AMRITA VISHWA VIDYAPEETHAM
DEEMED TO BE UNIVERSITY UNDER SECTION 3 OF UGC ACT, 1956

22MAT122 – MATEMATICS FOR COMPUTING 2

Anomaly Detection in Smart Meters

- **TEAM MEMBERS:**
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SMART METERS

- **Two-Way Communication**
  - •Sends usage data to utility providers.
  - •Receives commands or updates (like remote shut-off or firmware updates).

- **Automated Meter Reading (AMR)**
  - •No need for manual readings—data is sent automatically.
  - •Enables remote diagnostics and updates.

- **Data Encryption & Security**
  - •Uses secure communication protocols.
  - •Protects consumer data from tampering or hacking.

DATASET OVERVIEW

- The datasets which were used here are:

  - Normal Traffic- Contains data which does not contain any anomalies/attacks.

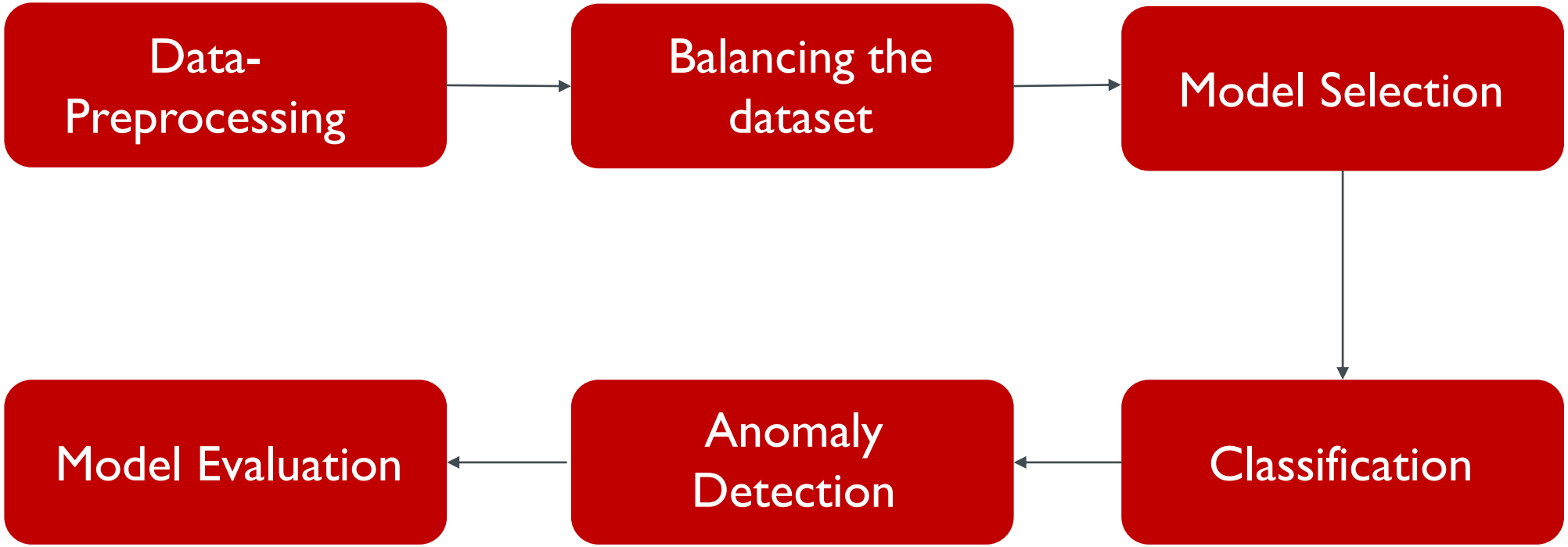
  - TCP_SYN attack with sniffing
  - TCP_SYN attack without sniffing

- We merged the datasets and labelled them accordingly.
- This dataset consists of 83 columns(83rd column is the label ; i.e., The Target Variable) and 219257 instances.

ABOUT THE DATASET

Category	Example Features	Purpose
Network Info	Src_ip,dst_ip,protocol	Identifies source and destination
Traffic Stats	flow_byts_s,flow_pkts_s	Measures data flow rate
Packet Details	Pkt_len_max,pkt_len_mean	Tracks packet size variations
TCP Flags	Syn_flag_cnt,ack_flag_cnt	Identifies connection behaviour
Time-Based	Flow_duration,flow_iat_mean	Detects timing irregularities
Label	Normal/Anomaly	Ground truth for classification

