JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

IDENTIFICATION OF PREDICTION OF FISH FEEDING USING MACHINE LEARNING AND DEEP LEARNING

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ABSTRACT

The precise estimation of group fish feed consumption is thought to be essential to any feeding system in aquaculture. This research proposed a feed intake prediction model for group fish using machine learning and deep learning to address the aforementioned problems. First, four variables were chosen as the input of the prediction model: the number of servings of fish food consumed daily, the total daily consumption of fish food (in grams), the total weekly consumption of fish food (in grams), and the total annual consumption of fish food (in grams).

After training, the prediction model was finally realized. Because fish food is not always consumed by the farmed species and sometimes sinks to the seafloor, it is a significant source of localized organic enrichment in aquaculture.

1. INTRODUCTION

One of the oldest human cultures is the one based on agriculture. It continues to be the origin of all societies now and has played a significant role in the advancement of mankind. Despite being used for quite some time, farming equipment and methods including water systems, strip editing, compost, manures, pesticides, and so forth have greatly improved during the past century. In fact, farming methods had advanced enough by the late nineteenth century to produce typically the highest yields per unit of land compared to the prior decades. Agribusiness is the exchange of seeds, soil, and agricultural synthetic compounds.

Because of this, the sustainability of the agrarian framework depends on the proper management and care of all viewpoints. The purpose of enhancing agricultural production without considering natural Enhancing fish food and pellets to cut down on aquaculture waste may help lessen the threat that localized pollution poses to subtidal benthic invertebrates. This may be accomplished by increasing the pellet's aggregate strength, which makes it less likely to break up, or by decreasing the rate at which feed and pellets sink, which would give cultured organisms more time to consume the food and reduce the amount that ends up on the seafloor.

To estimate fish feed, seven machine learning methods were taken into account: the Support Vector Machine (SVM), Decision Tree, K-Nearest Neighbor (KNN), Logistic Regression, Naive Bayes, and Multi-Layer Perceptron (MLP). Fish feed is the input dataset's main component. The three highest accuracies were attained using MLP Classifier, SVM, and LR.

Keywords: Deep learning, machine learning, performance evaluation, fish feed pellets

The consumption of food is essential to any feeding strategy in aquaculture. Production effectiveness and breeding expense are directly correlated with feeding level. Overfeeding could result in environmental and economic damage, while underfeeding could inhibit growth. Up until this point, the cultured fish were typically fed using the feeding rate table. However, a variety of factors, including the environment, temperature, dissolved oxygen, individual variability, and others, had an impact on how much fish were eating.

Whether the fish are from a lake, pond, river, or the sea, the growing population of fish forces fish farmers to find new ways to care for and feed a lot of fish. Fish need to be fed in order to survive, else they would starve to death.

The amount of food delivered in accordance with fish appetite is crucial for improving or raising the income of aquaculture business owners. The survivor of the company in question controls fish feeding in the broad area of aquaculture output. No matter how large or small the aquaculture project, proper fish feeding management is essential since it directly affects revenue and profits (F. Hungtinford et al., 2012).

While quantifying fish feed intake remains a considerable difficulty, the amount of feed delivered to match fish demand levels plays a vital role in enhancing fish output. Regulation-based fish feeding frequently results in feed waste, which could degrade the product's quality. This may also increase the biological oxygen need, impede fish growth, and ultimately lower productivity and profitability.

In a fish farm for commercial purposes, the feed supply was fairly plentiful. Almost all of the nutritional requirements for fish can be met by producers. In addition, fish that are too big or too small will be rated to get rid of individual variations in food intake. Consequently, in comparison to a fish shoal's individual variability, fish size, and abundance, water quality characteristics are

the primary elements that directly affect food intake. Each feeding procedure was simultaneously influenced by the observer's experience. As a result, each person's results were unique. They cannot thus establish a single standard. feeding of the fish To prevent food waste, their method predetermined 5% of the crab body weight to be distributed at each activation time. The results revealed a 0.05–0.1 gram disparity between the pre-defined and actual amounts of food given. This group of feed dispensing systems is simple to use. The investigation revealed that the majority of current feeding regimen systems are built to run at predetermined times.

The use of pre-determined timing, however, is ineffective because the timetable for the allotted amount of food does not alter as the fish's hunger varies as a result of changes in age, size, growth rate, and weather. Consequently, continuous use of such a device could result in the delivery of extra feeds and eventually.

