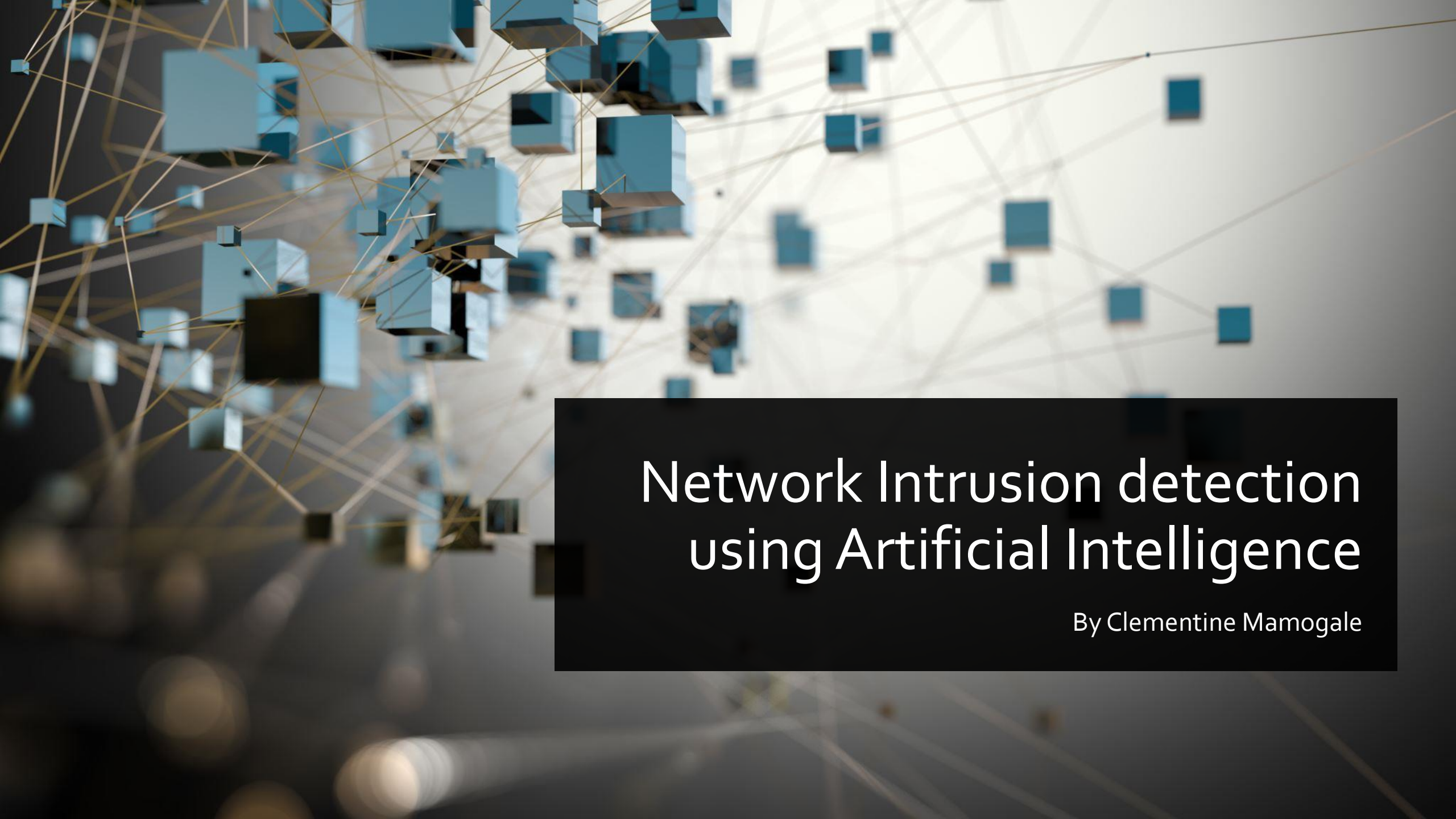


# Network Intrusion detection using Artificial Intelligence

By Clementine Mamogale

# Outline

Introduction

Research problem

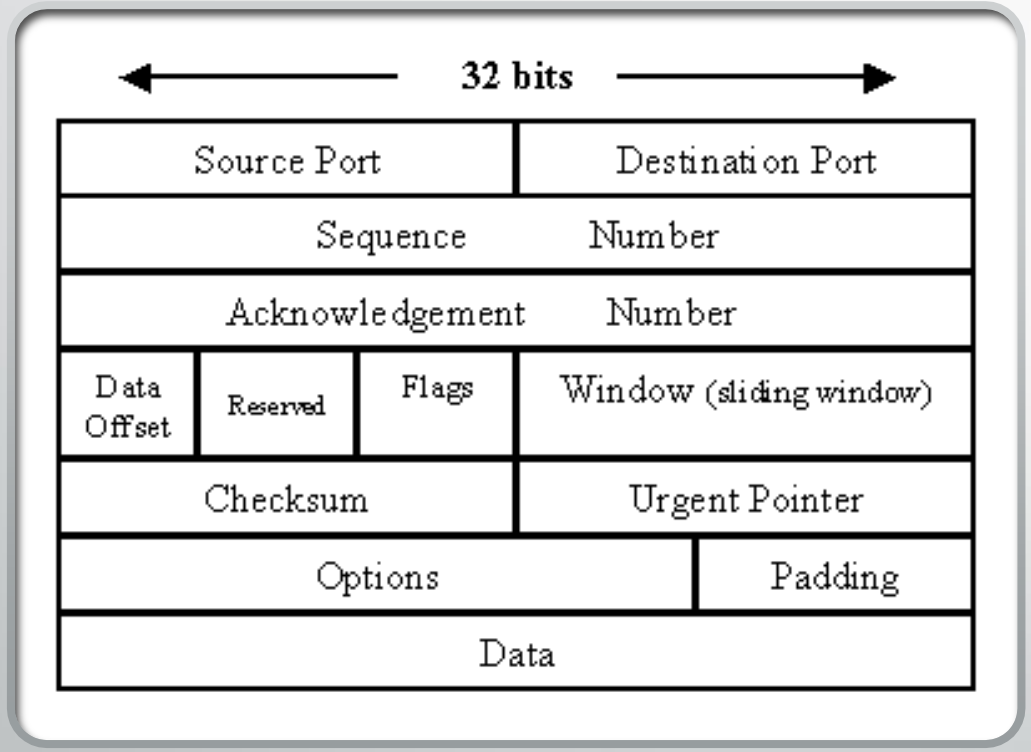
System overview

Models

Results

Conclusion

# Network intrusion detection system




- A security technology
- monitor and protect network
- Analyze packets - normal or malicious

https://www.techrepublic.com/article/exploring-the-anatomy-of-a-data-packet/

# Research Problem

- Network intrusion detection system (NIDS) is expensive
- A NIDS that uses AI is cheaper,
- Works better than the traditional NIDS
