

Conclusions: This study delves into the interdependence and combination of fatal causes within the construction industry. The proposed method aids project managers in identifying critical fatal cause groups promptly and reliably. In terms of author contributions, conceptualization, methodology, software development, validation, formal analysis, investigation, data curation, original draft preparation, visualization, supervision, project administration, and funding acquisition were carried out by Q.S. and Z.Z. All authors have read and approved the manuscript. The research received funding from several sources, including the Fundamental Research Funds for the Central Universities (grant number 2019JBW007), the National Natural Science Foundation of China (grant number 71501008), the Beijing Municipal Social Sciences Foundation (grant number 18GLC070), and the Ministry of Education of Humanities and Social Science Foundation (grant number 20YJC630121). The data used in the study is available for download, and models or code generated can be obtained from the corresponding author upon request. Utilizing an optimized machine learning (ML) model and permutation importance method, the research identifies 21 causes influencing fatalities. It develops a predictive model based on 34 fatal attributes to uncover these relationships.