Oil and Gas Pipeline Monitoring using Artificial Neural Network

Conventional Artificial Neural Network approaches such as Feed-Forward Networks have been used in diverse applications but are not naturally predictive and also require supervised learning. Feed-forward Artificial Neural Network also trained by backpropagation poses the problem of vanishing gradient. Long Short Term Memory is an Artificial Neural Network recurrent technique that allows long range contextual representation to be stored and learnt in an unsupervised manner. In this work a modified Sparse Distributed LSTM Algorithm using Gaussian membership function with a context-decision gate for detection and monitoring operations has been proposed as an alternative to the traditional Feed-Forward Architecture. The AI monitoring System shows promising results in solving many recurrent problems, particularly those requiring long-term storage dependencies - the Vanishing Gradient problem (VGP) and has the ability to use contextual information when mapping between input and output sequences. The Oil and Gas AI monitoring system employs dynamic data flow modeling to simulate the behavior of probably militant behaviors. The contextual information (context data) includes such context as Pressure; Vehicle passing along the pipeline area, Manual digging,
and Machine excavation. Dynamic simulations were performed using a real-time data obtained from the SPDC. The data is tested using AI system in MATLAB-SIMULINK environment to verify the performance of the proposed system. The results were promising indicating the real state of vandalism prediction.

References

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