Optimization Technique And Advances

Home Care problems
Bachelor of Technology
in
Computer Science And Engineering

Submitted by

Group 13

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Contents

Chapter **Page**

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CERTIFICATE

This is to certify that this project submitted by Group-13 of A2 batch in requirement of Optimization Technique And Advances course of Computer Science Engineering,is a bonafide record of work carried out by them at the Department of Computer Science Engineering, The LNM Institute of Information Technology, Jaipur, (Rajasthan) India, during the 3rd semester under my supervision and guidance and the same has not been submitted elsewhere .

_____ _____

Date Dr.Jayaprakash Kar

ACKNOWLEDGEMENTS

This project of ours would not have been a success without the helping hands of our fellow friends and patient mentors. We would like to thank a few of them for their selfless work with us. First and foremost, we would like to express our gratitude towards our mentor and distinguished faculty Dr.Jayaprakash Kar who had been a continuou support since the inception of the project. Also, we would like to thank our some friends and batchmates who always helped us whenever we were stuck anywhere.

INTRODUCTION

What is Home Care?

Home care includes any professional support services that allow a person to live safely in their home. In-home care services can help someone who is aging and needs assistance to live independently; is managing chronic health issues; is recovering from a medical setback; or has special needs or a disability. Professional caregivers such as nurses, aides, and therapists provide short-term or long-term care in the home, depending on a person's needs.
Home care can be the key to achieving the highest quality of life possible. It can enable safety, security, and increased independence; it can ease management of an ongoing medical condition; it can help avoid unnecessary hospitalization; it can aid with recovery after an illness, injury, or hospital stay—all through care given in the comfort and familiarity of home. Home care can include:

- Help with daily activities such as dressing and bathing
- Assistance with safely managing tasks around the house
- Companionship
- Therapy and rehabilitative services
- Short- or long-term nursing care for an illness, disease, or disability—including tracheostomy and ventilator care

About Homecare Problem

By providing care to patients in their home, we can reduce the hospitalisation costs, improve the patient’s quality of life (thus impacting them socially in addition to giving them economic advantage).This is focussed at optimizing the life expectancy of patient who receive home care. We aim to minimize the cost of treatment.

In this problem, a patient has been prescribed by the doctor to go through two treatment therapies namely therapy 1 and therapy 2 for his treatment from home. Each therapy needs medicines of two types say medicine A and medicine B. Using these medicine reduces the risk factor by some percentage . The patient can afford to pay only Rs.60,000 for Therapy 1 and Rs. 71,000 for Therapy 2 and needs to go through at least 28 hours of Therapy 1 and 70 hours of Therapy 2. Based on this optimize life expectancy, number of caretakers and total number of hours of therapy required per day.

Problem Statement 1.

A patient needs to go through two therapies for his treatment from home as prescribed by his doctor. Therapy needs medicines of two types say medicine A and medicine B. Using these medicine reduces the risk factor by some percentage data given in the table.Total life expectancy is the sum of expectancy by Medicine A and Medicine B. Maximize the total life expectancy.

	Percentage of risk reduction factor by Medicine A.	Percentage of risk reduction factor by Medicine B.	Average Life Expectancy
Therapy 1	1.8	2.5	0.90
Therapy 2	1.3	2.4	0.95

Formulation:

Let Z_1 : Life expectancy by medicine A.
Z_2 : Life expectancy by medicine B.

Optimization function:

Max $Z = Z_1 + Z_2$
Subject to :
$1.8Z_1 + 2.5Z_2 <= 0.90$
$1.3Z_1 + 2.4Z_2 <= 0.95$
$0 <= Z_1 <= 1$
$0 <= Z_2 <= 1$

Name of Method Used: Linear Programming

Code :

