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BOOK OF ABSTRACTS

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Decision Making System to Support the Cost of Ordered Products

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This work aims to identify the critical production costs, related to raw materials and labor, of ordered products without standardization in order to develop a quantitative model to predict these costs accurately in the early project stage, within the budget step. In order to achieve this goal, it was necessary to understand the production processes and the raw materials, as well as to study the principal theoretical aspects related to cost estimating techniques and methods, cost estimating models, model selection, and validation. Therefore, it is intended to develop a multiple linear regression model, applied to historical quantitative data, to estimate each critical variable concerning the quantity of the main raw material and the labor times for critical processes. Six models were analyzed, in which two models are identified for each critical variable such as the linear meters value of the main raw material used in the product, the main raw material cut time involved in the product and the sew time required by the product. The models were evaluated, selected, and validated, defining the best model for each critical variable. The model parameters were obtained using a train dataset and, afterwards, the results of the selected models were validated using a test dataset. The obtained results, through the proposed methodology, were evaluated and proved to be reliable for use in the early stage of product development within the budget step.

Techniques to Reject Atypical Patterns

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Supervised Classification algorithms are only trained to recognize and classify certain patterns, those contained in the training group. Therefore, these will by default, classify the unknown patterns incorrectly, causing unwanted results. This work proposes several solutions, to make the referred algorithms capable of detecting unknown patterns. The main approach for the development of models capable of recognizing these patterns, was the use of three different models of Autoencoders: Simple Autoencoder (SAE), Convolutional Autoencoder (CAE) and Variational Autoencoder (VAE), that are a specific type of Neural Network. After carrying out several tests on each of the three models of Autoencoders, it was possible to determine which one performed best the task of detecting/rejecting atypical patterns. Afterwards, the performance of the best Autoencoder was compared to the performance of a Convolutional Neural Network (CNN) in the execution of the referred task. The conclusion was that the VAE effectively detected atypical patterns better than the CNN. Some conventional Machine Learning techniques (Support Vector Machine (SVM), Random Forest (RF), Logistic Regression (LR)) were also tested. The one that presented the best performance was the RF classifier, achieving an accuracy of 75% in the detection of atypical/typical patterns. Thus, regarding the classification balance between atypical and typical patterns, Machine Learning techniques were not enough to surpass the Deep Learning methods, where the best accuracy reached 88% for the VAE.
