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Analysis of Sales Vitamins Drugs Covid-19 Pandemic with the Random Forest Method

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ABSTRACT

During the covid-19 pandemic that occurred in Indonesia until the new normal period, consumer demand for a vitamin drug was fast and unpredictable, thus making pharmacies must be able to plan the optimal supply of vitamin drugs based on the graph of public demand during the pandemic and new normal. This means that the pharmacy does not experience a shortage of stock or excess stock. Therefore, all systems that can predict sales of vitamin drugs are needed during the new normal pandemic. To be able to make predictions, an appropriate method is needed to get accurate results. One of them is the Random Forest method. With Random Forest, the data is predicted based on attribute data so as to produce a conclusion about the value of the desired attribute. Based on this study, 200 sales data of vitamin drugs were taken during the pandemic and new normal with categories of vitamin B complex drugs, vitamins C, D, E, K and Multivitamins and the attributes used were vitamin brand, category, sales conditions, price and sales category. and doesn't work. The test results from this study, it was found that the prediction of vitamin drug sales during the new normal pandemic using the Random Forest method obtained 100% accuracy for testing data with a composition of 80:20, 70:30 and 60:40, so that vitamin drugs would still be sold in new normal.

1. Introduction

The year 2020 is a tough year for countries in the world, especially in Indonesia, this is due to the corona virus pandemic that has hit the world. The corona virus pandemic has also paralyzed the world economy, including Indonesia in several sectors such as tourism and MSMEs. However, other sectors such as health and food remained stable and even experienced a surge in sales, especially sales of vitamins drugs at pharmacy outlets. This is due to the vigilance of the public who make purchases by buying up types of vitamins drugs that can prevent or make the body's immune system strong to fight the corona virus.

Of course, with the nature of the people who buy up any type of vitamins medicine to maintain the body's immune system to fight the corona virus, the stock of vitamins drugs has become scarce and prices have skyrocketed at pharmacy outlets in the Indonesian area. One of them is the Mako Farma Medan Pharmacy which experienced an increase in sales of vitamins drugs during the pandemic until the non-pandemic life was established during the covid-19 pandemic. Consumer demand for a vitamins drug is so rapid that it makes the pharmacy must be able to plan the optimal supply of vitamins drugs based on the graph of public demand during the pandemic and the non-pandemic. This aims to meet the demands of consumers who need it and to avoid losses due to the excessive supply of vitamins drugs with people's

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spending patterns starting to decline.

Based on these problems, therefore we need a system to predict or predict sales of vitamins drugs to minimize the expenditure of funds in supplying vitamins drugs from suppliers so that consumer needs are still met during the pandemic and so as not to suffer losses due to excessive stocking. One technique that can be used to predict and forecast drug sales is data mining techniques.

Data mining is an analysis and review of data sets to find unexpected information and summarize data in a different way from previous data, which is understandable and useful for data owners (Sarwo, 2016). With data mining techniques, the Mako Farma Medan Pharmacy can predict and forecast sales of vitamins drugs during the non-pandemic period of the COVID-19 pandemic, so that profits and losses and stock of vitamins drug sales can be controlled. Data mining techniques require methods to make the calculations more complex. Several methods have been created by several inventors, one of which is the Least Square method.

Random Forest is one of the methods for developing the Classification and Regression Tree (CART) with the application of bagging or bootstrap aggregating and random feature selection (Jatmiko. Y.A., 2019). The basic technique of the Random Forest method is a decision tree. In other words, Random Forest is a method that consists of a set of decision trees and then forms a random forest that is used to classify or predict data (Ocean, A. Y., 2019).

