

LOGISTICS DATA ANALYSIS FOR INCREASE EFFICIENCY NEED IN THE EFFORT TO OVERCOME RISK DISASTER WITH NAIVE BAYES ALGORITHM



Niko Suwaryo¹

Universitas Medika Suherman, Kabupaten Bekasi, Indonesia

suwaryoniko@gmail.com

Emmelia Kristina Hutagaol²

Universitas Medika Suherman, Kabupaten Bekasi, Indonesia

kristina.hutagaol73@gmail.com

Abstract

This Study make an effort evaluate implementation Naïve Bayes algorithm in analyzing logistics data For increase efficiency distribution help during effort responsive disaster . The hope is that findings from study This will help in create framework more work smart and data -driven for initiative management disaster , besides facilitate enhanced programs in field responsive future disasters . The Naïve Bayes technique can implemented For categorize condition logistics to improve request inventory with estimate need stock through analysis of past data . Algorithm This evaluate probability and integrating various element For produce exact estimate , so help in fulfillment need related disaster in a way effective . For example , with utilizing logistics data historical and can estimate amount required For prevent deficiencies and ensure necessary supplies available with easy . Every results obtained from every testing with use Naïve Bayes algorithm , or Naïve Bayes model with 85% accuracy proves to be very efficient in predict need logistics main . Implementation This own potential big For repair efficiency distribution logistics in situation emergency disaster . Although in a word simple , Naïve Bayes offers fast , stable , and easy results applied , so that become choice very good start For system supporters decision in field logistics data processing , Producing similar views , where the results are linear and comparable with the model scenario being run , so that the model valid enough for made into alternative reference in decision-making.

Keywords : Logistics Data, Naive Bayes, Classification, Natural Disasters, Goods Needs, Business Intelligence

INTRODUCTION

Disaster surprising and unexpected nature unexpected , such as earthquake earth , rapids , or eruption mountain fiery , often impactful significant in life humans and causes damage . In this situation like this , effort responsive fast and efficient emergency response depends heavily on the framework strong work that ensures delivery help appropriate time to affected area impact . Main constraints in initiative responsive emergency is requirements and complexity continuous logistics developing that changes along with conditions that occur at the location . [1] .

Disaster logistics covers Lots scenarios , including preparation and delivery goods important like food , water, supplies medical , and needs other to affected areas impact disaster . One of the challenge main issues faced is difficulty in evaluate in a way appropriate type and quantity goods needed in various location disaster . Therefore that is very important For do accurate and efficient logistics data analysis to improve flow distribution assistance and ensure that source Power limited finances can used with the most effective way . [2] .

With use Naïve Bayes algorithm , a techniques based on theory probability , possible decomposition information concrete about disaster previously , such as characteristic disaster , location , and needs emerging logistics . Algorithm This help in estimate need logistics with utilize the latest data while consider various elements that influence risk disaster . With utilise Naïve Bayes algorithm in logistics data analysis For management disaster , the previous trend hidden in information can revealed , besides allows more predictions effective about required supplies . Approach This play role important in minimize waste finance , improve speed delivery assistance , and reduce possibility lack during challenging period . Through accurate modeling , framework data - oriented work can facilitate more response faster and more accurate , improve Work the same among entity related , and accelerate the recovery process in the affected areas. impact disaster [3] . This is will help in increase practice management inventory , minimize waste , and optimize income generated from condition need product . Data driven decisions will speed up ability organization For react to change demand and offer superiority strategic in a highly competitive goods market . The goal of study This is For explore implementation Naïve Bayes algorithm in evaluate preference need logistics and for increase understanding about request goods . It is expected that findings from study This will give significant contribution to evolution tactics what is needed and management , besides offer outlook about How intelligence logistics can facilitate taking decision based on data [4]. Research This aim For evaluate implementation Naïve Bayes algorithm in analyze information logistics For increase efficiency delivery help during effort responsive disaster .

REVIEW OF LITERATURE

Perpetrator business must always think about method For keep on holding on And If may expand the scale of the business. In this case, the evaluation Which done For activity PKM training clustering product stock retail For determine movement need consumer can be done by collecting feedback from community service participants Society (Niko Suwaryo, 2023).

