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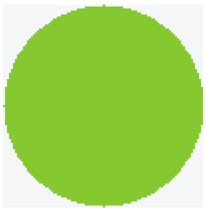

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Abstract

In our fast-paced, internationally competitive digital economy, a stronger focus on data-driven decision-making based on artificial intelligence (AI) and machine learning (ML) is required. While deep learning (DL) offers numerous benefits, a number of disadvantages have kept DL from being widely applied in the business. This essay explores the reasons why DL is not taking off in the business analytics industry as rapidly, despite its ubiquitous use. It is shown that the adoption of deep learning is influenced not only by the lack of big data architecture, computational complexity, lack of transparency (black-box), leadership commitment, and skill shortages, but also by the fact that DL models do not outperform traditional ML models when used on structured datasets with fixed-length feature

Deep learning is a powerful addition to the existing repertoire of machine learning models, not a "one size fits all" solution. The results unambiguously suggest that gradient boosting ought to be regarded as the industry standard approach in business analytics for forecasting structured data. In addition to the empirical examination based on three industrial use cases, the essay offers a comprehensive analysis of those results, a strategy for future research, and their practical implications.

Introduction

Over the past 10 years, significant developments in data storage and analytics capabilities have had an impact. Globalization and the continuous shift towards a digital global economy were accelerated by the big-data revolution and the period of constant digital change that followed. Businesses nowadays face fierce competition from across the world in a market that moves at lightning speed. Information management driven by artificial intelligence is crucial to weathering the digital storm of the twenty-first century.

AI and ML are now widely acknowledged as general-purpose technology for decision-making across a wide range of industries, enterprises, and jobs, including biotech, healthcare, marketing, human resources, insurance, risk management, cybersecurity, and many more.

The discipline of business analytics is responsible for converting raw data insights from statistics, machine learning, information systems, operations research, and management science. Just a few of the several forms of analytics that comprise business analytics include prescriptive, predictive, and descriptive analytics. Machine learning operates largely in the predictive domain of business intelligence; however it has started to encompass prescriptive analytics as well.

One of the main technologies advancing the present digital revolution is deep learning. It is a branch of machine learning that began with earlier research on neural networks that drew inspiration from the human brain. Complex hierarchical data representations can be learned via deep learning. It was able to surpass traditional methods and possessed prediction skills that, in some situations, were on level with or even superior to human intelligence. Three main areas of progress are responsible for DL's breakthrough.

Methodology

Machine Learning

This section gives a summary of the ML models used in the experiment as well as predictive analytics. Four machine learning models are used and compared in this experiment: Random Forest (RF), Gradient Boosting Machine (GBM), Deep Learning (DL), and Logistic Regression (LR). For a thorough analysis of the underlying theory.

Linear Regression

The logistic regression (LR) is a member of the broad family of generalized linear models (GLMs). A GLM uses a function to connect the input to the output, and its input is a linear combination of features. An underlying exponential probability distribution, such the normal distribution or the binomial distribution, underlies the output of a GLM (Murphy, 2012). For binary classification, the LR is a widely accepted standard method in both academia and business.

Random Forest

The recursive partitioning techniques Random Forest (RF) is a member of the ensemble approach family and works similarly to decision trees with bagging. By using replacement, M randomly selected portions of the training data are bagged (Breiman, 1996) and these estimates are averaged. The random forest creates many decision trees and averages the results in the end to reduce the variance. It's one of the best machine learning algorithms out there for jobs like regression and classification.

Gradient boosting

Boosting is comparable to bagging, except instead of averaging many results, it builds models one after the other. Boosting begins with a weak learner and gradually strengthens it by correcting the errors committed by the previous model. This strategy improves the performance of the weak learner by gradually increasing accuracy. The most common model for boosting is a decision tree. Gradient Boosting (GM) has several implementations available. Based on (Hastie et al., 2017), the gradient boosting version utilized in this work was put into practice by Malohlava & Candel in 2019. Gradient boosting is one of the best accessible prediction methods for structured data at the moment.

Deep Learning

Deep learning encompasses a variety of architectures, such as recurrent neural networks (RNNs), convolutional neural networks (CNNs), and feed-forward artificial neural networks (ANNs). The best architecture for transactional (tabular) data that are not sequential, like the data in this study, is a multi-layer feedforward artificial neural network. Other, more complex designs, such as RNNs, are not always beneficial (Candel & LeDell, 2019). The feed-forward neural network's architectural graph is displayed in Fig. 1. The first column, which shows the input properties, is the input layer. The last single neuron represents the output, to which the final activation function is applied. We call the two intermediary levels "hidden layers. If a neural network contains more than one hidden layer, it is referred regarded as deep. A deep learning model can consist of several hidden layers that are trained via stochastic gradient descent and backpropagation

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