International Research Journal of Advanced Engineering and Science
ISSN (Online): 2455-9024

Literature Surveys: Predictive Analysis of Catch Fisheries Production in Indonesian Sea Waters Using Machine Learning

Ganjar Adi Pradana[1], Tristyanti Yusnitasari[2], Nurasiah[3], Murniyati[4]
[1]Device of Information System, Gunadarma University, Jakarta, Indonesia
[2, 3, 4]Information System, Gunadarma University, Jakarta, Indonesia

Abstract**—** *The potential for catch fisheries in Indonesia is a priceless wealth. This wealth has not been explored optimally. Fishery resources are included in the category of renewable resources whose sustainability needs to be considered. This is important in maintaining food security which will increase over time, due to population growth. Catch Fisheries Production Prediction Analysis is needed to find out what determining variables affect capture fisheries production. There are many methods for predicting, the method that is widely used today is using machine learning. This research is a literature study, which aims to: (1) identify variables that can affect catch fisheries production, and (2) identify and analyze machine learning methods that are suitable for predicting catch fisheries production. The results of the study show that the Neural Network method is most widely used as a predictive model. In addition, the Random Forest and Linear Logistics methods provide better accuracy results. The results of the study also succeeded in finding 13 determining variables for the capture fisheries production prediction model.*

Keywords**—** *Catch Fisheries Production, Machine Learning, and Prediction.*

I. INTRODUCTION

Indonesia is the largest archipelago country in the world. The great marine and fishery potential is riches which no priceless price (Sofiyanti & Suartini, 2016). However, this wealth has not been explored with optimal, specific resource fishery catch. Resource fishery, including categorized resource which could renew (renewable resources), so that often arise question how much big total fish which could utilize without must have a negative impact in the future. Thing this urgent in guard resilience food which will increase along time, because growth population.

According to Nababan et al. (2007) in sustainability is the key to fisheries development expected through wise management can repair, condition resource nor the welfare of the fishing community itself. In activity arrest fish in the sea, there is a factor which can affect the number of catches. Thus, it is necessary to know the factors which influence production fishery. After knowing the factors, analysis and prediction could conduct. Thing this makes stakeholders get input for planning and policy making to increase production in this sector.

Predictive analysis is one common strategy used in part big company or organization in world for plan profession they before it actually happened. The essence of divination is to predict future events based on patterns period, then and apply assessment for projections. To run the process assessment with a lot of data, then we need a predictive system to improve effectiveness. There are many methods for predicting, method which many used moment this is use machine learning. Machine Learning could used as tools for analyze data which big, find pattern in period then, for know prediction in future.

Describe the problem and possible solution in on, make writer interested lift it Becomes a study. Study beginning this is studies literature, which aims to: (1) identify variables that can affect fishery production capture, and (2) identify and analyze method machine learning which corresponding for predicting production fishery catch. Thing this expected to be a guide for research technician Furthermore, in use variables the appropriate model as well as the machine 's prediction method proper study. The results of this study in general also expected to contribute as a reference scientific for para stakeholders in field fishery catch to press the right policy in order to increase the quality and quantity of production fishery catch which sustainable.

II. METHOD

This research is a literature study that summarizes from some relevant literature regarding prediction and analysis production fishery catch with use machine learning. A methodology which used in this literature study is identification literature, literature selection, method, analysis and analysis variable determinant model. The diagram flow methodology could see on picture 1.

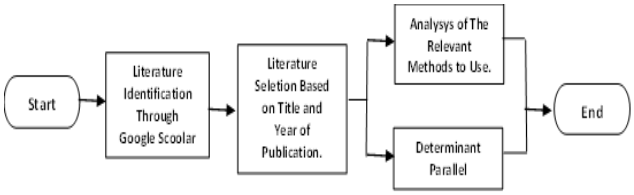

Fig. 1. Diagram Flow Methodology

Step first which conduct that is, identification literature via a Google Scholar site search. Say Keys used in the literature search via “Prediction Machine Learning”, “Water Productive", and "Analysis of Capture Fisheries Production". After literature was collected, literature selection was carried out. Literature is selected by title and year of publication. The title of the literature is considered whether it is appropriate the theme of prediction and analysis of capture fisheries

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International Research Journal of Advanced Engineering and Science
ISSN (Online): 2455-9024

production. Selection year publication literature restricted from year 2002 until 2022.

