

## PREDICTING FUTURE SUPPLY CHAIN RISK VALUES WITH GRAPH NEURAL NETWORKS

STEVE MATOVSKI & NASIM NEZAMODDINI

*Industrial and Systems Engineering Department, Oakland University, Rochester, MI, 48309, USA*

### ABSTRACT

*Calculating supply chain risk management values requires a granular set of parameters. Failure risk at each supply chain entity is a dependent value influenced by entities within a supply chain. Predicting future risk values from historical data is based on trends and patterns therein. On the surface, historical data does not show how the data interlinks and connects to each other. Current research is investigating the use of Graph Neural Networks (GNN) as a method to understand and predict data values as they can link separate data values to build an interconnected graph. In this technique, GNN represents the supply chain network as a graph that attention mechanism is designed to use weighting system for specifying node types and their importance. For this goal, the proposed method augments the process by using centrality algorithms to calculate a starting importance weight. Predicting future risk values using the encoded data is done by a Long Short-Term Memory (LSTM) Neural Network. The final outputs of artificial neural networks are used as part of a risk calculation algorithm that shows the risk at a node level of a supply chain graph. Two sets of experiments are implemented using centrality and Katz values and their results are compared with each other.*

**KEYWORDS:** *Supply Chain Risk Management, Graph Neural Networks, Bayesian Network, Centrality*

**Received:** Feb 01, 2023; **Accepted:** Feb 20, 2023; **Published:** Feb 25, 2023; **Paper Id:** IJIETJUN20232