SIMATS ENGINEERING

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Name: Mr. G Venkata Chalapathi
Register Number: 192211150
Guided by Dr. A.Moorthy

Improving Energy Economy with Intelligent Appliance Scheduling in Smart Buildings: A Thorough Comparison of ANN and SVM Algorithms for Optimal Resource Use

INTRODUCTION

- The demand for energy-efficient solutions in smart buildings is growing due to the increasing awareness of energy conservation and the need to reduce greenhouse gas emissions.
- Intelligent appliance scheduling and energy management systems are being explored as potential solutions.
- These systems use Internet of Things (IoT) based solutions, including software, hardware, and connectivity, to remotely monitor and manage energy, HVAC, lighting, and security assets1. They can drastically improve energy and utility efficiency while reducing wasteful or unnecessary usage and carbon emissions.
- While ANN and SVM have been used in various fields, their full potential in the context of energy consumption optimization in smart buildings has not been fully explored.
- ANN and SVM are powerful machine learning algorithms that can be used for tasks such as prediction, classification, regression, and even outlier detection. However, their application in the field of energy management in smart buildings needs further research.
- The aim is to optimize energy consumption in smart buildings using ANN and SVM. The objectives include training these models on real-world data and comparing their performance.

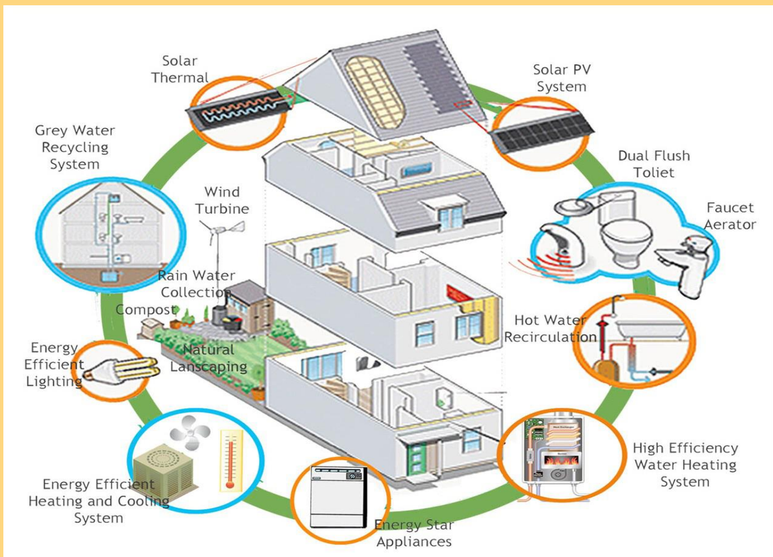
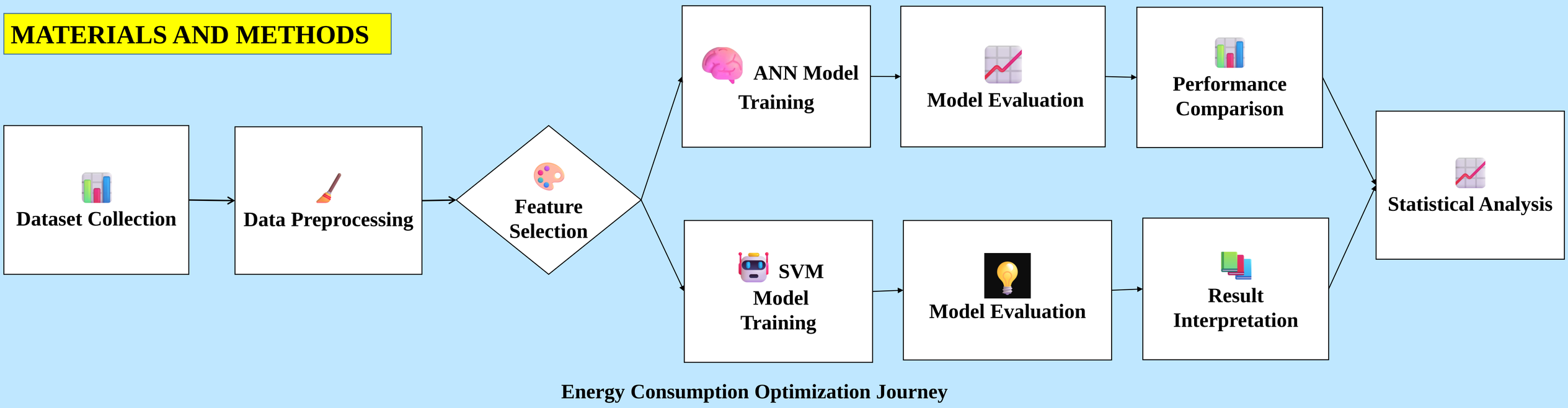


