MADE BY : TUSHAR ARORA (20514803119) & HARSHIT SAINI (20214803119)

SOFTWARE FAULT PREDICTION

Mentored By : Mr. Varun Goel & Mr. Sachin Garg

```
require 'spec_helper'
require 'rspec/rails'

require 'capybara/rspec'
require 'capybara/rails'

Capybara.javascript_driver
Category.delete_all;
Shoulda::Matchers.configure
  config.integrate do
    with.test_framework
    with.library :rails
  end
end

# Add additional requires
# Requires supporting ruby files
# spec/support/ and its
# run as spec files by default.
# in _spec.rb will both be
# run twice. It is recommended
# end with _spec.rb. You can
```

Abstract

The IT and software industry has grown tremendously over the past few years, creating an increasing impact on the lives of people and on society as a whole. Consequently, we must make the software and applications more accurate, free of major errors, and more reliable. Therefore, predicting software flaws could be very useful in the IT field and will have a profound impact on society at large.

Machine Learning

Machine learning is a branch of artificial intelligence (AI) and computer science that focuses on the use of data and algorithms to imitate the way that humans learn, gradually improving its accuracy.

The topics we have learnt so far

0102

Python & Jupyter Notebook

We went over Python fundamentals and became acquainted with the Jupyter notebook environment in order to run code easily.

How to use libraries

Next, we have learnt about different Python libraries like Numpy, Pandas, Scikit-learn, Matplotlib, etc., so that we can easily code the algorithms and plot the results.

03

Research Papers

We have also gone through a couple of research papers that have given us great insights about different algorithms and data sets that are great for solving this problem.

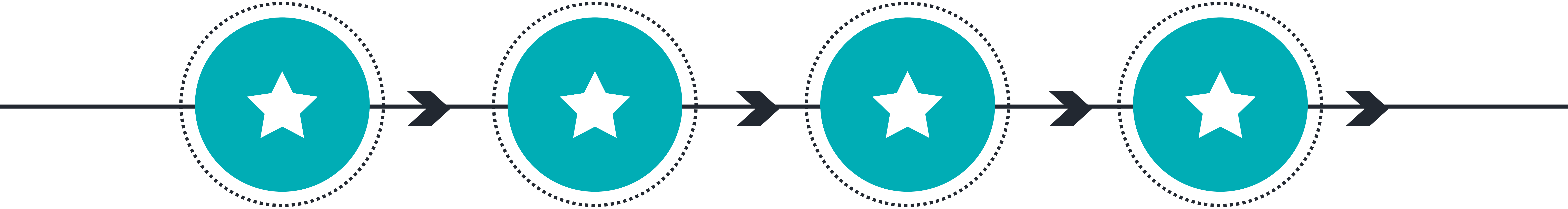
04

Analysing Datasets

At last, we gathered a bunch of data sets that are open source and publicly available.

What all is done?

The following are the topics that we are going to learn so that we have a good grasp on the concepts that are used in the project.



Machine Learning

In the next phase, we will be starting with the fundamentals of machine learning and its different concepts.

ML Algorithms

We will also be learning different algorithms like linear regression, KNN, etc.

Result Plotting

Next, result plotting is the main thing for finding how the algorithms and models are working.

Performance Analysis

In addition, we will learn techniques for determining the performance of our model and comparing it to existing datasets and models.

About DataSets

In this experiment, we have used 3 open source publicly available data from PROMISE Software Engineering Database. These datasets Tim Menzies et al. have been used in their research paper [1]. In another study, Jureczko et al. [2] have been assembled a software fault prediction model to predict the software defects using machine learning algorithms. They have discussed in their paper about 8 projects (PROMISE Repository) data and by taking 19 CK metrics and McCabe metrics for constructed a predictive model. In our study, we have used 22 attributes for building our automated fault predict model. Table 1 shows 22 different attributes from software defect datasets including 21 independent metrics and one is outcome information. i.e. which is faulty and no-fault.

We are using JM1, CM1, PC1 datasets which were implemented in C language.

Reference: [1] T. Menzies, J. Distefano, A. O. S, and R. M. Chapman, “Assessing Predictors of Software Defects.” [2] M. Jureczko and L. Madeyski, “Towards identifying software project clusters with regard to defect prediction,” in Proceedings of the 6th International Conference on Predictive Models in Software Engineering - PROMISE ’10, 2010, p. 1.