2. LITERATURE SURVEY AND RELATED WORK

One of the major costs of extensive fish farming is food, which requires special attention from fish farmers. Its availability, both in terms of quantity and quality, is crucial for fish to develop and reproduce in the proper ways. According to Metcalfe, feeding is essential for maintaining an animal's life. There is evidence that vertebrates, including some fish species, maintain the regulation of feed intake in much the same way that mammals do. One of the main goals of intensive fish feeding is to maximize food conversion efficiency and decrease nutritional losses, which can improve growth and body composition. Offering fish a free choice of food, which is thought to be the most biological and responsible method of feeding fish, has many advantages, according to da Silva. Fish can eventually learn to self-feed and choose specific foods based on their nutritional needs. The fish will also give its body the ideal amounts of nutrients needed for healthy growth and reproduction when it achieves its aim of consuming each particular nutrient.

A deep learning model was created to forecast fish feeding in a study by Yang et al. The Fish feed dietary lipid levels and their impact on fish growth and feed utilization were studied by Eya et al. Fish exhibit higher growth and feed utilization when fed a diet that contains at least 20% dietary fat and 42% crude protein in their feed.

Aquaculture is typically used to refer to fish farming, although it is also frequently defined as the art, science, and business of raising aquatic organisms and plants in freshwater or saltwater environments (NOAA Fishes, 2010).

Richard Gringer Due to the high protein content of fish meal as a human food, aquaculture plays a significant economic role in the food production business (NDP3, 2009). The only way to ensure a steady supply of fish for the nation's expanding population is to expand aquaculture operations both vertically and horizontally. Aquaculture is becoming more significant to the overall fish supply. The output of food from aquaculture is anticipated to surpass that from capture in the future. The prospects for the production of food fish will largely depend on how well fisheries are managed and how responsibly aquaculture is developed; both will be put to the test as we attempt to address the sustainability issue. As a necessary step to guaranteeing sustainable fisheries and

3. Implementation study

All the fish feed information is currently added manually to the system, and the data is then recorded. time-consuming and physically demanding to look for and upload information. The current system has no effective data upkeep and the potential for data loss. The handling of files via linear search may become more time-consuming. The diversity and excellence of the datasets used to train and test the algorithms are a flaw in the current systems. There may be differences in resolution, format, annotation, distribution, and bias between various datasets.

Currently used systems' drawbacks1.High Accuracy

2.High Efficiency

4. PROPOSED Approach and Algorithm

The accurate and efficient machine learning and deep learning algorithm continuously enhances the prediction of fish feed. Numerous deep learning and machine learning methods, including the Multilayer Perceptron, Naive Bayes, Decision Tree, Random Forest, and

Logistic Regression, forecast the feed for fish pellets. Using data on fish growth and feeding habits, machine learning algorithms may create individualized feeding plans for each fish.

The Fish Feed Dataset is a tiny dataset that includes serving and food group information for fish. Pellets are a food item in the dataset. The following details are given regarding this group of fish foods:

- Serving Daily
- Serving Weekly
- Portion Size
- Serving Size (Cups, Ounces, or Tbsp)
- Serving Model
- Daily Total Consumption (in grams)
- Overall Annual Consumption (kg)
- Serving Size Per Ye

5. METHODOLOGIES

MODULES

To anticipate fish feed, a machine learning method is employed. In order to recognize faces, ML algorithms evaluate and process features from a dataset. This enables the system to discover patterns and traits that are particular to each person by training a neural network. Fish feed dataset predictions are made using neural networks that have been trained. A big dataset of fish feed can be used to train a deep learning model.

An MLP development technique called a neural network uses data to process and apply data. Both feature extraction and classification are done simultaneously by neural networks. A huge number of datasets and a neural network method were used to train this model. Huge datasets were produced as a result, improving overall accuracy.

