

# Introduction

This small code project demonstrates a fully-tested numerical optimization implementation with comprehensive analysis and visualization capabilities. The project showcases the complete research pipeline from algorithm implementation through testing to result visualization.

## Research Context

Numerical optimization forms the foundation of many scientific and engineering applications. This project implements and analyzes gradient descent methods for solving optimization problems of the form:

$$\min_{x \in \mathbb{R}^n} f(x)$$

where  $f : \mathbb{R}^n \rightarrow \mathbb{R}$  is a continuously differentiable objective function.

## Key Components

The implementation includes:



Gradient descent algorithm with configurable parameters