

40th Sir Purshotamdas Thakurdas Memorial Lecture

By

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On

Knowledge Graph Integrated Credit Risk Assessment

Credit risk assessment is an essential process used by financial institutions to evaluate the creditworthiness and determine the likelihood of default. The market for credit risk assessment solutions is valued at approximately \$9.55 billion in 2025, growing at a Compound Annual Growth Rate (CAGR) of 14.1% and projected to reach \$23.97 billion by 2032. Traditionally, credit risk assessment has relied on credit scores and financial statements, but with the advent of Machine Learning (ML), Artificial Intelligence (AI), large language models, lenders have a new tool at their disposal. By and large, ML algorithms are designed to classify borrowers based on their credit history and transactional data while leveraging the entity relationship involved in credit transactions. Financial market volatility, concentration risks, liquidity risk, interest rate fluctuations and operational risk emphasizing that credit risk remains the most direct threat to lender solvency.

Knowledge Graphs (KGs) as a foundational technology for next-generation credit risk assessment. A knowledge graph is described as a structured representation of entities (such as borrowers, firms, banks and accounts) and their relationships, enabling semantic understanding and relational reasoning. Knowledge graph allow efficient querying, contextual inference and integration of heterogeneous structured and unstructured data sources based on ontologies and graph databases. Benefits of knowledge graph include improved data integration, flexible connectivity, hidden pattern discovery and scalable analytics. Several financial institutions like JPMorgan, HSBC, Alibaba/Ant Financial and Paypal using knowledge graph driven credit risk assessment models. KG-based credit analytics is employed by Crediwatch (India), martini.ai (USA) and IceKredit (China/Global) for their fintech solutions.

Our students also developed a Knowledge graph-driven credit risk assessment model (RGCN-RF) based on the Relational Graph Convolutional Network (RGCN) and Random Forest (RF) algorithm. RGCN is employed to identify topological structures and relationships, which is currently nascent in traditional credit risk assessment methods. RF categorises borrowers based on the enterprise embedding vector generated from RGCN. This model is validated utilizing data from the Centre for Monitoring Indian Economy (CMIE) database queried through ProwessIQ and Industry Outlook. The RGCN-RF model achieved a balanced accuracy of 92%. Knowledge graph-integrated credit risk assessment offers a scalable, explainable and future-ready alternative to traditional scoring systems, particularly for complex, interconnected and data-rich financial ecosystems. In coming days, agentic-AI based on LangChain and LangGraph can be utilized for credit risk assessment.

This is the excerpt from the 40th Sir Purshotamdas Thakurdas Memorial Lecture, which was delivered by Prof. Manoj Kumar Tiwari, Director, Indian Institute of Management, Mumbai, on December 03, 2025, in Virtual mode.