After selecting literature through title and year publication, literature which remaining studied. Assessment literature covers the suitability with a study which discussed and availability article in a manner full text. Literature selected will discussed on study this. Selected literature that will be discussed as much as a minimum 15 articles. The focus to be analyzed is the method relevant for used and determination variable model study.

III. Results and Discussion

Literature relevant which succeed collected shown in Table 1. This literature was chosen because already met the criteria in terms of relevance and year publication.

A. Machine Learning Methode

Results identification method machine learning for predictive analysis based on the collected literature shown in Table 2.

TABLE I. List Literature Primary.

No.	List Literature Primary		
	Writer (Year)	**Category Theme General**	**Method**
1	Andriani (2015)	Predictions Fishery Catch with Data mining	Comparison of Decision Tree, Naive Bayes, SVM, and Neural network.
2	Bahri (2017)	Area Arrest Fish Yellowfin.	Sensing Far, System Information Geographical, and Regression linear,
3	Bukhari (2017)	Area Arrest Fish mackerel	Sensing Far and System Information Geographical.
4	Damayanti (2016)	Production Fish	Function production Cobb-Douglas.
5	Hastomo (2021)	Predictions Share with Deep Learning	Hidden Layers Neural Network
6	Kusumodestoni (2021)	Predictions Speed Wind with Neural Network	Neural Network Backpropagation
7.	Nababan (2007)	Continuity Fishery Catch	Technique Rapfish (Rapid appraisal for Fisheries).
8.	Pambudi (2020)	Predictions Delivery Goods with Machine Learning	Comparison Random Forest. A rtificial Neural Network (ANN), and Regression Logistics.
9.	Son & Walmi (2020)	Predictions Production Paddy with Artificial Neural Network.	Artificial Neural Network Backpropagation
10.	Son & Azhar (2021)	Predictions Cancellation Hotel	Comparison Logistics Regression and Artificial Neural Network
11.	Saiful (2021)	Predictions Price Home with Machine Learning	Linear Regression
12.	Sari (2021)	Production Catch Fish Pelagic.	Analysis Linear Double.
13.	Sofiyanti & Suartini (2016)	Results Production Fishery	Analysis Regression
14.	Solihin (2011)	Production Fishery Catch	Analysis cpue, Scoring, Location Quation
15.	Suyudi (2021)	Stock Price Prediction with Recurrent Neural Network	Recurrent Neural network

TABLE III. Results Identification Machine Learning Method

No.	Identification Machine Learning Method		
	Write (Year)	**Machine Learning Method**	**Results**
1.	Andriani (2015)	Decision tree, Naive bayes,SVM, and Neural network	Application of Decision Tree algorithms, Naive Bayes, SVM, and Neural Networks in the case of prediction of increase in the average volume of capture fisheries is quite good. Algorithm neural network have highest accuracy value.
2.	Hastomo(2021)	Hidden Layer Neural Network	Challenge in process data deep Learning (DL) is determine scoreparameter epoch for produce prediction the accuracy tall.
3.	Kusumodestoni (2021)	Neural Networks Backpropagation	Application algorithm neural network capable for predict big wind speed with a prediction accuracy rate of 0.378 +/- 0.200 so with this prediction can help find out the amount of electric power that will be generated.
4.	Pambudi (2020)	Random Forest, Artificial Neural Network (ANN), and Regression Logistics.	Methode random forest produce score accuracy which more good if compared with logistic regression methode and artificial neural network (ANN), which is equal to 76.6%, while the ANN methode and logistic regression as big 73.81% and 72.84%.
5.	Son & Walmi (2020)	Artificial Neural Networks Backpropagation	Level accuracy reach 88.14% or with level error which relatively lowthat is 11.86%.
6.	Putra & Azhar (2021)	Logistic Regression and Artificial Neural Network	Of the five trials, the fifth experiment (logistic regression with GridSearchCV) is the most optimal methode for making predictions cancellation booking hotel, with score accuracy as big 79.77%, score precision85.86% and recall value 55.07%.
7.	Saiful(2021)	Linear Regression	Using 80% of the dataset for training and 20% of the dataset is used for testing produces an output value with a level of accuracy in predicting by 88%.
8.	Suyudi (2021)	Recurrent Neural Network	Prediction of seven variable features with RNN produces an accuracy of 94% for training data and 55% for test data. Accuracy is obtained after training with use 1218 data.

