

Implementation of Multi-Objective
Interval Valued Optimization Techniques
Applied to Parameter Estimation under
Uncertainty

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1 Introduction

2 Problem Description

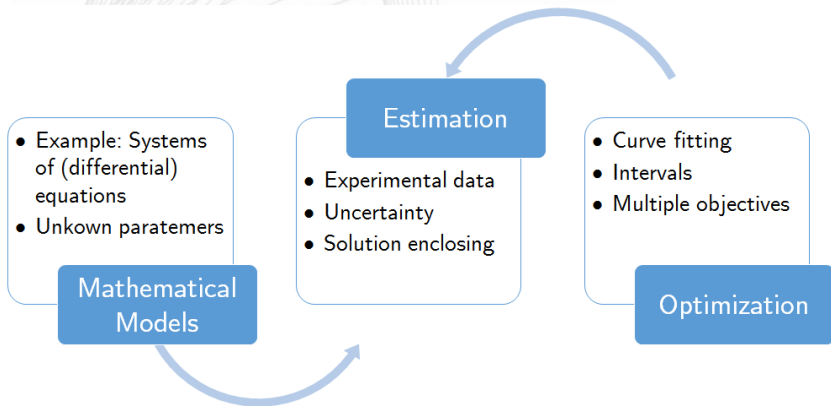
3 Preceding Research

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Introduction



Problem Description

Let $I(\mathbb{R}) := \{ [a, b] : a \leq b, a, b \in \mathbb{R} \}$ be the set of all closed intervals of \mathbb{R} . We would like to find efficient solutions of the problem:

$$\min f_i(x) \quad \forall i \in U$$

subject to,

$$h_i(x) \preceq [0, 0] \quad \forall i \in V$$

$$k_i(x) = [0, 0] \quad \forall i \in W$$

$$x \in D \subset \mathbb{R}^n$$

where $f_i, h_i, k_i : \mathbb{R}^n \rightarrow I(\mathbb{R})$, U, V and W are indexing sets, D is the domain set of the independent variables and \preceq is an order relation.

Preceding Research

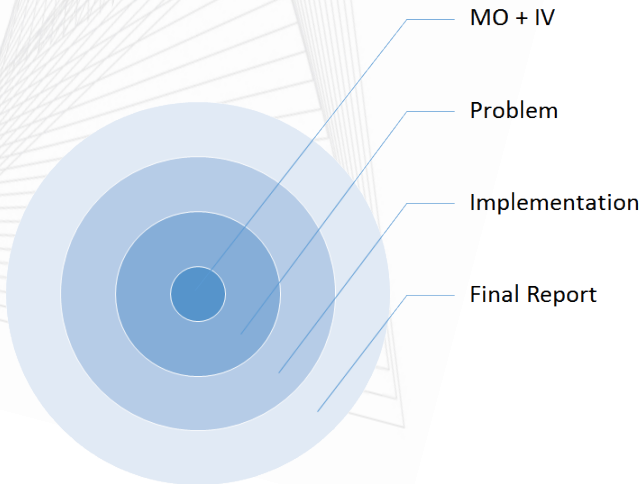
Interval Analysis

- ✓ Moore [1]
- ✓ Skelboe [2], Hansen [3], Ström [4], ...
- ✓ Ratschel & Voller [5], Bhurjee & Panda [6]

Multiobjective Interval Valued Optimization

- ✓ Ichida & Fujii [7]
- ✓ Karmakar [8]

Goals



Schedule

Activity	Description	Start	End
O1	Study of the mathematical structure of interval analysis and multi-objective optimization techniques.	W5	W8
O2	Selection of a problem requiring parameter estimation under uncertainty	W8	W10
O3	Computational implementation of the mentioned techniques in the selected context	W9	W14
O4	Writing and review of the final report of the project	W1	W19

References (I)

- [1] R. E. Moore, *Interval Arithmetic and Automatic Error Analysis in Digital Computing*. PhD thesis, Stanford, CA, USA, 1963. AAI6304614.
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- [3] E. Hansen, “Global optimization using interval analysis ? The multidimensional case,” *Numer. Math.*, vol. 34, no. 3, pp. 247–270, 1980.
- [4] T. Ström, “Strict estimation of the maximum of a function of one variable,” *BIT*, vol. 11, no. 2, pp. 199–211, 1971.

References (II)

- [5] H. Ratschek and R. Voller, “What can interval analysis do for global optimization?,” *Journal of Global Optimization*, vol. 1, no. 2, pp. 111–130, 1991.
- [6] A. Bhurjee and G. Panda, “Efficient solution of interval optimization problem,” *Mathematical Methods of Operations Research*, vol. 76, no. 3, pp. 273–288, 2012.
- [7] K. Ichida and Y. Fujii, “An interval arithmetic method for global optimization,” *Computing*, vol. 23, no. 1, pp. 85–97, 1979.
- [8] S. Karmakar and A. K. Bhunia, “An alternative optimization technique for interval objective constrained optimization problems via multiobjective programming,” *Journal of the Egyptian Mathematical Society*, vol. 22, no. 2, pp. 292–303, 2014.