M. M. Alves
Strong convergence of algorithms for convex feasibility problems in Hilbert spaces

We analyze a primal-dual pair of problems generated via a duality theory introduced by Svaiter. We propose a general algorithm and study its convergence properties. The focus is a general primal-dual principle for strong convergence of some classes of algorithms. In particular, we give a different viewpoint for the weak-to-strong principle of Bauschke and Combettes and unify many results concerning weak and strong convergence of subgradient type methods.

M. G. S. Batista, A. E. Xavier, F. L. de Lima and A. M. Santana
Use of clustering methodology by hyperbolic smoothing algorithm in taxonomy of Seaweed

This paper proposes to present the use of the clustering methodology by hyperbolic smoothing in taxonomy of marine algae. Were used algae of the genus Caulerpa. These algae were chosen as a study model for application of the methodology because they present great morphological plasticity and difficulty in their identification by systematic methods traditional. The method demonstrated advantage in view of the data compared to hierarchical methodologies

J. Y. Bello Cruz
A subgradient method for vector optimization problems

Vector optimization problems are a significant extension of scalar optimization, and have many real life applications. We consider an extension of the projected subgradient method to vector optimization, which works directly with vector-valued functions, without using scalar-valued objectives. We eliminate the scalarization approach, a popular strategy for solving vector optimization problems, exploring strongly the structure of these kinds of problems. Under suitable assumptions, we show that the sequence generated by the algorithm converges to a weakly efficient optimum point. The sequence generated by the subgradient method is, in general, nondecreasing in its functional values. Due to the fact that $\mathbb{R}^m$ does not expose a total order, non-monotone methods, such as a subgradient methods, encounters major difficulties in the convergence analysis. The technique developed may be useful in other optimization problems, such as the variational inequality problems, equilibrium problems, saddle points problems, and their variations. It is important to mention that in almost all methods that which have been extended for the context of the vector optimization, the monotony of the functional values plays an essential role in the convergence analysis.

G. C. Bento,
Unconstrained Steepest Descent Method for Multicriteria Optimization on Riemannian Manifolds

We present a steepest descent method with Armijo's rule for multicriteria optimization in the Riemannian context. The sequence generated by the method is guaranteed to be well-defined. Under mild assumptions on the multicriteria function, we prove that each
accumulation point (if any) satisfies first-order necessary conditions for Pareto optimality. Moreover, assuming quasi-convexity of the multicriteria function and non-negative curvature of the Riemannian manifold, we prove full convergence of the sequence to a critical Pareto point.

Trabalho em cooperação com Orizon Pereira Ferreira e Paulo Roberto Oliveira.

E. Birgin
Global Nonlinear Programming with possible infeasibility and finite termination

In a recent paper, Birgin, Floudas and Martínez introduced a novel Augmented Lagrangian method for global optimization. In their approach, Augmented Lagrangian subproblems are solved using the $\alpha$BB method and convergence to global minimizers was obtained assuming feasibility of the original problem. In the present research, the algorithm mentioned above will be improved in several crucial aspects. On one hand, feasibility of the problem will not be required. Possible infeasibility will be detected in finite time by the new algorithms and optimal infeasibility results will be proved. On the other hand, finite termination results that guarantee optimality and/or feasibility up to any required precision will be provided. An adaptive modification in which optimality subproblem tolerances depend on current feasibility and complementarity will also be given. Experiments showing how the new algorithms and results are related to practical computations will be given.

A. S. Brito
Interior Proximal Algorithm for Quasiconvex Programming Problems and Variational Inequalities with Linear Constraints

We present two interior proximal algorithms inspired by the Logarithmic-Quadratic Proximal method. The first method we propose is for general linearly constrained quasiconvex minimization problems. For this method, we prove global convergence when the regularization parameters go to zero. The latter assumption can be dropped when the function is assumed to be pseudoconvex. We also obtain convergence results for quasimonotone variational inequalities, which are more general than monotone ones.

O. Bueno and B. F. Svaiter
On linear non-type (D) monotone operators in non-reflexive Banach spaces

In this work we address two recent conjectures which were recently proved negative by the authors. The first one, given by Marques Alves and Svaiter [2], deals with extensions to the bidual of type (D) monotone operators. We show an explicit example of an type (D) monotone operator whose unique maximal monotone extension to the bidual is not of type (D). Moreover, we present a theorem which captures our example. The second one, given by Borwein [1, §4, question 3], is about the existence of non-type (D) operators in the Banach space $c_0$. We show an explicit example of a maximal monotone operator in $c_0$ which is not of type (D). Furthermore, we prove that we can construct non-type (D) operators in spaces which contain an isomorphic copy of $c_0$.