Disaster logistics encompasses the planning, procurement, storage, distribution, and monitoring of goods and services needed during emergency response and recovery. Logistics

efficiency determines the speed of response and the extent to which victims' needs are met (Ghaida et al., 2024).

Incomplete data availability, inter-agency coordination, dynamic needs during the emergency phase, infrastructure limitations, and prioritization of needs for food, water, medicine, and shelter (Munasip et al., 2024). accuracy forecasting need, allocation source Power Which appropriate time, route optimal distribution and storage, and a reliable logistics information system (Ayuni et al., 2024).

RESEARCH METHOD

This Study aim For produce classification of logistics data , with hope the result can give contribution for development system more logistics intelligent and data -driven in operation management disasters , as well as support more many programs in the future related management disaster . The Naïve Bayes method can implemented in classification need logistics For increase supply with predict inventory based on historical data . Algorithm This count probability and combining various factor For give accurate predictions , so that help fulfil need disaster with more efficient .

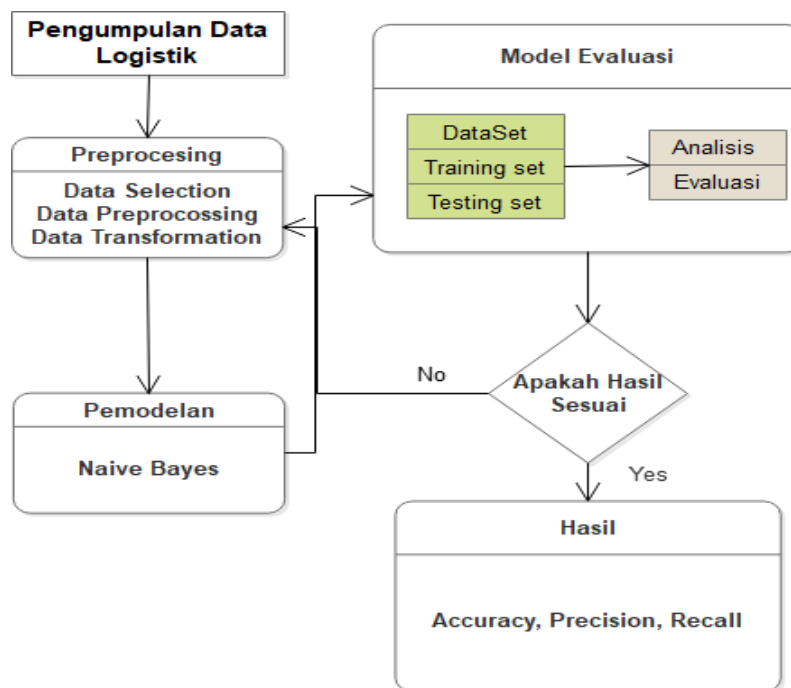


Figure 1
Research Stages

RESULTS AND DISCUSSION

1. Implementation of the Naive Bayes Algorithm

Data analysis

The Naïve Bayes model helps predict need logistics with fast based on characteristics disaster . This is allows taking more decisions efficient and delivery more help appropriate targets , especially in the first 72 hours post disaster . When the author take data, it will processed as a model for test training data , data that will later will be tested with naive bayes algorithm that has been determined . The initial process carried out in study This prepare testing data and data will be processed . method classification , author take sample data to be modeled by 100 data that have been transmitted through maintenance data First .

Table 1
Stock Dataset

ProductName	Qty_Order	Qty_Transfer	Location_Before	Location_After	Tingkat Kebutuhan
METHYL EUGENOL SUBST (RD2727)10%TRIA	0,09	0,09	Cikarang	Jakarta Timur	Kebutuhan Rendah
CGC BSD	8	8	Cikarang	Jakarta Timur	Kebutuhan Rendah
PRUNEAU NAT	499,97	499,97	Cikarang	Jakarta Timur	Kebutuhan Tinggi
TRI CALCIUM PHOSPHATE	149,94	149,94	Cikarang	Jakarta Timur	Kebutuhan Tinggi
ETHYL ISOVALERATE	0,01	0,03	Cikarang	Jakarta Timur	Kebutuhan Rendah
ETHYL VANILLIN	1.000,00	899,97	Cikarang	Jakarta Timur	Kebutuhan Tinggi
COFFEE BSD [DIA]	2,2	2,2	Cikarang	Jakarta Timur	Kebutuhan Rendah
SULFUROL MIX	50	49,7	Cikarang	Jakarta Timur	Kebutuhan Tinggi
CITRAL 70/30	60	49,5	Cikarang	Jakarta Timur	Kebutuhan Tinggi

