Project

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What factors affect the success of groups? Define three factors, e.g., GPA, gender, etc., that you feel affect the contributions that students make towards project success.

The factors that affect the success of group are as below:
1. Class GPA
2. Motivation (1-10 Scale, The lower the value, the higher it effetcs)
3. Previous Experience (1-10 years scale, which affects the scope of understanding of learnings with levels from ease to difficult)

How do the above factors combine to define success? For example, is a person with high GPA the same as one with a more relevant background? Decide on how each of the factors contribute toward your definition of success.

1. Class GPA: It should come as no surprise that having a higher GPA correlates with better academic performance than having a lower GPA.

2. Motivation: In this case, depending on fators like "how many hours willing to work","How interested in attending classes", will prove how succesful as student can be.Highly motivated students will have high success rates.

3. Previous Experience:Though not everyone will have previous experience in the respetive field.The students who are having relevant previous experience in the subject will have advantage in learning and implementation

How will you collect data for these factors? For this assignment, randomly generate sensible data for each of the above three defined factors.

For each of my requests, I made use of the round function to automatically generate random samples. Since this does not necessarily need to be rounded, I used completely random numbers for the first GPA problem. In order to avoid making it complex, I then made the two other factors as whole numbers that follow.

However we can obtain the data of GPA from Institutional Research of specific department. we can obtain data for Motivation from the survey given before the start of programme and data on previous experience can be obtaioned from graduate admissions office.

What are your decision variables?

1. Number of students

2. Number of students per group

What is your objective function?

We will endeavor to maximize the values of the factors for the group's success because each factor has a positive effect on performance. The "GPA" is the Primary factor of the three elements that contribute to the group's success. As a result, the objective function will maximize the GPA's values.

What are your constraints?

Student_Group1: G1S1 +G1S2 +G1S3 +G1S4 +G1S5 +G1S6 +G1S7 +G1S8 +G1S9 +G1S10 +G1S11 +G1S12 = 3;
Student_Group2: G2S1 +G2S2 +G2S3 +G2S4 +G2S5 +G2S6 +G2S7 +G2S8 +G2S9 +G2S10 +G2S11 +G2S12 = 3;
Student_Group3: G3S1 +G3S2 +G3S3 +G3S4 +G3S5 +G3S6 +G3S7 +G3S8 +G3S9 +G3S10 +G3S11 +G3S12 = 3;
Student_Group4: G4S1 +G4S2 +G4S3 +G4S4 +G4S5 +G4S6 +G4S7 +G4S8 +G4S9 +G4S10 +G4S11 +G4S12 = 3;

Student_1: G1S1 +G2S1 +G3S1 +G4S1 = 1;
Student_2: G1S2 +G2S2 +G3S2 +G4S2 = 1;
Student_3: G1S3 +G2S3 +G3S3 +G4S3 = 1;
Student_4: G1S4 +G2S4 +G3S4 +G4S4 = 1;
Student_5: G1S5 +G2S5 +G3S5 +G4S5 = 1;
Student_6: G1S6 +G2S6 +G3S6 +G4S6 = 1;
Student_7: G1S7 +G2S7 +G3S7 +G4S7 = 1;
Student_8: G1S8 +G2S8 +G3S8 +G4S8 = 1;
Student_9: G1S9 +G2S9 +G3S9 +G4S9 = 1;
Student_10: G1S10 +G2S10 +G3S10 +G4S10 = 1;
Student_11: G1S11 +G2S11 +G3S11 +G4S11 = 1;
Student_12: G1S12 +G2S12 +G3S12 +G4S12 = 1;

Group1_GPA: 3.70G1S1+1.58G1S2+1.82G1S3+3.83G1S4+0.97G1S5+1.96G1S6+1.16G1S7+1.94G1S8+2.70G1S9+ 2.58G1S10+3.96G1S11+3.21G1S12 >= 2.45;
Group2_GPA: 3.70G2S1+1.58G2S2+1.82G2S3+3.83G2S4+0.97G2S5+1.96G2S6+1.16G2S7+1.94G2S8+2.70G2S9+ 2.58G2S10+3.96G2S11+3.21G2S12 >= 2.45;
Group3_GPA: 3.70G3S1+1.58G3S2+1.82G3S3+3.83G3S4+0.97G3S5+1.96G3S6+1.16G3S7+1.94G3S8+2.70G3S9+ 2.58G3S10+3.96G3S11+3.21G3S12 >= 2.45;
Group4_GPA: 3.70G4S1+1.58G4S2+1.82G4S3+3.83G4S4+0.97G4S5+1.96G4S6+1.16G4S7+1.94G4S8+2.70G4S9+ 2.58G4S10+3.96G4S11+3.21G4S12 >= 2.45;

Group1_Mot: 10G1S1+5G1S2+3G1S3+6G1S4+10G1S5+3G1S6+6G1S7+3G1S8+5G1S9+10G1S10+3G1S11+6G1S12 >= 5.83;
Group2_Mot: 10G2S1+5G2S2+3G2S3+6G2S4+10G2S5+3G2S6+6G2S7+3G2S8+5G2S9+10G2S10+3G2S11+6G2S12 >= 5.83;

