

Methodology

This section describes the implementation methodology and experimental setup used in the optimization project.

Algorithm Implementation

Gradient Descent Algorithm

The core algorithm implements the following iterative procedure:

Input: Initial point x_0 , step size α , tolerance ϵ , maximum iterations N

Output: Approximate solution x^*

```
k = 0
```

```
while k < N:
```

```
    f = compute_gradient(x_k)
```

```
    if ||f|| < :
```

```
        return x_k # Converged
```

```
    x_{k+1} = x_k - f
```

```
    k = k + 1
```

```
return x_k # Maximum iterations reached
```

Top-Down Optimization Method