GALGOTIAS UNIVERSITY

SCHOOL OF COMPUTING SCIENCE & ENGINEERING

PROJECT APPROVAL FORM AND ABSTRACT

Odd 2024-2025

B. Tech

Project Details:

Project ID: - BT40497

Title	**Hyperparameter Optimization Using Various Optimizers**		
Project Type	☐ Community based design problem (Interdisciplinary) ☐ Sustainable development goal ☐ App Development / Utility ☐ IOT/Hardware based ☑ AI/ML/Data Science ☐ Healthcare Projects	**Project Outcome**	☑ Project and Research Paper ☐ Project and Patent ☐ Project and Book Chapter
Publication Target	☐ SCOPUS Journal ☑ SCOPUS Conference ☐ SCOPUS Book Chapter ☐ SCI Journal	**Guide Name: Mr. Sugan Patel**	06/08/2024

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Hyperparameter Optimization Using Various Optimizers

Area/Domain of Project: Artificial intelligence and Machine Learning

Hyperparameter optimization is a crucial step in machine learning that significantly influences model performance and generalizability. This project conducts a comparative analysis of various hyperparameter optimization techniques, including Grid Search, Random Search, Bayesian Optimization, and Gradient-Based Optimization. The primary objective is to evaluate the efficiency, accuracy, and computational cost of these methods across different machine learning models and datasets.

We implement and test each optimization technique on several models, such as decision trees, support vector machines, and neural networks, using datasets like MNIST, CIFAR-10, and UCI repositories. The analysis includes a detailed comparison of convergence rates, training times, and model accuracies to determine the optimal approach for different scenarios.

The results highlight the strengths and limitations of each method, providing insights into their practical applications. For instance, Grid Search, though exhaustive and time-consuming, often yields highly accurate results, while Bayesian Optimization offers a more efficient search through the hyperparameter space, balancing accuracy and computational cost.

This project demonstrates the impact of hyperparameter tuning on machine learning models and offers recommendations for selecting appropriate optimization techniques based on specific needs. The findings aim to guide practitioners in enhancing model performance through effective hyperparameter optimization.

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