
Implementation of The K-Nearest Neighbor Method to Determine The Quality of Export Import Swallow's Nest

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ABSTRACT

Many researchers are motivated to improve predictive performance. K-Nearest Neighbor (KNN) is one of the algorithms for regression and classification that has been successfully implemented in various fields. On the other hand, determining the appropriate variables can provide better performance on a model. This study aims to develop a prediction model using the K-Nearest Neighbor algorithm method. This study discusses the feasibility of swallow nests that are suitable for export. Based on the problem of the research, it discusses how to select suitable swiftlet nests for export and import in order to maintain the trust of purchases from abroad. The method used in this research is the K-NN method which can determine the feasibility of applying for the rank of lecturer. The data processed are 100, the input criteria for bowl 4, broken 2, crushed a 2, destroyed b 2. The results of this study are based on the data set that has been processed, the lecturers who are eligible to apply for the rank of lecturers are 15% people and who are not eligible as many as 85% people.

Keywords: data mining, K-NN, Swift's nest, quality, export

INTRODUCTION

Swallow is one of the birds that can make a nest with saliva. The edible bird's nest is known as the edible bird's nest (EBN). The swiftlet *C. fuciphaga* produces a white, cup-shaped nest made of saliva produced by a pair of sublingual salivary glands and then hardens in the study (Fitri Nuroini & Nastiti Wijayanti, 2017). The research explains that from a theoretical point of view independent variables such as exports and imports have a simultaneous positive effect on Indonesia's Gross Domestic Product. Exports are the more dominant influence in influencing Indonesia's Gross Domestic Product in 2008-2017 (Febriyanti, D., 2019).

The purpose of this algorithm is to classify objects based on attributes and training samples. The classifier uses nothing to match and is based solely on memory. Given a query point, it will find a number of k objects or (training points) closest to the query point. Classification uses the most voting among the classifications of k objects. The K-Nearest Neighbor (K-NN) algorithm uses neighboring classification as the predictive value of the new query instance (Lidya, K., S, Opim, S., & Syahril, E. 2015). According to the "China Bird Nest Development Research Report (2016)", the total production of swiftlet nests in the world in 2016 was about 2,000 tons. The total amount of bird's nest consumed in Hong Kong is about 200 tons per year, in Taiwan it is about 150 tons per year. Indonesia is the world's largest producer of swiftlet nests, and Indonesia accounts for 71.3% of China's swallow nest market. According to China's swallow nest commodity import statistics, Indonesia accounted for 59% of the country's swallow nest market in 2016, and Malaysia had a 40% market share of USD 21.68 million. In 2017, Indonesia rose 28.6%. The demand for swiftlet nests in China continues to increase, 80% of China's bird nests are imported from Indonesia, and Indonesia is the largest importer of swallow's nests in China. Apart from China, (Annisa Harapuspa 2018).

PT. Cefa Indonesia Sejahtera Lestari is a company engaged in the export and import of swallow's nests. Initially, the swallow's nest that wants to be processed will be harvested from the swallow's house and then delivered to the company to begin processing. The first few processes are washing the swallow's nest / removing the bird's nest feathers so that it is clean. After going through the washing process, the swallow's nest will begin to be reprinted after printing the swallow's nest and dry it for 1 day so that the shape remains intact. After passing through the printing process, the bird's nest will be tested for quality to be export worthy or not. The problem is that the quality of swallow's nests is still done manually individually, therefore a system is made to determine the quality of swallow's nests that are eligible for export with various conditions to determine whether or not a swallow's nest is suitable for export. The condition for the swallow's nest to be export-worthy is that the shape of the nest must meet the export criteria, namely

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bowl, fracture, crushed A, and crushed B. After the swallow's nest has export-worthy criteria. then the swallow's nest is ready to be packed and exported.

Based on the presentation of the background described above, regarding determining the quality of Swallow's Nests from North Sumatra, the formulation of the problem in this study is how to create a system that can select several swallow's nests that are suitable for export using the K-NN method. This study aims to determine the quality of export and import of swallows using the K-NN algorithm to increase sales of swallow nests from Indonesia outside and within the country based on the web.

