# Finding Pareto-Optimal Frontier with Minimum Disclosure for Multi-Party Negotiations

## Thesis Summary

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**The concepts of multiple objective optimization, distributed computing and secure multi-party computation have been utilized to address the problem of finding pareto-optimal (po) frontier in a scenario requiring minimum disclosure of information among participating parties. The problem draws its inspiration from the domain of multi-party negotiation in general and e-negotiation in particular. The issue of availability of a mediator has been considered in formulating the algorithms. Both the cases of finite (discrete) and infinite (continuous) decision space have been attempted. In continuous decision space the parties are assumed to have linear and nonlinear (concave and nonconcave) value functions and constraints†. Trade-o□s in communication and computation costs vis-à-vis information disclosure have been highlighted. New algorithms have been attempted for a few general problems in the in the area of cryptography and secure multi-party computation. These along with existing algorithms have been used to solve the privacy issues in finding po solutions.**

**Negotiation is an integral part of many human interactions. A desirable characteristic of the final agreement is its optimality (called**

**The set of po points is called** Pareto-Optimal Set or Pareto-Optimal Subset (POS) **and the frontier formed by the points of the pareto-optimal set is called** Pareto-Optimal Frontier (POF)**. The multi-objective literature refers to this as** Non-Dominated Surface **(Zeleny, 1982) and in database literature it is referred as** Skyline **(Kossmann, Ramsak, & Rost, 2002).**

**The thesis proposes algorithms for finding the pareto-optimal frontier in a variety of scenarios involving the characteristics of the objective functions and constraints which are 'private' to the participants. We assume that the parties have decided to find the po frontier first and then negotiate on that. We also assume the Partial Open Truthful Exchange (POTE) situations. The thesis explores a number of general algorithms in Secure Multiparty Computation too.**

**Building blocks : Negotiation can be viewed as Multiple Participant Multipl**

**methodologies in the MCDM literature particularly the multi-objective simplex method and weighted criteria method to the negotiation scenario. We also derive from the works in the database literature on Skyline queries.**

algorithms mentioned above. These general algorithms are for finding intersection of finite sets, multi-party comparison of a pair of alternatives, finding the minimum and finding the sum of a set of values.

In sum, the primary contribution of the thesis is in utilizing methodologies

# References