

Stat 2

Science, Statistics



STATISTICAL PROGRAMMING Pure integer programming problem is a linear programming whereby all the variables are required to be integers (Render, et al. 2012). The Linear programming problem below is a pure integer LP problem but also has mixed sets of integers, thus mixed integer linear programming.

$$\text{Minimize } Z = 8X_1 + 4X_1X_2 + 12X_2^2$$

$$\text{Subject to: } 6X_1 + X_2 \geq 50$$

$$X_1 + X_2 \geq 40$$

A statistical programming that uses a scale of 0-1 is a simple and powerful integer scale. Zero-one linear programming involves problems (Braaksma, et al, 2012)), in which the variables are restricted to be either 0 or 1 for instance,

$$\text{Minimize } Z = 8X_1 + 6X_2$$

$$\text{Subject to: } 4X_1 + 5X_2 \geq 10$$

$$X_1 + X_2 \leq 3$$

$$X_1, X_2 \geq 0$$

$$X_1, X_2 = 0 \text{ or } 1$$

A mixed integer programming problem is a linear programming in which only some of the variables are required to be integers, for instance,

$$\text{Maximize } Z = 5x_1 + 6X_1X_2 + 2x_2^2$$

$$\text{Subject to: } 3x_2 + 2x_2^2 \geq 6$$

$$X_1 + x_2 \leq 8$$

$$X_1, x_2 \geq 0$$

Sometimes, it is evident statistically that most decision making problems have multiple objectives that cannot be optimized simultaneously because of

the conflicting nature of the objectives or goals. Goal programming is used to solve programming problems with several objective functions (goals) or constraints (Tanlamai, 2011). The linear problem below represents a goal programming problem, and also represents a non-linear programming problem whereby the program is defined by systems of equalities and inequalities (constraints) with real variables X_1 and X_2 .

$$\text{Maximize } Z = 10X_1 + 5X_2$$

$$\text{Subject to: } 8X_1 + 10X_2 = 10$$

$$4X_1 + 6X_2 \geq 5$$

X_1 X_2 Integers

References

Braaksma, A. J., Meesters, A. J., Klingenberg, W. W., & Hicks, C. C. (2012). A quantitative method for Failure Mode and Effects Analysis. *International Journal Of Production Research*, 50(23), 6904-6917.

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