Group3_Mot: 10G3S1+5G3S2+3G3S3+6G3S4+10G3S5+3G3S6+6G3S7+3G3S8+5G3S9+10G3S10+3G3S11+6G3S12
>= 5.83;

Group4_Mot: 10G4S1+5G4S2+3G4S3+6G4S4+10G4S5+3G4S6+6G4S7+3G4S8+5G4S9+10G4S10+3G4S11+6G4S12
>= 5.83;

Group1_Exp: 7G1S1+8G1S2+5G1S3+2G1S4+2G1S5+3G1S6+5G1S7+5G1S8+7G1S9+2G1S10+4G1S11+9G1S12
>= 4.91;

Group2_Exp: 7G2S1+8G2S2+5G2S3+2G2S4+2G2S5+3G2S6+5G2S7+5G2S8+7G2S9+2G2S10+4G2S11+9G2S12
>= 4.91;

Group3_Exp: 7G3S1+8G3S2+5G3S3+2G3S4+2G3S5+3G3S6+5G3S7+5G3S8+7G3S9+2G3S10+4G3S11+9G3S12
>= 4.91;

Group4_Exp: 7G4S1+8G4S2+5G4S3+2G4S4+2G4S5+3G4S6+5G4S7+5G4S8+7G4S9+2G4S10+4G4S11+9G4S12
>= 4.91;

Here variables are taken as GiSJ where i=1-4 and J=1-12.
For example G1S1 means group 1 student 1

```
round(runif(12, min = 0, max = 4), 2)
```

```
## [1] 2.06 0.67 3.26 1.30 2.44 1.44 2.49 0.27 3.88 1.37 2.39 0.48
```

The values obtained for GPA for each student from above function are as below(random everytime) Values:(3.70, 1.58, 1.82, 3.83, 0.97, 1.96, 1.16, 1.94, 2.70, 2.58, 3.96, 3.21)

```
round(runif(12, min = 0, max = 10), 0)
```

```
## [1]  1  9  9  3  9  7  2  6 10  9  4  8
```

The values obtained for Motivation for each student from above function are as below(random everytime)
Values:(10, 5, 3, 6, 10, 3, 6, 3, 5, 10, 3, 6)

```
round(runif(12, min = 0, max = 10), 0)
```

```
## [1] 8 6 8 7 6 9 2 5 3 6 7 5
```

The values obtained for Previous Experience for each student from above function are as below(random
everytime) Values:(7, 8, 5, 2, 2, 3, 5, 5, 7, 2, 4, 9)

Taking into account all three factors, a total score would be calculated. In this case, the GPA would be
standardized by dividing it by four, and the motivation would be standardized by dividing it by 10. After
that, a weighted average would be calculated, with weights assigned based on how important each factor is
to success. The GPA has a weight of.5, and previous experience and motivation are.3 and.2. The utilized
data frame is displayed below.

```
library(dplyr)
```

```
##
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:stats':
##
##     filter, lag
```

```
## The following objects are masked from 'package:base':
##
##      intersect, setdiff, setequal, union

Data_tab <- data.frame("Student_Name" = c(1:12), "GPA" = c(3.70, 1.58, 1.82, 3.83, 0.97, 1.96, 1.16,
1.94, 2.70, 2.58, 3.96, 3.21),
"Motivation" = c(10,  5,  3,  6, 10,  3,  6,  3,  5,
                 10,  3,  6),
"Experience" = c(7, 8, 5, 2, 2, 3, 5, 5, 7, 2, 4, 9))
Data_val <- mutate(Data_tab, "combi" = (((GPA/4)*.5) + ((Motivation/10)*.3) + (Experience *.2)))
View(Data_val)
```

#Motivation - In order to ensure that each group has high level of motivation, a constraint was added that each team must have value greater than or equal to average value i.e 5.83

#Experience - In order to ensure that each group has optimum level of motivation, a constraint was added that each team must have value greater the or equal to average value i.e 4.91

#G.P.A: In order to attempt a fair distrubtion of knowledge in related topics, every group had to have a combined G.P.A greater than or equal 2.45 average GPA

```
library(lpSolveAPI)
Stu_Grp <- read.lp("C:/Users/lavak/Documents/Qmm/Project_QMM/lsaripud_F.lp")
solve(Stu_Grp)
```

```
## [1] 0
```

```
get.objective(Stu_Grp)
```

```
## [1] 29.41
```

```
get.variables(Stu_Grp)
```

```
##  [1] 0 1 0 0 1 0 1 0 0 0 0 0 0 0 0 1 0 0 0 0 1 0 0 0 1 0 0 0 0 0 1 0 0 0 1 1 0 1 0
## [39] 0 1 0 0 0 0 1 0 0 0
```

```
get.constraints(Stu_Grp)
```

```
##  [1]  3.00  3.00  3.00  3.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00
## [13]  1.00  1.00  1.00  1.00  3.71  6.97  8.50 10.23 21.00 12.00 16.00 21.00
## [25] 15.00 19.00  9.00 16.00
```

```
#Optimal Groups based on output below:
#Group1:Student 2, Student 5, Student 7
#Group2:Student 3, Student 8, Student 12
#Group3:Student 6, Student 10, Student 11
#Group4:Student 1, Student 4, Student 9
```