Research conducted by Sandag in 2020 regarding app store app rating predictions using the Random Forest algorithm, concluded that the Random Forest method was successfully applied to predict ratings with the highest prediction accuracy of 86.23% (Sandag, 2020), while research conducted by Siburian & Mulyna , in 2018 regarding the prediction of cell phone price production using the Random Forest method, it was concluded that the level of accuracy of Random Forest in predicting cell phone prices was 81% (Siburian VW, 2018), so based on the conclusions of previous studies, this study will predict sales of vitamins drugs at pharmacies. Mako Farma Medan with sales data format in .xls format on sales data in 2020 using the rapid miner application.

2. Method

2.1 Type of Research

Descriptive research is a research that performs a description of an event, or events that have occurred. Descriptive research solves problems by focusing on researchers at the time the research is carried out. What will be done, the problem that will be solved is to predict the sales of vitamins drugs during the non-pandemic period of the covid-19 pandemic using the Random Forest method.

2.2 Work Procedure

The stages of work procedures in this study can be seen as follows:

a) Perform problem analysis
b) Conduct research design
c) Feeding data for reference
d) Analyze the data used
e) Doing the test
f) Make a report

The steps of the work process are described as follows:

a. Perform Problem Analysis

Problem analysis is a process carried out to determine the problems that occur and how to overcome the problems taken. In this study, interviews were conducted on data on sales of vitamins drugs. Then the point of sales problem was determined which was solved by the sales prediction system for vitamins drugs during the non-pandemic period of the covid-19 pandemic.

b. Doing Research Design

For the process of developing the concept of the system to be built, a research design is carried out. In this study, the design applied was to build an operator used in the rapid miner application. The operators used are split data, and performance.

c. Collecting Reference Data

This stage is carried out to select the data that will be used as a reference in this study. Reference data taken through books, journals and websites that are relevant to the research title.

d. Perform Data Analysis

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In this process, an analysis of existing vitamins drug sales data was carried out in 2020 and then the sales data were collected into one year sales which was used as processing data for the sales prediction process for vitamins drugs using the Random Forest method, resulting in conclusions from the process.

e. Doing Tests

In this study, testing was carried out using a rapid miner application based on data on sales of vitamins drugs in 2020 at the Mako Farma Pharmacy. The purpose of the test is to get the predicted sales of vitamins drugs based on actual data. The test is carried out with the composition of training data and testing data, where training data consists of 80%, 70% and 60% data, while testing data is 20%, 30% and 40% data.

f. Making Reports

The final step of the research to be carried out is the process of making reports. This research report was prepared based on the provisions contained in the writing guidelines provided.

3. Result and Analysis

The date used in this study is date on sales of various brands of vitamins drugs available at the Mako Farma Pharmacy. In this study, the date collected was 200 sales data from January to December 2020 which was used as training data and testing data for the pandemic period and the non-pandemic period. Date sharing is carried out during the pandemic and during the non-pandemic. So there are 2 data that will be compared to see the accuracy of predictions. The following is the data used to predict drug sales during the pandemic and the non-pandemic period:

Table 1
Sales Date During Pandemic and Non-Pademic 2020

Vitamins Brand	Category	Price/ Tablet	Selling Condition	Amount Sold	Information
Neurobion	Vitamins B	2150	Pandemic	79	sold
Neurobion Forte	Vitamins B	3050	Pandemic	101	sold
Becom C	Vitamins C	2505	Pandemic	381	sold
C Ipi	Vitamins C	4850	Pandemic	473	Sold
Enervon C	Vitamins C	1000	Pandemic	173	Sold
Ester C	Vitamins C	700	Pandemic	632	Sold
Hevit C	Vitamins C	3850	Pandemic	354	Sold
Imbost	Vitamins C	7300	Pandemic	452	Sold
Imbost force	Vitamins C	4808	Pandemic	274	Sold
Imunped sirup	Vitamins C	112	Pandemic	512	Sold
Vitacimins	Vitamins C	50500	Pandemic	244	Sold
Vitalong C	Vitamins C	41000	Pandemic	214	Sold
Prove D3	Vitamins D	3083	Pandemic	97	Sold
Tride	Vitamins D	3750	Pandemic	78	sold
Ever E	Vitamins E	1250	Pandemic	147	sold
Natur E	Vitamins E	3800	Pandemic	189	sold
Becom Zet	Multivitamins	1950	Pandemic	188	sold
CDR 10's	Multivitamins	2500	Pandemic	210	sold
Fituno	Multivitamins	1500	Pandemic	98	sold
Surbex Z	Multivitamins	1156	Pandemic	71	sold
…..	….	….	….	….	….