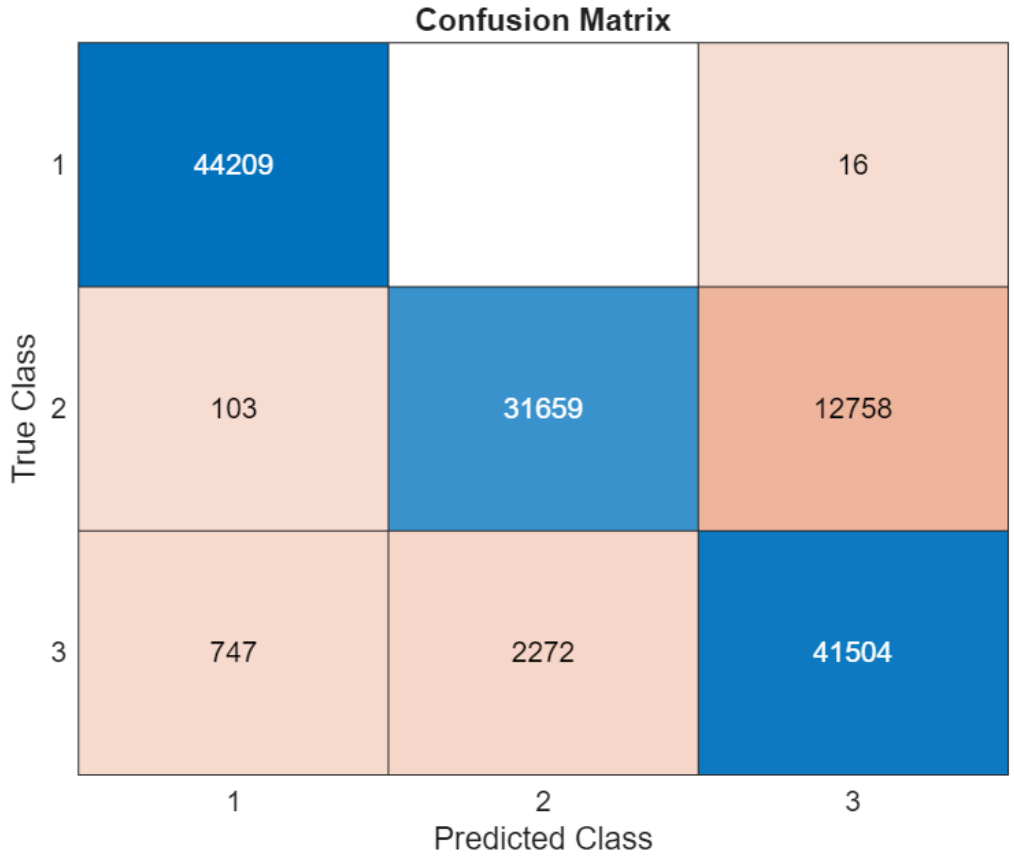
WORK FLOW


Data-Preprocessing
Balancing the dataset
Model Selection
Classification
Anomaly Detection
Model Evaluation

MULTICLASS CLASSIFICATION

A. MATLAB:

1.Using Ax=b:

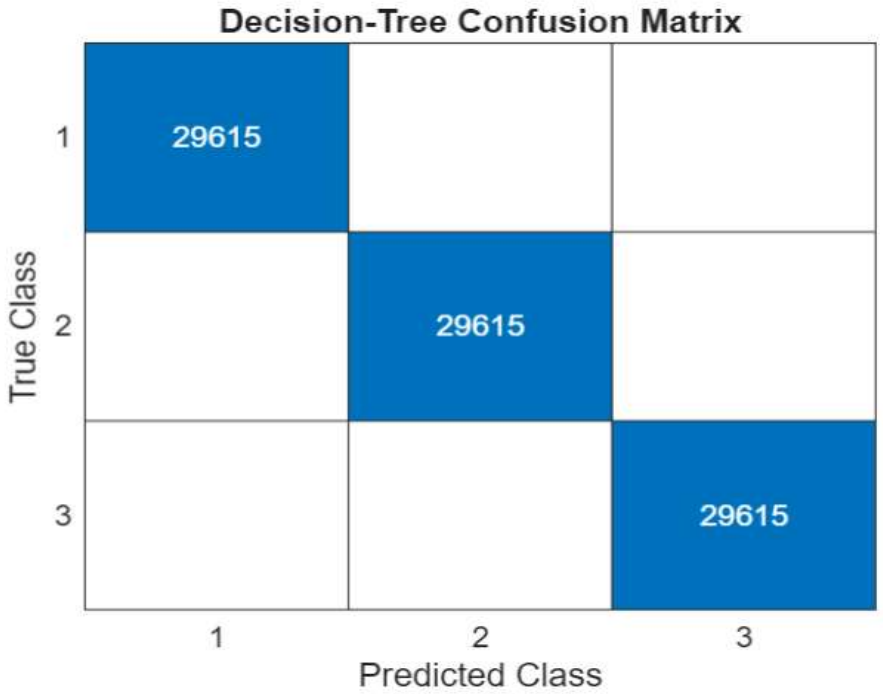



```
Accuracy: 88.07%
```

MULTICLASS CLASSIFICATION

A. MATLAB:

2.Using DecisionTree(fitctree):



