

An Intelligent Bigdata Flavor Space Recipe – A Survey

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Abstract - Data analytics is fast emerging technology and is making tremendous challenge in all the industry. The food industry is one of the largest industry that use data analytics. It create bond between producer, shopping companies, grocers and restaurants. Food is essential for all the people and everybody likes to taste different recipes. Therefore, food processing is mandatory to create new recipe with best quality that satisfies the customers. The existing system put forwarded by IBM researchers faces some undesirable consequences such that the new recipe created by the machine is indifferent and unpleasant to consume. Thus the proposed system works to find different recipes with good taste and flavor. The analysis of food can be found by using recurrent neural network. Mostly neural network can be used for predicting physical, chemical, functional and sensory properties of various foods during processing. The main motive is to generate cook book recipes, analyze the given data and attempts to mimic it. So the neural network is trained under the huge dataset and it provides unique recipe based on food pairing and food bridging. Those two techniques provide a way to overcome the problem in the existing system. The semi-metricity weighted graph is used for the flavor mixing and it measures all levels of triangle inequality. Finally it provides the new tasty recipe.

Key Words: Big data analytics, Food Industry, Bizarre recipes, Food bridging, food pairing

1. INTRODUCTION

Big Data controls the world. Because of the large amount of data transferred from various digital sources, the importance of the analysis increased significantly, with companies using dark data that was deemed useless in those years. Because companies can deliver results, the importance of large amounts of data in the industry has spread rapidly. Given the market strategy, companies that lose the opportunity for big data will lose the next frontier in terms of innovation, competition and productivity.

1.1 REVOLUTION IN HEALTH CARE

Most current health care systems can do many things without big data, including fulfilling most of the analysis and reporting requirements. We have not reached the limits of what health analysis can do with traditional relational databases. Effective use of this database is more valuable than worrying about large data. At present, most health care facilities are overwhelmed with some pedestrian issues, such as regulatory reports and operational panels. Smart phones

are just the beginning. With an application that allows you to be used by pedometers to measure how much time you spend in a day using a calorie counter to help you plan a diet, millions of us now use cellular technology to help us live a healthier life style. In the near future, you can also share this information with your doctor, who will use it as part of your diagnostic tool if you visit with a medical condition. Even if there is no problem with you, accessing a large database, developing community health information can help identify problems before they occur, and can be used to provide solutions. Today, the health system is needed to improve quality and cost management [6]. Health organizations are unable to wait for big data technology before they enter the analysis.

1.2 Big data Vs Public sector

Big Data can provide insight into deep social, political and economic trends and individual and group behavior. In most countries, public institutions collect large amounts of data, tax reports and health surveys. Much of this data is technically "public," but access to data is not always easy, and obtaining adequate insight may require technical knowledge and training that organizations and governments cannot always afford with limited resources. . The government generates and collects large amounts of data through their daily activities, such as pension and payment management, tax collection, national health systems, traffic data collection and issuance of official documents. So far, there is no extensive use of large amounts of data in the public sector. Compared to other sectors, the public sector has traditionally not used intensive data mining technology. However, in the public sector, there is growing interest in the potential for large volumes of data to improve the current financial environment.

1.3 In Education

Big data in the education sector offers numerous benefits to students and educational institutions. Revolutionize the way we manage education in fruitful ways. Provides deeper understanding of student's education experience and help the academicians to evaluate the state of education system. Improving student's result, customizing programs, reducing dropouts and targeted international recruiting are some of the key ways in which big data can impact the education system of any country. Big data analytics monitors student's activity such as favorite subjects, classroom performance, curricular activity interests, the time they take to finish an

exam, and many other things within a student's educational environment. A report can be constructed that will indicate the interest areas of a student. Educators can improve their teaching skills after receiving feedback for a better learning experience for students. Digging deep into a student's performance report will help the responsible authority to understand a student's progress and their strengths and weaknesses.

1.4 Industrial and Natural Resources

Energy and natural resources (ENR) companies are usually under tremendous pressure to achieve operational excellence in order to derive the maximum value from their resources. Whether it is oil & gas, mining, or petrochemical—the business operator's focus is always on effectively mitigating risks, investing capitals, commissioning assets, and timely supply of resources to the market. The compliance and regulatory requirements demand tight discipline in managing all the data maintained in asset documents, operational files, engineering documents, or legal contracts among others. Thus, data management in the ENR is a challenging proposition. The ENR industry, as everyone knows, is highly susceptible to information leakage—especially due to frequent cyber attacks on their digital archives. Mining can provide benefits by ensuring continuous material flow from ore production sites to processing plants by maximizing ore production by optimizing production barriers, thereby reducing unproductive time between unit operation.