References

F. G. M. Cunha
Numerical experiments with a class of primal affine scaling algorithms to quadratic programming

We apply a class of primal affine scaling algorithms to solve nondegenerate linearly constrained convex programming. This class, depending on a $r$-parameter, is constructed through a family of metrics generated by $-r$ power, $r \geq 1$, of the diagonal iterate vector matrix. The so-called weak convergence of this algorithm was proved in a previous work. To verify the computational performance of the class of algorithms, we accomplishing tests with some quadratic programming problems described in the Maros and Mészaros repository.

M. Dumett and P. Stephens
An Inverse Problem Algorithm for Estimating Ionosphere Electron Content

We consider the system of type $F(x) = 0$, where $F : \mathbb{R}^n \rightarrow \mathbb{R}^n$ is an application twice differentiable. Many optimization problems can be solved by finding solutions of a system (usually nonlinear) of equations. The methods utilized to solve numerically those systems are iterative in nature. From an initial guess they generate a sequence of iterates that converges to a solution of the system. Among these algorithms Newton's method is broadly utilized, and under certain assumptions, it has quadratic convergence.

R. G. Eustaquio, A. A. Ribeiro and M. Dumett
A study on the Halley's method using L-BFGS method

Nevertheless, the evaluation of the inverse of the Jacobian turns Newton's method fairly expensive computationally. In order to circumvent this problem, quasi Newton methods are widely used in practice, but for large problems the approximation for the Hessian holds a large memory space. Quasi Newton methods with limited memory have also been studied, in particular L-BFGS method, where the Hessian matrix is approximated without performing a matrix multiplication. Furthermore, we mention tensor methods, in particular Halley's method. This method belongs to a class of algorithms with cubic convergence, which by considering its degree of accuracy is better than Newton's method. We propose in this paper a study on the Halley's method using L-BFGS method.

D. Fernandez
Second order correction for augmented Lagrangian subproblems

An augmented Lagrangian method is based on a sequential (inexact) minimization of the augmented Lagrangian function. Computationally, the minimization is performed by an outer solver that performs an undetermined number of iterations in order to satisfy a prescribed tolerance. In this work we show that a suitable tolerance can be reached by solving only two constrained quadratic problems. The first one is a Newtonian iteration for the problem of minimize the augmented Lagrangian function. The second one is the well-known second order correction for the sequential quadratic programming method. While the first problem improves optimality, the second decrease the distance to stationary points. We show that the proposed method is well-defined and locally convergent.

O. P. Ferreira and R. C. M. Silva
Local convergence of Newton's method under majorant condition in Riemannian Manifolds

A local convergence analysis of Newton's method for finding a singularity of a differentiable vector field defined on a complete Riemannian manifold, based on majorant principle, is presented in this paper. This analysis provides a clear relationship between the majorant function, which relaxes the Lipschitz continuity of the derivative, and the vector field under consideration. It also allows us to obtain the optimal convergence radius, the biggest range for the uniqueness of the solution, and to unify some previous unrelated results.


R. Gárciga
Fixed point methods for a certain class of operators

We introduce in this paper a new class of nonlinear operators which contains, among others, the class of operators with semimonotone additive inverse and also the class of nonexpansive mappings. We study this class and discuss some of its properties. Then we present iterative procedures for computing fixed points of operators in this class, which allow for inexact solutions of the subproblems and relative error criteria. We prove weak convergence of the generated sequences in the context of Hilbert spaces. Strong convergence is also discussed.

M. L. N. Gonçalves
Local convergence analysis of inexact Gauss-Newton like methods under majorant condition

We present a local convergence analysis of inexact Gauss-Newton like methods for solving nonlinear least squares problems. Under the hypothesis that the derivative of the function associated with the least square problem satisfies a majorant condition, we obtain that the method is well-defined and converges. Our analysis provides a clear relationship between the majorant function and the function associated with the least square problem. It also allows us to obtain an estimate of convergence ball for inexact Gauss-Newton like methods and some important, special cases.