6. RESULTS AND DISCUSSION SCREEN SHOTS

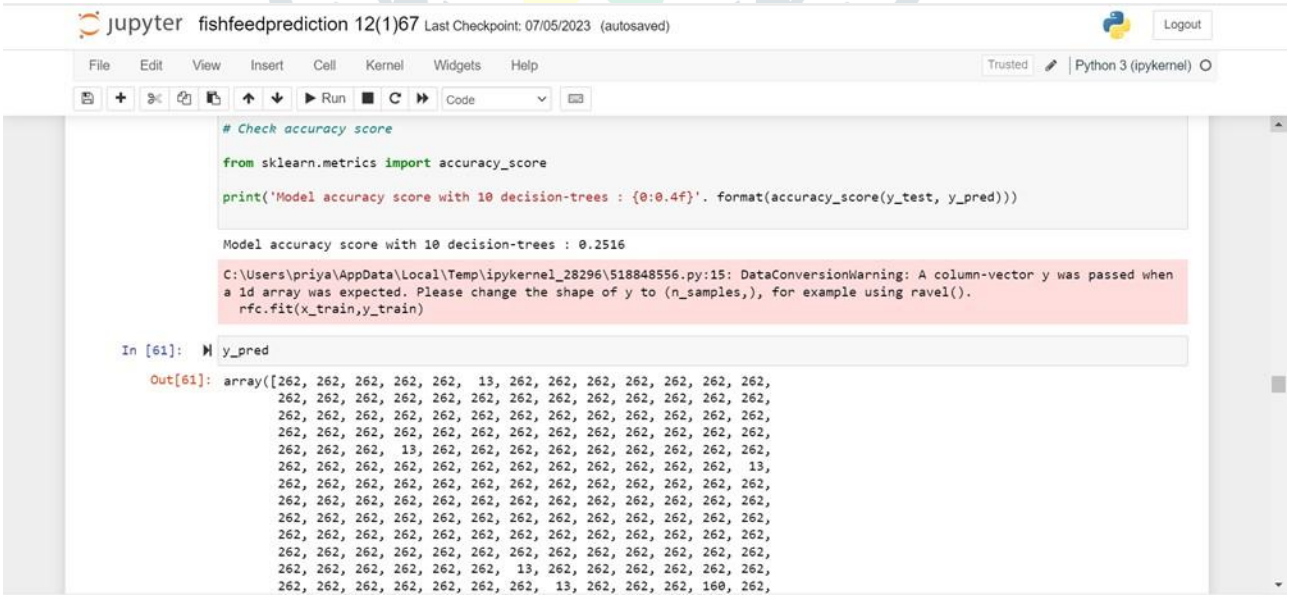

Fig 1: FISH FEED PREDICTION USING DECISION TREE

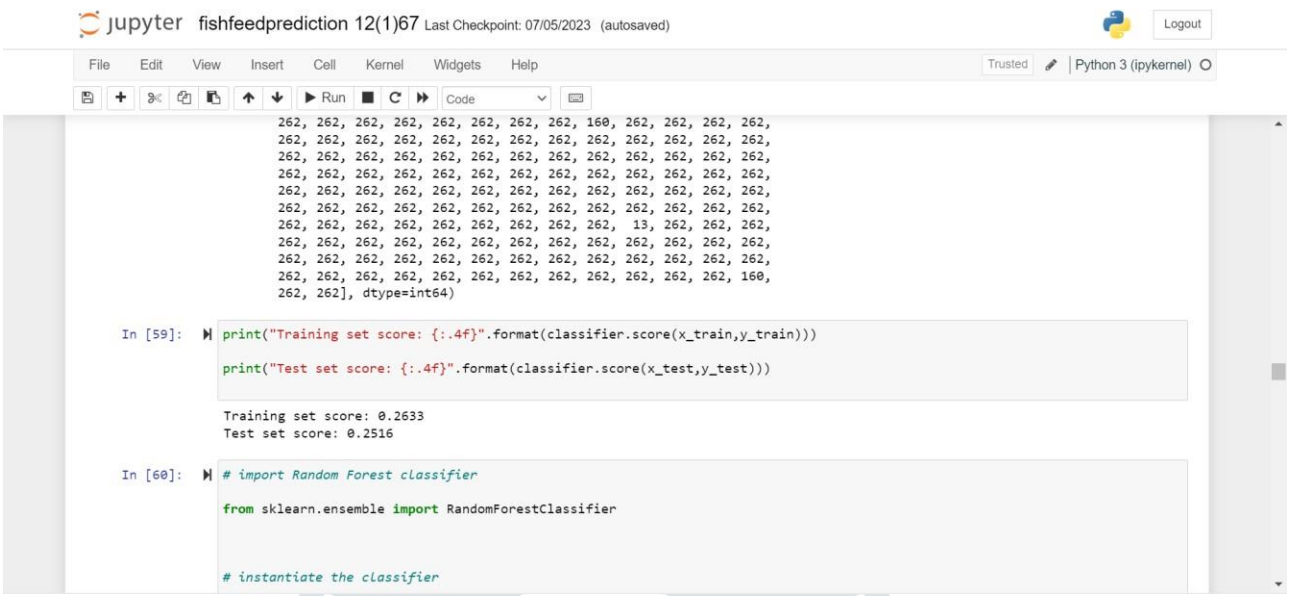

Fig 2: FISH FEED PREDICTION USING DECISION TREE-ACCURACY SCORE ON TRAINING DATA

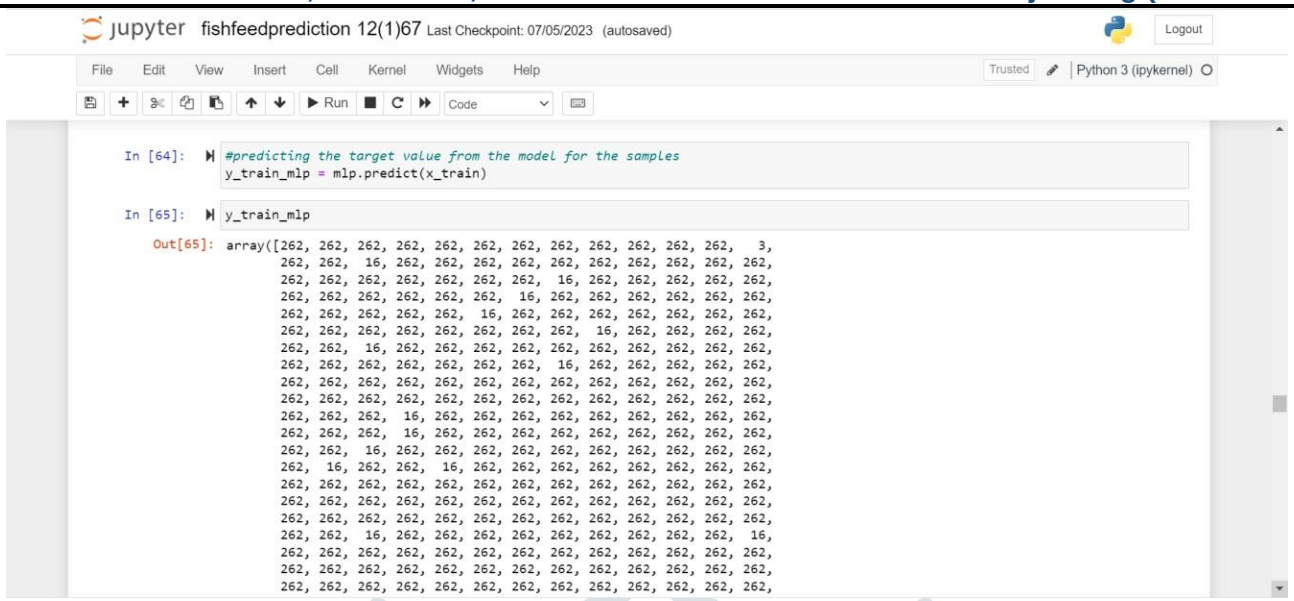

FIG 3:- FISH FEED PREDICTION USING MULTILAYER PERCEPTRON NEURAL NETWORK

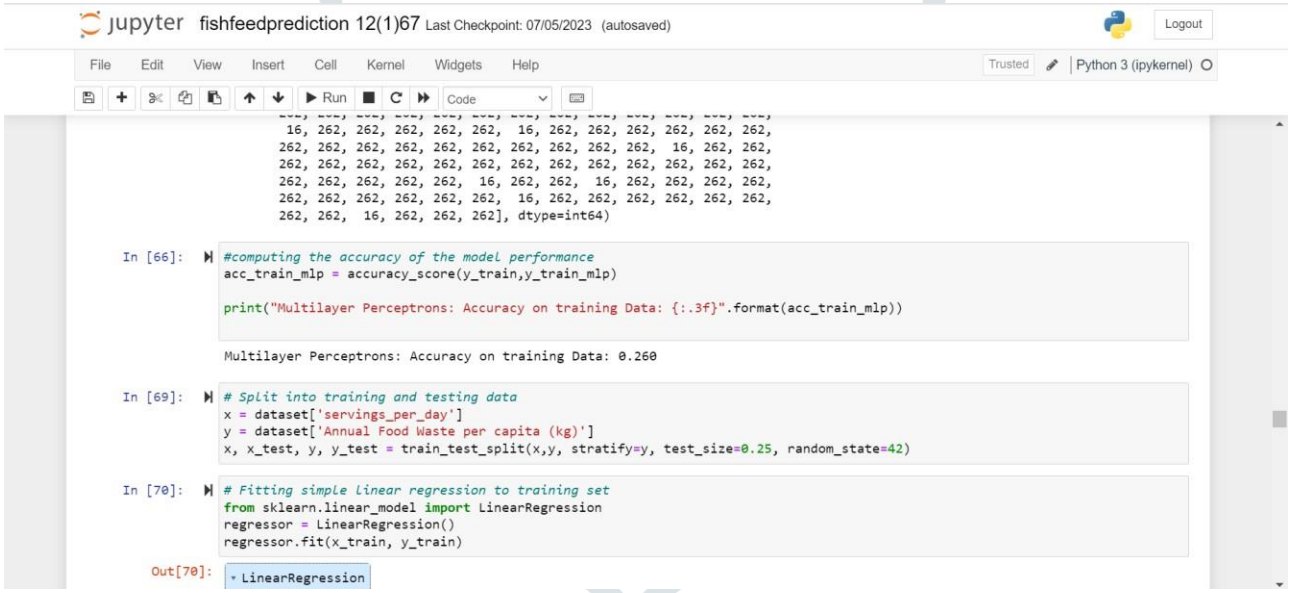

FIG 4: FISH FEED PREDICTION USING MULTILAYER PERCEPTRON NEURAL NETWORK –ACCURACY SCORE ONTRAINING DATA

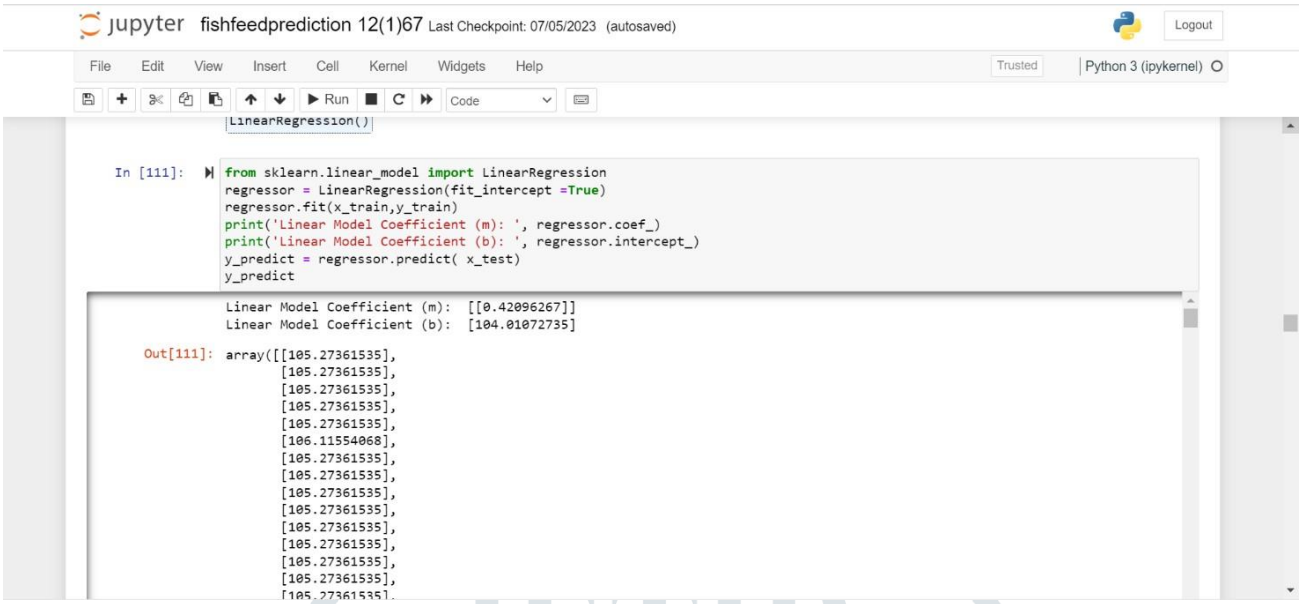

FIG 5:- FISH FEED PREDICTION USING LINEAR REGRESSION

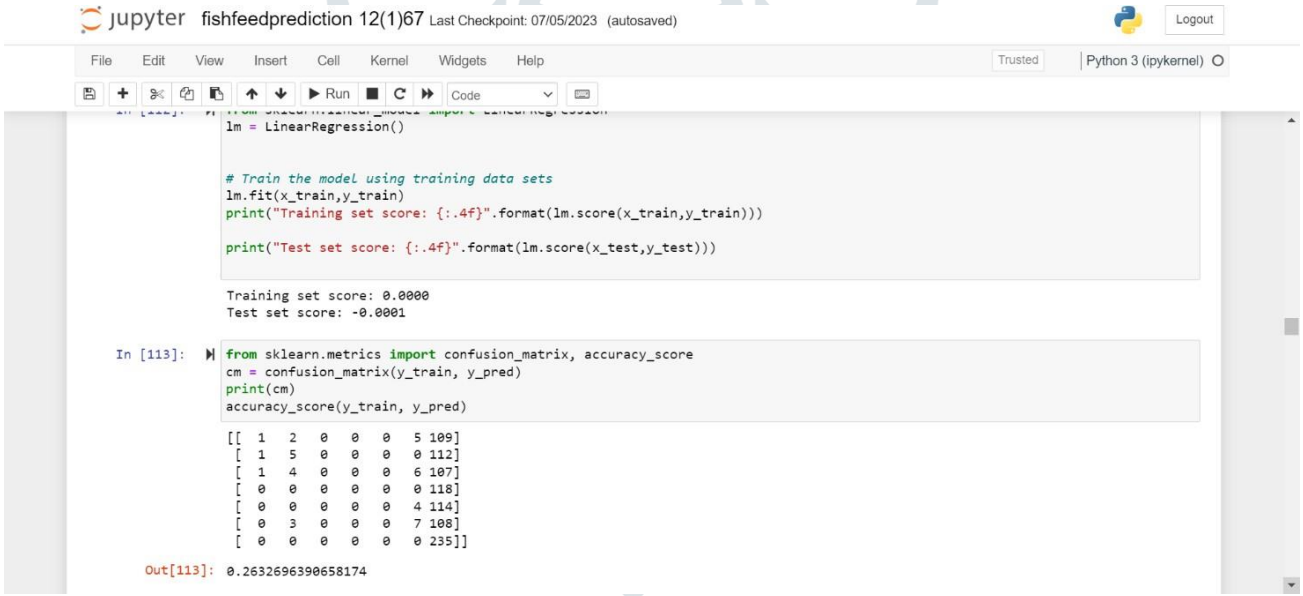

