International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Indentification of A Pertinent Food for A Variety of Aquarium Fishes Using Linear Discriminant Algorithm

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ABSTRACT

The aquaculture sector is expanding now a days. If the fish farmers had access to information about the fish, such as the ecosystem, food and associated data, it would help them enhance the yield of fish. Relational databases are used to store the vast majority of fish species data in the aquaculture industry. Relational tables, however, only function effectively with organized data. If the proper relational structure was in place and enforced, a common occurrence would be seen where the same fish are identified by different names. This is important because there are many species of fish, and it is often impossible to categorize the data that pertains to those species. The fishermen would benefit if the data could be shown graphically and given a proper recommendation system that suggests the best species and best ecology. Relational databases are used to store the vast majority of fish species data in the aquaculture industry. A connected user can view the relationships between fish species and receive appropriate recommendations on fish species based on their interests using data about fish species, names, threatened status, taxonomy, location, and type of water they can survive. The suggested system can suggest food varieties to the user and is scalable and capable of producing recommendations. A database system will integrate information from different locations and process, manage, store, and retrieve relational data. As a result, when compared to the conventional approaches, suggested technique, the linear discriminant algorithm increase the accuracy of the recommendations of the food for the fish even more correctly and quickly.

KEYWORDS: Linear Discriminant, fish, aquaculture, fish species, suggest food, Relational Database, food, aquaculture industry.

1. INTRODUCTION

Like other food products, Aquaculture feeds have a limited shelf life and unique handling needs, so proper storage and handling are essential to maximize their economic and nutritional benefits. These feeds consist of various ingredients that meet the animal's nutritional needs for growth, reproduction, and immune function [1]. Fish farming has been used for natural food production since ancient times, but semi-intensive and intensive production have been adopted to create fish diets that meet nutrient requirements [2]. Due to legal restrictions or unfavorable delivery methods, disease preventive and treatment tactics including the use of medications and vaccinations may also be restricted in certain aqua cultural activities. The assessment of various dietary additives that may affect immunity and disease resistance in aquatic species has therefore garnered increased interest [3]. Possible for feed producers to choose high-quality components by interpreting the findings of chemical tests. This contains methods to analyze the impact of food on fish quality and consumer safety, feeding trials and their evaluation, including measurements and calculations for digestibility [4]. The quality of the components used in the creation of the aqua feed as well as the processing conditions has a significant impact. Ingredient variations are a common issue for the manufacture of aqua feed, and they should be effectively managed by establishing a quality control system in order to create consistent feed in each batch of production. A proper laboratory should assist the quality control system, which should begin with a sampling plan and system to get representative samples. The quality and adulteration of frequently used aqua feeds such fish meal, rice bran, oil, animal by-products, phosphate source, and corn co-products can be determined using a number of spot tests or rapid procedures [5].

Feed additives are substances added to the diet for purposes other than meeting nutrient needs. These include enhancing the culture environment, improving the wellbeing of the cultured organism, improving the quality of the fish produced as a final product, and improving the physical and chemical properties of the feed. [6]. Feeds low in fish meals(FM) and fish oil(FO) must guarantee acceptable growth performance, feed utilization, fish health, and a finished good that is nutritionally adequate, safe to eat, and well-liked by consumers [7]. Overall, it is rather easy to cut back on some of the FM and FO in fish diets. However, drastic cuts or complete substitution with alternative feedstuffs are more challenging without compromising fish health and growth performance. Additionally, FO continues to be the main commercial source of essential fatty acids for fish, therefore decreasing it runs the danger of stifling the expansion of the fish industry [7].

Aquaculture has been acknowledged as a significant component of ensuring food security, particularly in low- and middle-income countries (LMIC) where fish is an established and important element of diets. Finfish and other aquatic items (referred to as "fish") are strong in protein and minerals. Lowincome people's employment in aquaculture value chains is increasingly contributing to their food and nutritional security, both directly and indirectly [8]. This chapter discusses legislative regulations, voluntary feed schemes, aquaculture feed standards, organic feed requirements, and future developments [9]. Fertilizer is used to boost primary productivity in aquaculture ponds. Chemical fertilizers are accessible sooner than organic fertilizers for phytoplankton development. Fertilization helps to build and maintain a pond environment that permits culture organisms to use compound or complete meals efficiently [10].