Information that records data about logistics inventory (stock) in the warehouse or post logistics , good before , during , and after occurrence disaster . In this process , the naïve Bayes algorithm is used For apply method classification based probabilistic based Bayes' theorem , with assumption that every mutual input features independent One each other so that capable produce prediction with accurate accuracy . In the study this , the author utilise testing calculation with help Collaboratory. Testing the obtained model through Collaboratory done with steps as following:

Import necessary libery for the process in the Colaboratory, then type required libraries For data testing.

```
[ ] import numpy as np
import pandas as pd

from sklearn.preprocessing import LabelEncoder
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from sklearn.naive_bayes import GaussianNB
from sklearn.metrics import confusion_matrix
from sklearn.metrics import classification_report
from sklearn.metrics import accuracy_score
```

Figure 2
Import Liberty

The dataset must be prepared in Excel format (.xlsx) and saved in the project folder or uploaded to room work (if use Jupyter Notebook/Google Colab). Importing data, in the process view , enter the dataset from the folder to screen appearance in xlsx data format.

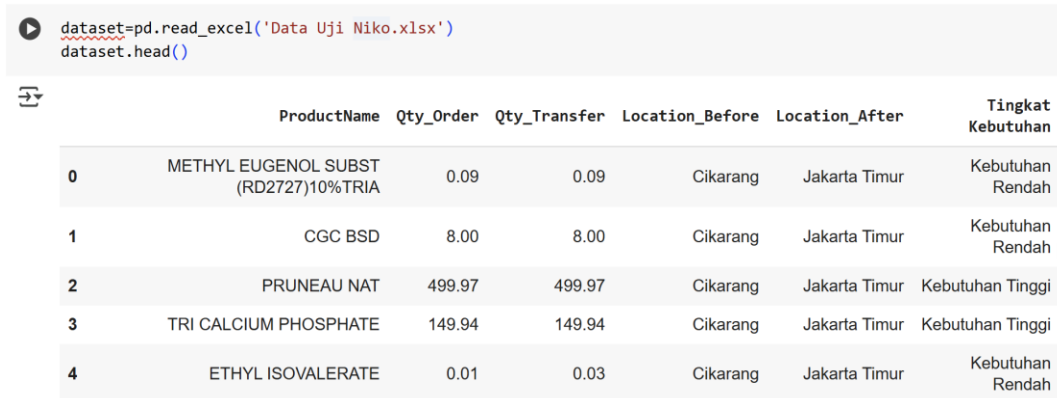


Figure 3
Data Display

Visualization logistics data graph is step convert logistics data (such as amount stock , demand , distribution and delivery or level needs) to be visualization or chart to make it clearer simple For analyzed and understood .

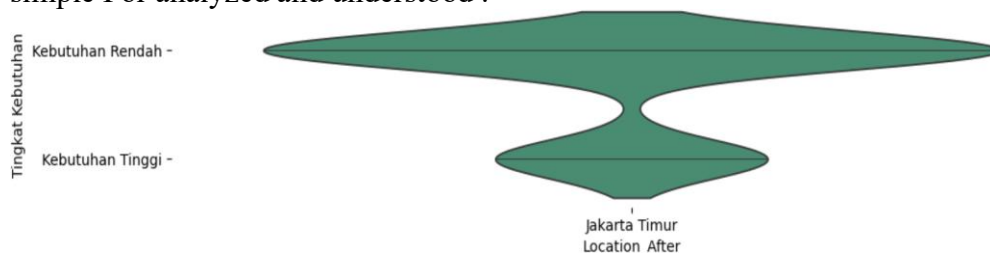


Figure 4.