S.-M. Grad, R.I. Bot and G. Wanka
Classical linear vector optimization duality revisited

This talk will bring into attention a vector dual problem that successfully cures the trouble encountered by some classical vector duals to the classical linear vector optimization problem (see [4, 5]) in finite-dimensional spaces. This “new-old” vector dual is based on a vector dual introduced by Bot and Wanka for the case when the image space of the objective function of the primal problem is partially ordered by the corresponding nonnegative orthant, extending it for the framework where an arbitrary nontrivial pointed convex cone partially orders the mentioned space. The vector dual problem we propose (cf. [1]) has, different to other recent contributions to the field (see [3]) which are of set-valued nature, a vector objective function. Weak, strong and converse duality for this “new-old” vector dual problem are delivered and it is compared with other vector duals considered in the same framework in the
literature (see [1, 2]). We also show that the efficient solutions of the classical linear vector optimization problem coincide with its properly efficient solutions (in any sense) when the image space is partially ordered by a nontrivial pointed closed convex cone, too, extending the classical result due to Focke and, respectively, Isermann.

L.M. Grana Drummond
New strategies for vector optimization problems

Under partial orders derived from arbitrary closed convex pointed cones with nonempty interior, we propose extensions of scalar optimization procedures to the vector setting. For constrained vector-valued optimization, we seek efficient/weakly efficient points by adapting classical real-valued strategies. Assuming reasonable hypotheses, we establish some convergence results to optimal points.

V. Guigues
Joint dynamic chance constraints with linear decision rules for some multistage stochastic linear programs

We consider a class of multistage stochastic linear optimization problems where the underlying stochastic process is a generalized linear model. When uncertainty is dealt with using joint dynamic chance constraints with linear decision rules, we show that the computation of values, gradients, and Hessian matrices of the functions appearing in the constraints reduces to the computation of Gaussian distribution functions. Combining efficient algorithms to compute these distribution functions with a nonlinear optimization solver allows us to solve the chance-constrained problems under consideration. The application to an inventory problem is discussed.

E. W. Karas, P. Conejo, J. M. Martínez and L. Pedroso
A derivative-free method for nonlinear programming

In this talk we discuss a derivative-free method for constrained continuous optimization. We consider problems in which the derivatives of the objective function are not available. At each iteration we construct a model of the objective function based on polynomial interpolation as proposed by Powell in BOBYQA algorithm. The constraints are treated in the trust region subproblems which are solved by the ALGENCAN algorithm proposed by Andreani, Birgin, Martinez and Schuwerdt. The analysis of the global convergence of the algorithm is one of our tasks. We present some preliminar numerical experiments.

L. R. Lucambio Perez, J.Y. Bello Cruz
A modified subgradient algorithm for solving $K$-convex inequalities

We propose a strongly convergent variant of Robinson's subgradient method for solving a system of $K$-convex inequalities in Hilbert spaces. The advantage of the proposed method is that it converges strongly, when the problem has solutions, without additional assumptions. The proposed method also has the following desirable property: the sequence converges to the solution of the problem which lies closest to the initial iterate.

L. C. Matioli and S. R. dos Santos
Two new augmented Lagrangian algorithms with quadratic penalty for equality problems

In this talk we present two augmented Lagrangian methods applied to nonlinear programming problems with equality constraints. Both use quadratic penalties and the structure of modern methods to problems with inequality constraints. Therefore, they can be seen as augmented Lagrangian applied to problem with inequality constraints extended to problems with equality constraints without additional of slack variables. We show that under conventional hypotheses the augmented Lagrangian function generated by the two methods has local minimizer, as in the case of the proposed method by Hestenes and Powell. Comparative numerical experiments on CUTEr problems are presented to illustrate the performance of the algorithms.

J. G. Melo
Convex Feasibility on Riemannian Manifolds

We present a subgradient algorithm for solving convex feasibility problems on Riemannian manifolds. The sequence generated by the algorithm converges to a solution of the problem when the sectional curvature of the manifold is nonnegative. Assuming a Slater type qualification condition, we propose a variant of the first algorithm which ensures finite convergence. Convex feasibility on Riemannian manifolds with negative sectional curvature will also be discussed.

F. A. G. Moreno
A partial proximal method associated with a quasi-distance for equilibrium problems

In this work we consider an equilibrium problem defined on a closed convex set, whose cost bifunction is not necessarily monotone. We show that this problem can be solved by an inexact partial proximal method with a quasi-distance by consider an appropriate regularization. Under some assumptions, we prove convergence of the generated sequence to a solution of the problem.

