

National Cheng Kung University

Modular Course 2020 Summer Program

最佳化決策之實作與應用

Practices and Applications for Optimal Decision Making

Instructor

Affiliation

Graduation (Ph.d.)

王逸琳

NCKU

Department of Industrial and Information Management

Georgia Institute of Technology

Course Type

Course Credit

Student Size (Maximum)

Notice

Lecture

1

30

Each student should use his/her own computer.

Student Background

Students from all college are welcome.

Format of The Course

Lecture 65% , Presentation 10% , Workshop 25%

Grading Policy

Quiz and Exam 60% , Presentation 40%

We will have in-class quiz every day (around 10-15min at most), and two reports which require coding in python to call GuRoBi functions. More details are as follows:

1. In the first day, we will have a quiz (8%) to check whether a student can use python and GuRoBi to code and run a simple linear programming example.
2. In day 2-5, the lecturer will give at least one in-class quiz every day, to test the course taught in previous days and that day. (each quiz is around 8% of the grade. The precise percentage will be announced in class.)
3. In day 6 (Sat), we will hold an 1-hr on-line exam (20%) on moodle.
4. There are 2 reports (20% each):
 - (i) one is to solve (model/implement python code) a given problem, upload your codes/report to moodle by Sat. 11pm.

the other is to design a problem of your own (with python code and report), upload them to moodle by Sun. 11pm

Code of Conduct for The Course

This course requires each student to use the optimization software GuRobi and python language. Each student should use his/her own computer, install Anaconda/GuRobi/Python in advance. The course is very intense (will have a quiz to test whether one can use GuRoBi and python in the 2nd day; will have at least 2 coding assignments that require a student to), so it is not suitable for those who are unfamiliar with python coding or without a computer.

Course Description

People make decisions all the time, yet optimal decisions are often difficult to make, mostly due to numerous choices with consideration on many inter-related factors. In this course, we focus on the decision-making problems whose factors can be quantified. By correctly defining the decision

National Cheng Kung University

Modular Course 2020 Summer Program

variables, we will learn how to build a mathematical programming model that includes an objective function to achieve and constraints to follow. The purpose of this course is to provide students with the tools and knowledge necessary to model practical optimization problems. We will see how to properly formulate a decision-making problem, and how to solve practical real-world applications with state-of-the-art solvers.

Timetable and Syllabus

Period	Timetable	Syllabus
8/24(MON)	9:00-12:35	Introduction to some applications of optimal decision making problems, and how to use the software GuRoBi by python to solve them.
8/25(TUE)	9:00-12:35	Basics of the mathematical properties and theorems behind linear programming (LP) and integer programming (IP).
8/26(WED)	9:00-12:35	Techniques to make LP and IP models
8/27(THU)	9:00-12:35	IP modeling Practices (I): facility location, logistics network flows
8/28(FRI)	9:00-12:40	IP modeling Practices (I): scheduling, routing problems

Goal of The Course

1. To understand the basics of the mathematics behind the mathematical models and solution methods for solving an optimization decision making problem.
2. To learn how to solve an optimization decision making problem by computer language (python/julia) and software (GuRoBi).

The Importance, Cross-Over Disciplinary and Contemporary of The Curriculum

Optimal decision making problems appear often as some real-world applications in the fields of Engineering, Management, and Science. How to make the decision in a scientific way is the main theme of this course, where we will learn how to define decision variables, how to derive constraints and objective functions, and how to solve them by computer programs.

Remarks

This course requires each students to use the optimization software GuRobi and python language. Each student should use his/her own computer, install Anaconda/Gurobi/Python in advance. The course is very intense (will have a quiz to test whether one can use GuRoBi and python in the 2nd day; will have at least 2 coding assignments that require a student to), so it is not suitable for those who unfamiliar with python coding or without a computer.

References:

Model Building in Mathematical Programming, by H. Paul Williams, 5th Edition 2013, Wiley