Display of intrusion detection system data on a computer network system

Step " Execute Running Process" for get results classification from 100 records dataset with use Naïve Bayes algorithm , especially in context logistics data analysis (for example prediction need logistics during disaster). **Running Process** means operate all over a series of modeling processes that have been prepared For reading data , training models , performing classification / prediction and m displays results classification

```
▶ dataset.info()
↳ <class 'pandas.core.frame.DataFrame'>
  RangeIndex: 100 entries, 0 to 99
  Data columns (total 6 columns):
   #   Column                Non-Null Count  Dtype
  ---  ---
   0   ProductName           100 non-null    object
   1   Qty_Order              100 non-null    float64
   2   Qty_Transfer           100 non-null    float64
   3   Location_Before        100 non-null    object
   4   Location_After         100 non-null    object
   5   Tingkat Kebutuhan      100 non-null    object
  dtypes: float64(2), object(4)
  memory usage: 4.8+ KB
```

Figure 5
Data Display

Test Results Analysis

Carry out classification type need logistics main with using historical data disaster (*product name, qty_order, qty_transfer, location_before, location_after*) for ensure distribution help more precise , fast , and efficient . After go through the process in data classification using naïve bayes algorithm , application naïve Bayes algorithm used produce classification For can predict each data. The dataset obtained from recording of the requirements process logistics 100 data records to be tested in the classification process use naïve bayes algorithm . The results of the model classification during testing in *the colabatory* can seen in the image below This .

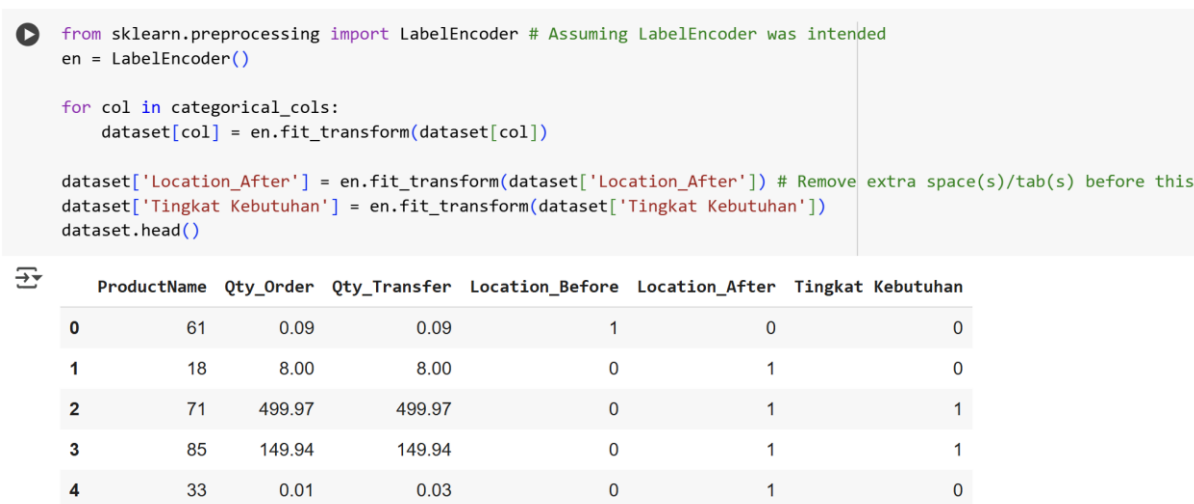


Figure 6
Classification results of the Logistics Needs Data Model

From the results above , it can be known that formation of training data and test data obtained through testing with *Collaboratory* This is relevant . Compilation each variable (*product name* , *qty_order* , *qty_transfer* , *location_before* , *location_after*) and label Level of need low and high , shows dominant results need low . However , in the process of use *collaborative* , no There is determination mark from training and testing data initial . The results of the model classification in testing in *the colaboratory* can shown in the image following .