LITERATURE REVIEW

Related research

Sales of a company's products are influenced by several factors, such as changes in the number of consumer requests, changes in the number of sales and the influence and market trends. The existence of these factors makes the company management need to plan product sales well, so that profits and order fulfillment are achieved. One of the important parameters in sales planning is the number of products to be produced and sold for the next period. In predicting or forecasting product sales or consumer demand, you can use several forecasting methods such as the research conducted by Karina and Mariza in 2019, where in this study the observed data variables were sales value, consumer names, Auliasari, K. and Kertaningtyas, M., (2019). Furthermore, Yunus et al's research in 2018 conducted a forecasting analysis to predict the yield of palm fruit production at PT. Bumi Sawit Sukses (BSS) uses the K-Nearest Neighbor method where the amount of palm oil production is uncertain every month. This study aims for the future period at PT. Bumi Sawit Sukses (BSS). The object of this research is the amount of oil palm production while the data used is historical data from the amount of oil palm production in 2015-2017. By using the (K - NN) K-Nearest Neighbor method, the output of Rapidminer obtained an accuracy of 85.15%,

Furthermore, in 2014 Iman Mustofa et al made a prediction of book sales at the PT. Niaga Swadaya bookstore. He revealed that by looking at previous sales data, it will produce data similarities between past and future sales data, which can be used to predict sales. Book sales need to be predicted accurately, because accurate prediction results are very important for companies for the assumptions used in planning activities and for the development of short-term financial control systems (Kamal, IM and Ilyas, R., 2017). Furthermore, in 2016 Resti Hutami et al stated that the company was founded with the aim of producing goods or services aimed at meeting consumer needs as well as to gain profits for the company. The company must have long-term goals so that in the future it will change for the better and develop than before. And one of the business activities that must be carried out to keep the company running and growing is sales. Decisions taken by the holder of corporate responsibility will affect the company in the future. One of the decisions that must be determined is the product to be produced and sold for the next period. In making decisions, a method is needed so that the decisions to be taken can be right on target. The technique used to predict the situation in the next period is called prediction. This study proposes the use of the K Nearest Neighbor method to predict furniture sales data on CV. Octo Agung Jepara. The results showed that the proposed method was successfully implemented to solve the sales prediction case with an error rate or MSE of 6 percent and an accuracy of 94 percent (HUTAMI, R, 2016). Furthermore, in 2018 Yulia Rizki did a forecast at PT. Bintang Multi Sarana Palembang. He stated that to find out the amount of consumer demand for electronic products based on sales data for the last 3 years, predictions were needed for the sales of the best-selling electronic products, in order to facilitate the company in planning for stock supply. The K-Nearest Neighbor method was chosen because it is based on research from the accuracy value of the best-selling product sales classification has a value of 92.51% AMALIA, YR, (2018).

The existence of trade in swallow nest products that have been processed from Indonesia began in 1980. Business actors began to process it by washing the swallow's nest. The shape of the processed swallow's nest is classified into 4 categories, namely; The Swallow's Nest Bowl, formed when the swallow forms it in the swallow's nest house, the shape can also be a triangle if it is formed in the corner of the room, the Foot Swallow's Nest, is formed from both ends of the swallow's nest. This part is more chewy when cooked, Swallow's Nest Patahan, which is the shape of a broken bowl, Swallow's Nest of Fibers and Crushes, which is a bird's nest that is reprinted with a rectangular shape for the crushed type, and a bowl shape for the fiber type.

