Application of machine learning to construction injury prediction

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1 Abstract

Construction safety decisions need to be based on objective, empirical data. However, machine learning (ML) has not yet been considered for use in addressing safety concerns. In this paper, we apply advanced machine learning models (Random Forest and Stochastic Gradient Tree Boosting) to a detailed safety outcomes dataset collected from textual construction injury reports with the help of a natural language processing tool (NLP). The models demonstrate high accuracy in predicting injury types and affected body parts($0.236 \leq RPSS \leq 0.436$). The results demonstrate that injuries are not random occurrences; thus, construction safety should be studied empirically, rather than relying solely on subjective data or expert opinions. Predictions about injury severity were less successful, nevertheless, the importance of additional details, such as environmental energy levels, has been indicated. Our research made a significant contribution to providing reliable probabilistic forecasts of accident consequences. A similar data-driven approach had been absent in the field of safety science.

2 Keywords

Machine learning, safety science, injury modeling, random forest, stochastic gradient tree boosting.

3 Highlights

- The high predictive skill demonstrated indicates that injuries are not the result of random occurrences.
- The importance of environmental energy levels in accident's severity have been shown.
- It is therefore recommended that construction safety be studied empirically and quantitatively.

4 Introduction

This paper was selected for review because it demonstrates the utility of diverse machine learning models in forecasting the probability and severity of injuries at the construction. Furthermore, this paper employs the NLP approach to data pre-training, a novel technique in the domain of safety science.

5 References

1. Tixier, Antoine J.-P.; Hallowell, Matthew R.; Rajagopalan, Balaji; Bowman, Dean . (2016). Application of machine learning to construction injury prediction. Automation in Construction, 69(), 102–114. doi:10.1016/j.autcon.2016.05.016