

# **DemandEst - AI powered Food Demand Forecaster**

## **LITERATURE SURVEY**

**TITLE:** Enhanced Demand Forecasting System For Food and Raw Materials Using Ensemble Learning

**AUTHOR:** K. Harshini, Padmini Kousalya Madhira, Sutari Chaitra, G. Pradeep Reddy

**YEAR:** 2021

Human needs have been evolving along with time. There has been a constant change in the way people eat food and their taste pallets, with cuisines varying from continent to continent. In the older days, people used to cook with the ingredients they found around them and ended up with a new dish. Food wastage and raw materials deterioration are the most noteworthy predicaments faced by any food selling business. To avoid wastage, the restaurants should have prior knowledge of the amount of food required. Several solutions with the help of AI have been compounded to solve this problem of food wastage. Nevertheless, much of this research concentrates on the prediction of sales and its accuracy. It is important to note that sales prediction alone won't be enough to decrease food wastage. Predicting the number of raw materials required also plays a crucial role in reducing food wastage. Therefore, in this paper, a demand forecasting system is proposed that predicts the number of customers, sales for particular dishes, and the amount of raw materials required. Stacking technique is used in the proposed model for making the predictions. This model has been evaluated with the help of MAE metric and it ranges from 0.4 to 0.7. The proposed system will help the restaurant cook dishes and buy raw materials with minimum wastage.

**TITLE:** Demand forecasting in restaurants using machine learning and statistical analysis.

**AUTHOR:** Takashi Tanizaki, Tomohiro Hoshino, Takeshi Shimmura, Takeshi Takenaka

**YEAR:** 2018

In the paper, demand forecasting in restaurants using machine learning is proposed. Many researches have been proposed on demand forecasting innovation utilizing POS information. However, in order to make demand forecasts at a genuine store, it is important to lay out a store-explicit demand forecasting model in light of different factors, for example, the store area, the climate, occasions and so on. Thus, we developed a demand forecasting model that practically consolidates the previously mentioned information utilizing machine learning. In this paper, the interest determining model utilizing AI and the check consequence of the model utilizing genuine store information is examined.

In this paper, demand forecasting techniques utilizing inner information, for example, POS information and outside information in the omnipresent climate like climate, occasions, and so on are proposed. we utilize Bayesian Straight Relapse, Helped Choice Tree Relapse, Choice Backwoods Relapse and Stepwise technique as the demand forecasting strategy. There was no huge distinction in the determining rate utilizing the strategy for Bayesian, Choice, and Stepwise, and the forecasting rate of Helped was somewhat low. The figure rate of any store surpassed around 85%.

**TITLE:** Food demand prediction using machine learning.

**AUTHOR:** K.Aishwarya, Aishwarya.N.Rao, Nikita Kumari, Akshit Mishra,  
Mrs.Rashmi M R

**YEAR:** 2020

Demand forecasting is the cycle where authentic information is utilized to assess the amount of item client will buy. This forecast movement is utilized in many fields like retailing, food industry and so on. In restaurants, prediction assume a crucial part as a large portion of the essential fixings have short-time span of usability. The demand rely on numerous unequivocal and secret setting, for example, season, region and so on. In this paper, number of request is utilized to estimate supply of things, utilizing AI with internal and external data.

In this paper, involving outside and inward information for the expectation comprising of various variables like district ID, week and so on. Food demand prediction is a significant and testing issue. In this paper , introduced punished relapse strategy, Bayesian Linear Regression K-nearest Neighbor, decision tree approach as a food demand technique. As we go through various calculation for expectation the exactness rate continues to move along. There was not enormous distinction other than accuracy pace of estimating. XGboost is a decision based helping calculation which is utilized for expanding the exactness rate. This assessment is utilized basically for restaurants. Besides, in future more refined expectation should be possible in view of numerous different variables like social propensities, strict occasion, customer inclinations and so on. In future, this technique can be utilized for predicting work force requirements, robotized food requesting in view of forecasting results.