Basic theory

The k-nearest neighbor algorithm (K-NN or KNN) is a method for classifying objects based on the learning data that is closest to the object. K-Nearest Neighbor is based on the concept of learning by analogy. Learning data

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is described with n-dimensional numerical attributes. Each learning data represents a point, denoted by c, in the n-dimensional space. If a data query whose label is not known is entered, then KNearest Neighbor will search for k learning data that are closest to the query data in n-dimensional space. The distance between the query data and the learning data is calculated by measuring the distance between the points that represent the query data and all the points that represent the learning data using the following Euclidean Distance formula.

$$\sqrt{(x1 - x2)^2 + (y1 - y2)^2} \dots\dots\dots 2.1$$

In the training phase, this algorithm only stores feature vectors and classifies training sample data. In the classification phase, the same features are calculated for data testing (the classification is not yet known). The distance from this new vector to all training sample vectors is calculated, and the closest k numbers are taken. The point whose new classification is predicted is included in the most classification of these points. The best value of k for this algorithm depends on the data; In general, a high value of k will reduce the effect of noise on the classification, but make the boundaries between each classification more blurred. A good value of k can be selected by parameter optimization, for example by using cross-validation. The special case in which the classification is predicted based on the closest learning data (in other words, k = 1) is called the nearest neighbor algorithm. The closest K pieces of learning data will vote to determine the majority label. The query data label will be determined based on the majority label and if there is more than one majority label then the query data label can be chosen randomly among the existing majority labels Mohammad K. (2019).

Export

Exports are goods and services that are produced in one country and sold to buyers in another. Exports make up international trade. Exports are very important to the modern economy because they offer people and companies more markets for their goods. In carrying out export activities, there is a list of classifications of goods called the HS (Harmonized System) (Harmonized System 2019).

Import

Imports are goods or services purchased in one country that are produced in another. Import is one component of international trade. According to the Law of the Republic of Indonesia, import is the activity of entering goods into the customs area. Literally, imports can be interpreted as the activity of entering goods from abroad into the customs area of our country (Susilo, 2008). If the value of a country's imports exceeds the value of its exports, then the country has a negative trade balance (BOT) or also called a trade deficit. Countries are more likely to import goods or services that their domestic industry cannot produce as efficiently or as cheaply as the exporting country. Countries can also import raw materials or commodities that are not available within their borders. For example, many countries import oil because they cannot produce it domestically or cannot produce enough to meet demand. Free trade agreements and tariff schedules often dictate which goods and materials are cheaper to import. The value of imports depends on the value of the country's national income level, the higher the national income, the lower the production of domestic goods, the higher the imports as a result of the many leakages of national income.

International trade is a trade that involves two or more countries, each of which has different results both in terms of quality and quantity. This is because the conditions of each country are different. Both in terms of natural resources, geographical location, climate, population characteristics, expertise, labor, price levels, economic and social structure conditions. The existence of these differences then causes a country to conduct international trade. This is done in order to complement the needs of the country concerned, both to obtain resources, profits, more modern technology, as well as market expansion. In addition, international trade is also carried out to improve the country's economy.

For China and also for ASEAN, Indonesia is a relatively large market as well as a producer of raw materials (Ivan A Hadar 2010). This happens because Indonesia is rich in natural resources, and Indonesia also has a large population. Meanwhile, in its export activities, Indonesia can be affected by several factors. In general, these factors are divided into two, namely domestic factors and international market factors. Domestic factors include production capacity, prices in the domestic market, and various domestic policies. Meanwhile, the international market factors include prices in the international market, exchange rates, and the demand side of the importing country (economic growth conditions, competitor products, and related policies of the country (Adrian D. Lubis 2010).

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METHOD

The explanation in Figure 2 is where first the swallow's nest data will be input, then it will input the desired criteria data, after inputting the criteria data it enters the selection stage and will display the selection results from the system that has been created.

