VIETNAM NATIONAL UNIVERSITY, HO CHI MINH CITY
UNIVERSITY OF TECHNOLOGY
FACULTY OF COMPUTER SCIENCE AND ENGINEERING

MATHEMATICAL MODELING (CO2011)

Assignment (Semester: 231, Duration: 06 weeks)

"Stochastic Programming and Applications"

(Version 0.1, in Preparation)

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HO CHI MINH CITY, OCTOBER 2023

Contents

1 Abstract

When you have a problem that requires you to find the optimal solution to a goal, while taking into account the limitations of your resources and the trade-offs of your choices, you may have a **linear programming problem**. This type of problem can be expressed using linear functions of some variables for both the goal and the limitations. Linear programming problems are very useful for modeling many practical situations in different fields, such as:

- A farmer who wants to maximize the profit from planting crops, while considering the available land, water, seeds, and fertilizer.

- A manufacturer who wants to minimize the cost of producing goods, while meeting the demand and quality standards of the customers.

- A transportation company who wants to optimize the routes and schedules of its vehicles, while reducing the fuel consumption and travel time.

In this report, we will introduce the basic concepts of ...

2 Introduction to Stochastic Programming and Optimization

2.1 What is Stochastic Programming?

An optimization problem is said to be a **stochastic program** if it satisfies the following properties:

1. There is a unique objective function.

2. Whenever a decision variable appears in either the objective function or one of the constraint functions, it must appear only as a power term with an exponent of **1**, possibly multiplied by a constant.

3. No term in the objective function or in any of the constraints can contain products of the decision variables.

4. The coefficients of the decision variables in the objective function and each constraint are **_probabilistic_** in nature.

5. The decision variables are permitted to assume fractional as well as integer values.

These properties ensure, among other things, that the effect of any decision variable is proportional to its value.

2.2 Basic concepts, assumptions - Motivation

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2.3 Bonus exercises

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3 Probabilty

3.1 Problem 1

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3.2 Problem 2

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3.3 Bonus exercises

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4 Graph

4.1 Problem 1

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4.2 Problem 2

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4.3 Bonus exercises

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5 Member list & Workload

No.	Fullname	Student ID	Problems	Percentage of work
1	Trần Đình Đăng Khoa	2211649	- Relation & Counting: 1, 2, 3 Bonus: 1, 2, 3. - Probability: 1, 2, 3.	30%
2	Trần Đặng Hiển Long	2252449	- Relation & Counting: 4, 5, 6 Bonus: 4, 5, 6. - Graph: 1, 2, 3, Bonus: 1, 2, 3.	20%
3	Nguyễn Hồ Phi Ưng	2252897	- Relation & Counting: 7, 8, 9 Bonus: 7, 8, 9. - Probability: 4, 5, 6.	20%
4	Nguyễn Hồ Đức An	2252009	- Relation & Counting: 10, 11, 12 Bonus: 10, 11, 12. - Graph: 4, 5, 6, Bonus: 4, 5, 6.	20%
5	Vũ Minh Quân	2212828	- Relation & Counting: 13, 14, 15 Bonus: 13, 14, 15. - Probability: 7, 8, 9.	10%

References

[1] Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein. *Introduction to Algorithms.* The MIT Press, 2022.

[2] Frank R. Giordano, William P. Fox, and Steven B. Horton. *A First Course in Mathematical Modeling.* Cengage Learning, 2013.