About DataSets

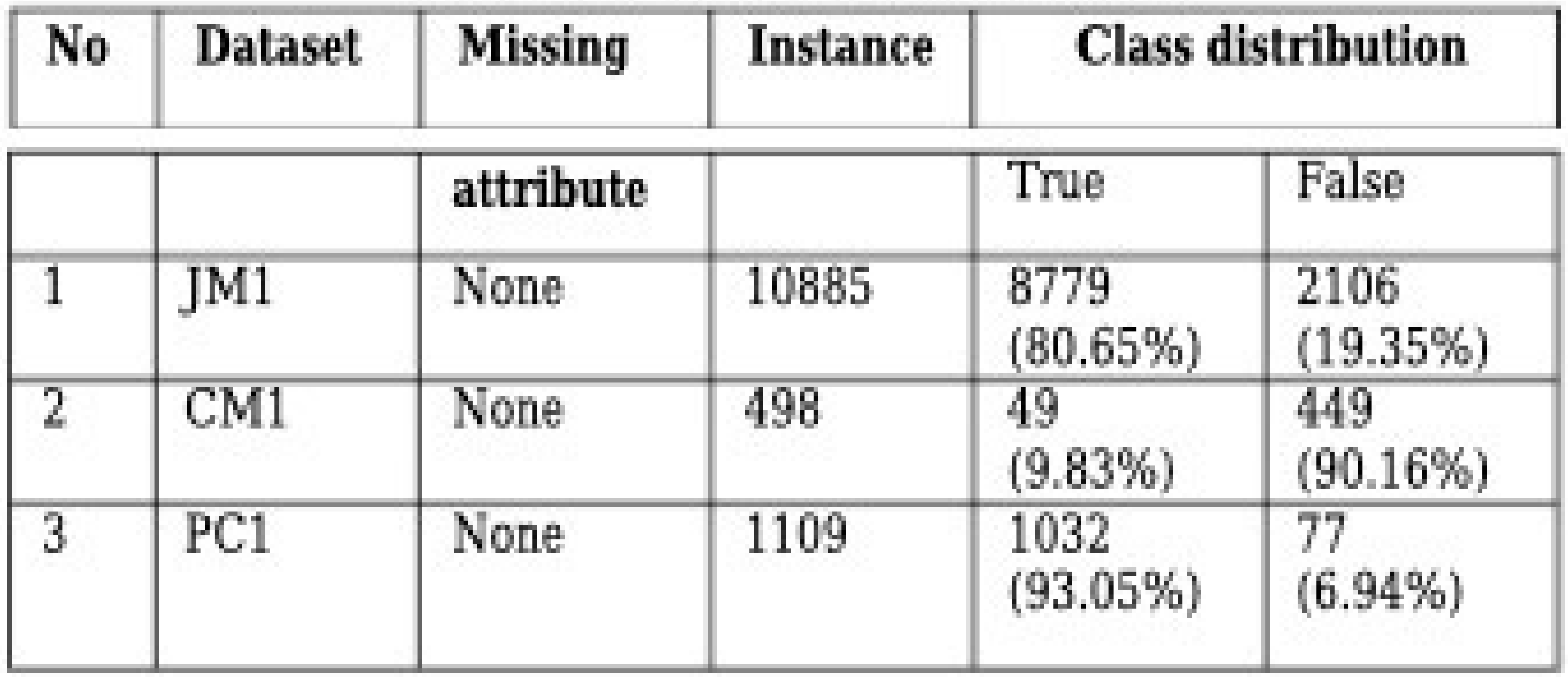