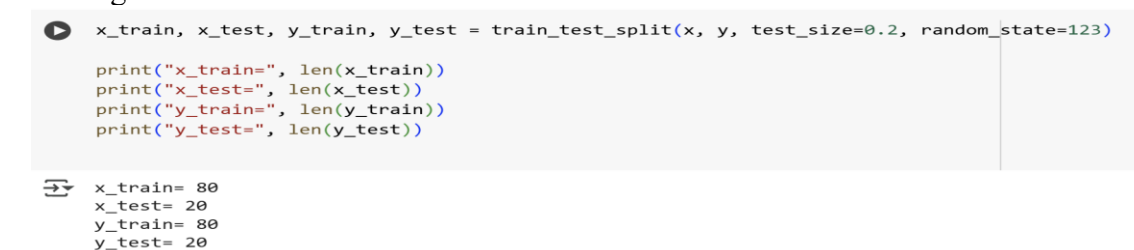


Figure 7
Results of Training and Testing Data Division

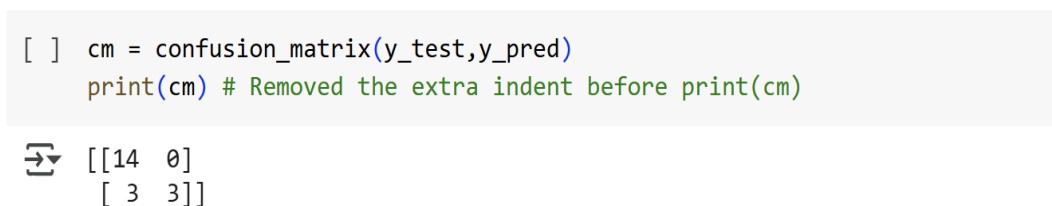


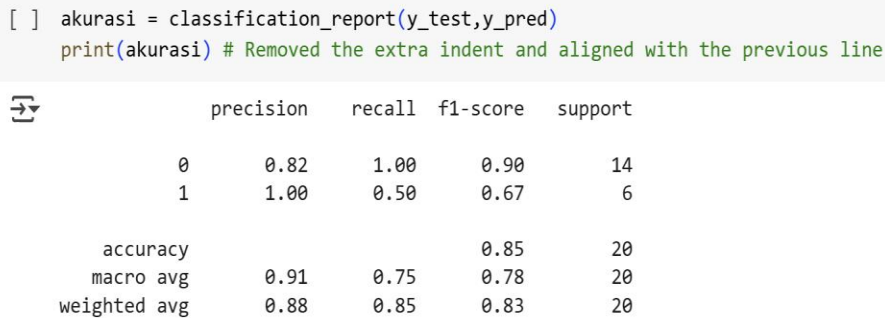
Figure 8
Matrix Division Results

Trials method done for known results analysis and assessment whether method as well as the algorithm used functioning with effective or no . Procedure testing use collaborative and check data for ensure suitability with results obtained through collaborative said . Meanwhile that , validation Naive Bayes method and algorithm are carried out with evaluate results accuracy , precision , and recall, which can counted using the Confusion Matrix as following:

1. Accuracy is metric assessment that assesses how much Lots correct prediction compared to with the total of the data tested).
2. For evaluate how much effective Naïve Bayes model in predict the right class (category) from new data in harmony with patterns that have been studied from training data

From the test data Then results from the data state level *accuracy* , *recall* and *persistence* from algorithm *Naïve Bayes* . Here This results from mark *accuracy*, *recall* and *persicion*

```
[ ] akurasi = classification_report(y_test,y_pred)
    print(akurasi) # Removed the extra indent and aligned with the previous line
```

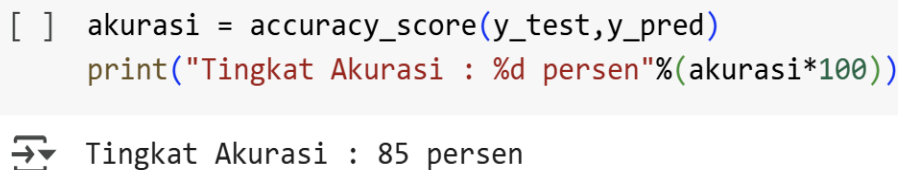


	precision	recall	f1-score	support
0	0.82	1.00	0.90	14
1	1.00	0.50	0.67	6
accuracy			0.85	20
macro avg	0.91	0.75	0.78	20
weighted avg	0.88	0.85	0.83	20

Figure 9
Accuracy, recall, and precision results of the Naïve Bayes algorithm

From the test data , the results obtained show level accuracy Naive Bayes algorithm. Here is results from mark accuracy.

```
[ ] akurasi = accuracy_score(y_test,y_pred)
    print("Tingkat Akurasi : %d persen"%(akurasi*100))
```



```
⇒ Tingkat Akurasi : 85 persen
```

Figure 10
Accuracy Results Naive Bayes Algorithm

Performance testing on models and algorithms done For know results analyzed accuracy as well as measure whether methods and algorithms used functioning optimally , so that can reach level Accuracy 85.00 % .