1.5 Banking Zones and Fraud Detection

By using data analysis, banks can understand the pattern of client activity and their industry as a whole. The use of large data to track certain factors, such as, the frequency of user access to profiles on a mobile device or computer, how quickly the user enters a username and password, and the geographical location where users access the account most often can significantly increase fraud detection. The result is that banks have tools that significantly increase the detection of expensive and high-value transactions. The fraud team focuses on offers that really need to be explored. The results of the study will then be used to continue training in machine learning models, both in terms of new fraud cases and new secure relationships.

1.6 Food Industry

Big data analysis checks large amounts of data to detect hidden patterns, correlations, and other useful data. Other industries generally introduce this technology faster than the food and beverage processing industry, but applications in the food industry vary and go beyond general applications. Increasing Machine Visibility, Making New Recipes, and Cleaning Machines is part of the process discussed in our study. This helps the analysis process to

make conditions more visible and to allow for the adjustment of the necessary processes.

2. Need of Big data in Food Industry

Nearly every industry is struggling to manage its constantly evolving and continuously growing data, and food industry is no different. Everyone needs food for survival, and most of us thoroughly enjoy eating. Thus, it makes sense that the industry would take an advantage of big data services. Data present everywhere in the food industry, from the origin of a particular product's harvest and where it went next, to how long it spent in refrigerator and what products it ended up in. Data provides the means to implement track and trace strategies to manage emergencies when necessary.

3. Related Work

There are programs to produce receivers that are usually simple and case-based, replacing new flavor-based ingredients that have worked well in other dishes. The IBM project strives to achieve something far more difficult: a system that offers radically new food based on a combination of ingredients and flavors. People will find that recipes are uncomfortable and cannot be consumed.

4. Survey on Big data analytics in Food processing Industries

The big data analytics can be applied for various factors, to increase the efficiency and quality of food processing industries that in turn can provide greater profit and positive consumer feedback [10].

4.1 Market-Basket Analysis

Market basket analysis is a technique that predicts the most obvious item that a customer is likely to purchase next. This analysis is based on purchase history of the consumer and the items currently in the customer's cart. Based on the insights from the market basket analysis, food retailers and restaurants can create effective combo deals and improve their marketing messages. Recently, IBM researchers have created a food program that creates original recipes based on mentioned food items. That program uses big data analytics to study different aspects of food like the taste, combinations, chemical properties etc to suggest new and innovative recipes. The program works in five steps to ensure that the recipes are creative, unusual and pleasing to eat.

1. Initially set the parameters for the type of recipe to create for example , selecting an ingredient, regional cuisine and the type of dish
2. It processes the large data sets to evaluate the various relationships between ingredients and their chemical composition and human flavor preferences[8]

3. Generates the new ideas based on traditional recipes and their project parameters
4. Select the best ideas based on recipe novelty and quality
5. Present recipes as a list for the team and then create in a kitchen

This technology revolutionize the way that food manufacturers and even top chefs come up with new ideas for their recipes, which is good news for the one who quickly become bored eating the same meal over and over. With business intelligence now it plays an integral part in the food preparation, consumption, and selling process, it could be assumed that the art of cooking will soon replaced by the science of big data. Market basket analysis techniques can be applied in food processing and can initiate new innovations to make well eaters smile as profit to the manufacturers.

which mainly focuses on retrospective identification of associations and increasingly real-time monitoring of processes. The uses of large datasets and big data analytics in food safety is the quality to focus on providing improved root cause and retrospective analyses. In future the predictive analysis in food safety is to grow soon. Analyzing data about food quality can allow restaurants (or other organizations in the supply chain) to easily detect spoiled food, preventing it from reaching the customer. This analysis can also help producers and distributors in the food industry to identify contaminated food, and isolate its source and current location. Not only this allowed for faster recalls, it minimizes the number of people exposed to the food. This saves the significant amount of money. Scientists are also developing scanners that can identify the nutritional content of food. While this can be useful to people looking to monitor caloric intake and the types of food they consume, it can also identify ingredients that the user is allergic tool. This method can help to reduce food-related issues and allergic reactions. In the processing environment, integration of diverse data sources with historical microbial testing data may not only allow for accelerated root cause analysis, but also for prediction of time intervals that may be used to reduce the wastage of food and also food safety issues; This information could be used to adjust food safety and operational practices in near real-time to include additional barriers and controls, including adjustments in preventative maintenance schedules, etc. Data sources that could also be used in these analyses which include weather patterns, environmental parameters in a facility (monitoring humidity, dew points, etc.), and equipment related parameters (vibration, flow rates, etc.). These are few ways that big data is improving the food industry. It increases the efficiency, reducing environmental impact, and improving food safety in environment. And with new developments being made all the time, this is sure to be only the beginning.

