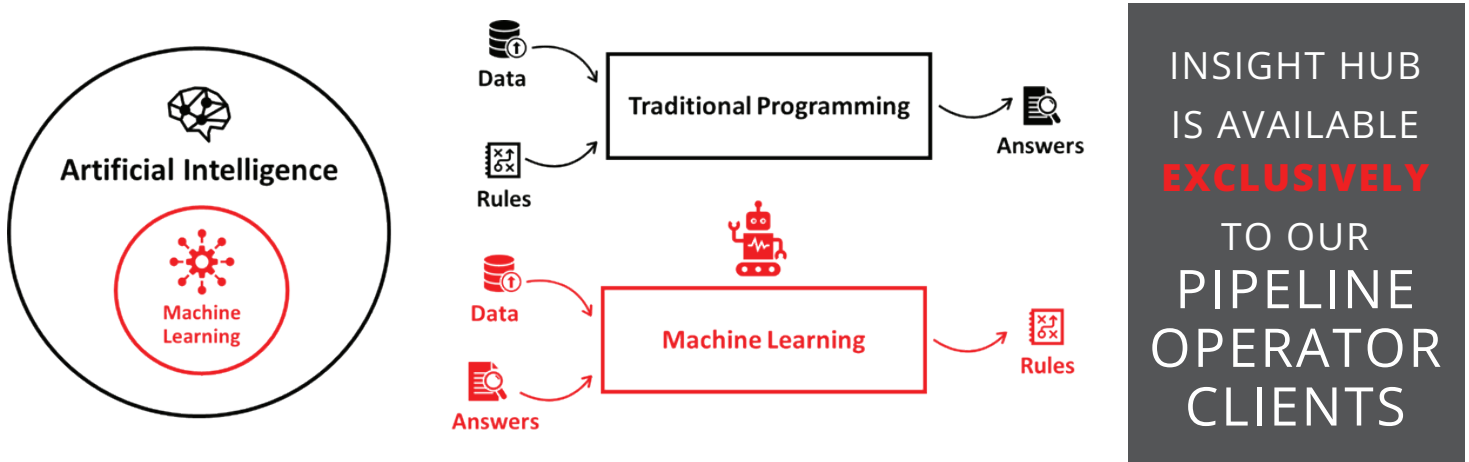
Operators who have embraced a proactive continuous improvement approach to managing their Pipeline Integrity Management Programs are now including elements of data science to efficiently assess large volumes of data for trends and outliers. With structured and normalized data, data scientists can construct machine learning models that expose previously unavailable insights and automation.

Dynamic Risk has partnered with a growing number of pipeline operators across the globe to compile the vast amount of available data from their pipeline assets into our Insight Hub. With the support of these forward-thinking operators, and a significant investment of technical resources; the Insight Hub is poised to enable previously impossible insights and data applications.

### MACHINE LEARNING, THE DYNAMIC RISK APPROACH

A mix of specialized skills, domain expertise and data scientists collaborate from data preparation through model development to ensure produced results can be leveraged to bring tangible business benefits. As models are developed and mature, data augmentation will enable additional new insights and applications.

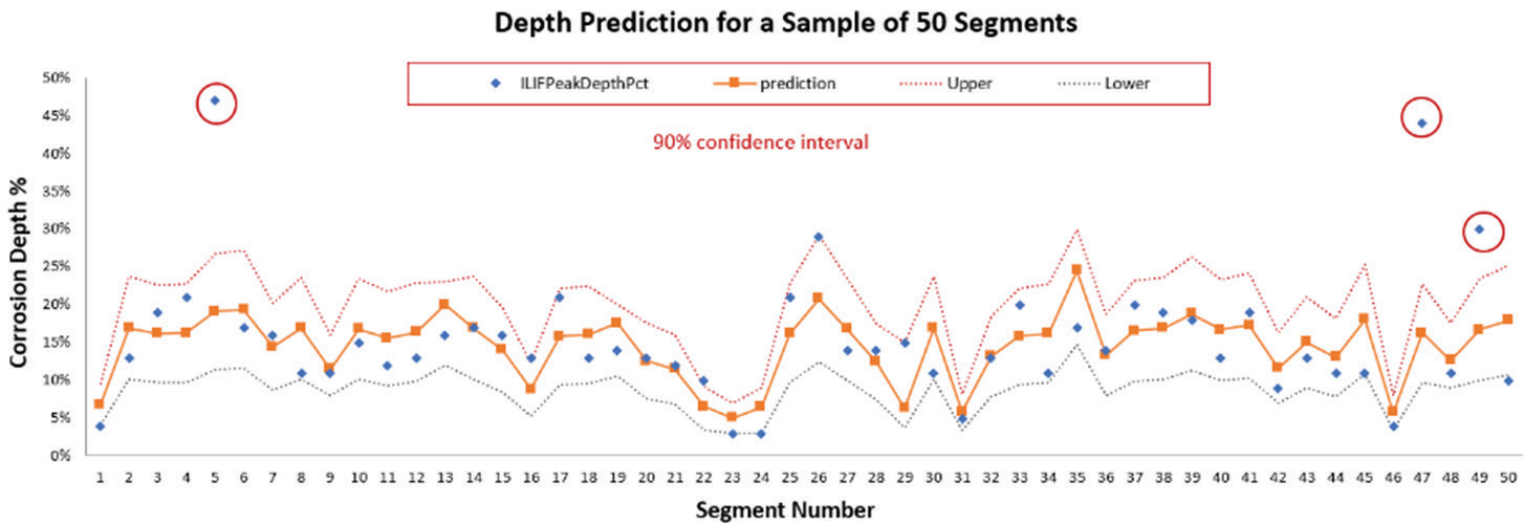
The objective of implementing Machine Learning and Artificial Intelligence tools at Dynamic Risk is to enhance operators' understanding of and reasoning in real-life situations encountered as part of pipeline integrity management.