- Can be deployed in critical infrastructure

# System overview

- Datasets
- Pre-processing
- Model selection
- Training
- Testing
- Classification

# Datasets

- **KDD+**
- It is used in many NIDS research papers since it is old, 1999
- Can be used for good baseline of the system

- **CICIDS 2017**
- It is new, it uses modern technologies
- It has datasets that occurred recently

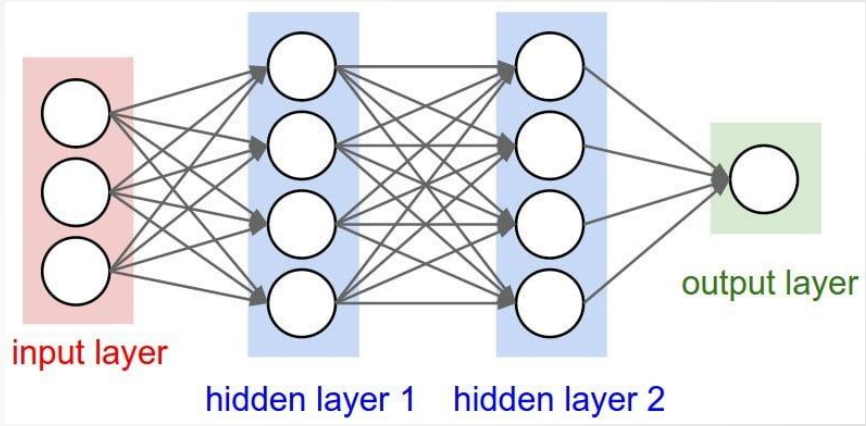
# Pre-Processing

- **KDD+ Pipeline**
- Duration
- Protocol type
- Src_bytes
- Dst_bytes
- Labels

- **CICIDS 2017 Pipeline**
- Flow Duration
- Total Forward
- Total backward
- Forward Packet Length
- Backward Packet Length
- Labels

