

A small tour of optimization models

Theory of games and markets with examples

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OPTIMIZATION AND APPLICATIONS

Consulting:

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Web-sites:

http : //soften.ktu.lt/~mockus

http : //pilis.if.ktu.lt/~jmockus

http : //eta.ktl.mii.lt/ mockus

http : //mockus.us/optimum (short)

Optimality

Objective function

$$f(x), \quad x = (x_1, \dots, x_m). \quad (1)$$

Global minimum

$$f(x_A) \leq f(x) \quad x \in A, \quad (2)$$

or

$$x_A = \arg \min_A f(x). \quad (3)$$

Here A is a feasible region.

Local minimum

$$f(x_\epsilon) \leq f(x) \quad x \in \epsilon. \quad (4)$$

Here ϵ is a vicinity of x_ϵ .

Vector optimization

Objective is to maximize vector-function

$$f(x) = (f_i(x), i = 1, \dots, m). \quad (5)$$

Pareto optimum is the set X^* .

$x^* \in X^*$, if there are no such x that

$$f_i(x) \geq f_i(x^*), \quad \forall i \quad (6)$$

$$f_j(x) > f_j(x^*), \quad \exists j \quad (7)$$

Scalarization

By weights

$$x(c) = \operatorname{arg\,max}_x \sum_i c_i f_i(x), \quad c_i > 0. \quad (8)$$

Here $x(c) \in X^*$.

By constraints

$$x(b) = \operatorname{arg\,max}_x f_1(x) \quad (9)$$

$$f_i(x) \geq b_i, \quad i = 2, \dots, m. \quad (10)$$

Here $x(b) \in X^*$, if $x(b)$ is unique,
otherwise, non-Pareto points are possible.