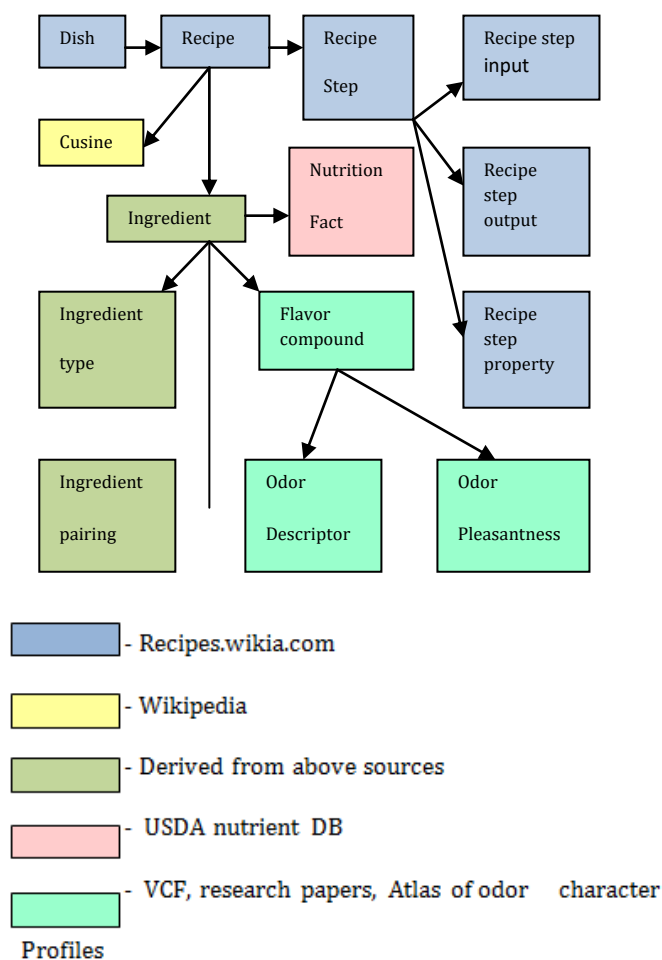


Figure 1: Food Knowledge Database (Create and Discover)

4.2 Food Safety

Big data is also linked to predictive analytics, it can be compared to the more typical use of data in food safety,

4.3 Sentiment Analysis

Sentiment analysis is the monitoring and analyzing the customer emotions over social media networks. The techniques used here are the natural language processing, data analysis tools go through the text and categorize it into positive, negative or neutral. This technique of big data analysis can be used to analyze customer sentiment by monitoring customer emotions expressed on social media networks. Food companies uses sentiment analysis to track their customers' emotions by using that any negative review can be analyzed at scale and preventive actions can be taken to prevent the spread of negative word. This technique is more beneficial for large-scale food retailers like McDonald's, KFC, Pizza Hut etc.

4.4 Better Quality and On-time delivery

The consumer always expects the same taste in food at the places they love. Though it sounds easy to maintain the same taste, it is a very challenging task. The taste of food not only

depends upon the proper measurement of ingredients but also on their quality, storage and season [9]. Big data analysis can analyze such changes and predict the impact of each on the food quality and taste. Data analysis can also analyze the impact of factors like storage and transportation on quality of packaged foods. The insights from such analysis can be used to understand points and suggest measures for improvement[6]. Food delivery can be highly optimized and timed using various big data analysis tools and techniques. While this comes more under the role of big data in logistics, there are many food retailers who specialize in food delivery and not to forget the number of restaurants that provide home delivery options. Big data can collect data from various sources like road traffic, weather, temperature, route etc and provide a proper estimate for the time taken to deliver goods. Moreover, big data analysis can also predict the impact of all the above factors on food quality. Thus data analysis helps ensure that you don't waste your resources in transporting stale products and deliver perishable food items in good quality.

