A PYTHON PACKAGE FOR SOLVING NONLINEAR ADDITIVELY SEPARABLE NONCONVEX OPTIMIZATION PROBLEMS

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(189354H)

Degree of Master of Science

Department of Computer Science and Engineering

University of Moratuwa

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Dissertation submitted in partial fulfillment of the requirements for the degree Master of Science in Computer Science

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Candidate's Declaration

I hereby declare that this report was carried out by me under the supervision of Dr. Charith Chitraranjan, in the Department of Computer Science and Engineering, University of Moratuwa as a partial fulfillment of the requirements of the of the M.Sc. degree in Computer Science at the University of Moratuwa. It has not been submitted to any other institution or study program by me for any other purpose.

Candidate's name : Ms. I.C. Udatiyawala

UOM Verified Signature

Condidate's signature: …….....

Date : …31.05.2021……

Supervisor's Recommendation

I/We certify that the above declaration made by the candidate is true & this report is forwarded for the purpose of evaluation.

UOM Verified Signature

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ABSTRACT

Nonlinear optimization problems are difficult to solve in many practical situations, and only a few approaches are developed in recent history. The main problem in the nonlinear optimization problem is it needs some convexity approximation to obtain global optima. Otherwise, it ends up with the local optima. Separable programming is a common method to solve nonlinear optimization problems. Most of the nonlinear programming techniques, including the separable programming end up with the local optima when the problem is nonconvex. To overcome this problem several types of research have been conducted in recent history.

Computational implementations are an essential component in nonlinear programming as they are hard to solve with traditional methods. Also, very limited computational implementations have been developed in this area. However, in general, such implementations cannot promise that the results they generate are globally optimal. Therefore "**laptimize**" python package was developed to solve nonlinear separable nonconvex optimization problems using a branch and bound method. This algorithm was proposed by James E. Falk of The George Washington University. It has been verified that it can produce a global solution in a finite number of steps for a large class of nonlinear programming problems in the separable class. The correctness, stability, and convergence of the algorithm are evaluated with nonlinear programming examples.

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