

Introduction to Optimization Through the Lens of Data Science Course Exercises



Exercises - Section 1: Lecture 5 – More-complex Binary Modeling - Questions

Suppose there are variables defined as follows:

English	Math	gurobipy
Will the restaurant put	w_i	<pre>w = m.addVars(dishes,</pre>
each dish on its menu?	,	vtype=GRB.BINARY, name="dish")
(1=yes, 0=no)		
		# dishes is the list of dishes
		("burgers", "hotdogs", "fries", etc.)

Fill in the following table with mathematical and gurobipy constraints that match the English constraint.

English	Math	gurobipy
1. If the restaurant has both		
hamburgers and hot dogs on the menu,		
then it must put French fries on the		
menu.		
2. The restaurant can only put French		
fries on the menu if it has either		
hamburgers or hot dogs (or both) on		
the menu.		
3. The restaurant must either (i) have		
steak on the menu, or (ii) have both		
hamburgers and hot dogs on the menu,		
or (iii) both i and ii.		
4. If the restaurant does not have steak		
on the menu, then it must have both		
hamburgers and hot dogs on the menu.		
5. The restaurant cannot have on its		
menu both (i) steak and (ii) hamburgers		
and hot dogs.		
6. The restaurant cannot have on its		
menu both of these pairs: (i) steak and		
fish-and-chips, and (ii) hamburgers and		
hot dogs.		
7. The restaurant must either (i) have		
steak on the menu, or (ii) have both		
hamburgers and hot dogs on the menu,		
but not both i and ii.		
8. The restaurant must have on its		
menu at least two more dishes with a		
lot of protein (steak, hamburgers, hot		



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dogs, baked chicken, fried chicken,	
chicken fingers, chicken soup, fish-and-	
chips) as it has dishes with a lot of	
starch (French fries, fish-and-chips,	
baked potato).	
9. The restaurant must have on its	
menu at least twice as many dishes	
with a lot of protein (steak,	
hamburgers, hot dogs, baked chicken,	
fried chicken, chicken fingers, chicken	
soup, fish and chips) as it has dishes	
with a lot of starch (French fries, fish-	
and-chips, baked potato).	
10. The restaurant must have at least	
two of the following: (i) at least two of	
steak, hamburgers, and hot dogs; (ii) at	
least three of baked chicken, fried	
chicken, chicken fingers, and chicken	
soup; (iii) fish-and-chips.	

NOTES:		

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