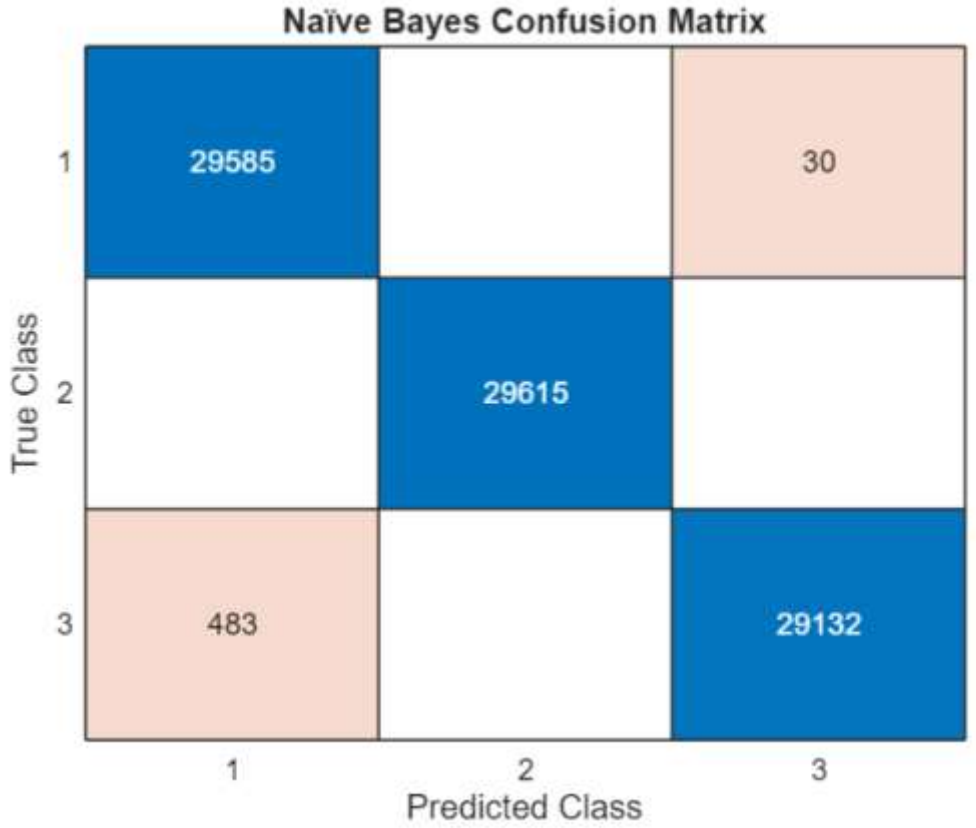

```
Accuracy: 100%
```

MULTICLASS CLASSIFICATION

A. MATLAB:

2.Using Naïve-Bayes(fitcnb):

```
Naïve Bayes Accuracy: 99.4226%
```

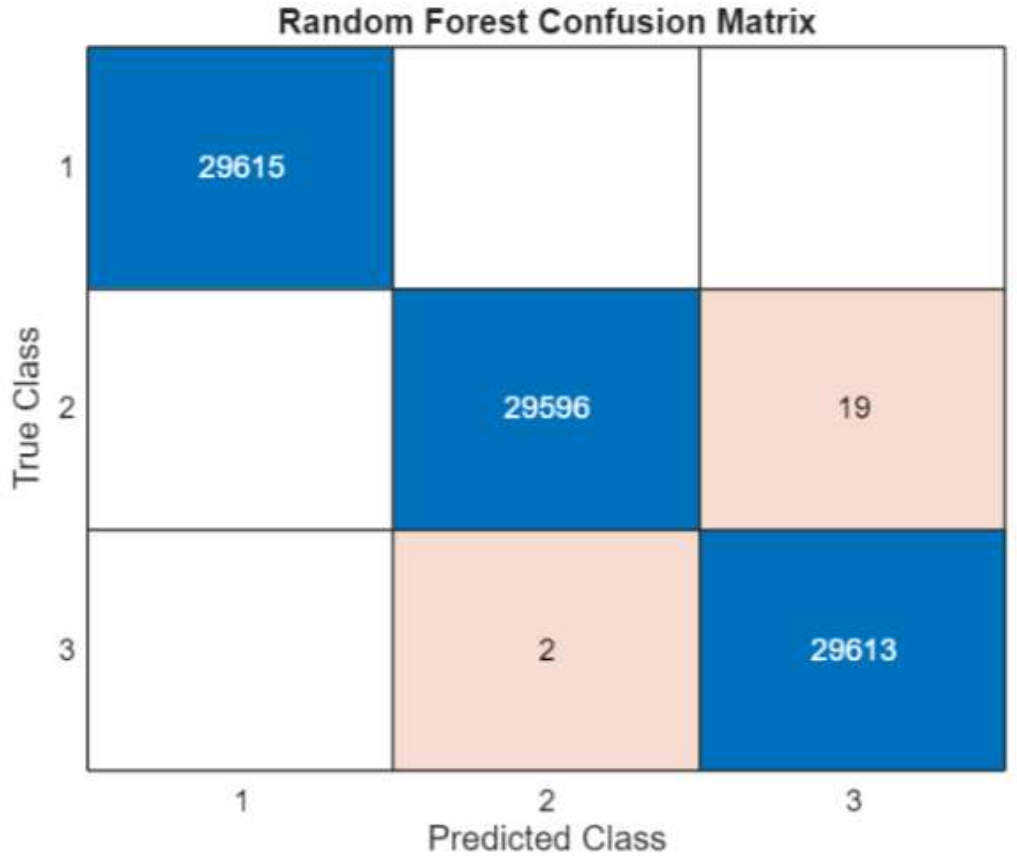