P. R. Oliveira
Optimization on Manifolds

The extension of concepts and techniques as well as mathematical programming methods, developed in Euclidean spaces to Riemannian manifolds, is natural, and generally not trivial. In recent years it has been the subject of significant research, either for theoretical or practical purposes. They possess some important advantages. For example, restricted optimization problems can be considered as unrestricted ones, from the point of view of Riemannian geometry and, in this case one has an alternative possibility, in relation to the various approaches of classical optimization in its resolution. Moreover, through the introduction of an appropriate Riemannian metric, non convex problems in the classic sense, can become convex. Finsler varieties are more general than the Riemannian, in particular, because they do not have a scalar product associated to the tangent space. Furthermore, the distance between points is generally asymmetric, which allows applications, for example, in decision theory. They require, in order of optimization applications, more sophisticated mathematical techniques. In this talk, I present the main results obtained in this area, including the group's production of optimization in varieties of Brazilian Universities.
W. Oliveira
Proximal and level bundle methods for nonsmooth convex optimization: a unified algorithm

Most bundle algorithms use information to build linearizations for the objective function. The piecewise maximum of linearizations defines a cutting-plane model that enters the quadratic program (QP) whose solution gives the next iterate. Proximal bundle methods use the model in the QP objective function, while level methods use the model in the QP constraints. We consider the proximal form of a bundle algorithm that defines new iterates by alternating the solution of the two different quadratic programs. In contrast to the classical proximal bundle method, our new variant is able to update lower bounds for the objective function allowing an additional stopping test based on the optimality gap. Furthermore, the projections onto successive approximations of level sets provide Lagrange multipliers that are used to update the proximal parameter, thus accelerating the optimization process. Some numerical experiments comparing our variant with level and proximal bundle methods are given.

V. C. Onishi and M. A. S. S. Ravagnani
A MINLP Model for the rigorous design of shell and tube heat exchangers

The design of shell and tube heat exchangers can be formulated as an optimization problem. The main objective is to find the equipment that provides the minimum cost, considering the expenses related to the heat transfer area of and/or pumping associated with pressure drop. This paper proposes a mixed integer non-linear programming (MINLP) model for the design of shell and tube heat exchangers, following rigorously the TEMA (Tubular Exchanger Manufacturers Association) Standards. Bell-Delaware Method is used for the heat transfer coefficients and pressure drop calculus in the shell side. The final design of the equipment shall comply with the limits for pressure drop, fluid speed and fouling imposed by the process. The mechanical design characteristics (shell and tube bundle diameters, external and internal tube diameters, tube length, pitch and tube arrangement, number of tubes and tube passes), and thermal-hydraulic variables (heat exchange area, heat duty, overall and individual heat transfer coefficients, shell and tube pressure drops and fouling), are variables of optimization. The equipment is designed under pressure drop and fouling limits. More realistic values are obtained, considering fouling and pressure drop effects according to TEMA Standards.

E. A. Papa Quiroz
Proximal Methods with Bregman Distances to Solve VIP on Hadamard manifolds

We present an extension of the proximal point method with Bregman distances to solve Variational Inequality Problems (VIP) on Hadamard manifolds (simply connected finite dimensional Riemannian manifold with nonpositive sectional curvature). Under some natural assumption, as for example, the existence of solutions of the (VIP) and the monotonicity of the multivalued vector field, we prove that the sequence of the iterates given by the method converges to a solution of the problem.

O. Popova
Application of the affine scaling method to energy problems

The paper addresses the affine scaling method suggested by I. Dikin. This method is
widely used for solving applied energy problems. Algorithms of search for optimal and feasible solutions to the mathematical programming problems are presented. The author developed a computational system which was then used to implement the algorithms of the considered method. The effectiveness of the method for solving the equilibrium thermodynamics problems (minimization of Gibbs free energy function and maximization of entropy) is shown. The sequence of dual variables was experimentally found to have good convergence to a solution to the dual problem. A computational algorithm is presented for the problem of search for a flow distribution in the hydraulic system that has flow rate and pressure regulators.

