

# Gradient Descent Learning Project

## Overview

This project explores the concept of **Gradient Descent**, a fundamental optimization algorithm used in machine learning and statistics. The goal is to minimize the Mean Squared Error (MSE) by iteratively adjusting the slope and intercept of a linear model. This repository contains code that provides a visual representation of the gradient descent process using the OpenCV library.

## Demo

<https://github.com/user-attachments/assets/8570d974-f72a-40cf-8ee2-d51cfe1b125f>

## Repository Structure

The code for this project is organized as follows:

```
ML-Math-Concepts/  
  Gradient Descent/  
    app.py  
    algos  
      gradient_descent.py  
    README.md
```

- **app.py**: Contains the implementation of the gradient descent algorithm and visual representations.
- **gradient\_descent.py**: Generates visualizations of MSE, slope, and intercept during the gradient descent process.
- **README.md**: This file.

## Key Features

- **Gradient Descent Algorithm**: Implementation of the gradient descent optimization technique.
- **Visual Representation**: Uses OpenCV to visualize the convergence of MSE, as well as the changes in slope and intercept values.
- **Interactive Visuals**: Visual outputs help in understanding how gradient descent iteratively approaches the optimal solution.

## Getting Started

To run the code in this repository, follow these steps:

- **Clone the Repository**: `bash git clone https://github.com/vijaytakbhate2002/ML-Math-Concepts.git cd ML-Math-Concepts/Gradient Descent`
- **Install Required Libraries**: Make sure you have Python installed, and then install the required libraries: `bash pip install -r requirements.txt`
- **Run the Code**: You can run the main script to see the gradient descent in action: `bash python app.py`

## License

This project is licensed under the MIT License. See the [LICENSE](#) file for details.

## Acknowledgments

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- [OpenCV](#) for providing the tools for visual representation.
- The concept of Gradient Descent is foundational in optimization and machine learning.

Feel free to explore and contribute to the project! If you have any questions, open an issue on the repository. ``