QMM FINAL PROJECT

Group 1

2022-12-09

Random data Creation

```
library(randomNames)
```

```
## Warning: package 'randomNames' was built under R version 4.2.2
```

```
set.seed(12345)
GPA <- sample(1:4, 12,replace = TRUE)


Experience<-sample(0:6, 12,replace = TRUE)

Presentation_skills<-sample(1:10, 12,replace = TRUE)
Students<-c(1,2,3,4,5,6,7,8,9,10,11,12)
```

Here success of student is assumed to be **success=(0.5*GPA+0.3*Experience+0.2*Presentation_skills)**

Created Data

```
set.seed(12345)
student_data<-data.frame(Students,GPA,Experience,Presentation_skills)

student_data$success<-with(student_data,0.5*GPA+0.3*Experience+0.2*Presentation_skills)

student_data
```

```
##    Students GPA Experience Presentation_skills success
## 1         1   2          5                   4     3.3
## 2         2   3          2                   8     3.7
## 3         3   4          5                  10     5.5
## 4         4   2          6                   3     3.4
## 5         5   4          5                   9     5.3
## 6         6   4          1                   4     3.1
## 7         7   2          0                  10     3.0
## 8         8   1          6                   7     3.7
## 9         9   3          5                   2     3.4
## 10       10   4          5                   4     4.3
## 11       11   4          0                   9     3.8
## 12       12   2          3                   9     3.7
```

Constraints and Assumptions used:

- Since we need 4 groups with equal success, our objective is to maximize one group success and apply a constraint where all groups success ratio is equal.
- Each group can have only 3 members.
- Total GPA of group should be atleast 5
- Total Experience of group should be atleast 5
- Total Skill rating of group should be atleast 11
- Assuming all decision variables are binary

Importing LP File

```
library(lpSolveAPI)
y <-read.lp("GA_DATA.lp")
print(y)
```

```
## Model name:
##   a linear program with 48 decision variables and 31 constraints
```

We can see that there are 48 decision variables with 31 constraints in the LP model

Decision Variables= X_{ij}

where i= 1,2,3,4 Groups

j=1,2,3,4,5,6,7,8,9,10,11,12 Students

Solving LP

```
set.seed(2345)
solve(y)
```

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

```
Assignment <- get.variables(y)
```

Output after solving LP

```
# Objective maximisation
get.objective(y)
```

```
## [1] 9.5
```

```r
# Constraints
get.constraints(y)
```

```
##  [1] -0.1 -0.2 -0.1  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.0
## [16]  3.0  3.0  3.0  3.0  7.0 11.0  9.0  5.0  8.0  5.0 10.0 13.0 18.0 13.0 11.0
## [31] 16.0
```

```r
#decision variables
a<-matrix(Assignment,nrow=12,byrow=F)
colnames(a)<-c('Group 1','Group 2','Group 3','Group 4')
rownames(a)<-student_data$Students
a
```

```
##    Group 1 Group 2 Group 3 Group 4
## 1        0       0       0       1
## 2        0       1       0       0
## 3        0       1       0       0
## 4        1       0       0       0
## 5        0       0       1       0
## 6        0       0       0       1
## 7        1       0       0       0
## 8        0       0       1       0
## 9        0       1       0       0
## 10       0       0       1       0
## 11       0       0       0       1
## 12       1       0       0       0
```

- **Group1 students - 4,7,12**
- **Group2 Students - 2,3,9**
- **Group3 Students - 5,8,10**
- **Group4 Students - 1,6,11**