DIET PROBLEM

Dr. Natalia Summerville

Use Case Name	LP/MILP/NLP	Type of Problem	MC?
Backpack packing	MILP	Knapsack	No
Production Optimization	MILP		No
Network Optimization	LP	Shipment	No
School Schedule Optimization	MILP	Scheduling	No
Diet Optimization	MILP	Blending	No

Problem Version 1

The following tables shows the amount of protein and carbs per pound of different food types.

Food Type	Protein	Carbs
Food A	4	15
Food B	8	11
Food C	8	0

The cost per pound of food A, B and C is $5, $15 and $20 respectively. You are required to maintain a diet of at least 20 grams of protein and 10 grams of carbs per meal. How much of each food would you include in a meal to comply with your diet limitations but minimizing your cost?

Vars: #pounds of each food

Obj: min total cost

Const: satisfy nutrients req.

Vars: $Pounds_A$, $Pounds_B$, $Pounds_C$

min $5 Pounds_A + 15 Pounds_B + 20 Pounds_C$

s.t. $4 Pounds_A + 8 Pounds_B + 8 Pounds_C \geq 20$

$15 Pounds_A + 11 Pounds_B \geq 10$

$Pounds_i \geq 0 \quad \forall i$

F in FOODS, N in NUTR✗

Parms:

$cont_{F,N} \quad req_N$

$cost_F$

min $\sum_F cost_F \cdot Pounds_F$

s.t. $\sum_F cont_{F,N} \cdot Pounds_F \geq req_N \quad \forall N$

$Pounds_F \geq 0 \quad \forall F$

Vars: $Pounds_F \quad \forall F$ in FOODS

Parms: $prot_F$

$carb_F$

$cost_F$

min $\sum_F cost_F \cdot Pounds_F$

s.t. $\sum_F prot_F \cdot Pounds_F \geq 20$

$\sum_F carbs_F \cdot Pounds_F \geq 10$

$Pounds_F \geq 0 \quad \forall F$

Problem Version 2

Now scale the problem to 21 food items and 6 nutrients. Use DP_input_xxx.csv files.