ABSTRACT

The efficacy vis-à-vis the generalizability of conventional anomaly detection tools in large-scale accounting data has not presented itself devoid of skepticisms. In general, the current status quo with regard to the performance of the commonly used methodologies can be justifiably characterized to be a factor of dissatisfaction. The current repertoire of tools is largely based on known fraud scenarios whereby generalizability for new data tends to be compromised. This situation is further exacerbated given the costly business implications of failures in such systems, as compromised detection leads to wasteful follow-up procedures by way of operations under a pretense of false flags. At the same time, the growth in artificial intelligence and/or machine learning in other disciplines has demonstrated a sense of urgency for technological realignments in leveraging the new technologies. Within this research, we tested the efficacy of an artificial intelligence/machine learning based autoencoder neural network approach in conducting anomaly detection, benchmarked against a popular anomaly detection tool namely the Benford's law first digit analysis, alongside proposing a new method that combines the two approaches through a heuristical multiplier mechanism. By conducting an experiment on a real world dataset containing 500,000+ rows of accounting journal entry data obtained from an anonymized entity's SAP ERP BKPF and BSEG table that has been injected with synthetic anomalies, we found that the autoencoder based approach to be the best performing method both in terms of recall (sensitivity) and in balancing the precision-recall tradeoffs measured in terms of F1-Score, highlighting its great potential within the context of internal auditing. The novel proposed method was found to be inconsequential in alleviating the identified recall problem of the baseline autoencoder, although the discrepancy in performance is not conclusive enough to derive a generalizable conclusion. Collectively, these results suggest that the autoencoder neural network approach represents a promising framework in conducting anomaly detection especially in cases whereby recall is more preferable than precision (such as in internal auditing), as the opposite is true in the case for Benford's law first digit analysis (such as in external auditing).

Keywords: Anomaly Detection . Accounting . Auditing . Autoencoder . Benford's Law . Artificial Neural Network . Machine Learning . Deep learning . Artificial Intelligence