## POTENTIAL APPLICATIONS

Relevant data along with subject matter expert knowledge, can be used to characterize the variables which can be used for machine learning of a Bayesian Network (BN) model. This BN model rigorously encodes interdependencies among the variables. A “What if” scenario would then correspond to any subset of variables being fixed to specific values and the effect of this being propagated through the entire network. This enables diagnosis of the “What if” scenario in terms of input data elements (e.g., a nominal wall thickness, depth of metal loss feature, a potential failure of pipeline markers, human error, etc.), to predict its most important consequences in terms of outputs of concern (e.g., a failure pressure due to corrosion, an third-party excavator hit, etc.). This type of analysis could then determine the most efficient prioritized list of mitigation or repair activities to forestall or remedy negative outcomes.







A recently completed Machine Learning (ML) project which utilized the Insight Hub predicts corrosion susceptibility and severity, based on a limited number of pipeline attributes. Sample performance metrics for the corrosion prediction model appear below.



THE PLANET'S ENERGY DELIVERED SAFELY

## ADVANTAGES OF MACHINE LEARNING

- Easily identify trends and patterns;
- No human intervention required (automation);
- Continuous improvement with new data added and augmented;
- Better management of multi-dimensional and multi-variable data;
- Suitable for a wide variety of applications;
- Based on both probabilistic as well as deterministic underpinnings;
- Accounts for uncertainties inherent in complex problems;
- Provides actionable results for diagnoses, predictions, optimal mitigations, and strategic planning in pipeline integrity management

	Types of input information about knowledge domain	Level of transparency	Level of human supervision	Type of output information about knowledge domain
<b>Bayesian Networks, Casual Graphical Models, Structural Graphical Models</b>	Any mix of relevant information: datasets, expert judgements, degrees of belief			Actionable insight into and explanation of casual mechanisms operating among variables, enabling diagnoses, predictions, investigations, strategic planning
<b>Influence Diagrams, Decision Trees</b>				
<b>Regressions, Clustering, Optimization</b>	Datasets			Correlation among variables, enabling certain predictions
<b>Neural Networks</b>	Very large datasets (typically)			Recognition of visual and auditory features, classification

Machine Learning covers a wide range of techniques and skill sets. A comparison of approaches are shown above.

THE PLANET'S ENERGY DELIVERED SAFELY

## DYNAMIC RISK'S INSIGHT HUB

Dynamic Risk's Insight Hub is offered exclusively to pipeline operators that wish to better understand their data in a broader industry context.

All client information is kept confidential with the final analysis and reporting deliverables provided in an anonymized format to protect the privacy of each participating operator.

## KEY BENEFITS OF INSIGHT HUB

- Detailed comparison metrics and like-in-kind analysis
- Increased accuracy of predictive analysis
- Data cleansing & augmentation
- Trending analysis and insights
- Ability to leverage an expansive dataset of pipeline information

## CONTACT US TODAY

Our Insight Hub is open to all Transmission, Midstream and Upstream pipeline operators. Our team of subject matter experts are available to answer any questions or concerns to ensure your trust and confidentiality is not compromised. To learn more or arrange an exploratory discussion, please contact us directly at [info@dynamicrisk.net](mailto:info@dynamicrisk.net).

## ABOUT US

Dynamic Risk's technology and consulting services optimize risk-informed decision making to manage risk through an asset's entire life cycle. Our IRAS platform software models pipeline systems to proactively determine where they are most likely to fail and the corresponding consequences of unintended releases. From gathering systems, midstream pipelines, transmission pipelines, and distribution networks, we have software applications and in-house engineering expertise to provide complete pipeline risk assessment, data management and compliance reporting.

Dynamic Risk is part of Eddyfi/NDT, an innovative industrial technology group focused on advanced diagnostic technologies to monitor the world's infrastructure health. The company employs over 1,200 people throughout 25 offices worldwide and serves clients in more than 110 countries. [www.eddyfi-ndt.com](http://www.eddyfi-ndt.com)

### Canadian Headquarters

Suite 1110  
333 - 11 Avenue SW  
Calgary, AB, T2R-1L9  
(403) 547-8638

### USA Headquarters

Suite 250  
10001 Woodloch Forest Dr  
The Woodlands, TX, 77380  
(832) 482-0606



THE PLANET'S ENERGY DELIVERED SAFELY