Results identification based on literature relevant which collected (Table 3) show that method, neural network Very many used as tools for predicting various Thing with variable-the determining variable, namely as much as 7 times. After that following the Logistic Regression method 2 times. While the Linear Regression method, Random Forest, SVM, and Naïve Bayes also used as method Machine Learning for predictive analysis. Summary the identification results of this method are shown in Table 4 following. Studies literature this also show results that method random forest and Logistics linear produce level accuracy which more good compared to Neural Network (Pambudi, 2020 and son & Azhar, 2021).

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International Research Journal of Advanced Engineering and Science
ISSN (Online): 2455-9024

TABLE IIIII. Summary of Identification Machine Learning Method

No.	Summary of Identification Machine Learning Method	
	Method	Amount
1	neural network	7 (seven)
2	Logistics Regression	2 (two)
4	Random forest	1 (one)
5	SVM	1 (one)
6	Naïve Bayes	1 (one)

B. Variabel Model of Production Fishery

Results of identification of fishery production model variables catch based on the literature which collected shown in Table 5.

Results identification based on literature relevant which collected (Table 3) managed to find 13 variables which determine the capture fisheries production model. However, thus in study method machine learning required the availability of historical data or relatively large number of time series. It is supported by research results Suyudi et al., (2021) stated that good accuracy in his research was achieved after training with use 1218 data. To study technical Furthermore, possible variable- this determining variable needs to be re-selected based on availability data time series.

TABLE IV. Summary of Identification Variable Production Fishery Model

No.	Identification Variable Production Fishery Model	
	Variable Independent/Determinant	Amount
1.	Amount Boat	3 (three)
2.	Amount Fisherman	3 (three)
3.	Tool Catch	3 (three)
4.	Temperature Surface Sea	2 (two)
5.	Klofofil-a	2 (two)
6.	*Illegal Fishing* and Aspect Law Other	2 (two)
7.	Solar (Ingredients Burn Oil)	1 (one)
8.	Time went to sea	1 (one)
9.	Distance went to sea	1 (one)
10.	Income Fisherman	1 (one)
11.	Speed Wind	1 (one)
12.	Amount Day Rain	1 (one)
13.	Amount rainfall Rain	1 (one)

TABLE V. Results Identification Variable Model of Production Fishery

No.	Identification Variable Model Production Fishery			
	Write (Year)	Variable Independent	Variable Dependent	Results
1.	Bahri (2017)	Temperature Surface sea, Chlorophyl -a	Results Catch FishYellowfin.	Spread SPL and chlorophyll-a no influential real to results catch fish tuna yellowfin in provincial waters aceh.
2.	Bukhai (2017)	Temperature Surface sea, Chlorophyll-a	Results Catch Fishmackerel	Waters fart worthy as estimator dpi potential mackerel. The spread of DPI is not only inwaters close to the fishing base (PPN Sungailiat), but also in the waters that enough far from fishing base.
3.	Damayanti (2016)	Solar, Time, Distance, AmountShip, Number of Crew, Distance, Equipment Catch.	Production Fish	Significant factors are time, ship, and Equipment Catch. Whereas factor no significant are Solar, Number of crew, and distance.
4.	Nababan (2007)	Ecology (Catch), Social (Quantity and Quality of Fishermen),Economy (Income Fisherman), Technology (Boat and Tool Catch), Law and Institutional (Illegal Fishing, Personnel Enforcer Law, Regulation).	Continuity Fishery Catch	Condition Ecology aspect which Very bad, the most visible technological dimension is differentiation, and Importance cohesiveness between or cross aspect.
5.	Sari (2021)	Speed Wind, Amount rainfallRain, Number of Rainy Days.	Catch Cob, Bloating, Squid.	Speed Wind significant to results catch of squid and cob. Total BulkRain and Number of rainy days significant to results catch bloating
6.	Sofiyanti& Suartini (2016)	Amount Boat, Amount Fisherman	Production ResultsFishery	Amount Boat and Amount Fisherman in a manner together influence ProductionFishery.
7.	Solihin(2011)	Catch Fish historical, ToolCatch, Illegal Fishing	Fisheries Production Catch	Steps strategic which required: increasing the capacity and coverage of the fleet arrest fish, efforts which effective for prevent exists practice arrest illegal, the construction of a fishing port that directed to become the basis of fishing effort and enhancement quality resource man.

IV. CONCLUSION

The study results show that there are many methods used for model prediction with Machine Learning are neural Network. Method, random forest and Logistics Linear too need to consider for study technical next related Thing this, because give results accuracy which more good than a method neural network. Study technical next expected could use method- method this as tools and also do study comparison from a number of method this on model prediction production fishery catch.

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