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Based on table 1, it can be explained below:

a. The categories of vitamins available at the Mako Farma pharmacy are Vitamins B, C, D, E and Multivitamins.
b. The terms of the sales period based on the provisions of the government from March to June are stipulated by the provisions of the pandemic so that sales are said to be "Pandemic" and from July to December the provisions for non-pandemic life are stipulated so that the sales are called " Non-Pademic".

Furthermore, based on the sales date in table 2, data preprocessing is carried out with the following conditions:

a. Date Normalization

Attributes that will be used as labels in the prediction results are sales that are sold and those that are not sold are on the number of sales attributes. The purpose of determining the label is to compare the accuracy of the prediction results with the actual date. Based on the results of interviews with pharmacies, the terms of sale and sale are obtained as follows:

Table 2
Category Assignment

Selling Amount	Information
0-49	Not sold
=>50	sold

b. Date Sharing

In this process, sales data for the pandemic period and sales data for the non-pademic period are separated. The results can be seen in the table below:

Table 3
Sales Date During the 2020 Pandemic at Mako Farma

Vitamins Brand	Category	Price/ Tablet	Selling Condition	Amount Sold	Information
Neurobion	Vitamins B	2150	Pandemic	79	Sold
Neurobion Forte	Vitamins B	3050	Pandemic	101	Sold
Becom C	Vitamins C	2505	Pandemic	381	Sold
C Ipi	Vitamins C	4850	Pandemic	473	Sold
Enervon C	Vitamins C	1000	Pandemic	173	Sold
Ester C	Vitamins C	700	Pandemic	632	Sold
Hevit C	Vitamins C	3850	Pandemic	354	Sold
Imbost	Vitamins C	7300	Pandemic	452	Sold
Imbost force	Vitamins C	4808	Pandemic	274	Sold
Imunped sirup	Vitamins C	112	Pandemic	512	Sold
Vitacimins	Vitamins C	50500	Pandemic	244	Sold
Vitalong C	Vitamins C	41000	Pandemic	214	Sold
Prove D3	Vitamins D	3083	Pandemic	97	Sold
Tride	Vitamins D	3750	Pandemic	78	Sold
Ever E	Vitamins E	1250	Pandemic	147	Sold
Natur E	Vitamins E	3800	Pandemic	189	Sold
Becom Zet	Multivitamins	1950	Pandemic	188	Sold
CDR 10's	Multivitamins	2500	Pandemic	210	Sold
Fituno	Multivitamins	1500	Pandemic	98	Sold

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Vitamins Brand	Category	Price/ Tablet	Selling Condition	Amount Sold	Information
Surbex Z	Multivitamins	1156	Pandemic	71	Sold
…..	….	….	….	….	….
Neurobion	Vitamins B	2150	Pandemic	110	Sold
Neurobion Forte	Vitamins B	3050	Pandemic	132	Sold
Becom C	Vitamins C	2505	Pandemic	412	Sold
C Ipi	Vitamins C	4850	Pandemic	411	Sold
Enervon C	Vitamins C	1000	Pandemic	204	Sold
Ester C	Vitamins C	700	Pandemic	574	Sold
Hevit C	Vitamins C	3850	Pandemic	385	Sold
Imbost	Vitamins C	7300	Pandemic	389	Sold
Imbost force	Vitamins C	4808	Pandemic	305	Sold

