Macgyvering with R: Creating a Work Schedule

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The task at hand

5 teaching assistants (TAs)

5 lab sections

Each TA is assigned to teach 1 section

Each TA is asked to identify 3 sections that they are available to teach, but sometimes they provide fewer

Amy Z: B, C, D

Brian Y: C, D, E

Carol X: A, C, E

Daniel W: C, D

Elaine V: B, C, D

Step 1: Create a data frame

Data is entered as a data frame, and the columns representing sections have numeric data types.

Availability is represented as 0 or 1 because these will be used for counting.

	Name	A	B	C	D	E
1	Amy	Z	0	1	1	0
2	Brian	Y	0	0	1	1
3	Carol	X	1	0	1	0
4	Daniel	W	0	0	1	1
5	Elaine	V	0	1	1	1

Step 2: Choose a section to assign

In this step, the column/s with the lowest sum is selected.

In the event that multiple columns are tied for the lowest sum, the leftmost column would be selected.

	Name	A	B	C	D	E
1	Amy Z	0	1	1	1	0
2	Brian Y	0	0	1	1	1
3	Carol X	1	0	1	0	1
4	Daniel W	0	0	1	1	0
5	Elaine V	0	1	1	1	0
6	Sum	1	2	5	4	2

Step 3: Find TAs who are available

In this step, any row/s with a 1 in the selected column is selected.

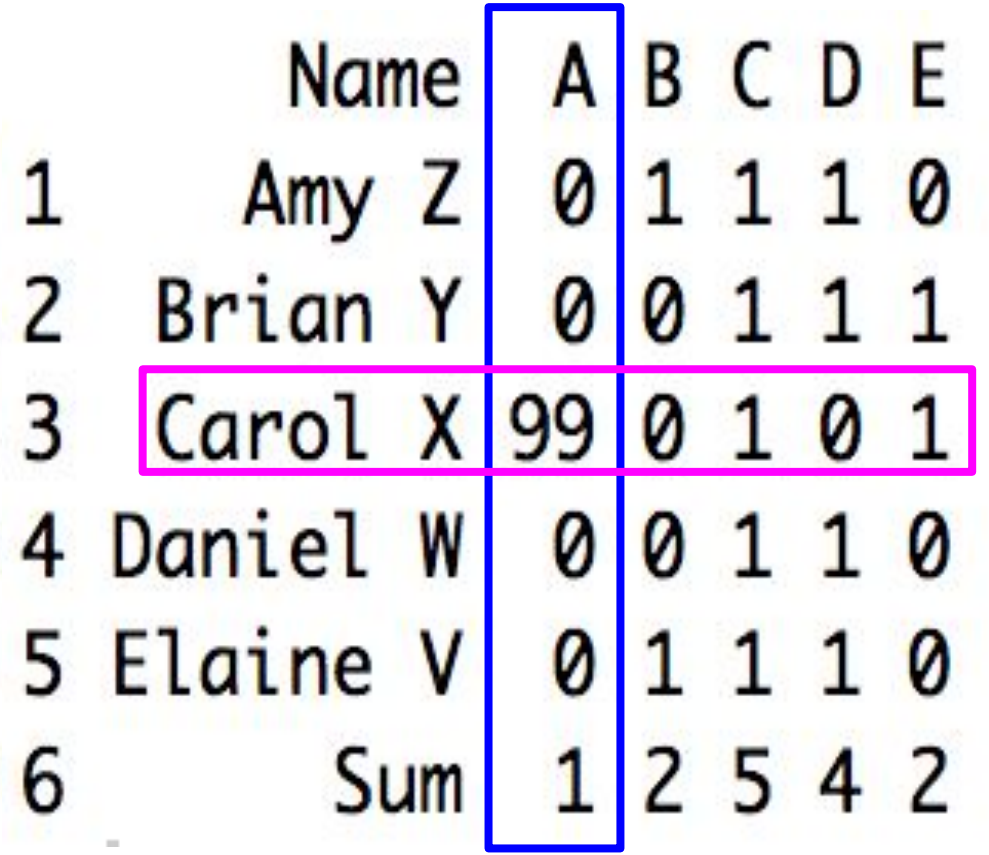
In the event that multiple rows have a 1 in the column, the topmost row would be selected.

	Name	A	B	C	D	E
1	Amy Z	0	1	1	1	0
2	Brian Y	0	0	1	1	1
3	Carol X	1	0	1	0	1
4	Daniel W	0	0	1	1	0
5	Elaine V	0	1	1	1	0
6	Sum	1	2	5	4	2

Step 4: Assign a TA to the section

In this step, the results of Steps 2 and 3 are used to identify and replace an element in the data frame.

A number (99) is used to mark the assignment because the columns need to remain numeric.



	Name	A	B	C	D	E
1	Amy Z	0	1	1	1	0
2	Brian Y	0	0	1	1	1
3	Carol X	99	0	1	0	1
4	Daniel W	0	0	1	1	0
5	Elaine V	0	1	1	1	0
6	Sum	1	2	5	4	2

Step 5: Drop the TA from the schedule

The remaining elements in the selected row and column are changed from 0 or 1 to missing.

This is to allow updated column sums for each loop.

	Name	A	B	C	D	E
1	Amy Z	<NA>	1	1	1	0
2	Brian Y	<NA>	0	1	1	1
3	Carol X	99	<NA>	<NA>	<NA>	<NA>
4	Daniel W	<NA>	0	1	1	0
5	Elaine V	<NA>	1	1	1	0

Step 6: Repeat until all sections have TAs

A FOR loop is used to repeat Steps 2 through 5.

The number of iterations is determined by the number of rows in the data frame.

Two ways to view the final schedule:

```
     Name  A  B  C  D  E section
1   Amy Z NA 99 NA NA NA       B
2 Brian Y NA NA NA NA 99       E
3 Carol X 99 NA NA NA NA       A
4 Daniel W NA NA 99 NA NA      C
5 Elaine V NA NA NA 99 NA      D
```

```
[1] "Assign Amy Z to Section B"
[2] "Assign Brian Y to Section E"
[3] "Assign Carol X to Section A"
[4] "Assign Daniel W to Section C"
[5] "Assign Elaine V to Section D"
```

Next steps in development

1) Identifying an “unsolvable” schedule (e.g., no one chose Section A).

2) Generating useful messages when a schedule is unsolvable (e.g., “Solicit availability for Section A”)

3) Automatically detecting the number of sections/TAs

Thanks!

https://github.com/wendychristensen/ScheduleR

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