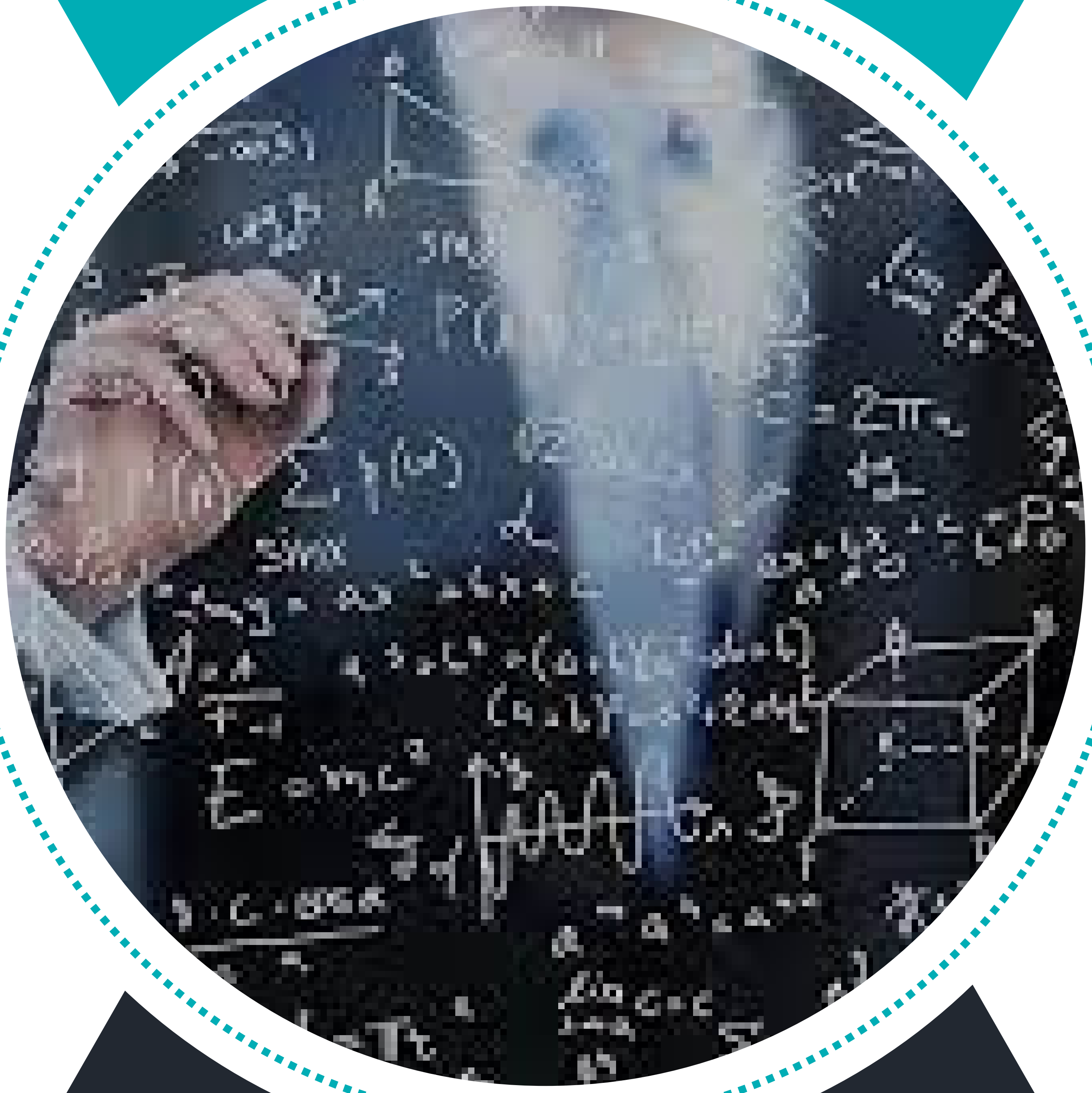