Fig. 1: Eco-Friendly Home: Sustainable Living Features

MATERIALS AND METHODS



Energy Consumption Optimization Journey

RESULTS

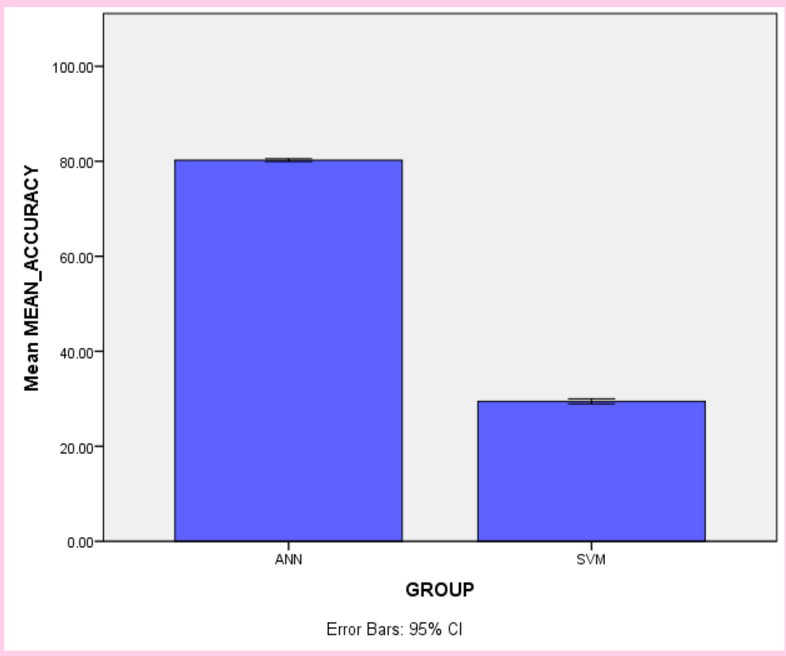


Fig. 2 represents the Mean Accuracy of ANN and SVM

Table 1: Represents the mean and standard deviation of the group and the accuracy of the existing and proposed methods

	GROUP	N	Mean	Std. Deviation	Std. Error Mean
MEAN_ACCURACY	ANN	5	80.24	40607	0.12841
	SVM	5	29.46	0.73212	0.23152

Table 2: Independent Samples Test

	Mean Difference	Std. Error Difference	t	df	Sig. (2-tailed)
Equal variances assumed	50.780	0.265	191.808	18.00	0
Equal variances not assumed	50.780	0.265	191.808	14.059	0

The Artificial Neural Network (ANN) attained an accuracy of 80.24%, whereas the Support Vector Machine (SVM) recorded an accuracy of 29.46%.

DISCUSSION AND CONCLUSION

- Based on T-test Statistical analysis, the significance value of p=0.001 (independent sample T-test p<0.05) is obtained and shows that there is a statistically significant difference between group 1 and group 2.
- ANN achieves an accuracy of 80.24%, showcasing its proficiency in predictive modeling for smart building systems. Meanwhile, SVM demonstrates a competitive accuracy of 29.46%.
- ANN outperformed SVM in terms of accuracy and practical applicability in smart building scenarios.
- The results align with previous studies that highlight the effectiveness of ANN in prediction tasks.
- As we look ahead to future research endeavors, it is essential to acknowledge the time and complexity involved in training neural network models.
- The study was limited by the available data. Future work could explore other machine learning algorithms and larger datasets.

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