Optimization Library: System VnV Plan

By: Fasil Cheema

Optimization Library

- Main problem of function optimization; specifically function minimization

- We narrow down to the class of functions that can be expressed in the quadratic form

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

$$\text{where } f(x) = \frac{1}{2} x^T A x - bx + c$$

Optimization Library

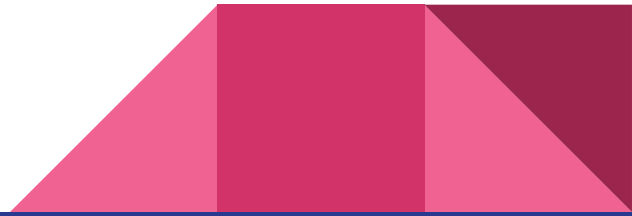
- Narrow down the dimensionality of the matrices/vectors to constrain them to 6 dimensions

$$\mathbf{A} = \begin{pmatrix} 3 & -1 & 7 & 3 & 9 \\ -2 & 2 & -2 & 7 & 5 \\ -5 & 9 & 3 & 3 & 4 \\ -2 & 6 & 6 & 3 & 7 \end{pmatrix}$$

System Test Description

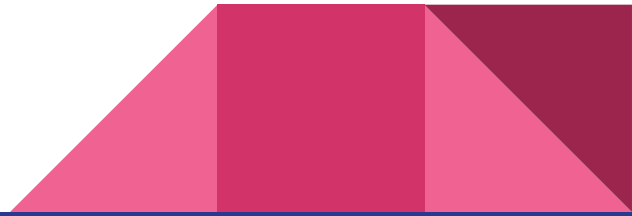
- Functional System Test Cases
  - Input Test Cases
  - Run-Time Test Cases

- Pseudo-Oracle (Scipy)



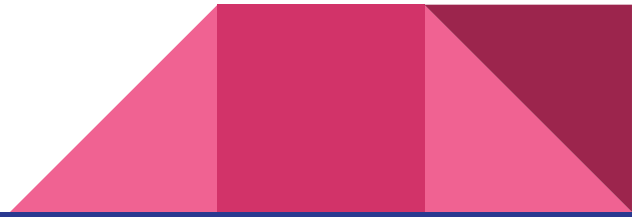
Implementation Verification Plan

- Expert Reviews
- Error Handling Testing
- Rubber Duck Testing
- Boundary Value Testing



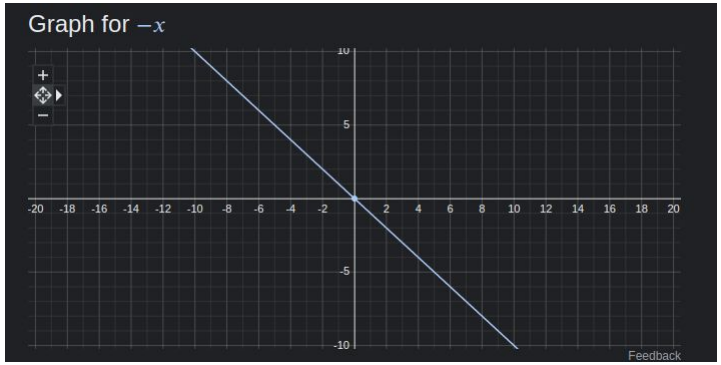
Nonfunctional testing

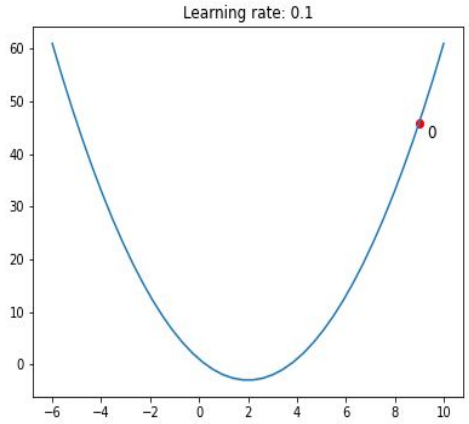
- Installation testing
- Performance testing

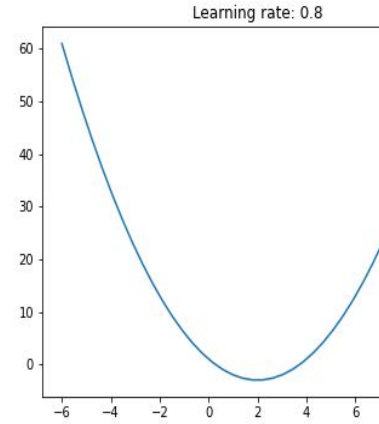


Error Handling Testing

- Non-PSD matrices
- Convergence guarantees
- Step size/wolfe conditions







Boundary Value Testing

- Maximum number of steps
- NonConvex functions
- Highest value of ε

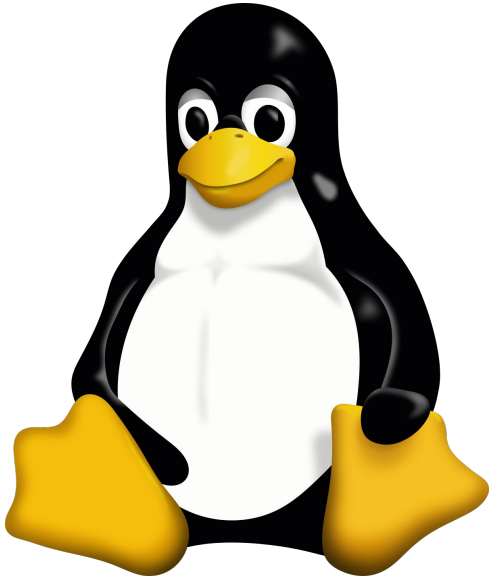
Software Validation Plan

- For each algorithm test input cases and obtain results
- Run the same input case in Scipy.minimize(method=...)
- Compare results!

Installation testing

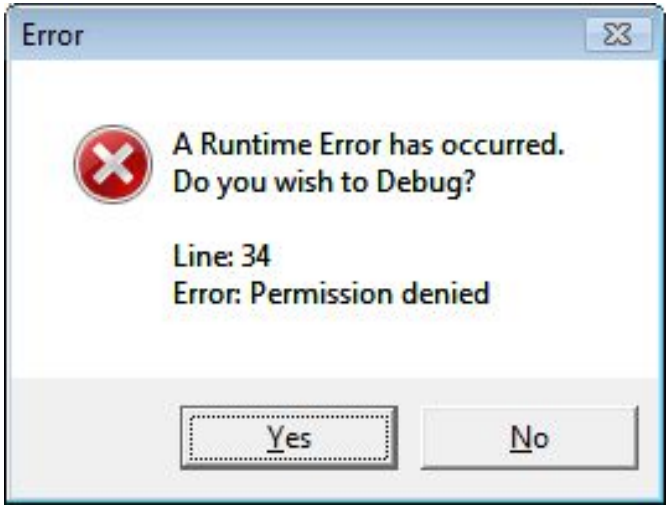
python™

CONDA



Windows®

Runtime Testing



Thank You!