

Support Vector Machine (SVM)

Complete Overview, Analysis
& Implementation

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Introduction to Machine Learning

Machine Learning is a subset of Artificial Intelligence.

It allows systems to learn from data and improve automatically.

Supervised Learning uses labeled data for training.

Support Vector Machine is a powerful supervised learning algorithm.

What is Support Vector Machine (SVM)?

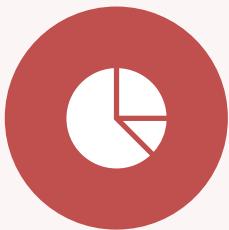
SVM is a
supervised
learning algorithm.

Used for
Classification and
Regression tasks.

It finds the optimal
hyperplane that
separates data.

Works effectively
in high-
dimensional
spaces.

Why Do We Use SVM?



EFFECTIVE IN HIGH
DIMENSIONAL DATA.



WORKS WELL WHEN
NUMBER OF
FEATURES > SAMPLES.



MEMORY EFFICIENT
(USES SUPPORT
VECTORS).



ROBUST AGAINST
OVERFITTING.

Core Concepts of SVM



Hyperplane:
Decision boundary
separating classes.



Margin: Distance
between hyperplane
and nearest points.



Support Vectors:
Data points closest
to hyperplane.

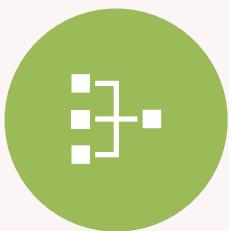


Kernel Trick: Used
for non-linear
classification.

Types of Kernels in SVM



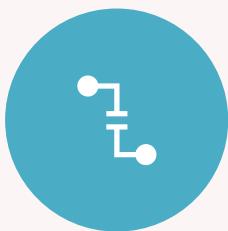
LINEAR KERNEL –
USED FOR LINEARLY
SEPARABLE DATA.



POLYNOMIAL KERNEL
– HANDLES CURVED
BOUNDARIES.



RBF (RADIAL BASIS
FUNCTION) – MOST
COMMONLY USED.



SIGMOID KERNEL –
SIMILAR TO NEURAL
NETWORKS.

Problem Statement

To classify data
into categories
accurately.

Identify optimal
decision
boundary.

Improve
prediction
accuracy.

Reduce
misclassification
errors.

SVM Implementation Steps

1. Data Collection
2. Data Preprocessing (Scaling)
3. Train-Test Split
4. Model Training using SVC
5. Model Evaluation (Accuracy, Confusion Matrix)

Analysis & Outcomes

Training Accuracy and Testing Accuracy compared.

Kernel comparison analysis performed.

Best kernel selected based on performance.

Model shows strong generalization ability.

Advantages & Limitations

Advantages:

- High accuracy
- Effective in high dimensions

Limitations:

- Computationally expensive
- Hard to tune parameters

Conclusion

SVM is a powerful supervised learning algorithm.

Works well for classification problems.

Kernel trick makes it flexible.

Provides strong performance with proper tuning.

Acknowledgement



THANKS TO MY MENTORS
AND LEARNING RESOURCES.



SPECIAL THANKS TO OPEN-
SOURCE LIBRARIES LIKE
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PROJECT COMPLETED AS
PART OF MACHINE LEARNING
LEARNING JOURNEY.