**TITLE:** Demand Forecasting For Production Planning In a Food Company.

**AUTHOR:** N. de P. Barbosa, E.da S.Christo, and K. A. Costa

**YEAR:** 2015

The food and beverage industry is one of the main areas of the Brazilian economy, with a huge cooperation in Gross domestic product list. The Brazilian economy has been showing an overall solidness somewhat recently, which takes the business interest to be more unsurprising. Because of this situation of monetary solidness, the organizations has been stressed over putting resources into arranging their activities, making use, principally, of forecasting techniques to turn out to be more serious on the lookout. On account of food industry, the occasional and the short perishability factors are a constraint to the upkeep of stocks, requiring a forecasts with a high exactness level. The current work comprises in applying techniques to estimate the interest for results of a food industry, which guides its deals to the food administration market, to base the short to medium term creation arranging. Posteriorly, the forecast will be assessed utilizing the blunder measure MAPE and contrasted with the interest presently thought to be by the organization. The proposed techniques highlight a decrease of the mistake roughly 5%.

The technique applied in this work showed its straightforwardness and openness because of the minimal expense and effortlessness of use. By having these attributes, this strategy can be utilized by little and medium-sized organizations, where is preposterous to expect to make immense interests in arranging their tasks. The food items have a component that restricts the support of stocks, the short perishability. These items have a period wherein they keep their qualities and ought to be consumed prior to being viewed as unacceptable for consuming. Hence, it is recommended for future works that the short perishability of items should be considered while assessing the outcomes got by the quantitative techniques. To make conceivable not well thought out plan the creation to fulfill the anticipated interest, yet additionally add to limit the deficiency of items because of its short perishability and subsequently, working on the benefit of the organization.

**TITLE:** Flexible Demand Forecasting in Intelligent Food Supply Chain Management.

**AUTHOR:** Srimathi Ravisankar, Kanimozhi Mahendran, Srilakshmi Arulmurugan  
M.R. Sumalatha

**YEAR:** 2022

In the Food industry, Big data analytics concepts and techniques are being used in the food business for inventory optimization, which combines historical data with predictive techniques to improve supply chain management techniques. Demand forecasting, food tracing, and information exchange for suppliers, warehouses, and restaurants to connect with one another are the three modules covered in this paper that deal with managing the food supply chain. In this paper, a novel algorithm for the demand forecasting module is proposed. It combines an outlier detection method with the Light GBM Regressor, which manages the target, and the SARIMA Algorithm, which handles data seasonality. This paper also suggests a Food Tracing System (Find my Food) that employs the Nakamoto Consensus method for network participants to agree on issues such as traditional data invisibility, data manipulation, and sensitive information exposure, as well as an information sharing module between supply chain entities using a database where they can share about food quality issues, share information about stock and requirement details of the ingredients needed for pre-production. This method of incorporating an information sharing module into the supply chain aids in information sharing and the smooth operation of the supply chain.

**TITLE:** Food demand prediction using the Nonlinear Autoregressive Exogenous Neural Network.

**AUTHOR:** K.Lutosławski ,M.Hernes, J.Radomska, M.Hajdas, E.Walaszczyk<sup>1</sup>, A. Kozina

**YEAR:** 2020

Predicting food demand is a critical problem for both sustainable development and corporate process optimization. Artificial intelligence techniques as well as data science techniques are frequently employed for this. The goal of this study is to create nonlinear autoregressive exogenous neural network-based models for predicting food demand. The research is concentrated on processed foods like bread and butter. Architectures of developed models with varying numbers of hidden layers and neurons, as well as with various diameters of the delay-line, were evaluated for a particular product. The study's findings indicate that the performance of prediction varied slightly based on the type of product. The R2 metric yielded scores between 96,2399 and 99,6477. depending on particular products. The suggested models can be incorporated into an organization's intelligent management system to control stocks and food production in a sensible manner. Additionally, it may result in less food waste.

A useful method for creating time series prediction models is the hybrid concept of Nonlinear Autoregressive Exogenous with the Neural Network (NARXNN). In order to predict the demand for particular foods with accuracy, this paper has introduced a novel use of NARXNN. The suggested method can actually be used as a part of an organization's intelligent management system. It can help with supply chain waste reduction and rational control of food production and inventories. The inability of the developed models to analyse small data sets is their primary drawback.

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**TITLE:** Daily Food Demand Forecast With Artificial Neural Networks.

**AUTHOR:** Zeynep cetinkaya, Erdal erdal

**YEAR:** 2019

The majority of the universities in our nation offer catering services to both employees and students in their cafeterias. There are more people asking for this service, and there are numerous factors that are specific to people and institutions, which causes disruptions and makes it challenging to predict the daily food need. The organisation loses money and time as a result of this circumstance. Demand projections are achieved in companies utilising statistical and heuristic methodologies in order to eliminate or minimise these losses.

