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CLUSTERING AND ENSEMBLE LEARNING FOR ACCURATE PREDICTION OF NUTRITIONAL HEALTH OUTCOMES IN CHILDREN'S FOODS

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1.Introduction

Nutrients are essential for children's and teenagers' growth, development, and overall well-being. However, most children's diets are of poor quality, with parents struggling to ensure balanced nutrition. Eating habits formed in childhood often persist into adulthood, influencing long-term health outcomes. Studies show that many American children and adolescents fail to meet nutritional standards. Modern dietary patterns reveal increased snacking, soft drink consumption, and processed food intake. Childhood obesity and overweight have become major public health concerns, affecting about 15% of American youths. Many overweight children face risks of diabetes and cardiovascular issues. Digital nutrition interventions show promise but need validated best practices. Malnutrition, caused by deficiencies in essential nutrients, remains a global issue, particularly in low-income countries. Children represent the most vulnerable group, with millions worldwide lacking adequate nutrition.

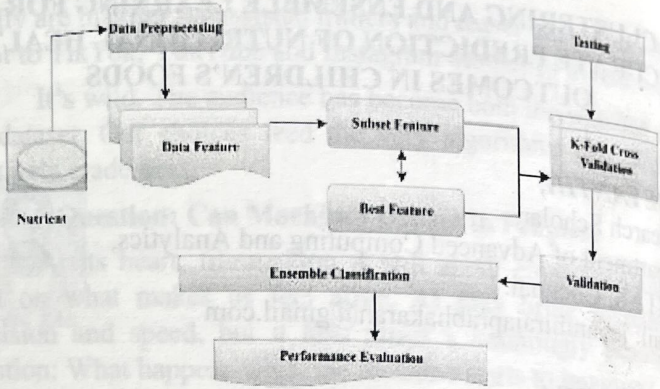


Figure 1: Introduction flow diagram

Figure 1 illustrates a basic introductory flow diagram fo using ensemble learning methods to assess the health benefits o nutrients (protein, sugar, fat, iron, folate, calcium, an immunity). Pre-processing, feature selection, feature subse generation, and selection occur following ensemble learning i the preceding section. Testing values are validated prior t classification, and classification is then used to assess th performance and health benefits of children's nutrients (protein sugar, fat, iron, folic acid, calcium, and immunity). The projec aims to evaluate the effectiveness of risk factor-specific liv video consultations on physical activity, alcohol usage smoking, and obesity. Predict child nutrients (protein carbohydrate, fat, iron, folate, calcium, immunity) using a mixed model that incorporates Naive Bayes Gradient Boostin Sequential Ranked Cluster Feature Analysis (SRCFA-NBGB).

This method employs a combinatorial learning strateg to construct a predictive model by combining weighte classifiers and feature selection based on an evaluation functio It predicts children's nutritional health by assessing ingredient age, weight, and BMI and recommending appropriate good Sequential Ranked Cluster Feature Analysis enhances featu selection by reducing ranking loss and focusing on high-marg

features. An ensemble learning system improves accuracy by combining various nutrient and health data sources. For accurate validation, stratified K-Fold cross-validation ensures balanced data splits, hence avoiding bias. This method minimizes the need for expensive trials while providing precise, scalable nutrition recommendations. Congenital muscular torticollis (CMD) is a paediatric neuromuscular condition that worsens with age, and EMG-based approaches help monitor nutrition levels in children. CNN computations utilizing LDA eliminate multiplication but have large energy costs due to nearest-neighbour searches. Body fat research using DXA scans provides insights, however sales forecasting inefficiencies exist due to data gaps. Memory-based LDA increases CNN efficiency but still has energy overheads.

New products are difficult for current sales prediction algorithms to predict; attribute-based models are not reliable for projections, and time series approaches overestimate in the absence of past data. Although they eliminate multiplication, energy-efficient CNN implementations that use LDA have significant NNS energy costs. Quantifying food biomolecules in nutrition allows for data-driven dietary decisions, and UPF research relates trends in ingredients to health effects that are particular to a given income or location. ML alters agriculture through fertilizer optimization and irrigation control utilizing multi-source data. Sensor data and ethnographic insights are used by Improved Genetic Algorithms (IGA) to improve nutrition recommendations.