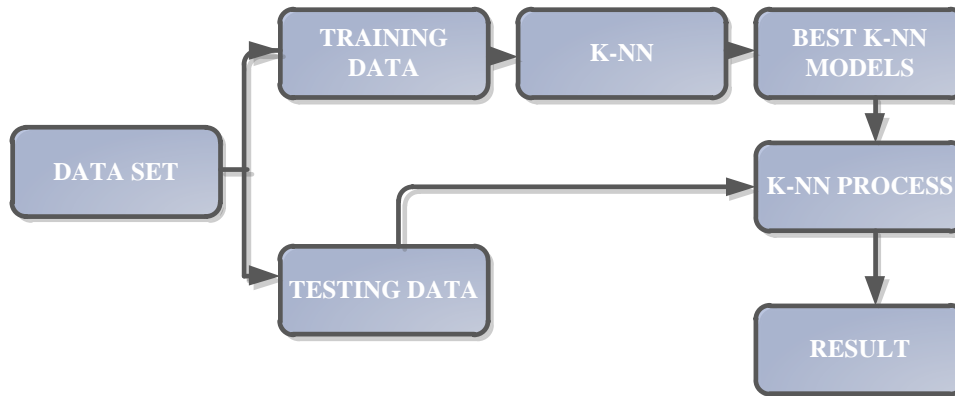


Figure 2. proposed system

In this research, the proposed system flowchar is as shown in Figure 3 above. Where the data will be processed based on the dataset, after that, do data training, test the data that will be used, after that enter the K-NN method process stage in this section, data selection testing will be carried out based on the data that will be input after the method used has been processed. used to eat displays the results that are feasible and are not suitable for export at higher prices abroad.

Criteria Analysis

The criteria used in the motorcycle selection process are as follows:

1. Lecturer criteria for promotion can be seen in table 3.1 below

Table 1. CriteriaSwift's nest

Type	Mark
Mug	5
Fault	4
A Destruction	3
B Destruction	2

In the table above, the details of each swallow's nest are divided into 4 groups, namely Bowl, Fracture, Destroy A, Destroyed B. and each type of swallow's nest has different values from the Bowl which has a value of 5, Fractures with a value of 4, Destroyed A with a value of 3 and Destruction B with a value of 2 . This data was obtained from PT. Cefa Indonesia Sejahtera Lestari.

2. The bowl is one of the criteria for a swallow's nest which is said to be the best

Table 2. Criteria for Long Teaching

Criteria	Mark
Mug	5

3. Criteria for this fault is a swallow's nest that is broken and is no longer printed and has a value of 4

Table 3. Fault Criteria

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- | Criteria | Mark |
|----------|------|
| Fault | 4 |
4. Criteria for Destruction A , Criteria for swallow's nests Destroyed A is the destruction of a swallow's nest that is reprinted and has a value of 3

Criteria	Mark
A Destruction	3

5. Criteria for Destruction B , Criteria for swallow's nest Destroyed B is the destruction of a swallow's nest that is not reprinted and has a value of 2

Criteria	Mark
B Destruction	2

1. K-NN Selection Process Analysis

For example, data *training* which is used as a calculation with the K-NN method as shown in table 3.5.

Table 4. Data Training

data 1	data 2	data 3	data 4
vip original kps	2 oranges	4 kps	orange oval
original vip	1 ori orange	4 app	orange side
vik original	oval ori orange	4 ac	4 tk
4 original kps	orange original	3 kps	3 tk
4 ori	4 ori tk	3 app	2 tk
4 ak original	3 ori tk	3 ac	1 tk
3 ori kps	2 ori tk	2 kps	Kindergarte n oval
3 ori	1 ori tk	2 app	in terms of kindergarten
3 ak original	oval ori tk	2 ac	akk
2 ori kps	in terms of original tk	1 kps	ovkk
2 ori	1 ori kps m	1 app	in terms of kk
2 ak original	1 ori m	1 ac	bs
1 original kps	1 ak ori m	ovp b kps	bs pink
1 ori	ovp ori m kps	ovp b	in terms of bs
1 ak original	ovp ori m	ovk b	in terms of pink bs
ovp ori b kps	ovk ori m	ovp kps	what h
ovp ori b	in terms of original m	ovp	oval h
ovk ori b	in terms of km	ovk	in terms of h
ovp original kps	ori h	p segi	1 app (3)
ovp original	oval ori h	k	1 ak (3)

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ovk original	in terms of original h	orange vip	1 kps (3)
in terms of original	Dragon	4 oranges	
in terms of original k	vip kps	3 oranges	
4 ori orange	VIP	2 oranges	
3 ori orange	vik	1 orange	

The criteria used have their own provisions such as the types of bowl criteria are divided into 4 types, namely: 1A, 2A, 3A, 4A, the Fault Criteria are also divided into 4 types, namely: P1, P2, P3, P4, Criteria for Destruction A is divided into only 1 type, namely: Destruction A, Criteria for Destruction B, are divided into only 1 type, namely: Destroyed B. Criteria data that is processed is only based on general criteria.