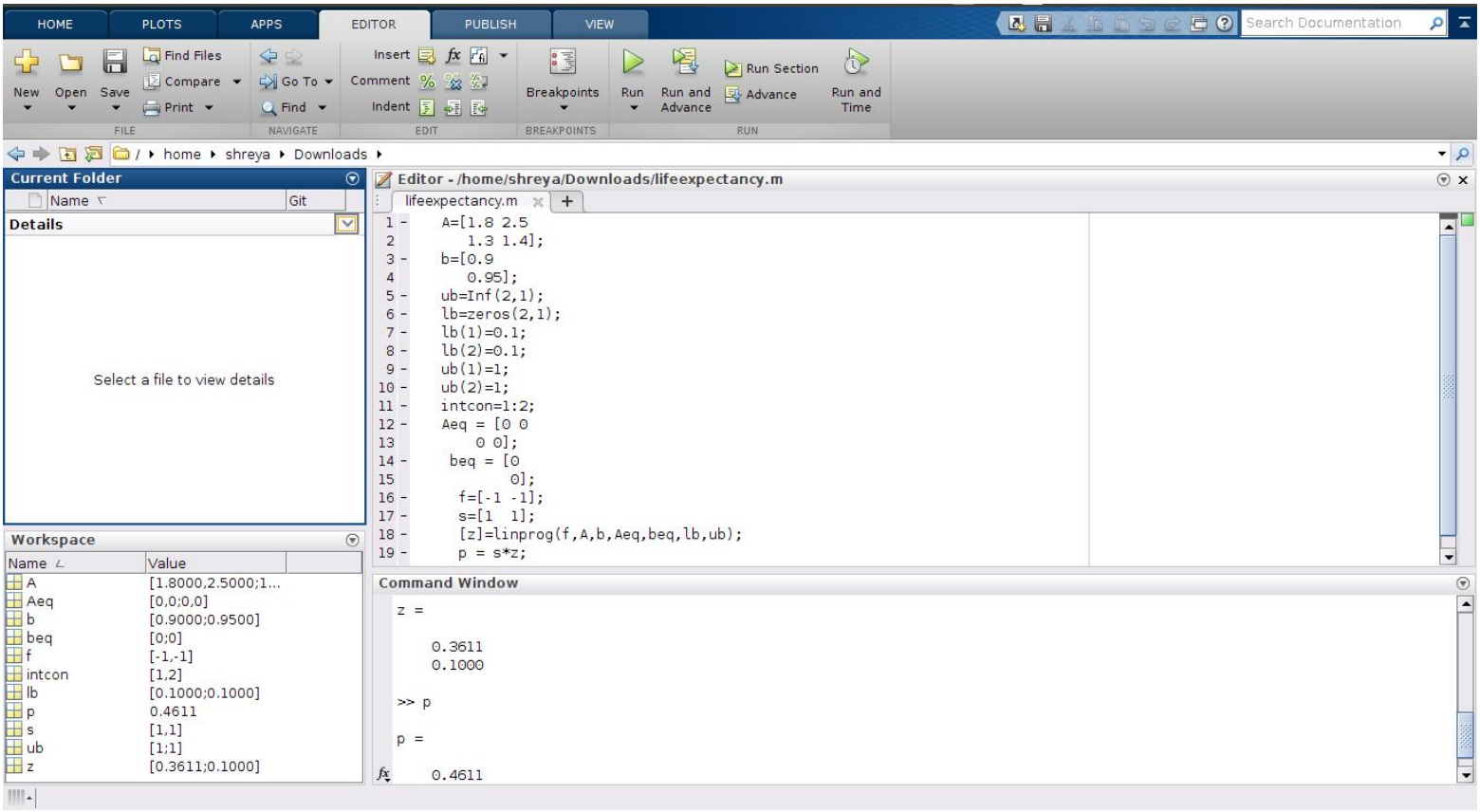
```
A = [1.8   2.5
     1.3   1.4];
B = [0.9
      0.95];
ub = Inf(2,1);
lb = zeros(2,1);
lb(1) = 0.1;
lb(2) = 0.1;
ub(1) = 1;
ub(2) = 1;
intcon=1:2;
Aeq = [0  0
         0  0];
 beq = [0
          0];
  f  =  [-1   -1];
  p = [1    1];
  [z] = linprog(f,A,b,Aeq,beq,lb,ub);
```

Result :

Z_1=0.3611

Z_2=0.1

p=0.461



Problem Statement 2.

Patient can afford to pay only Rs.60,000 for Therapy 1 and Rs. 7 1,000 for Therapy 2.

Minimize the number of caretaker needed. The number of caretakers of Agency 1 should be atleast 1.5 times more than the number of caretakers of Agency 2 .Find out the number of caretakers needed from each agency in order to minimize the total number of caretaker needed.

	Caretaker charges of Agency 1	Caretaker charges of Agency 2	Max. amount patient can afford
Therapy 1	4,000	5,000	60,000
Therapy 2	6,000	3,700	71,000

Formulation:

Let X_1 : No. of caretakers of Agency 1
X_2 : No. of caretakers of agency 2

Optimization function : Minimize $Z = X_1 + X_2$

Subject to :