In order to analyze and assess the nutritional value of daily food intake, the suggested approach presents a food recommendation system that makes use of a Naive Bayesian Gradient Boosting (NBGB) model. It focuses on important nutrients such as protein, sugar, fat, iron, folate, calcium, and components that boost immunity. The technology offers real-time calorie and nutrient consumption monitoring to support balanced diets and is intended to assist children and adults in

managing obesity. The implementation follows a structure workflow: first, the input data is pre-processed to guarante consistency and quality; next, Sequential Ranked Cluste Analysis is used to select relevant features to maximize mode performance; an ensemble learning approach is then used fo robust classification; and lastly, stratified K-fold cross- validation is used to validate the accuracy of the model.

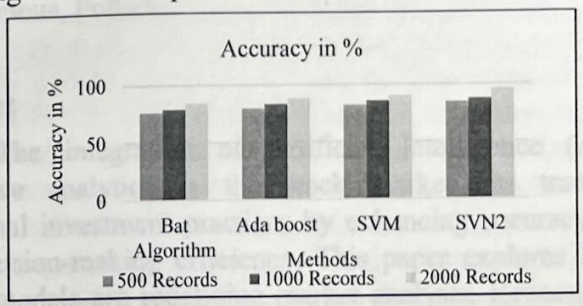
2. Related work

A pediatric neuromuscular diagnosis known a congenital muscular torticollis (CMD) is characterized b postural abnormalities and neck muscle dysfunction tha progressively worsens with maturity. Nutrient verification i children is facilitated by neck electromyography utilizing topographic electromyography (EMG) with flexible and stretchable surface electromyography (sEMG) in the array.[6] SFNN (Sales Factor Model Using Neural Networks) uses weight matrix functions and backpropagation multilayer perceptron neural networks to investigate the mechanisms impacting online product sales on e-commerce sites.

More information is currently needed regarding the causal relationship between enterprises' digital transformation and overall productivity of green factors [8]. Products for Consumer Electronics (CEP) On high-speed, high-precision, and high-reliability, CEP is desperately needed in the Computer, communication, and home appliance sectors. Due to the high production requirements, CEP has always been challenging to manufacture, ship, assemble, and test [9]. However, it takes more work to predict new product sales accurately using current techniques. Time series models overestimate new products because they have little historical sales data. In contrast, models that do not incorporate historical data have high sales indicators on the product's essential features and cannot forecast the future accurately because they need more data [10].

3.Result And Discussion

This section provides a thorough analysis of the outcomes generated by the different strategies covered in the earlier algorithms. The approaches' performances are assessed in a variety of scenarios with varying limitations. The Nutrients data collection, which includes records of several classes of nutrient items digital marketing, is used to apply the approaches. This section presents the approaches and measures their performance according to different parameters.



Analysis of accuracy

Compares and measures the categorization accuracy performance. Compared to existing Bat algorithms, Ada boost, and SVM approaches, the suggested SVN2 algorithms have achieved superior accuracy. Compared to previous methods, the SVN2 method has a greater classification accuracy of up to 95.67%.

4. Conclusion

This study created a sophisticated machine learning framework to categorize children's food products according to their nutritional content by integrating Sequential Ranking Clustering Feature Analysis (SRCFA) and Naïve Bayes Gradient Boosting (NBGB). With an accuracy of 94.5%, the model outperformed conventional methods, and its performance was improved by feature engineering techniques such as the Healthy Food Score and Allergen Risk Index. The findings enable focused promotion of healthier options (e.g., low-sugar, high-protein diets) by providing parents, food manufacturers, and marketers with useful information. But there are still issues

like disparities in the data and regional dietary differences. Re
time picture identification and deep learning could be combin
in future research for wider applicability. Finally, by bridgi
the gap between AI and nutrition science, our research promot
healthy eating habits and raises awareness of child health issue

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