Analysis of Results

Capable model identify pattern main in the data requirements variable logistics (*product name*, *qty_order* , *qty_transfer* , *location_before* , *location_after*) and *level* labels need low and high , and numbers refugees to type need logistics). Based on the results that have been obtained in study This so results testing from Naïve Bayes algorithm that produces level *Accuracy* 85.00%, 15% error estimate Can happen as a result , the data is not balanced between category very common needs and features or No related case outside normal (case) rare or No general). Increasing accuracy This can make things easier in taking decisions and efforts prevention from every algorithm is one of the factors that cause mark accuracy tall Because every attributes and classes or label has influence on the Naïve Bayes algorithm and model with 85% accuracy proves to be very efficient in predict need logistics main . Implementation This own potential big For repair efficiency distribution logistics in situation emergency disaster . Although in a word simple , Naïve Bayes offers fast , stable , and easy results applied , so that become choice very good start For system supporters decision in field countermeasures disaster .

CONCLUSION

Every results obtained from every testing with use Naïve Bayes algorithm , or Naïve Bayes model with 85% accuracy proves to be very efficient in predict need logistics main . Implementation This own potential big For repair efficiency distribution logistics in situation emergency disaster . Although in a word simple , Naïve Bayes offers fast , stable , and easy results applied , so that become choice very good start For system supporters decision in field logistics data processing , Producing similar views , where the results are linear and comparable with the model scenario being run , so that the model valid enough for made into alternative reference in decision- making .

REFERENCES

- [1] Kokom Komariyah, Rahaditya Dasuki, Dias Bayu Saputra, Saeful Anwar, and Gifthera Dwilestari, "Inventory Classification Using the Naive Bayes Algorithm at PT. Dharma Electrindo Manufacturing," *KOPERTIP J. Ilm. Manaj. Inform. and Comput.* , vol. 4, no. 2, pp. 35–41, 2020, doi: 10.32485/kopertip.v4i2.117.
- [2] A. Derry Ali Munthohar, T. Pribadi, A. Sulistiawan, and J. Timur, "Application of the Naive Bayes Method for Predicting Building Materials Stock at the Rejo Mulyo Building Materials Store," *Multidiscip. Appl. Quantum Inf. Sci.* , vol. 4, no. 1, pp. 1–7, 2024, [Online]. Available: <https://journal.unugiri.ac.id/index.php/almantiq/article/view/2158>
- [3] M. Taufik Hidayat, N. Suarna, and N. Rahaningsih, "Implementation of the Naïve Bayes Algorithm for Inventory Prediction of PT. Dilmoni Citra Mebel Indonesia," *JATI (Jurnal Mhs. Tek. Inform.* , vol. 7, no. 1, pp. 693–699, 2023, doi: 10.36040/jati.v7i1.6310.
- [4] A. Yahya and R. Kurniawan, "Implementation of K-Means Algorithm for Clustering Sales Data Based on Sales Patterns," vol. 5, no. January, pp. 350–358, 2025.
- [5] F. Daud, S. Sianturi, A. Sulton, A. Insaniyati, U. Sa, and F. Ramadhani, "Evaluation of Logistics Warehouses Based on Observations at the Regional Disaster Management

