

A Systematic Review and Bibliometric Analysis of Artificial Intelligence Applications in Slope Stability: An Indian Perspective

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Abstract:

This study presents a comprehensive review of machine learning (ML) applications in slope stability analysis in India, highlighting their integration with traditional methods such as limit equilibrium and finite element techniques for calculating the factor of safety (FOS). The research employs a systematic review approach, supported by bibliometric analysis, to identify trends and patterns in the field. A total of 886 articles were initially identified from the Scopus database, but after applying the PRISMA tool, 87 relevant articles were retrieved. This studies primarily focused on machine learning models like Support Vector Machines (SVM), Random Forests (RF), Adaptive Neuro-Fuzzy Inference System (ANFIS), Artificial Neural Networks with Particle Swarm Optimization (ANN-PSO), and Decision Trees (DT). The findings indicate a significant increase in the use of ML techniques in slope stability studies, particularly after 2018. Keyword co-occurrence analysis revealed the prominence of ML methods in addressing slope stability problems, while co-authorship analysis emphasized strong international collaborations. Bibliometric coupling further identified influential journals, with Geotechnical and Geological Engineering and Advances in Space Research standing out for their citation counts and impact. Despite limitations in data retrieval, such as the potential omission of articles due to terminological differences, the study underscores the growing recognition of ML approaches in improving slope stability assessments and enhancing engineering solutions, particularly in landslide-prone regions.

Keywords:

Systematic Review, Bibliometric Analysis, Slope Stability, Machine Learning.