

15.S60: Computing in Optimization and Statistics
Homework 6: Introduction to Julia and Linear Programming

IAP 2023

Due: Feb.2, 11:59 pm.

Please submit a jupyter notebook with file name “Lastname_15S60_HW6.ipynb”.

Problem 1: Sudoku

Have you ever played sudoku? Well it was a waste of time because an integer program can solve it for you!

Rules of sudoku: You are given a 9×9 grid with some cells filled with digits 1–9. The goal of the game is to fill in the rest of the cells with digits 1–9 so that:

- Each row contains digits 1–9 exactly once.
- Each column contains digits 1–9 exactly once.
- Each 3×3 block contains digits 1–9 exactly once.

Tasks

1. Formulate an integer program to solve a sudoku puzzle according to the rules of the game.
2. Implement your formulation in Julia with the JuMP package.
3. Validate your formulation using the provided data, which is an instantiation of a game of sudoku. Print your sudoku solution so that each row is on its own line.

Data

The sudoku puzzle inputs are provided in a CSV with the following attributes: Row; Column; Cell value. Note: the data is not a comprehensive solution to the puzzle; it is the starting point.

Submission

Write a solution to the provided puzzle in JuMP with Julia. Note: all code must be in Julia, including any data wrangling. Print the solution to your model so that each of 9 lines contains the full solution to the puzzle. There is no need to visualize your solution in beautiful puzzle format (i.e. creating a grid in a plot) but it will make Kayla happy to see J Submit all code in a Jupyter notebook.

Check your answer

Figure 1 is the puzzle you’ve been given in CSV format, in its initial state and in its solution state. Your final printout is suggested to look like Figure 2. Also, this is the bare minimum of printout beauty. Please feel free to wow me with your Julia Plots prowess. However your solution must be printed somewhere (not in an indigestible PDF format, help me just glance at it and give you full credit lol.

								2
						9	4	
		3						5
	9	2	3		5		7	4
8	4							
	6	7		9	8			
			7		6			
			9				2	
4		8	5			3	6	

6	8	4	1	5	9	7	3	2
7	5	1	8	3	2	9	4	6
9	2	3	6	7	4	1	8	5
1	9	2	3	6	5	8	7	4
8	4	5	2	1	7	6	9	3
3	6	7	4	9	8	2	5	1
2	3	9	7	4	6	5	1	8
5	1	6	9	8	3	4	2	7
4	7	8	5	2	1	3	6	9

Figure 1: Sudoku and solution

```

6 8 4 1 5 9 7 3 2
7 5 1 8 3 2 9 4 6
9 2 3 6 7 4 1 8 5
1 9 2 3 6 5 8 7 4
8 4 5 2 1 7 6 9 3
3 6 7 4 9 8 2 5 1
2 3 9 7 4 6 5 1 8
5 1 6 9 8 3 4 2 7
4 7 8 5 2 1 3 6 9

```

Figure 2: Printing of the solution