- Agency (BPBD) of Bantul Regency in Facing the Threat of Megathrust Disasters on the South Coast of Java,” vol. 2024, no. November, pp. 55–62, 2024.
- [6] MSA Prasetyo, A. Wahyono, and MA Aziz, “Detecting Disaster Incident Patterns Using the Naive Bayes Algorithm in Boyolali Regency,” *JITU J. Inform. Technol. Commun.* , vol. 8, no. 1, pp. 97–106, 2024, doi: 10.36596/jitu.v8i1.1119.
- [7] U. Semarang, “Development of an Inventory Classification Application Based on Stock and Sales Using the Naive Bayes Algorithm,” pp. 1–12.
- [8] D. Susanti and T. Wahyuni, “Analysis of Landslide Natural Disaster Potential in Majalengka Regency Using the Naïve Bayes Classifier Algorithm,” *INFOTECH J.* , vol. 9, no. 2, pp. 299–306, 2023, doi: 10.31949/infotech.v9i2.5645.
- [9] Juwita, M. Safii, and B. Efendi Damanik, “Naive Bayes Algorithm for Predicting Sales at VJCakes Store in Pematang Siantar,” *J. Mach. Learn. Artif. Intell.* , vol. 1, no. 4, pp. 337–346, 2022, doi: 10.55123/jomlai.v1i4.1674.
- [10] RPM Rosidi and K. Setiawan, “Implementation of the Naïve Bayes Algorithm on Sales Data to Determine Consumer Purchasing Patterns in Canteens,” *J. Indones. Manaj. Inform. and Commun.* , vol. 5, no. 1, pp. 120–126, 2024, doi: 10.35870/jimik.v5i1.407.
- [11] NW Wardani, PGSC Nugraha, and GS Mahendra, “Implementation of Naïve Bayes in Data Mining to Classify Best-Selling Items in Retail Companies,” *JST (Jurnal Sains dan Teknol.* , vol. 12, no. 3, pp. 656–668, 2024, doi: 10.23887/jstundiksha.v12i3.38605.
- [12] NS Niko, A. Rahman, D. Marini Umi Atmaja, and A. Basri, “Clustering Retail Product Stock to Determine Consumer Demand Movements Using the K-Means Algorithm,” *Bull. Inf. Technol.* , vol. 4, no. 3, pp. 306–312, 2023, doi: 10.47065/bit.v4i3.736.
- [13] R. Pajri *et al.* , “APPLICATION OF K-MEANS ALGORITHM FOR OPTIMIZATION,” vol. 9, no. 1, pp. 1594–1599, 2025.
- [14] S. Kasus, T. Agung, M. Jaya, FD Agustiar, BN Sari, and I. Maulana, “APPLICATION OF DATA MINING FOR SALES PRODUCT CLUSTERING USING THE K-MEANS ALGORITHM,” vol. 9, no. 1, pp. 59–67, 2025.
- [15] R. NOVIANTO, “Application of Data Mining using the K-Means Clustering Algorithm to Analyze Insurance Company Business,” *JATISI (Journal of Information Technology and Information Systems)* , vol. 6, no. 1, pp. 85–95, 2019, doi: 10.35957/jatisi.v6i1.150.
- [16] VK Sudha and D. Kumar, “Hybrid CNN and LSTM Network For Heart Disease Prediction,” *SN Comput. Sci.* , vol. 4, no. 2, 2023, doi: 10.1007/s42979-022-01598-9.
- [17] D. Susanti and T. Wahyuni, “Analysis of Landslide Natural Disaster Potential in Majalengka Regency Using the Naïve Bayes Classifier Algorithm,” *INFOTECH J.* , vol. 9, no. 2, pp. 299–306, 2023, doi: 10.31949/infotech.v9i2.5645.
- [18] F. Daud, S. Sianturi, A. Sulton, A. Insaniyati, U. Sa, and F. Ramadhani, “Evaluation of Logistics Warehouses Based on Observations at the Regional Disaster Management Agency (BPBD) of Bantul Regency in Facing the Threat of Megathrust Disasters on the South Coast of Java,” vol. 2024, no. November, pp. 55–62, 2024.
- [19] A. Derry Ali Munthohar, T. Pribadi, A. Sulistiawan, and J. Timur, “Application of the Naive Bayes Method for Predicting Building Materials Stock at the Rejo Mulyo

- Building Materials Store,” *Multidiscip. Appl. Quantum Inf. Sci.* , vol. 4, no. 1, pp. 1–7, 2024, [Online]. Available: <https://journal.unugiri.ac.id/index.php/almantiq/article/view/2158>
- [20] M. Taufik Hidayat, N. Suarna, and N. Rahaningsih, “Implementation of the Naïve Bayes Algorithm for Inventory Prediction of PT. Dilmoni Citra Mebel Indonesia,” *JATI (Jurnal Mhs. Tek. Inform.* , vol. 7, no. 1, pp. 693–699, 2023, doi: 10.36040/jati.v7i1.6310.