4.5 Keeping Up with Trends

Food Genius offers a data platform that gives insights into what dishes are trending as well as how to price and market them. The site tracks more than 360,000 restaurant locations with 110,000 menus and 16.3 million menu items. The platform uses this data to provide specific recommendations, such as which vegetable is popular with a certain type of pasta or how chicken is typically prepared when served on a particular dish. Access to these insights come at a hefty price, beginning at \$2,000 a month and going up to \$10,000 to access all of the features, but having a better understanding of what the customer wants is worth the large price tag to many in . About one third of food produced for human consumption wasted every year in a world where 795 million people—a ninth of the population—go hungry. Cutting post harvest losses in half would produce enough food to feed a billion more people. It made the clear case that reducing losses through better quality supervision and prediction models, using more advanced technology, is not only possible but should be mandatory. With the current rate of population growth and developing countries needing a larger share of limited resources, the world can neither afford nor sustain food loss caused by inefficient cold chains[2]. In developing countries food waste and losses occur mainly during the early stages of the food value chain and can be traced back to financial, managerial and technical constraints in harvesting techniques and cooling facilities. In medium and high income countries, food is wasted and lost mainly at later stages in the supply chain[4]. It's a really big target to achieve but by taking small steps we can all make a big difference and can save millions of hungry people's lives. One of the simplest methods to get the best expiry date is monitoring the temperature of food right through from the manufacturing unit to the retail counter. Big data is allowing various restaurants to closely monitor every aspect of their business. By collecting various information from every

individual restaurant, it is possible for food analytics to detect patterns such as what menu items perform best in which regions, how much food needs to be stocked and prepared for a given week or even a particular time of day, and what building layout provides the best and most efficient experience [2].

4.6 Making big data a recipe for success

Talk to any restaurant owner, and he will tell you that food wastage is one of the biggest problems that plagues his business and threatens to eat into its revenue. For a long time, restaurant owners have been reeling from the bitter aftertaste of revenue leakage resulting from the colossal food wastage. They've wracked their brains for a solution without finding any. Petoo, a Bangalore based food startup faced the same predicament. Operating in the online food space, it is a quick service restaurant that rustles up Indian cuisine and processes home delivery orders coming from food aggregators like Food panda and Just Eat among others. With generous dollops of technology, Petoo decided to give a unique spin to the food servicing model using hyper local phenomenon. If you can do a successful deconstruction of the consumption patterns on the basis of region and demographics you can make an intelligent guesstimate of the volumes you need to produce. For instance, in Bangalore, a locality like Jayanagar sees a higher share of vegetarian food being ordered than an area like Koramangala. "These consumer insights can be intelligently used to manage menus and plan inventories, thus resulting in less wastage due to improper inventory management,

Petoo leverages algorithms to derive data insights on various consumption parameters. They start by finding which are the most popular dishes in a given geography. This is used to plan the menu offering. Since India has a very heterogeneous demography the same dishes cannot be sold pan India. So, Petoo uses data to find out what people like to eat in a city or even a small locality within a city. The second challenge for restaurants is to understand the patterns of food consumption. For example, how does the food consumption change with the weather, month, day of the week, on festivals or holidays, during a cricket match or for that matter when a Bollywood blockbuster is releasing. Petoo's algorithm suggests that during sports tournaments and holidays customers increasingly seek home deliveries.

Cultural milieu is also a key factor when it comes to demand forecasting. "We have also seen that events impact not only the order volumes but also affect the consumption of particular dishes. We mine past order data in a bid to predict ordering pattern, this helps us in menu planning and inventory management. A proper planning is necessary for a business like ours as it ensures we have adequate stock so that no customer is disappointed due to unavailability of dishes, our food wastage is controlled and people see those dishes in the menu which they are more likely to enjoy". The food startup has leveraged R and developed in-house data

modeling tools using C, Java, Python and MySQL to serve up success on its big data platform. We will continue to fine-tune our data modeling tools in future to be able to generate more accurate and granular (location wise and dish level) predictions.

5. Challenges & Benefits

The success of a large amount of data in the food chain has increased the productivity of people who produce and serve food stores and food. Three valuable things can be learned from these shells:

5.1 Stick with very specific, tightly defined projects

The sensor in the container detects the risk of contamination and environmental exposure. He tells you which central network is focused on the food company, and transportation does not help make the business case too large.