Table 2: Details about datasets

No	Dataset	Missing	Instance	Class distribution	
		attribute		True	False
1	JM1	None	10885	8779 (80.65%)	2106 (19.35%)
2	CM1	None	498	49 (9.83%)	449 (90.16%)
3	PC1	None	1109	1032 (93.05%)	77 (6.94%)



Algorithms Used

- *Naive Bayes*
- *Decision Tree*
- *Random Forest*
- *KNN*
- *Logistic Regression*
- *SVM*

Naive Bayes

Naive Bayes classifiers are a collection of classification algorithms based on Bayes’ Theorem. It is not a single algorithm but a family of algorithms where all of them share a common principle, i.e. every pair of features being classified is independent of each other.

Decision Tree

- Decision Tree is a Supervised learning technique that can be used for both classification and Regression problems, but mostly it is preferred for solving Classification problems. It is a tree-structured classifier, where internal nodes represent the features of a dataset, branches represent the decision rules and each leaf node represents the outcome.

Random Forest

- Random Forest is a popular machine learning algorithm that belongs to the supervised learning technique. It can be used for both Classification and Regression problems in ML. It is based on the concept of ensemble learning, which is a process of combining multiple classifiers to solve a complex problem and to improve the performance of the model.

KNN

- K-Nearest Neighbour is one of the simplest Machine Learning algorithms based on the Supervised Learning technique.

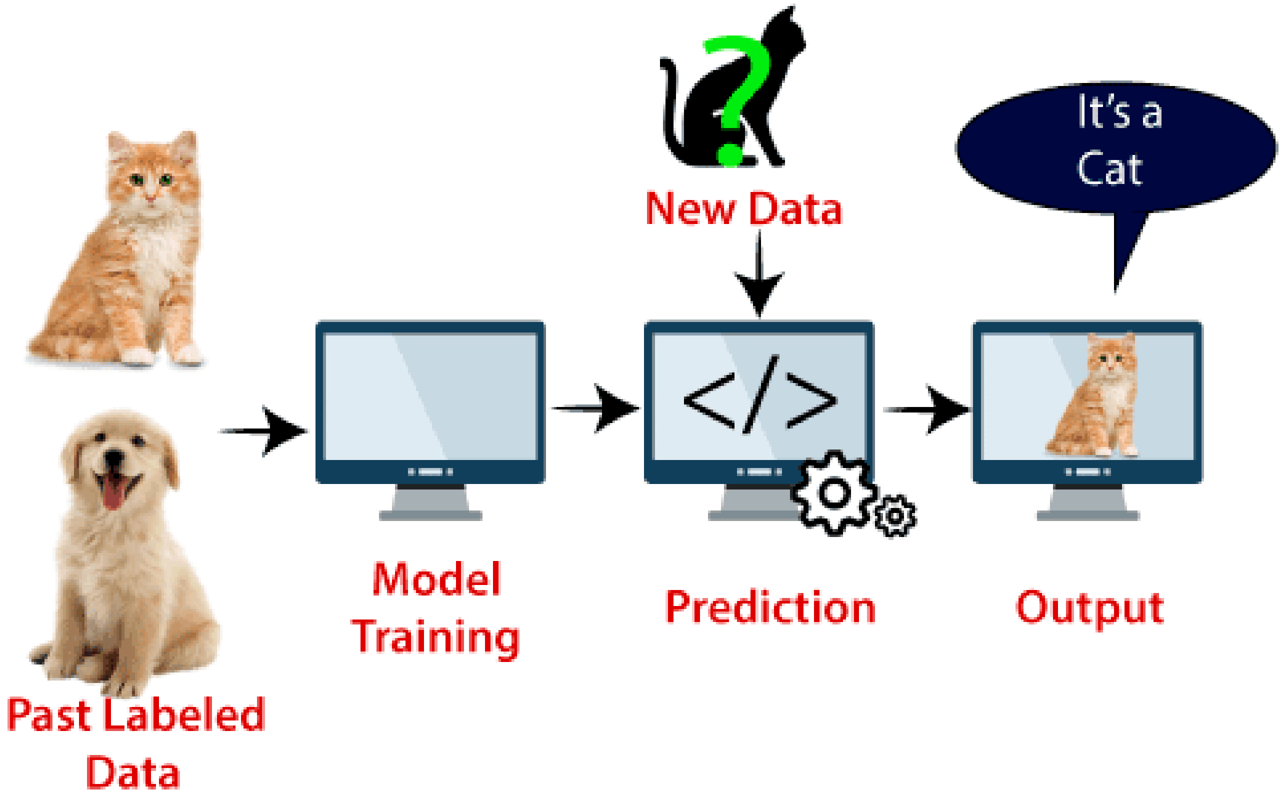
- K-NN algorithm assumes the similarity between the new case/data and available cases and put the new case into the category that is most similar to the available categories.

Logistic Regression

- Logistic regression is one of the most popular Machine Learning algorithms, which comes under the Supervised Learning technique. It is used for predicting the categorical dependent variable using a given set of independent variables.

