National Institute of Technology Rourkela

Departmental Seminar

Seminar Title	: Return Seminar-Development of an Open-Source Web Application for Optimizing Agricultural and Food Processing Operations Using Machine Learning
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Venue	: CH-306
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Abstract : Objective To develop open-source web application for optimization of agriculture and food processes using machine learning Methodology An open-source web application was developed using Python (3.12) for optimizing all kinds of food and agricultural processes. The developed web application supports the creation of experimental designs, data preprocessing, the development of artificial neural network (ANN) models, and optimization using genetic algorithms (GA). The web application was validated using an ultrasound-assisted millet hydration dataset consisting of four independent variables (amplitude (%), water-to-grain ratio (mL/g), time (min), and frequency (kHz)) and five dependent variables (antioxidant activity (%), condensed tannins (mg CE/g), foaming capacity (%), foaming stability (%), and phytate content (mg/g)). In addition, comparative analysis was conducted using MATLAB (neural net fitting app, R2024b) to evaluate the evaluation metrics of ANN and GA. Results and Conclusion The developed web application demonstrated lower mean square error (MSE) values compared to MATLAB across all independent variables, while no significant difference ($p > 0.05$) was observed in the R^2 values of ANN models. The Adam optimizer used in the developed web application significantly reduced ($p < 0.05$) the MSE values for all independent variables. In addition, GA results showed an average deviation of less than 5% in optimized values, establishing the developed web application as a comprehensive, open-source alternative to MATLAB. This web application can bridge the gap between advanced machine learning techniques and practical applications in agriculture and food processing operations.