5.2 Look for results in revenues or cost savings

Sensors in food containers remind workers that the environment is limited and can quickly improve the situation so that products are not damaged or polluted. These results can easily be converted to savings dollars and profits.

5.3 Work on one IoT technology at a time

When navigating a train on a route, you must choose the optimal safety time and route. In addition, trucks with costs and perishable goods should be more easily transported to the most demanding markets. Instrumentation sensors, IoT and vehicle tracking networks. This unique online application has brought many benefits, including better inventory management and customer satisfaction. Applying a single concept to the technology of the Internet of Things is simple.

6. Methodology

Wherever you come from this world, food has the ability to calm down, relax, eat and be agitated. Food has the ability to heal and maintain our bodies and minds. Food is emotion, food is life, food is experience, and it means a lot to others. We have long believed that the taste and delicacy of food is highly dependent on human contact. To create dishes to your taste requires years of experience and practice. But still with this idea, it will soon change. It may be a little difficult to learn, but big data is unique in creating recipes for people. Latin cuisine has a lot of nutritious food. The power of direct taste and indirect taste is used in recipes to enhance the overall taste and smooth the contrast between the ingredients. [9]. But south Asian cuisines tend to use contrasted ingredients to a larger extent that results in high food bridging but low food pairing [5]. Food-pairing and food-bridging are different hypotheses that may describe possible mechanisms behind the recipes of traditional cuisines." These results bring a new, more nuanced, and

perspective on food-pairing and introduces food-bridging as a new principle behind cooking and flavor mixing. Food-pairing intensifies flavor by mixing ingredients in a recipe with similar chemical compounds, and food-bridging smoothes contrast between ingredients. Food pairing deals with combining strong directly connected pair of ingredients using semi metricity-weighted graphs is a mathematical property of distance that measures all levels of triangle inequality violations. Food bridging connects a pair of ingredients which may or not have a direct connection in the flavor network. A recurrent neural network, the kind of network may be used to generate the cookbook recipes, analyzes the given data and attempts to mimic it. A huge database of existing recipes with its knowledge of how chemical compounds interact to propose bizarre ingredient pairings. Neural network is trained under the huge data set and it provides unique recipe based on the food pairing and food bridging accuracy of the given input ingredients. The user will select the ingredient in the user interface and it will check the database. The concepts of food bridging and food pairing are used. The algorithms are implemented and the user can get the tasteful different recipe.

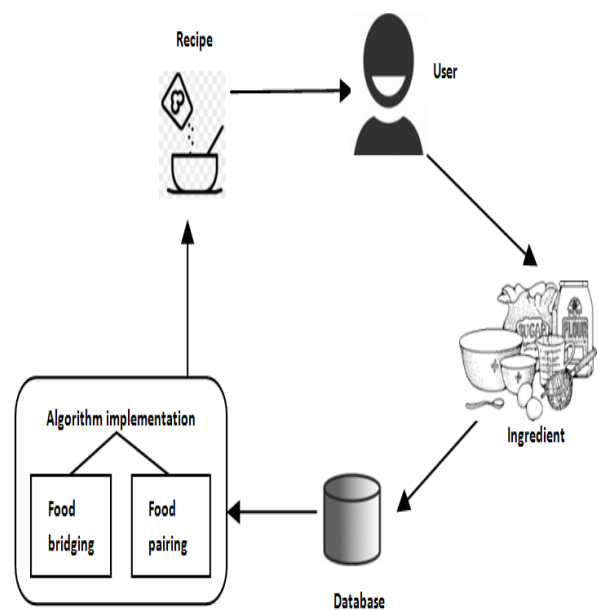


Figure 2: Architecture diagram

7. Conclusion

The application of large amounts of data in the food industry is so wide that you can optimize everything from production to after-sales service. The food industry generates a large amount of data and needs to manage information in real time, such as food temperature, operating time, inventory, labelling information and relevant data for retailers. New machine learning algorithms provide automated solutions based on neural networks and large amounts of food data. Many existing studies use an image recognition system and

instruct the system to identify all the ingredients necessary for preparing recipes. Early learning of new recipes, but limited. The proposed system is focused on processing a large number of data sets and provides customers with unique recipes with neural network technology, which increases the combination of a high percentage of food and food mixtures for consumers.

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