FIG 6: FISH FEED PREDICTION USING LINEAR REGRESSION LINEAR REGRESSION –ACCURACY SCORE ONTRAINING

7. CONCLUSION AND FUTURE SCOPE

Fish Pellet Annual Food Waste per capita (kg) was predicted using Fish Pellet Feed servings per day, and the model predicted total annual consumption of Fish Pellet Feed (kg) with 85% accuracy. The quantity and caliber of historical data that are readily available determine the accuracy of model prediction. The efficiency of production can be considerably increased by accurate fish intake prediction. In this study, a model for predicting feed consumption for group fish in intensive aquaculture was proposed.Fish Pellet Annual Food Waste per capita (kg) and Total Annual Fish Pellet Feed Consumption (kg) were utilized as inputs, and this model may be used to determine the appropriate feed intake. However, only the most crucial elements influencing fish eating were taken into account in this study. Other contributing elements may be added in the future Other contributing elements may be included in the future to create a more complete predictive model of fish eating.According to the experimental findings, there is a significant correlation between anticipated and actual values, with the Spearman correlation coefficient between them reaching 0.994. Get the mapping association between fish consumption and environmental elements as part of an intelligent predictive model. It may direct production practice since it is very intelligent and accurate at the same time. However, only the most crucial elements influencing fish eating were taken into account in this study. Other contributing parameters may be included in the future to create a more thorough predictive model of fish eating.

Future Work: To create a more complete predictive model of fish feeding, additional influencing elements can be included in the future. Fish meal and fish oil are still used in some aqua diets, but work is still being done to replace or reduce them. Future research may focus more on unsupervised transfer learning.

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