World Academy of Science, Engineering and Technology
International Journal of Mathematical and Computational Sciences
Vol:14, No:12, 2020

Comparison of Two Neural Networks To Model Margarine Age And Predict Shelf-Life Using Matlab

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Abstract : The present study was aimed at developing & comparing two neural-network-based predictive models to predict shelf-life/product age of South African margarine using free fatty acid (FFA), water droplet size (D3.3), water droplet distribution (e-sigma), moisture content, peroxide value (PV), anisidine valve (AnV) and total oxidation (totox) value as input variables to the model. Brick margarine products which had varying ages ranging from fresh i.e. week 0 to week 47 were sourced. The brick margarine products which had been stored at 10 & 25 °C and were characterized. JMP and MATLAB models to predict shelf-life/ margarine age were developed and their performances were compared. The key performance indicators to evaluate the model performances were correlation coefficient (CC), root mean square error (RMSE), and mean absolute percentage error (MAPE) relative to the actual data. The MATLAB-developed model showed a better performance in all three performance indicators. The correlation coefficient of the MATLAB model was 99.86% versus 99.74% for the JMP model, the RMSE was 0.720 compared to 1.005 and the MAPE was 7.4% compared to 8.571%. The MATLAB model was selected to be the most accurate, and then, the number of hidden neurons/ nodes was optimized to develop a single predictive model. The optimized MATLAB with 10 neurons showed a better performance compared to the models with 1 & 5 hidden neurons. The developed models can be used by margarine manufacturers, food research institutions, researchers etc, to predict shelf-life/ margarine product age, optimize addition of antioxidants, extend shelf-life of products and proactively troubleshoot for problems related to changes which have an impact on shelf-life of margarine without conducting expensive trials.

Keywords : margarine shelf-life, predictive modelling, neural networks, oil oxidation
Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development
Conference Location : Chicago, United States
Conference Dates : December 12-13, 2020

Open Science Index, Mathematical and Computational Sciences Vol:14, No:12, 2020 publications.waset.org/abstracts/138687/pdf