

Applied Linear Algebra for Data

Linear Programming

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Linear Programming: Examples

Example. A prosthetics and orthotics department produces three types of assistive devices – Ankle Foot Orthosis (AFO), Knee Brace (KB), and Wrist Splint (WB). The production of these products requires three types of resources: metal, plastics and labor. The following table shows the amount of each resource required for fabricating each product. The amount of each of the three resources available for production is limited to 20 units of metal, 30 units of plastic and 25 units of labor. How much of each product $\{x_i\}_{i=1}^3$ should the company produce using the available resources to maximize its productivity. Fractional amount of products are allowed.

Item	Metal	Plastic	Labor
Ankle Foot Orthosis (AFO)	2	4	4
Knee Brace (KB)	4	3	5
Wrist Splint (WS)	1	2	2

Linear Programming: Examples

Example. Five patients with a highly infectious drug resistant infection are admitted to a hospital. The hospital has a set of 4 drugs that can be used to treat the infection, but the amount of benefit/harm caused by each of these drugs is different for each patient. given by the benefit matrix $\mathbf{B} \in \mathbb{R}^{5 \times 4}$, where the b_{ij} terms indicates the amount of benefit (or harm) caused by drug j to patient i (+ve \implies benefit and -ve \implies harm). The hospital has a limited supply of each drug, given by the vector $\boldsymbol{\mu} \in \mathbb{R}^4$. The hospital wants to maximize the total benefit to the patients by choosing the right combination of drugs for each patient. Formulate this as a linear programming problem.