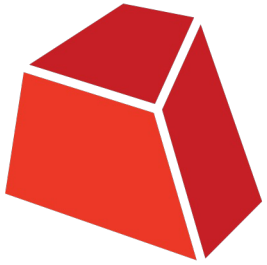

GUROBI
OPTIMIZATION

Installation Guide

Gurobi Optimizer

- Gurobi Optimizer is a solver for mathematical programming, where users can build and solve optimization problems much faster.
- The function **`sps`** in R package **`spsR`** uses an internal CVXR optimization, with a default solver “ECOS_BB”.
- Users can choose “GUROBI” as a solver to run **`sps`** much faster as long as they obtain the license and install the Gurobi software.

Registration

- Go to https://portal.gurobi.com/iam/register
- Create an account or sign-in
- Make sure to use your university email account

Request Academic License

- Go to User Portal > Licenses > Request
- Click Named-User Academic > Generate Now
  - Academic Domain Error means you're not under a university network
  - To access Gurobi outside of university network (recommended):
    - Request license via email at license@gurobi.com or Gurobi Support
    - Provide the following information:
      - Your academic profile information (i.e., email, institution, position, department)
      - A copy of academic ID or a link to your profile on the institution's website
  - Once approved, the license key will be automatically generated in your account

License Activation

- Go to User Portal > Licenses
- Copy the license key
- Activate license by pasting the key into Terminal/Command Prompt

Software Installation

- Go to User Portal > Downloads
- Check installation path
  - By default, the software is installed in Library (for Mac) or C:\ (for Windows)
  - Copy the full path to R package

R Package Installation

- Open R Studio
  - `install.packages([path to Gurobi R package], repos = NULL)`
  - `install.packages("slam", repos = "https://cloud.r-project.org")`
- Check for successful installation
  - `library(gurobi)`
  - Run the code from https://www.gurobi.com/documentation/current/examples/mip_r.html

R Package Installation

```
# Copyright 2024, Gurobi Optimization, LLC #

# This example formulates and solves the following simple MIP model:
# maximize
# x + y + 2 z
# subject to
# x + 2 y + 3 z <= 4
# x + y >= 1
# x, y, z binary
library(gurobi)
model <- list()
model$A <- matrix(c(1,2,3,1,1,0), nrow=2, ncol=3, byrow=T)
model$obj <- c(1,1,2)
model$modelsense <- 'max’
model$rhs <- c(4,1)
model$sense <- c('<', '>’)
model$vtype <- 'B’
params <- list(OutputFlag=0)
result <- gurobi(model, params) print('Solution:’)
print(result$objval)
print(result$x)
```

Use Gurobi in spsR

- Open R Studio
  - **`library(spsR)`**
  - **`library(gurobi)`**
- In **`sps`**, include **`solver = "GUROBI"`**

Use Gurobi in spsR

```
library(gurobi)
library(spsR)

data(X_Imm)
head(X_Imm)

var_cont <- c(”GDP”, “Unemployment”, “Immigration”, “Female”, “Age”, “Education”, “Immig_Support”)
X_Imm(, var_cont) ,- scale(X_Imm[, var_cont])

out <- sps(X = X_Imm,
           N_s = 3,
           solver = “GUROBI”,
           num_iter = 1e6)

out$selected_sites
```

Thanks for watching!

- Helpful Links:
  - Official Guide to R Installation
  - Official Guide to Academic License