Table 4
Sales Date for 2020 non-pandemic Period at Mako Farma

Vitamins Brand	Category	Price/ Tablet	Selling Condition	Amount Sold	Information
Neurobion	Vitamins B	2150	Non-Pademic	141	Sold
Neurobion Forte	Vitamins B	3050	Non-Pademic	163	Sold
Becom C	Vitamins C	2505	Non-Pademic	443	Sold
C Ipi	Vitamins C	4850	Non-Pademic	442	Sold
Enervon C	Vitamins C	1000	Non-Pademic	235	Sold
Ester C	Vitamins C	700	Non-Pademic	478	Sold
Hevit C	Vitamins C	3850	Non-Pademic	345	Sold
Imbost	Vitamins C	7300	Non-Pademic	425	Sold
Imbost force	Vitamins C	4808	Non-Pademic	336	Sold
Imunped sirup	Vitamins C	112	Non-Pademic	315	Sold
Vitacimins	Vitamins C	50500	Non-Pademic	306	Sold
Vitalong C	Vitamins C	41000	Non-Pademic	276	Sold
Prove D3	Vitamins D	3083	Non-Pademic	159	Sold
Tride	Vitamins D	3750	Non-Pademic	140	Sold
Ever E	Vitamins E	1250	Non-Pademic	209	Sold
Natur E	Vitamins E	3800	Non-Pademic	251	Sold
Becom Zet	Multivitamins	1950	Non-Pademic	250	Sold
CDR 10’s	Multivitamins	2500	Non-Pademic	272	Sold
Fituno	Multivitamins	1500	Non-Pademic	160	Sold
Surbex Z	Multivitamins	1156	Non-Pademic	133	Sold
…..	….	….	….	….	….
Neurobion	Vitamins B	2150	Non-Pademic	15	Not sold
Neurobion Forte	Vitamins B	3050	Non-Pademic	141	Sold

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Vitamins Brand	Category	Price/ Tablet	Selling Condition	Amount Sold	Information
Becom C	Vitamins C	2505	Non-Pademic	217	Sold
C Ipi	Vitamins C	4850	Non-Pademic	394	Sold
Enervon C	Vitamins C	1000	Non-Pademic	176	Sold
Ester C	Vitamins C	700	Non-Pademic	285	Sold
Hevit C	Vitamins C	3850	Non-Pademic	318	Sold

3.1 Random Forest Pandemic Prediction Test

After the actual sales date during the pandemic is obtained as shown in table 5, the next step is to test the sales prediction of vitamins drugs using the random forest method during the pandemic. The following is the distribution of training date and testing date used in the random forest application to predict sales of vitamins drugs during the pandemic:

Table 5
Distribution of Sales Prediction Training and Testing Date during the Pandemic Period

Amount of date	Prediction Ratio (%)
80	80:20
80	70:30
80	60:40

Prediction testing with the application of the method is carried out on the Rapidminer 2019 application. The following operators are used:

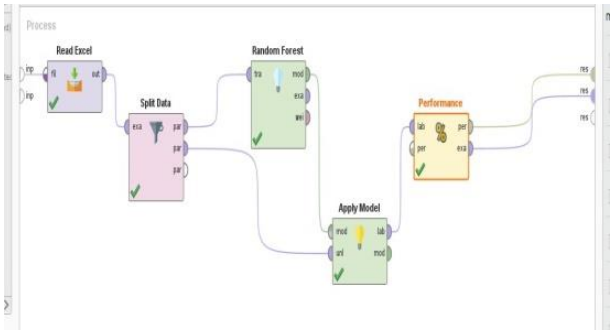

Fig 1. Display of the First Test Operator during the Pandemic

The test uses split data which functions to divide training data and testing data either randomly or linearly based on the desired prediction ratio. The data used in this first prediction test is 80 sales date during the 2020 pandemic with testing ratios of 80:20, 70:30 and 60:40. The parameter used to see the accuracy is operator performance. After testing with the prediction ratio as in for the pandemic period, the following accuracy is obtained:

