

## ABSTRACT

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Surface mine slope failures pose serious risks, necessitating continuous stability monitoring and accurate slope failure prediction models for improving safety and productivity of mines. Slope Stability Radar (SSR) offers real-time deformation data, aiding in slope movement tracking. However, SSR's potential for predicting failures remains underutilized, hindering effective early warning systems. This research aimed to develop a model predicting surface mine slope failure times using displacement/time records and data from South Eastern Coalfields Limited mines, using MATLAB.

Analysis of past displacement/time data from radar monitoring system yielded empirical thresholds, enhancing understanding of slope deformation and failure processes. This integration of radar systems in mining is pivotal for accurate prediction and prevention. The research achieved three significant outcomes: (i) interpretation of slope deformation and failure processes using radar data, (ii) development of an easy-to-use model to determine critical slope threshold values, and (iii) creating a Slope Failure Prediction Model for Surface Mines (SFPMSM), accurately forecasting failures. The proposed model offers a systematic, real-time approach to evaluating failure time, showcasing the potential of integrating ground-based radar systems for monitoring deformations and predicting slope failures in the mining industry. The SFPMSM serves as a vital tool for timely intervention, helping prevent catastrophic consequences of slope failures and enhance overall slope stability of slopes and safety in surface mining operations.

*Keywords: Slope failures, Mine slope monitoring, Slope Stability Radar (SSR), Deformation analysis, Failure prediction, Early warning system.*