2. LITERATURE REVIEW

The existing system of food feeding recommendations for the aquatic species, between the food supply vendor and supplier is very much lagging due to the high manual processes involved and also because the data from multiple sources has not been able to be used efficiently to ensure transparency, traceability, and authenticity and to streamline the food distribution process[1]. As a result, the chances of getting the appropriate food in the appropriate circumstances are relatively low. And the nutrients for the fish are artificial due to limited supply data and sources [1]. Aquaculture output is rising, which is causing environmental degradation due to nitrogen and phosphorus discharges. This chapter covers the factors and solutions to this problem [11].Manufacturers and providers of aquaculture feed must ensure that the feed or food supplied is safe and healthful. Salmonellae, mycotoxins, veterinary medicine residues, persistent organic pollutants, pesticides, heavy metals, and excess mineral salts are all major animal feed contaminants [12]. Antibiotic residues, persistent organic pollutants, and toxins in farmed seafood have heightened public concern about food safety. FAO and the Codex Alimentarius Commission play critical roles in the development of international standards, guidelines, and recommendations [12]. The feeding of fish in aquaculture tanks is controlled by an effective visual signal processing system that has two parts: a continual determination of whether the fish are actively consuming feed, and an automatic identification of surplus feed. The system can estimate both metrics reliably and effectively, according to experimental data [13].

In order to supply the rising demand for dietary protein, aquaculture is a rapidly expanding industry in the global food production chain. Crustaceans are a significant and expensive aquaculture crop that could aid in the spread of innovative, sustainable technology [14]. Aqua feeds and crustacean aquaculture can have less of an impact on the environment by using insects as a protein-rich substitute for fishmeal. The current condition of crustacean aquaculture is discussed in this article, along with the advantages of bug meal over conventional compound aqua feeds in terms of both environmental and health benefits [14]. Aquaculture has been intensified to increase yield and economic benefits, but sustainability has been challenged by increased freshwater use and pollution discharge [15].

Global aqua feed output is predicted to increase by 33% by 2025, with protein meals of plant and animal origin being introduced [16]. This study discovered that trophic status was cultural species specific, with SRP accounting for the majority of total phosphorus. The trophic condition and rate of regeneration of N and P were assessed using enzymatic kinetic parameters [17]. Aquaculture based on feed is an essential portion of global production, requiring vast amounts of fish meal and oil, energy, and carbon dioxide. Substitutes must be identified, and feeding practices must be optimized, in order to minimize impacts [18]. Pond fertilization is a major component of semi-intensive to intensive aquaculture pond smanagement, which is distinguished by high stocking rates, limited fertilizer use, compound or full meals, and water quality monitoring and control [19]. This study discusses nutrients and their requirements for cultured fish, how this information may be utilized to build feeds, and the philosophy behind feed formulation [20].

The great majority of fish species data in the aquaculture business is stored in relational databases. A connected user can explore the relationships between fish species and receive relevant recommendations on fish species based on their interests by using data about fish species, names, threatened status, taxonomy, location, and the sort of water in which they can thrive. The proposed system can recommend food varieties to the user, is scalable, and can provide recommendations. A database system integrates information from various sources and processes, manages, stores, and retrieves relational data. As a result, as compared to conventional approaches, the linear discriminant algorithm improves the accuracy of feeding suggestions for fish even more accurately and swiftly.

3. PROPOSED WORK

In proposed system using linear discriminant, assists in suggesting a suitable food for the fish that the harvester desires, as well as one that is suitable for the conditions and methods by which the harvester grows the fish. This method employs a machine learning process with data gathered from harvesters about harvesting methods, types, and food details from suppliers and sources of food supply. As a result of the data gathered from both the supplier and the harvester, manual errors can be eliminated, and the accuracy of the recommendations can be improved. After collecting the accurate data from the farmer and the supplier the algorithm predicts the suitable food for the fishes that the farmer mentioned in the details. So it aids in the appropriate food supply with a regular supply so the fish can grow healthy and have the appropriate food to feed the fish that are cultivated in the aquaculture farm for growing.

3.1 ADVANTAGES OF PROPOSED WORK

- Saves time by providing pre-suggested suitable foods
- Saves money and time when compared to traditional waste manual process
- Reduces manual errors and risk of feeding wrong food.

