Université Jean Monnet

Optimization and Operational Research

Practical Session Report

Constrained Optimization

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Abstract

This document represents a report on the outcomings of a practical session in the optimization and operational research course. The goal of this practical session is to formulate some realistic problems as optimization problems and use the AMPL software to solve them.

1 Introduction

During studying mathematical optimization and constrained problems, it is natural to seek software to be able to solve real-world optimization problems in a practical and specialized technique. Thus, we use AMPL in our solution through out this report to solve the provided problems in the practical session PDF document.

In order to run our implementation, only a free-demo of the AMPL's IDE software solution is enough accompanied with our files available on the GitHub repository in the following link:
`https://github.com/Sabrout/Constraint-Optimization-AMPL`

To run our code, follow the following steps by executing them in the AMPL console:

1. Load the model file corresponding to the problem number by typing `model <filename>;`
2. Load the data file corresponding to the problem number by typing `data <filename>;` (if applicable)
3. Solve the current problem by typing `solve;`
4. View the solution by typing `display <Variable Name>`

2 Unconstrained optimization

2.1 Problem 1

2.2 Problem 2

2.3 Problem 3

3 Modeling constrained problems

3.1 Water resources

3.2 Good-smelling perfume design

3.3 Roadway expenses

3.3.1 Rural/Urban case

3.3.2 General case

3.4 Design you own optimization problem

4 Data Analysis

5 Sections

Use section and subsection commands to organize your document. LaTeX handles all the formatting and numbering automatically. Use ref and label commands for cross-references.

5.1 Comments

Comments can be added to the margins of the document using the todo command, as shown in the example on the right. You can also add inline comments too:

This is an inline comment.

Here's a comment in the margin!

Figure 1: This is a figure caption.

Item	Quantity
Widgets	42
Gadgets	13

Table 1: An example table.

5.2 Tables and Figures

Use the table and tabular commands for basic tables — see Table 1, for example. You can upload a figure (JPEG, PNG or PDF) using the files menu. To include it in your document, use the includegraphics command as in the code for Figure 1 below.

5.3 Mathematics

LaTeX is great at typesetting mathematics. Let $X_1, X_2, \ldots, X_n$ be a sequence of independent and identically distributed random variables with $\mathrm{E}[X_i] = \mu$ and $\mathrm{Var}[X_i] = \sigma^2 < \infty$, and let

$$S_n = \frac{X_1 + X_2 + \cdots + X_n}{n} = \frac{1}{n}\sum_{i}^{n} X_i$$

denote their mean. Then as n approaches infinity, the random variables $\sqrt{n}(S_n - \mu)$ converge in distribution to a normal $\mathcal{N}(0, \sigma^2)$.

5.4 Lists

You can make lists with automatic numbering ...

1. Like this,
2. and like this.

... or bullet points ...

- Like this,
- and like this.

We hope you find writeLaTeX useful, and please let us know if you have any feedback using the help menu above.