RESULT

Login

Fig 3. Admin Login Form



Fig 4. Main Menu Display

Fig 5. Form Adding Attributes

Kode	Nama Atribut	Status Atribut	Nilai	Keterangan	Aksi
A01	Mangkok	diketahui	Numerik	4cm=5, 3cm=4, 2cm=3, 1cm=2	[Edit] [Hapus]
A02	Patahan	diketahui	Numerik	4= Patahan, Patahan 1=3, Patahan 2=2, Patahan 3=1	[Edit] [Hapus]
A03	Patahan A	diketahui	Numerik	1= kecil, 2=sedang, 3=besar, 4=tidak keluar	[Edit] [Hapus]
A04	Patahan B	diketahui	Numerik	Patahan 1=2 Patahan= 2kbs=1	[Edit] [Hapus]
A05	Hasil	dicari	Kategorikal		[Edit] [Hapus]

Fig 6. Attribute data

Dataset

Nomor	Mawak	Patahan	Patahan A	Patahan B	Hasil	Aksi
1	73	4	3	2	Layuh	[Edit] [Hapus]
2	72	1	4	2	Tidak	[Edit] [Hapus]
3	69	4	1	0	Layuh	[Edit] [Hapus]
4	76	3	3	0	Layuh	[Edit] [Hapus]
5	66	1	0	0	Tidak	[Edit] [Hapus]
6	70	2	0	0	Tidak	[Edit] [Hapus]
7	68	1	1	0	Layuh	[Edit] [Hapus]
8	79	2	2	0	Tidak	[Edit] [Hapus]
9	64	2	0	0	Tidak	[Edit] [Hapus]
10	65	1	4	0	Layuh	[Edit] [Hapus]
11	63	4	1	0	Layuh	[Edit] [Hapus]

Fig 7. data set

Fig 8. K-NN method value input form results

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Total	
Hasil	Total
Tidak	13
Layak	2

Berdasarkan perhitungan, dengan Mankok: 4, Patahan: 3, Patahan A: 2, Patahan B: 1, maka hasilnya: Tidak.

Fig 9. K-NN method calculation results

in the picture above explains the process of logging into the system where in picture number 1 the admin form displays where the user who will use this system will log in first, after this enter the inputting attribute or criteria that will be used, then input the value in the system dataset section, then enter the calculation section of the K-NN method, after inputting the value of each criterion, then clicking the count button displays the results as shown in Fig 9 which shows the results of the calculation of the K-NN method.

DISCUSSIONS

The research will discuss the implementation of the k-nn method in determining the feasibility of swallow's nests that are suitable for export in order to maintain the trust of customers from abroad and domestically. Swallow's nests have several types or are termed in this study the criteria used in this research are the bowl, a type of swallow's nest which has high quality with a value of 5, the second one is fault where the criteria are lower than the type of bowl with a high quality. value 4, destroyed A is one of the swiftlet nests that has been selected and has a lower selling price compared to criteria 1 and 2, while the destroyed criteria B is the type of swallow's nest with the lowest selling price compared to all types of criteria above.

This system will process data according to the dataset that has been inputted from the beginning, then this data does not discuss the types of swallows, only focuses on swallow nests that will be resold. This system will need to be developed with a system that can provide maximum results or can be compared with other methods with the same goal of solving the problem.

CONCLUSION

Based on the problem from the research, it discusses how to select export-worthy swallow's nests in order to maintain the confidence of buying from abroad. The method used in this research is the K-NN method which can determine the feasibility of applying for the rank of lecturer. The data that is processed is 100, the input criteria for bowl 4, broken 2, destroyed a 2, destroyed b 2. This system succeeded in displaying appropriate and inappropriate results for lecturer data that had been input into the data set. The results of this research with some data that has been inputted, the results of the 100 eligible data are 85, 2 are not eligible, the rest are still in the category.

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