# Model Selection

- Deep Neural Network (DNN)
- Naïve bayes
- Support Vector Machine (SVM)




https://www.bmc.com/blogs/deep-neural-network/

## Naive Bayes

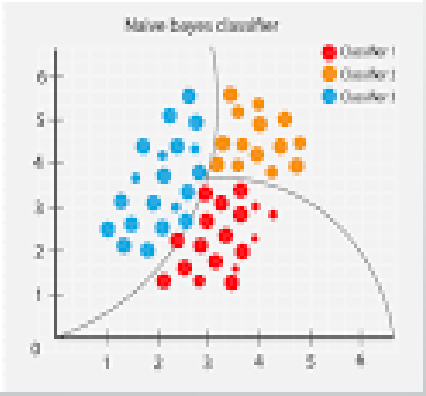
thatware.co

In machine learning, naive Bayes classifiers are a family of simple "probabilistic classifiers" based on applying Bayes' theorem with strong (naive) independence assumptions between the features.

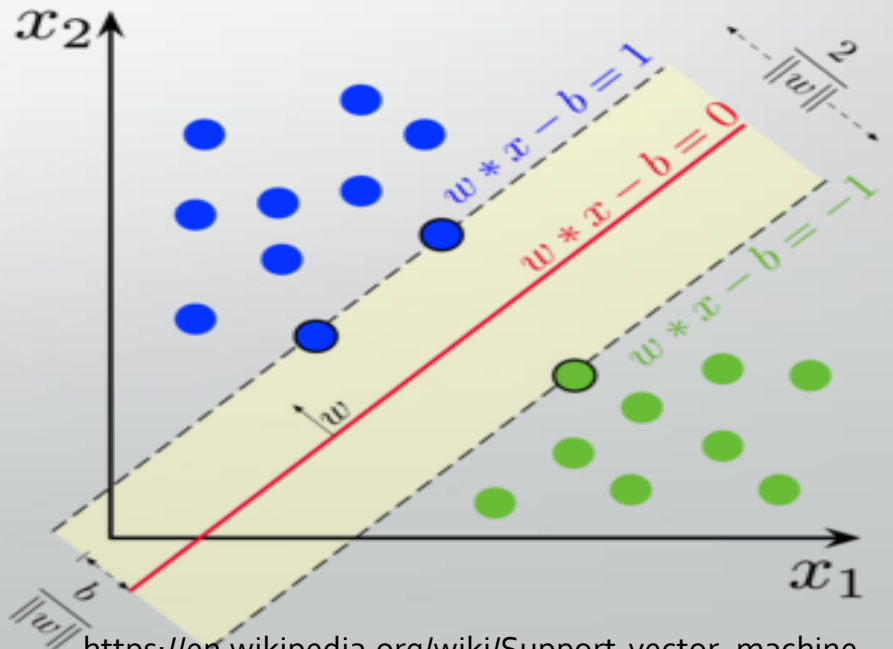
$$P(A|B) = \frac{P(B|A)\ P(A)}{P(B)}$$

Using Bayesian probability terminology, the above equation can be written as

$$\text{Posterior} = \frac{\text{prior} \times \text{likelihood}}{\text{evidence}}$$




https://towardsdatascience.com/introduction-to-na%C3%AFve-bayes-classifier-fa59e3e24aaf




https://en.wikipedia.org/wiki/Support-vector_machine

# Results

| Model | Dataset | Accuracy |
|---|---|---|
| Deep Neural Network (DNN) | KDD+ | ~90.92% |
| Deep Neural Network (DNN) | CICIDS 2017 | N/A |
| Naïve Bayes | KDD+ | ~55.6% |
| Naïve Bayes | CICIDS 2017 | N/A |
| Support Vector Machine (SVM) | KDD+ | ~46.38% |
| Support Vector Machine (SVM) | CICIDS 2017 | ~97.48% |

# Conclusion

- NIDS can be done using AI
- Takes time to train the model, but…
- Beneficial to many organizations and businesses