Eindopdracht Optimization

Mohammed Al Hor

2023-06-04

## Exercise 1 MIP formulation

# a. Formulate the problem as a mixed integer linear programming (MIP) model.

Binary decision variables: - : Indicates whether project is assigned to employee . - : Indicates whether project is scheduled before project .

Continuous decision variables: - : Tardiness of project . - : Finishing time of project .

Objective function:

Constraints:

Brief description of the constraints:

(1): Tardiness must be greater than or equal to the difference between the finishing time and the deadline for each project j.

(2): Tardiness must be non-negative for each project j.

(3): The finishing time of project j must be greater than or equal to the duration of project j if it is scheduled before project k for each project j and k.

(4): The finishing time of project j must be greater than or equal to the finishing time of project i plus the duration of project j if project i is directly before j and assigned to the same employee, considering a large constant MM to enforce the condition.

(5): If project i is scheduled before project j, then project j cannot be scheduled before project i.

(6): Transitivity constraint that enforces the ordering of projects. If project i is scheduled before project j and project j is scheduled before project k, then project i must be scheduled before project k.

(7): Each project j must be assigned to exactly one employee.

(8): Ranges of the decision variables ​ and ​ as binary.

# b. Implement the model in R and solve the small instance with the Gurobi solver. Report the assignment and order of the projects, the finishing times, as well as the optimal objective value.

rm(list = ls())  
suppressPackageStartupMessages(library(dplyr, quietly = TRUE))   
suppressPackageStartupMessages(library(ROI))

## Warning: package 'ROI' was built under R version 4.2.3

library(magrittr)

## Warning: package 'magrittr' was built under R version 4.2.3

library(ompr)

## Warning: package 'ompr' was built under R version 4.2.3

library(ompr.roi)

## Warning: package 'ompr.roi' was built under R version 4.2.3

library(ROI.plugin.gurobi)  
source("readInstance.R")  
source("printVector.R")

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When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:

summary(cars)

## speed dist   
## Min. : 4.0 Min. : 2.00   
## 1st Qu.:12.0 1st Qu.: 26.00   
## Median :15.0 Median : 36.00   
## Mean :15.4 Mean : 42.98   
## 3rd Qu.:19.0 3rd Qu.: 56.00   
## Max. :25.0 Max. :120.00

## Including Plots

You can also embed plots, for example:



Note that the echo = FALSE parameter was added to the code chunk to prevent printing of the R code that generated the plot.