Quasi-Newton Methods Comparision using Ackley, Beale, Booth, Matyas, Rastrigin and RosenBrock Functions

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***Abstract*—This paper discusses briefly four popular algorithms to solve optimization/minimization problems, belonging to Quasi-Newton class: *Davidon–Fletcher–Powell* (DFP), *Broyden–Fletcher–Goldfarb–Shanno* (BFGS), limited memory BFGS and *Levenberg-Marquardt Algorithm* (LMA). These algorithms are implemented in *Python language*, version 3.10 and uses *SymPy*, *SciPy* and *NumPy* libraries. One of them, *BFGS*, is implemented natively on the *SciPy* library and the rest are implemented by hand to provide useful insights about the inner operation of the algorithms. The results are, however, very corrent with a few exceptions.**

***Index Terms*—Optimization Problem; Linear Programming; Non-linear Programming; Quasi-Newton Algorithms**

I. Introduction

II. Methodology

III. Results

A. Ackley Function

Algorithm	Solution	Iterations	Evaluations	Value
dfp	-3.18e-16, 6.468e-16	32	110	0.0
bfgs	-4.51e-16, 2.88e-16	44	127	0.0
lbfgs	-1.43e-16, 6.13e-16	36	379	0.0
lma	8.60e-18, 3.22e-16	38	320	0.0

Algorithm	Minimal	Maximum	Mean	Median
dfp	0.0	7.10e-15	1.60e-15	0.0
bfgs	0.0	3.55e-15	2.17e-15	3.55e-15
lbfgs	0.0	7.11e-15	2.13e-15	3.55e-15
lma	0.0	0.0	0.0	0.0