PerformanceVector

```
PerformanceVector:
accuracy: 100.00%
ConfusionMatrix:
True:    Tidak Laku      Laku
Tidak Laku:      0         0
Laku:    0         32
```

Fig 2. Performance Vector First Test

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3.2 Non-Pandemic Random Forest Prediction Test

After the actual sales data for the non-pandemic period is obtained as shown in table 3.4, the next step is to test the sales prediction of vitamins drugs using the Random Forest method during the non-pandemic period. The following is the distribution of training date and testing data used in the random forest application to predict sales of vitamins drugs during the non-pandemic:

Prediction testing with the application of the method is carried out on the Rapidminer 2019 application. The following operators are used:

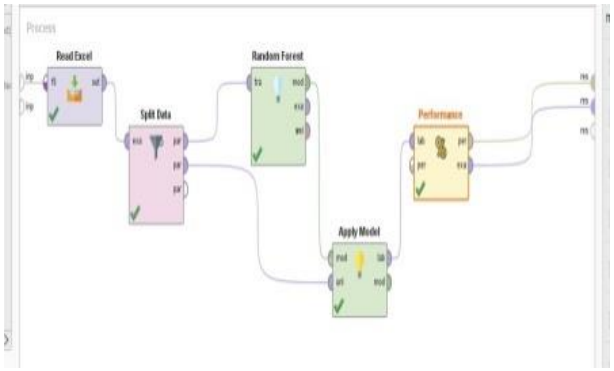

Fig. 3. Display of the First Test Operator during the Pandemic Masa

The test uses split data which functions to divide training data and testing data either randomly or linearly based on the desired prediction ratio. The data used in this second prediction test is 120 sales data during the 2020 non-pandemic pandemic with a ratio test of 80:20, 70:30 and 60:40. The parameter used to see the accuracy is operator performance. After testing with the prediction ratio as in table 6 for the non-pandemic pandemic period, the following accuracy is obtained:

Table 6
Test Results of Non-Pademic Sales Predictions

Prediction Ratio (%)	Prediction Accuracy
80:20	100%
70:30	100%
60:40	100%

PerformanceVector

```
PerformanceVector:
accuracy: 100.00%
ConfusionMatrix:
True:    Laku    Tidak Laku
Laku:    31      0
Tidak Laku:      0       17
```

Fig 4. Performance Vector First Test

3.3 Discussion

After testing the prediction of sales of vitamins drugs during the pandemic with several test ratios, namely 80:20, 70:30 and 60:40, resulting in an accuracy of 100%, which means that if the same situation occurs in the future, sales of various vitamins drugs will be carried out. the brand is sure to be sold. Meanwhile, during the non-pandemic pandemic, several test ratios, namely 80:20, 70:30 and 60:40, produced the same accuracy of 100%, which means that if the same situation occurs in the future, the sale of various brands of vitamins drugs sure to sell. Therefore, from the comparison of the pandemic period and the non-

pandemic period of the pandemic, sales of various brands of vitamins drugs will continue to sell according to the situation in the previous date, this is due to various factors such as public awareness, panic buying and others.

4. Conclusion

Based on the results of testing the prediction of vitamins drug sales during the non-pandemic period of the covid 19 pandemic using the rapidminer application, it was concluded that:

a. Randomforest prediction is done by looking at the actual data conditions as training data and testing data for prediction results under the same conditions in the future.
b. The Randomforest method was successfully applied to predict the sale of vitamins drugs with the highest accuracy rate of 100% both during the pandemic and the non-pandemic.
c. Based on the results of testing the sales prediction for vitamins drugs with a dataset of 200, which is divided into pandemic data and non-pandemic data, it can be concluded that with sales conditions during the non-pandemic covid-19 period, all brand vitamins drugs owned by Mako Farma pharmacies are still sold. with 100% accuracy, so predictions with Randomforest can be a reference for Mako Farma pharmacies to provide sufficient stock if they are still in the non-pandemic period of covid-19.

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