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# Near-Miss Deep Learning Approach for Neuro-Fuzzy Risk Assessment in Pipelines

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**Abstract :** The sustainability of traditional technologies employed in energy and chemical infrastructure brings a big challenge for our society. Making decisions related with safety of industrial infrastructure, the values of accidental risk are becoming relevant points for discussion. However, the challenge is the reliability of the models employed to get the risk data. Such models usually involve large number of variables and with large amounts of uncertainty. The most efficient techniques to overcome those problems are built using Artificial Intelligence (AI), and more specifically using hybrid systems such as Neuro-Fuzzy algorithms. Therefore, this paper aims to introduce a hybrid algorithm for risk assessment trained using near-miss accident data. As mentioned above the sustainability of traditional technologies related with energy and chemical infrastructure constitutes one of the major challenges that today's societies and firms are facing. Besides that, the adaptation of those technologies to the effects of the climate change in sensible environments represents a critical concern for safety and risk management. Regarding this issue argue that social consequences of catastrophic risks are increasing rapidly, due mainly to the concentration of people and energy infrastructure in hazard-prone areas, aggravated by the lack of knowledge about the risks. Additional to the social consequences described above, and considering the industrial sector as critical infrastructure due to its large impact to the economy in case of a failure the relevance of industrial safety has become a critical issue for the current society. Then, regarding the safety concern, pipeline operators and regulators have been performing risk assessments in attempts to evaluate accurately probabilities of failure of the infrastructure, and consequences associated with those failures. However, estimating accidental risks in critical infrastructure involves a substantial effort and costs due to number of variables involved, complexity and lack of information. Therefore, this paper aims to introduce a well trained algorithm for risk assessment using deep learning, which could be capable to deal efficiently with the complexity and uncertainty. The advantage point of the deep learning using near-miss accidents data is that it could be employed in risk assessment as an efficient engineering tool to treat the uncertainty of the risk values in complex environments. The basic idea of using a Near-Miss Deep Learning Approach for Neuro-Fuzzy Risk Assessment in Pipelines is focused in the objective of improve the validity of the risk values learning from near-miss accidents and imitating the human expertise scoring risks and setting tolerance levels. In summary, the method of Deep Learning for Neuro-Fuzzy Risk Assessment involves a regression analysis called group method of data handling (GMDH), which consists in the determination of the optimal configuration of the risk assessment model and its parameters employing polynomial theory.

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