F.M. P. Raupp, W. Sosa, J. Cotrina
A duality scheme for semi-continuous programming

We introduce a duality scheme for the class of mathematical programming problems called Semi-Continuous Programming (SCP), which contains constrained minimization problems with lower semi-continuous objective functions. First, we study some solution existence conditions for SCP based on asymptotic techniques. Then, in order to devise the duality scheme for the SCP problem, a modification of the Fenchel-Moreau conjugation is used. Promising results are obtained when we apply this tool to minimize quadratic functions (whose Hessians can be symmetric indefinite) over polyhedral sets.

D. Reem
The Bregman distance without the Bregman function

The notion of Bregman distance has various applications in optimization. We generalize this notion in several ways. The context is not necessarily normed spaces and the Bregman function, which is part of the standard definition of the Bregman distance, is removed. Many examples illustrating the generalized concept are given. We also introduce the concept of weak-strong spaces and generalize to this setting a weak convergence theorem of Reich regarding the limit of an infinite product of strongly nonexpansive operators. Along the way we obtain a lemma which seems to be useful in other scenarios, especially for proving the convergence of a given sequence to a limit.

E. W. Sachs
Preconditioners for PDE-Constrained Optimization

There is a variety of applications which lead to optimization problems with partial differential equations. In the numerical solution of these nonlinear optimization problems a sequence of linear systems with saddle point structure has to be solved. We address the special structure of these problems and point to possible sources of ill-conditioning. Then we discuss various efforts to design efficient preconditioners in order to improve the convergence properties of the iterative solvers. We conclude with several examples of constrained optimization problems with partial differential equations in three dimensions.

P. S.M. Santos and S. Scheimberg
An Explicit Reflection-Projection Algorithm for Equilibrium Problems

We introduce an explicit two-step algorithm for solving nonsmooth equilibrium problems
in Euclidean spaces. In the first step, we use reflections onto suitable hyperplanes to achieve feasibility. In the second step, a projected subgradient type iteration is replaced by a specific projection onto a halfspace. We prove, under suitable assumptions, convergence of the whole sequence to a solution of the problem. The proposed algorithm has a low computational cost per iteration and some numerical results are reported.

S. A. Santos, D. S. Gonçalves and M. A. Gomes-Ruggiero
An adaptive algorithm for nonlinear least-squares problems based on second-order spectral approximations

An adaptive algorithm is proposed for solving nonlinear least-squares problems, based on scalar spectral matrices employed in the approximation of the residual Hessians. The spectral parameter regularizes the Gauss-Newton step, providing an automatic updating for the so-called Levenberg-Marquardt parameter. Moreover, the spectral approximation has a quasi-Newton flavour, including second-order information along the generated directions, obtained from the already computed first-order derivatives. Global convergence is ensured by means of a nonmonotone line search strategy. Local convergence analysis is provided as well. Numerical results from the comparison with the routines LMDER and NL2SOL put the approach into perspective, indicating its effectiveness in two collections of problems from the literature.

M. R. Sicre
An inexact generalized projection proximal point method for the variational inequality problem

The objective of this work is to present an inexact proximal point algorithm for the monotone variational inequality problem VIP (T, C). This algorithm uses the approach for inexact proximal point methods based on a constructive relative error, introduced by Solodov and Svaiter, and the theory of generalized interior projection type methods developed by Asulender and Teboulle. Asulender and Teboulle’s work is based on the use of non-Euclidean distance functions, related projection-like operators and induced proximal distances.

P. J. S. Silva, E. H. Fukuda, and M. Fukushima
Differentiable Exact Penalty Functions for Nonlinear Second-Order Cone Programs

We propose a method to solve nonlinear second-order cone programs (SOCPs), based on a continuously differentiable exact penalty function. The construction of the penalty function is given by incorporating a multipliers estimate in the augmented Lagrangian for SOCPs. Under the nondegeneracy assumption and the strong second-order sufficient condition, we show that a generalized Newton method has global and superlinear convergence. We also present some preliminary numerical experiments.

R. C. M. Silva and O. P. Ferreira
On the convergence of the entropy-exponential penalty trajectories and generalized proximal point methods in semidefinite optimization

The convergence of primal and dual central paths associated to entropy and exponential functions, respectively, for semidefinite programming problem are studied in this paper. It is proved that the primal path converges to the analytic center of the primal optimal set with respect to the entropy function, the dual path converges to a
point in the dual optimal set and the primal-dual path associated to this path converges to a point in the primal-dual optimal set. As an application, the generalized proximal point method with the Kullback-Leibler distance applied to semidefinite programming problems is considered. The convergence of the primal proximal sequence to the analytic center of the primal optimal set with respect to the entropy function is established and the convergence of a particular weighted dual proximal sequence to a point in the dual optimal set is obtained.