- Low cost, low human error and environmentally safe method.
- More efficient compared to the traditional method.

3.2 PROPOSED ARCHITECTURE

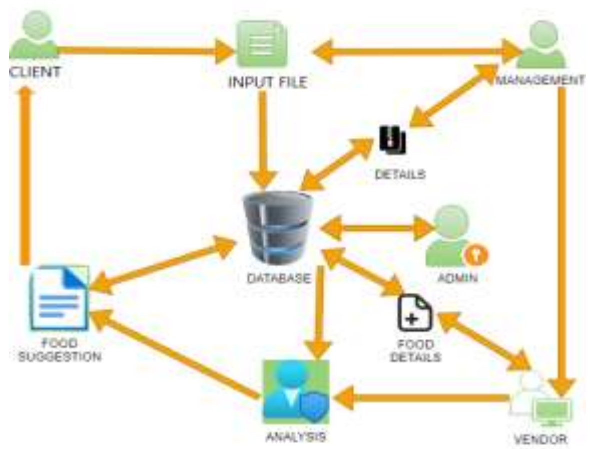


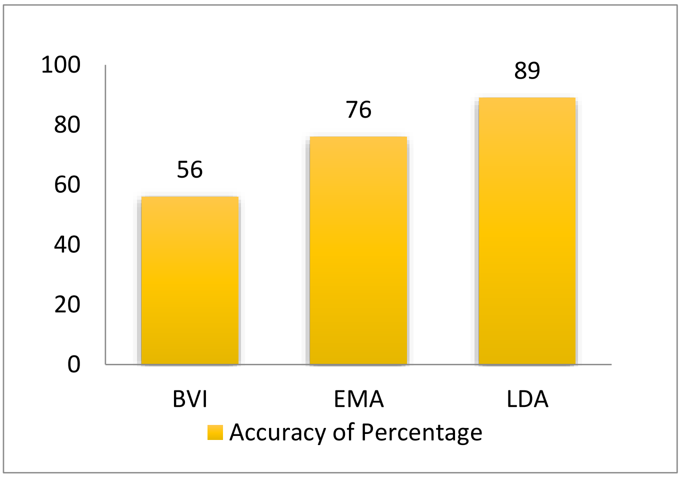
Figure 3.2 System Architecture

3.3 IMPLEMENTATIONS

The client enters personal information to authenticate themselves and uploads details of the aquaculture process, culture methods, food type, and variety. The vendor collects the food supply from various sources and stores it in a single location. The management team reviews client information to proceed with the recommendation process. The management team sends the food supply details to the analysis team, who uses the algorithm to recommend a food item to meet the client's requirements. The admin approves the process and sends the approval mail to the client and the vendor. The analysis team then analyses the client requirements and the vendor supply and recommends a food recommendation to the client. The admin approves sending the details to the client with the analysis details. Finally the analysis team once verified and approves the client requirements the proposed algorithm Linear Discriminant Analysis (LDA) was suggest feed for the fish.

4. RESULT ANALYSIS

This result analysis compares the three algorithms for the accuracy of food recommendation for the fish. When the Bayes variational inference algorithm (BVI) and the Expectation maximization algorithm (EMA) were compared, the BVI had a food proposal accuracy of 57% and the EMA had a food suggestion accuracy of 78%.



4. Comparative Evaluation

The proposed system can recommend food varieties to the user, is scalable, and can provide recommendations. A database system integrates information from various sources and processes, manages, stores, and retrieves relational data. As a result, when compared to standard methodologies, the linear discriminant algorithm was suggested. Increase the accuracy and speed with which food recommendations for fish are made. So, in this case, an LDA was utilized to propose foods in a linear sequence. LDA has an accuracy of 89%.

5. CONCLUSION REMARKS

Aquatic food demand is predicted to climb in the future decades as these foods serve to meet the wants and preferences of a growing human population. Non-nutritive feed additives are being utilized more frequently in aquatic feeds to ensure that dietary nutrients are consumed, digested, absorbed, and delivered to the cells. As an outcome, the proposed system makes more accurate recommendations. The proposed linear discriminant system assists in providing a suitable diet for the desired fish to the harvester. As a result, as compared to the conventional ways, the linear discriminant algorithm improves the accuracy of the food suggestions for the fish even more accurately and quickly.

DECLARATION OF COMPETING INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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