

**COMPARISON BETWEEN FOUR NON-CLASSICAL  
CONJUGATE GRADIENT METHOD FOR SOLVING  
UNCONSTRAINED OPTIMIZATION PROBLEM**

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## DECLARATION BY CANDIDATE

We certify this report to which it refers is the product of our own work and that any idea or quotation from the work of other people, published or otherwise are fully acknowledged in accordance with standard referring practices of the discipline.

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## ABSTRACT

Conjugate gradient method is an efficient technique to solve unconstrained optimization problem. This method was proposed by Magnus Hestenes and Eduard Stiefel in 1952. For our research, it focus on non-classical which is Fletcher-Reeves (FR) and PRP for hybrid conjugate gradient, modified, scaled and parametrized methods. Hybrid conjugate gradient is the combination of attractive features of known conjugate gradient such as PRP and FR. Modified is where the existing numerator and denominator is modified with new terms. Scaled is when a parameter is added at search direction. Parametrized is added a parameter to a classical conjugate gradient. To find the best method, we compare the methods in terms of its efficiency and robustness. Efficiency is measured by the number of iteration and CPU time. Whereas, robustness is the ability of method to solve the most problems or test function than other methods. As a conclusion, from this study, we could determine what are the factors could make PRP-FR Hybrid, Scaled, Modified and Parametrized methods more efficient and more robust.

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