Estimating demand is crucial for production planning in the food service industry. The resources are used more effectively and some areas of production desire to be lost when a demand forecast is prepared. Demand projections for the quantitative and qualitative goals are made in institutions where it is unclear how many people will submit a request. A model using artificial neural networks has been suggested to calculate the daily calorie need. Utilizing the example data from the preceding section and a predetermined demand estimate, artificial neural networks are a qualitative target. A suitable model was developed in MATLAB, a programme was prepared to address the demand, and data were assessed in the interim.

**TITLE:** Scientia Agriculture Food Demand Forecast For Nigeria

**AUTHOR:** Olawa O.W, Olawa O.A

**YEAR:**2016

It is impossible to overstate the value of food in any economy. The research that is now available in Nigeria shows that food production is increasing at an arithmetic rate in Nigeria while the population is growing at a geometric rate. Therefore, there is a need for proper and organised planning and preparation in order to close the food supply-demand gap. Future food demand must be estimated and quantified in order to accomplish this. This essay makes an attempt to predict Nigeria's food demand over the course of the next 14 years. The outcome shows an increase in overall food demand from 243,168,942 metric tonnes in 2016 to 335,100,918 metric tonnes in 2017. When divided into fish, livestock, and crop, the trend revealed that crop (21,927,280 metric tonnes) will have the biggest demand when compared to other food components (1,821,092, 427,920, and 21,927,280 metric tonnes, respectively). It is advised to implement policies and programmes that will lessen the impact of climate change on agriculture and promote increased food production to keep up with the rising population.

It is impossible to overstate the significance of food as a fundamental requirement of existence. The need for a productive and healthy lifestyle at the household level depends on it. Food has political, strategic, and economic importance on a national level. The food subsector of agriculture is a substantial contributor to gross domestic product, export revenue, employment, and industrial growth in many nations. Cereals, particularly rice and wheat, are even viewed as cheap foods in some nations (olayemi, 1998). The inclusion of food as a crucial variable in topics relating to national security and in planning against national disasters and other emergencies is indicative of the national strategic relevance of food. Food can be used as a political tool to uphold political stability and promote public tranquilly and happiness. Food production and supply conditions are becoming more precarious in Nigeria as a result of the high and continuing demand pressure on food brought on by the country's rapid population growth, rising real per capita income, growing importance of food and nutrition status as indicators of national socio-economic development, and the use of food in relief operations in areas affected by disasters of all kinds.



**TITLE:** Forecasting Future Global Food Demand: A Systematic Review and Meta-analysis Of Model Complexity.

**AUTHOR:** Emily j. Files, Barry W. Brook, Linus Blomqvist, Jessie C. Buettel

**YEAR:**2018

Predicting future food demand is an important step in developing the agricultural, economic, and conservation policies needed to feed more than 9 billion people by 2050. While causing the least amount of environmental damage. However, published estimates of future food demand vary significantly, making it difficult to determine optimal policies. We present a systematic review of the food demand literature, including a meta-analysis of papers reporting average global food demand forecasts, and we investigate the effect of model complexity on predictions. We show that, while future global kilocalorie demand estimates vary widely, they are not consistently dependent on model complexity or form. Indeed, despite having different underlying assumptions and mechanisms, time-series and simple income-based models frequently make similar predictions to integrated assessments. However, reporting model accuracy and uncertainty was uncommon, making evidence-based decisions about which forecasts to trust difficult. We argue for improved model reporting and transparency to address this issue and accelerate development in this field.

**TITLE:**Demand Forecasting: A Case Study in the Food Industry

**AUTHOR:**Juliana C. Silva, Manuel C. Figueiredos and Ana C. Braga

**YEAR:**2019

Forecasting methods are now regarded as a business ally because they support both operational and strategic decision making processes. This paper is based on a research project aimed at developing demand forecasting models for a company in the food industry, specifically the delicatessen segment. This paper concentrated on demand forecasting models that can be used to support production planning and inventory management at the company. It has been demonstrated that combining these forecasts improves accuracy significantly. Simple approaches to combining produce adequate results, and combining methods can be used at a low cost. As a result, the simple average of the forecasts produced by the three different models provides a good solution for this forecasting problem in terms of simplicity and efficiency. In addition to the model's performance versus the company's current methodology, there are other benefits, such as the fact that this is a more robust methodology capable of generating demand forecasts in a timely manner, freeing managers from this task, allowing them to devote more time to scenario analysis and improving decisions in this area.