SVM

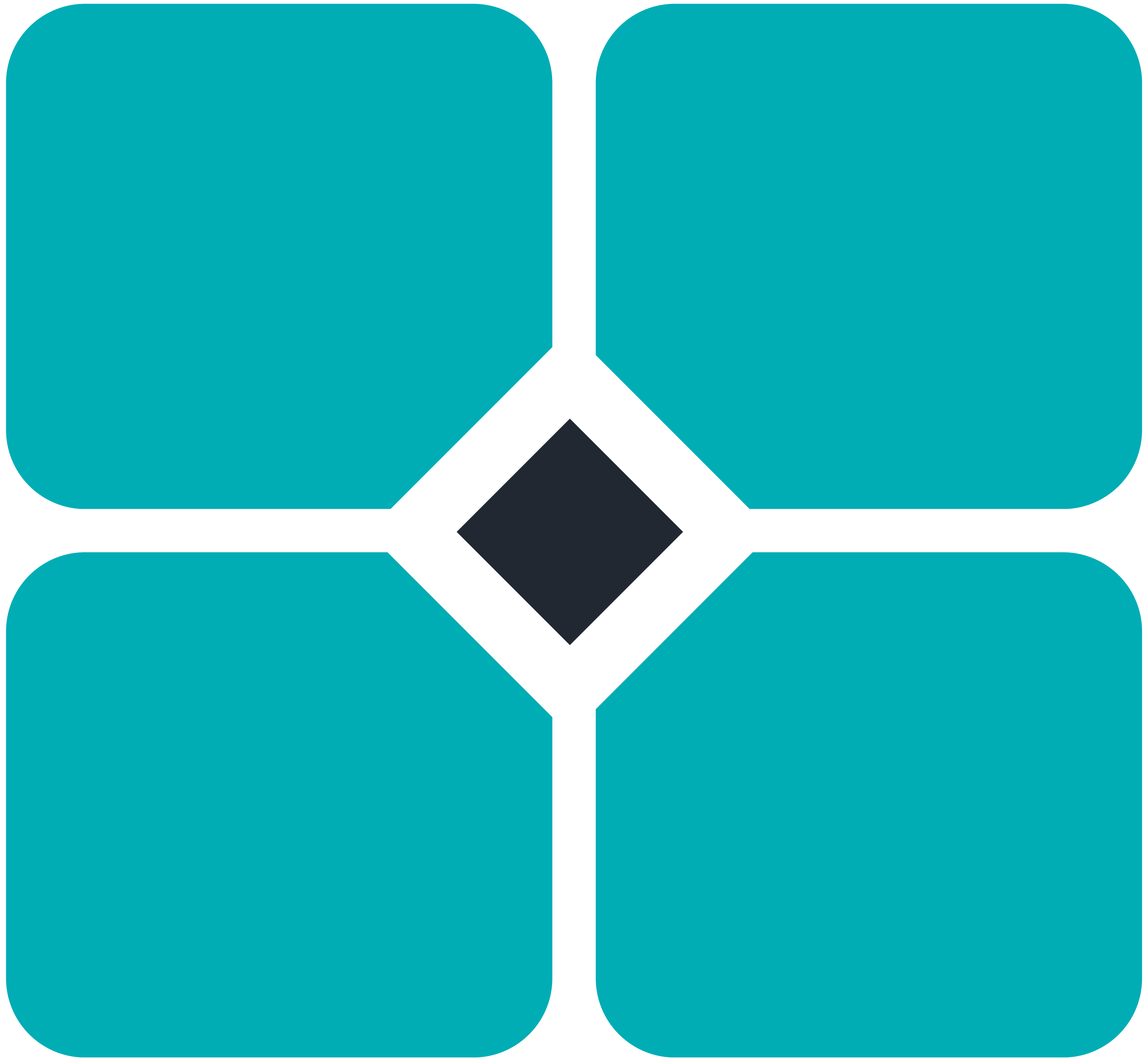
- Support Vector Machine or SVM is one of the most popular Supervised Learning algorithms, which is used for Classification as well as Regression problems. However, primarily, it is used for Classification problems in Machine Learning.



Conclusion

So finally, we are going to conclude with some points that we will be considering once we are done with running algoritms on the datasets mentioned.

- In the next part, we will be analysing the performance of the model and the techniques that we will be using in this phase.
- We will also be comparing the results with the other results already obtained with the algorithms.
- Next, we will be running the same model that we will be making with other datasets to verify if the model is working with accuracy or not.



Our Research Paper can be found at shorturl.at/blxY1

SOFTWARE FAULT PREDICTION

THANK YOU

Have a great day ahead.