COMPARING STATISTICAL AND MACHINE LEARNING MODELS FOR ASSESSING BODY FAT PERCENTAGE USING BODY COMPOSITION DATA

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The aim of this research is to develop statistical and machine learning models for assessing body fat percentage. The data is obtained from https://www.kaggle.com/fedesoriano/body-fat-prediction-dataset, which comprises 15 features, including body fat percentage, density (determined from underwater weighing), age, weight, height, circumference of neck, chest, abdomen, hip, thigh, knee, ankle, extended biceps, forearm, and wrist. To simplify the model-building process, the approach begins with feature engineering using RapidMiner Studio version 9.10. In this feature engineering step, parameters such as generalized linear model (GLM), gradient boosted tree (GBT), deep learning (DL), and support vector machine (SVM) are utilized to create appropriate features. Subsequently, the newly created features are used to construct GLM, GBT, DL, SVM, generalized additive model, naive Bayes model, decision tree model, and random forest model using R for Windows (version 4.3.3) for forecasting body fat percentage. The results reveal that the GLM model demonstrates the highest predictive performance. A GLM model using features derived from feature engineering with GLM achieves a minimum RMSE of 3.921. Meanwhile, a GLM model employing features derived from feature engineering with SVM achieves a minimum MAE of 3.818.

PREDICTION OF ICU ADMISSION FOR COVID-19 INFECTED PATIENTS USING BINARY LOGISTIC REGRESSION ANALYSIS

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This research focuses on creating a predictive model using binary logistic regression to anticipate ICU admission of COVID-19 patients in Mexico based on data from 2020. The backward elimination method is employed for variable selection, considering statistical measures like the loglikelihood ratio and Wald statistic. Python libraries within the Anaconda environment, specifically Jupyter Notebook, are utilized for analysis. The dataset is divided into three different training-to-testing data ratios: 70:30, 75:25, and 80:20, with synthetic minority oversampling technique (SMOTE) applied for data balancing. The models trained on imbalanced data ratios (70:30, 75:25, and 80:20) achieve accuracies of 88.18%, 87.94%, and 88.12%, respectively, with sensitivities of 39.47%, 40.53%, and 38.46%, compared to actual data. In contrast, models trained on balanced data achieve accuracies of 77.39%, 76.91%, and 78.05%, respectively, with sensitivities of 58.61%, 58.23%, and 57.79%. The models trained on balanced data show comparable accuracy and sensitivity but outperform models trained on imbalanced data, indicating improved prediction of ICU admissions for COVID-19 patients with increased sensitivity.

An Intelligent Fall Detection Technique Using Convex Hull Analysis

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Falls represent a serious health risk, especially among the elderly population. This paper introduces a real-time fall detection system utilizing MediaPipe, a widely recognized pose estimation library. The system leverages the geometric properties of a convex hull, which represents the minimal polygon outlining a person's silhouette within a video frame, for fall analysis. Key joints of the human body are extracted from video frames using MediaPipe and utilized to construct the convex hull. A sudden and substantial decrease in the convex hull's area indicates a potential fall event, marking the transition from a standing posture to a fallen posture. This approach provides a computationally efficient method for fall detection. Moreover, the system can seamlessly integrate with various communication protocols to deliver real-time notifications, such as LINE notifications, upon detecting a fall. While recognizing the limitations of relying solely on area changes, the paper proposes incorporating additional checks to enhance the system's robustness. This contributes to advancing the exploration of convex hull analysis in practical fall detection systems, paving the way for further advancements in the field and ultimately improving the well-being of the elderly population.