MULTICLASS CLASSIFICATION

A. MATLAB:

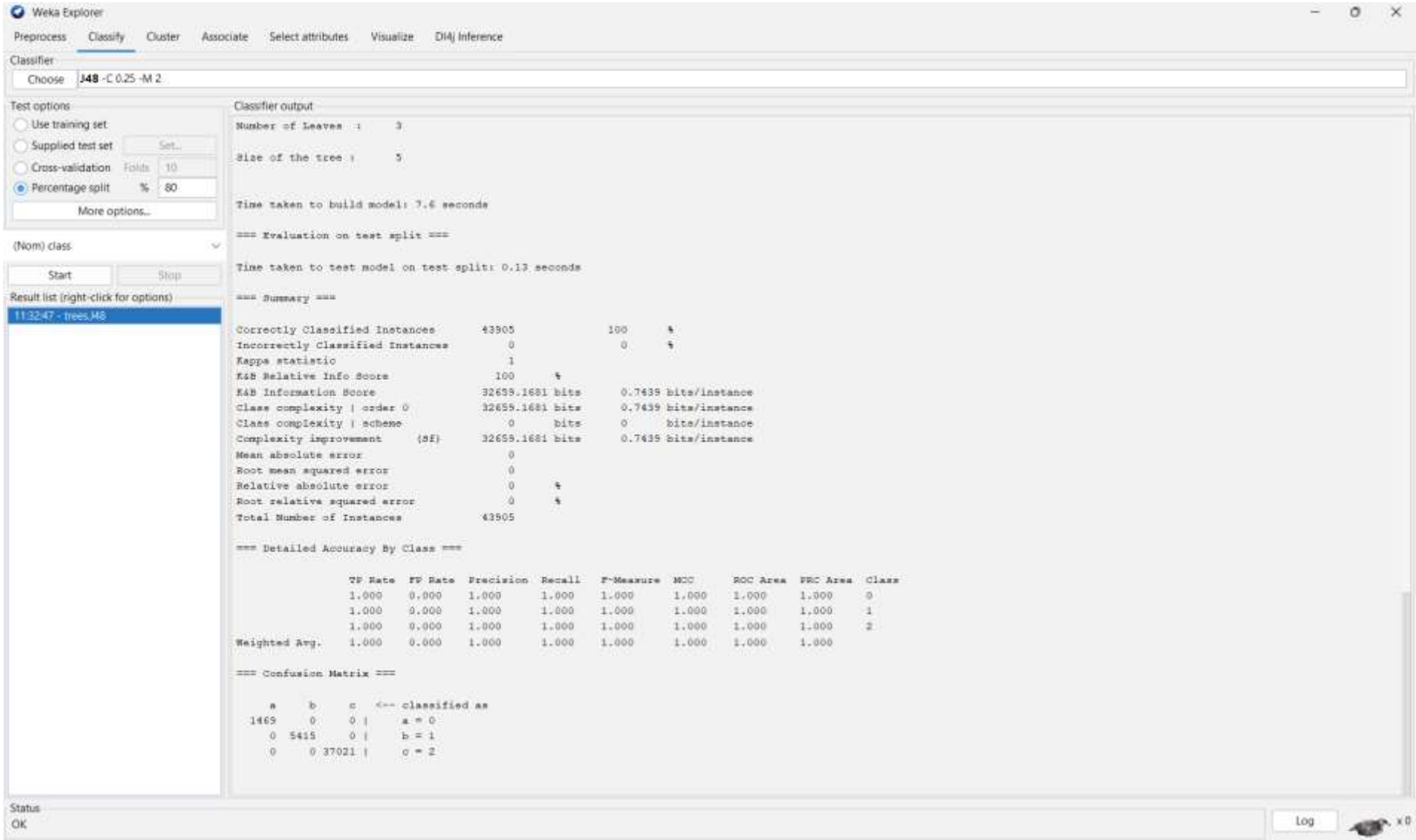
2.Using Random-Forest(Treebagger):

```
Random Forest Accuracy: 99.9764%
```



B. WEKA:

1.Using J48(Decision Tree):