G. P. da Silva, J. X. da Cruz Neto and J. O. Lopes
A Subgradient method for multiobjective programming

We present a method for solving quasiconvex nondifferentiable unconstrained multiobjective optimization problems. This method extends to the multiobjective case of the classical subgradient method for real-valued minimization. We use a divergent series stepsize rule and a convex combination of the subgradients of the objective functions and assuming the basically componentwise quasiconvexity of the objective components, full convergence (to Pareto optimal points) of all the sequences produced by the method is established.

P. A. Soares Júnior
The minimization algorithm alternated to non-convex problems in Riemannian context, with applications in game theory

Several optimization problems in which one uses the Alternating proximal Point algorithm can be modeled in Riemannian ambient, especially in a Hadamard manifold. Problems of this nature appear naturally in Economics: Game Theory. In this presentation, we consider the problem of minimizing a function non-convex, with restrictions in a Hadamard manifold. As an application, we discuss results of game theory concerning the convergence in finite time and speed of convergence.

W. Sosa
Theorems of Separation for closed sets

Os teoremas de separação para conjuntos convexos são ferramentas muito importantes na teoria da otimização. O objetivo deste trabalho é estender esses teoremas para conjuntos fechados, isto é trocar a convexidade pela fechadura. Portanto novos teoremas de separação são propostos neste trabalho. Como aplicação, nos recuperamos a conjugação para funções semicontínuas inferiores.

S. S. Souza
A Sufficient descent direction method for quasiconvex optimization over Riemannian manifolds

We extend the definition of sufficient descent direction to the setting of Riemannian geometry. We propose an algorithm based on sufficient descent directions for solving the problem of minimizing quasiconvex functions over a Riemannian manifold. The choice of the stepsize is given by Armijo search with backtracking procedure. We show full convergence by considering complete finite-dimensional Riemannian manifolds with
nonnegative sectional curvature. Computational experiments illustrate the behaviour of the method and its comparison with the steepest descent method is also given.


M. V. Travaglia
Error bound for a perturbed minimization problem related with the sum of smallest eigenvalues

Let $C$ be a $n\times n$ symmetric matrix. For each integer $1 \leq k < n$ we consider the minimization problem $\displaystyle m(\varepsilon) := \min_{X} \left\{ \text{Tr}(C X) \, + \, \varepsilon \, f(X) \right\}$. Here the variable $X$ is an $n\times n$ symmetric matrix, whose eigenvalues satisfy $0 \leq \lambda_i(X) \leq 1$ and $\sum_{i=1}^{n} \lambda_i(X) = k$, the number $\varepsilon$ is a positive (perturbation) parameter and $f$ is a Lipschitz-continuous function (in general nonlinear). It is well known that when $\varepsilon = 0$ the minimum value, $m(0)$, is the sum of the smallest $k$ eigenvalues of $C$. Assuming that the eigenvalues of $C$ satisfy $\lambda_1(C) \leq \cdots \leq \lambda_k(C) < \lambda_{k+1}(C) \leq \cdots \leq \lambda_n(C)$, we establish the following upper and lower bounds for the minimum value $m(\varepsilon)$:

$$\sum_{i=1}^{k} \lambda_i(C) \, + \, \varepsilon \overline{f} \geq m(\varepsilon) \geq \sum_{i=1}^{k} \lambda_i(C) \, + \, \varepsilon \overline{f} - \frac{2 \, k \, L^2}{\lambda_{k+1}(C) - \lambda_k(C)} \varepsilon^2,$$

where $\overline{f}$ is the minimum value of $f$ over the solution set of unperturbed problem and $L$ is the Lipschitz-constant of $f$. The above inequality shows that the error by replacing the upper bound (or the lower bound) by the exact value is at least quadratic in the perturbation parameter. We also treat the case that $\lambda_{k+1}(C) = \lambda_k(C)$. We compare the exact solution with the upper and lower bounds for some examples.


K. D. V. Villacorta
A trust-region method to the unconstrained multiobjective problem

In this work we consider an extension of the scalar trust-region method for solving the problem of finding Pareto critical points for unconstrained multiobjective optimization. Under certain assumptions, which are a natural extension of those used in the scalar case, we show that any sequence generated by the algorithm converge to a Pareto critical point.