B. WEKA:

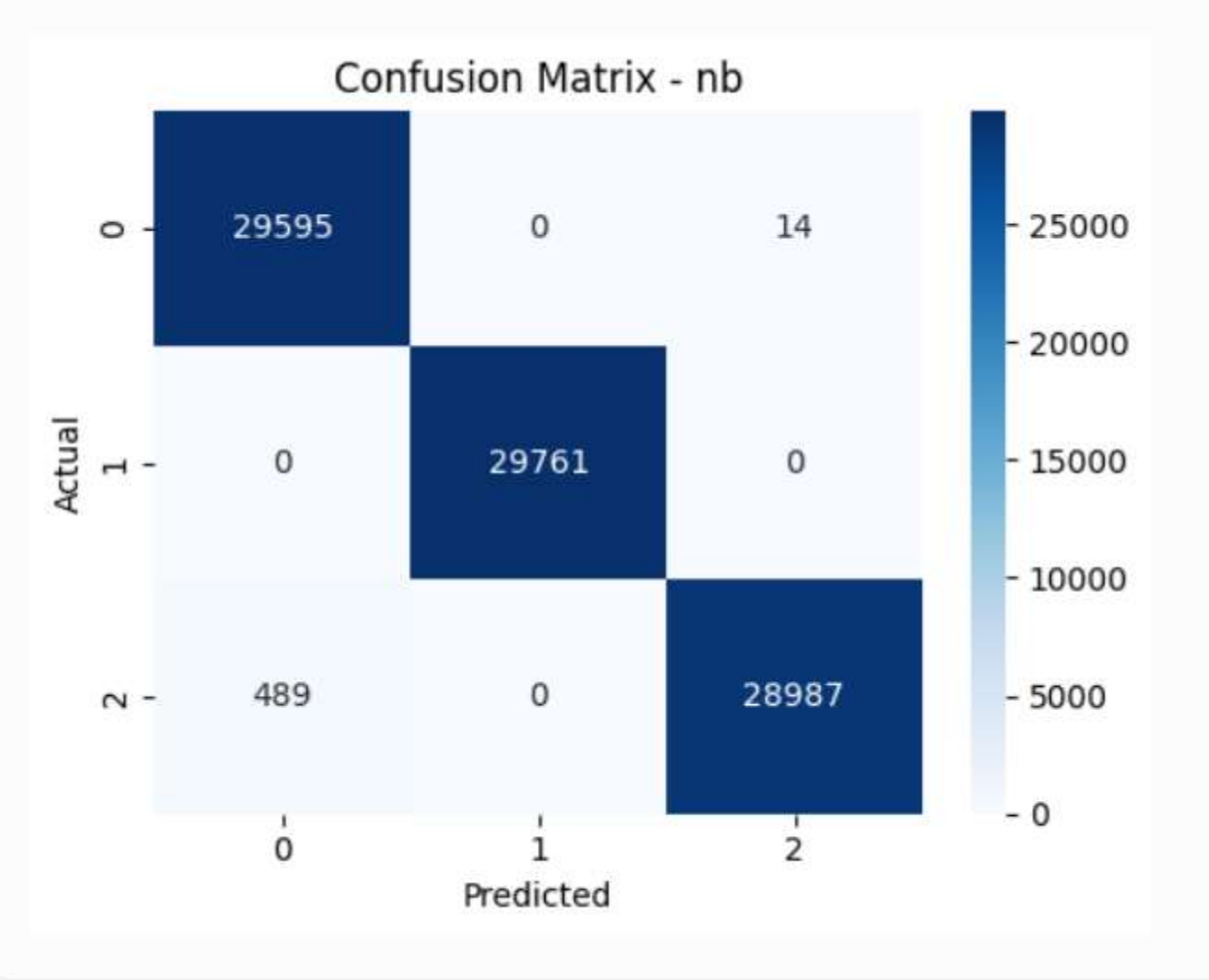
2.Using Naïve Bayes:

B. WEKA:

3.Using Random Forest:

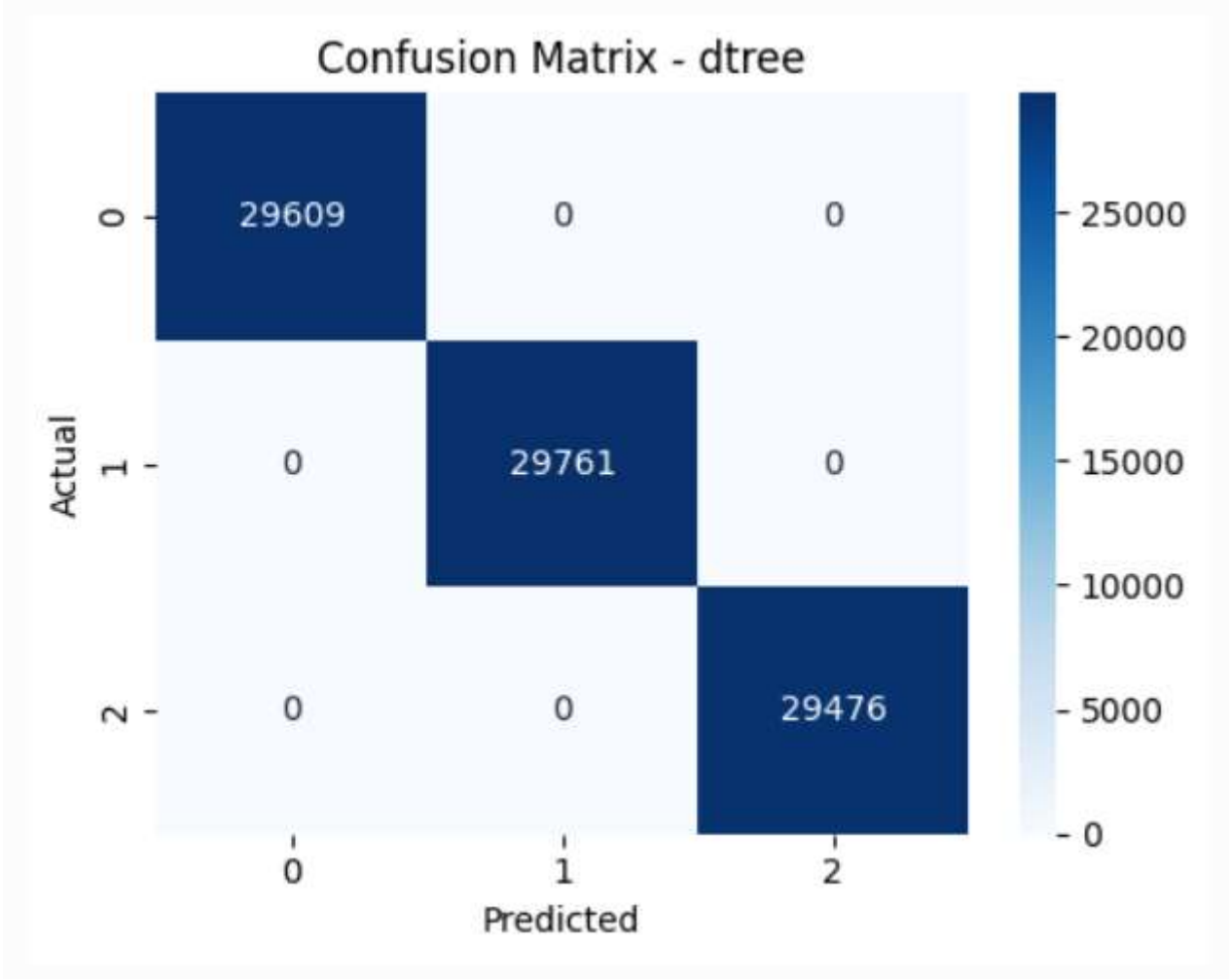
MARIMO

1.Using Naïve Bayes:



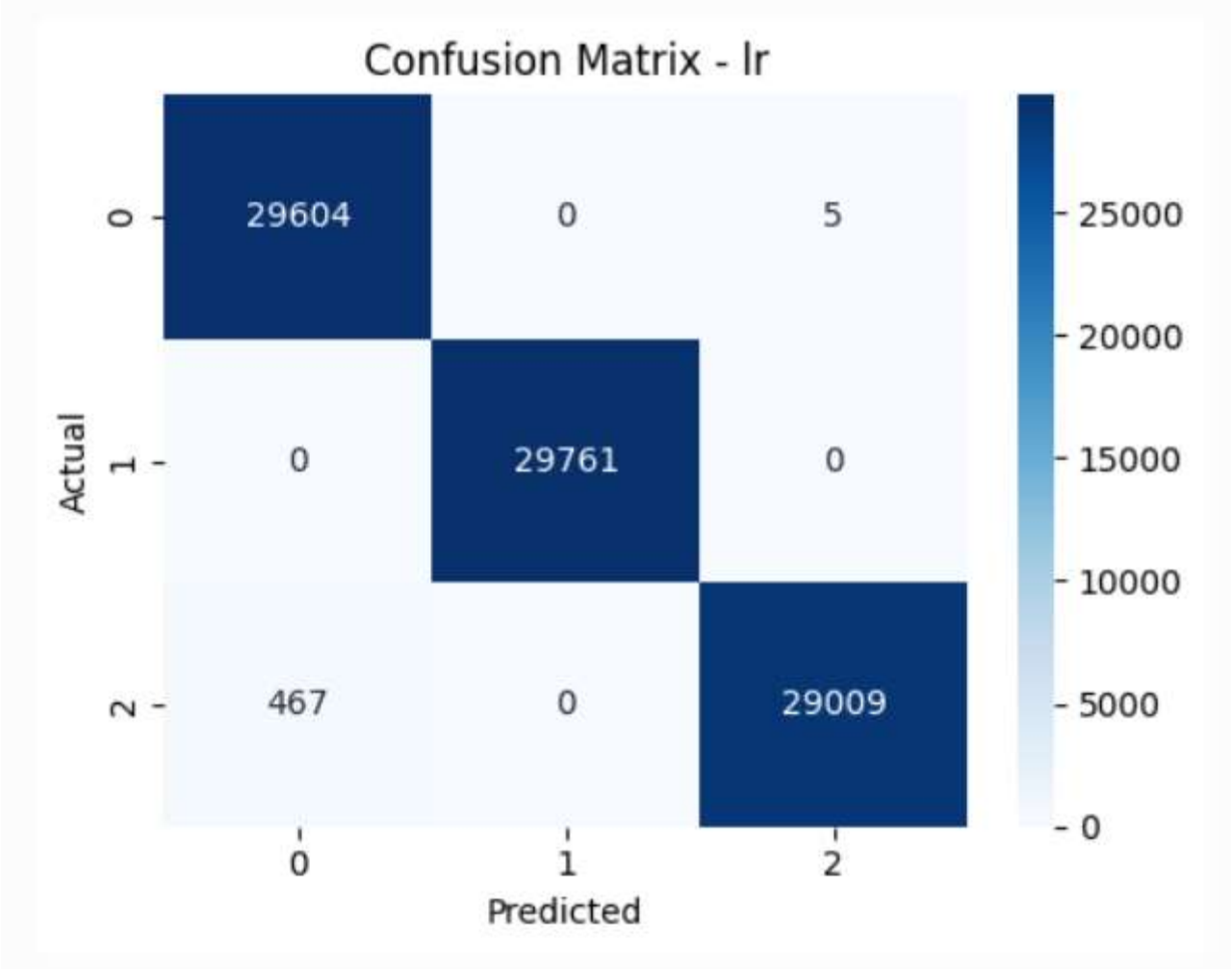
MARIMO

2.Using Decision Tree:



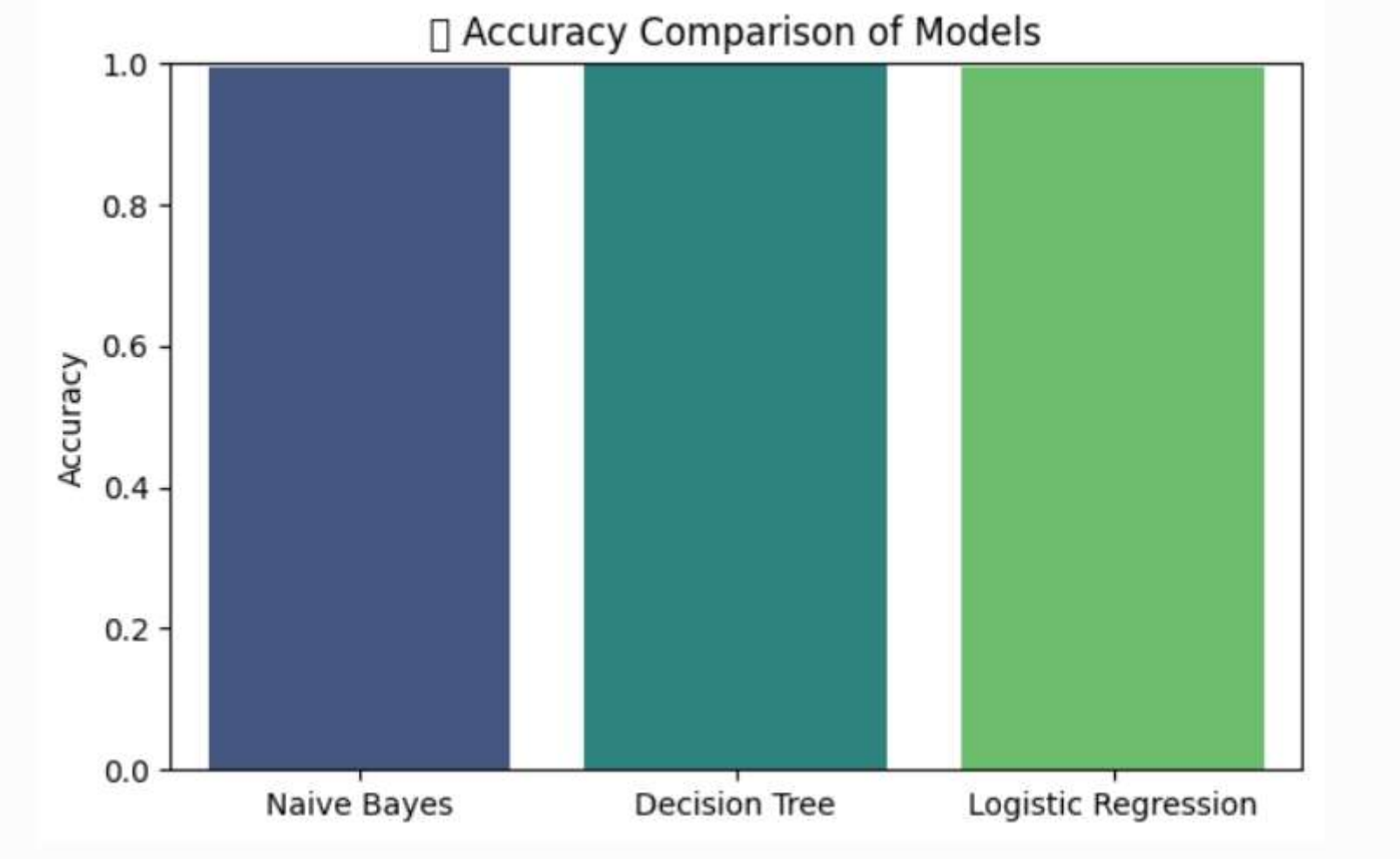
MARIMO

3.Using Logistic Regression:

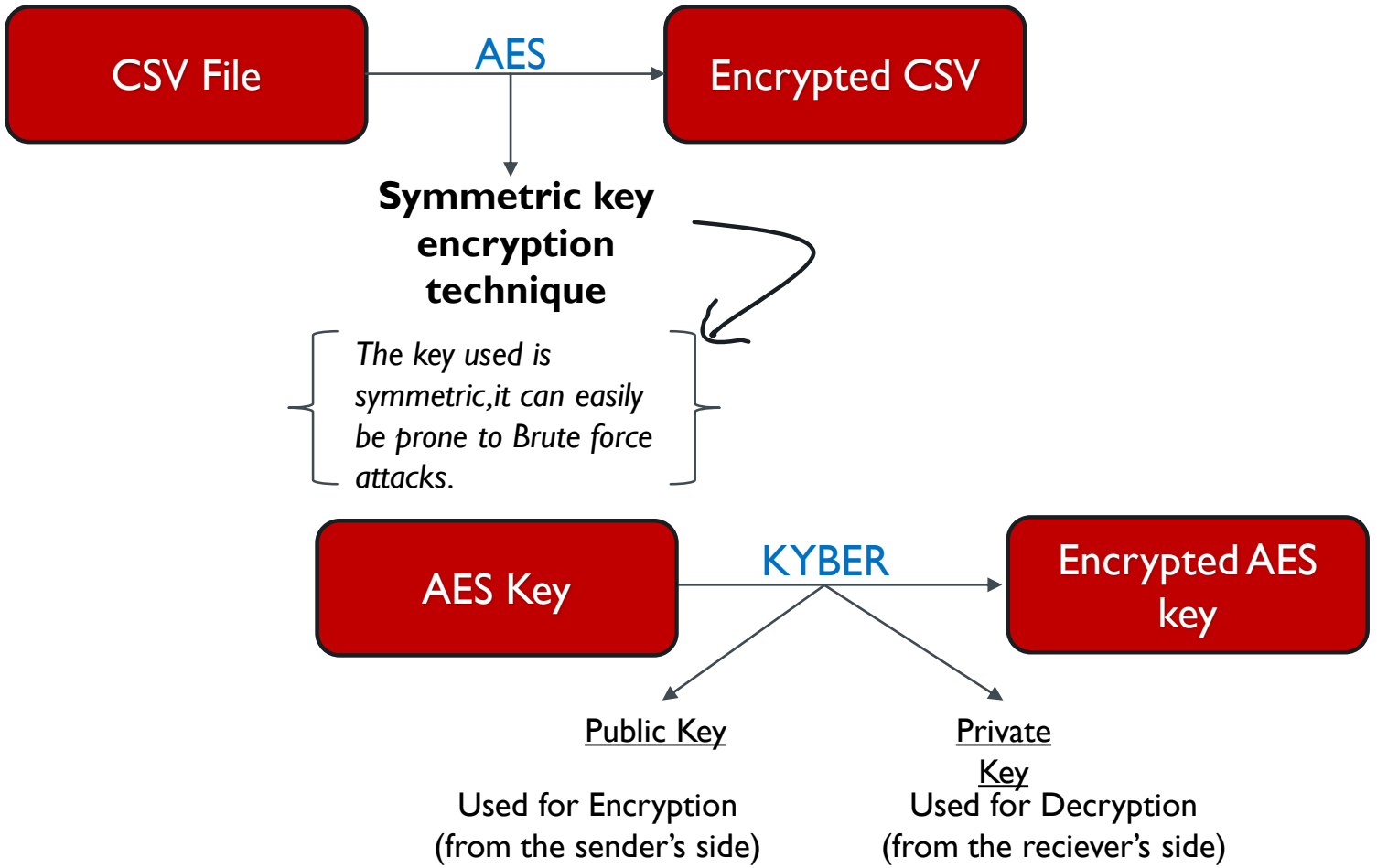


MARIMO

Model Accuracy Comparison:



ENCRYPTION


CSV File
AES
Encrypted CSV
Symmetric key encryption technique
The key used is symmetric,it can easily be prone to Brute force attacks.
AES Key
KYBER
Encrypted AES key
Public Key
Used for Encryption
(from the sender's side)
Private Key
Used for Decryption
(from the reciever's side)

REFERENCES

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[4] B. Harjito, H. M. Sukarno, and Winarno, "Performance Analysis of Kyber-DNA and RSA-Base64 Algorithms in Symmetric Key-Exchange Protocol," *2024 Ninth International Conference on Informatics and Computing (ICIC)*, Medan, Indonesia, 2024, pp. 1-6. [Online]. Available: https://icic-aptikom.org/2024/wp-content/uploads/2024/10/Program-Book-ICIC-2024-Binder-2.pdf

THANK YOU