$4000X_1 + 5000X_2 <= 60,000$

$6000X_1 + 3700X_2 <= 71,000$

$1 <= X_1 <= 10$

$1 <= X_2 <= 12$

$2X_1 - 3X_2 >= 0$

Name of Method : Integer Programming

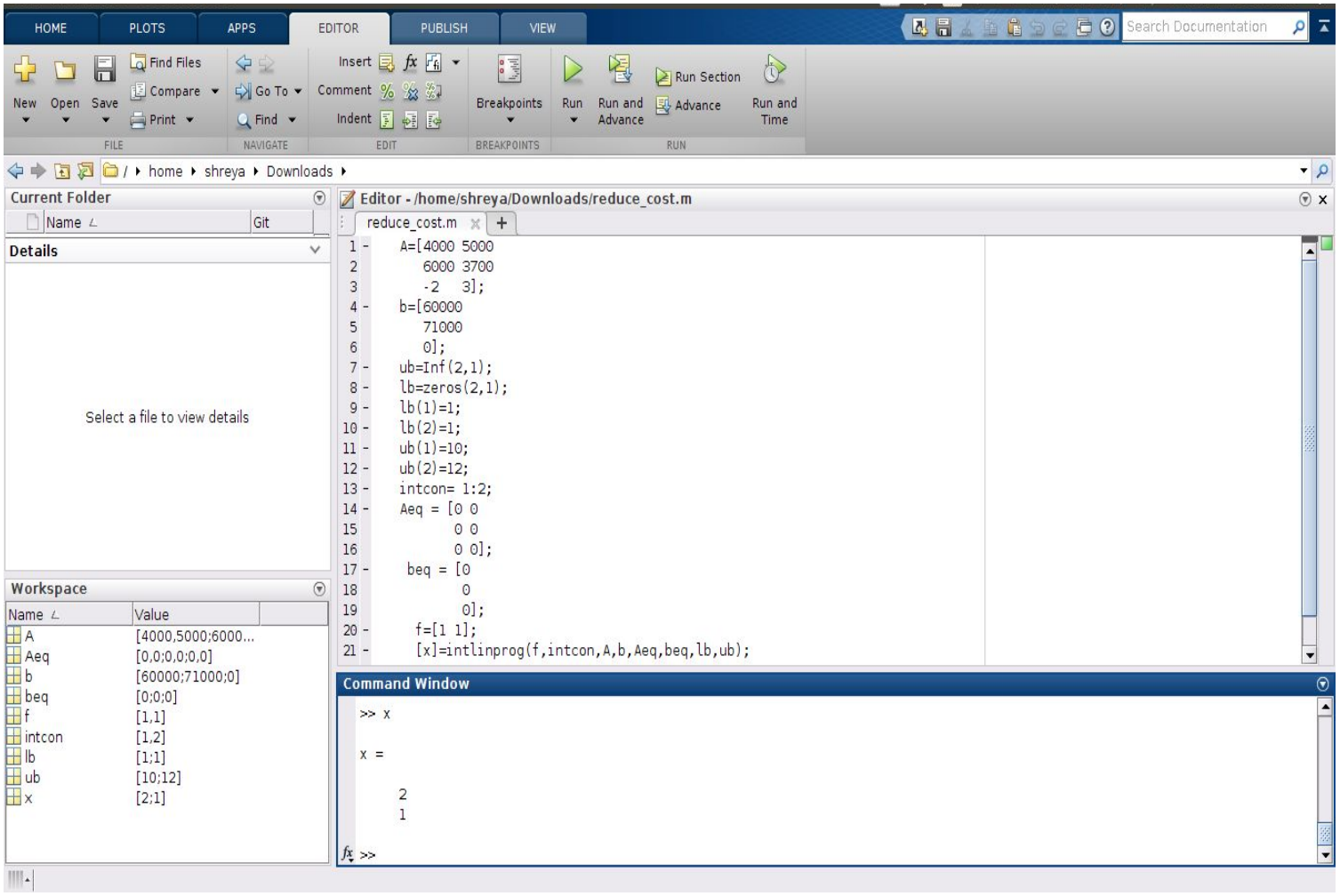
Code :

```
A=[4000    5000
   6000    3700
   -2        3];
 b=[60000
    71000
        0];
 ub = Inf(2,1);
 lb = zeros(2,1);
 lb(1) = 1;
 lb(2) = 1;
 ub(1) = 10;
 ub(2) = 12;
 Intcon = 1:2;
 Aeq = [0   0
        0   0
        0   0];
  beq = [0
         0
         0];
  f = [1   1];
  [x] = intlinprog(f,intcon,A,b,Aeq,beq,lb,ub);
```

Result :

X_1=2

X_2=1



Problem Statement 3.

The patient needs to go through at least 28 hours of Therapy 1 and 70 hours of Therapy 2 in a week.Minimize the total number of hours the patient has to go through a therapy in a day.

	Caretaker A (day/week)	Caretaker B (day/week)	Total time that can be spent on therapies (hours/week)
Therapy 1	4	5	28
Therapy 2	3	4	70

Formulation:

Let Y_1 : Number of hours per day caretaker 1 does a therapy

Y_2 : Number of hours per day caretaker 2 does a therapy

Optimization function:

Min Z = Y_1 + Y_2

Subject to :

$4Y_1 + 5Y_2 >= 28$

$3Y_1 + 4Y_2 >= 70$

$1 <= Y_1 <= 12$

$1 <= Y_2 <= 12$

Name of Method : Integer Programming

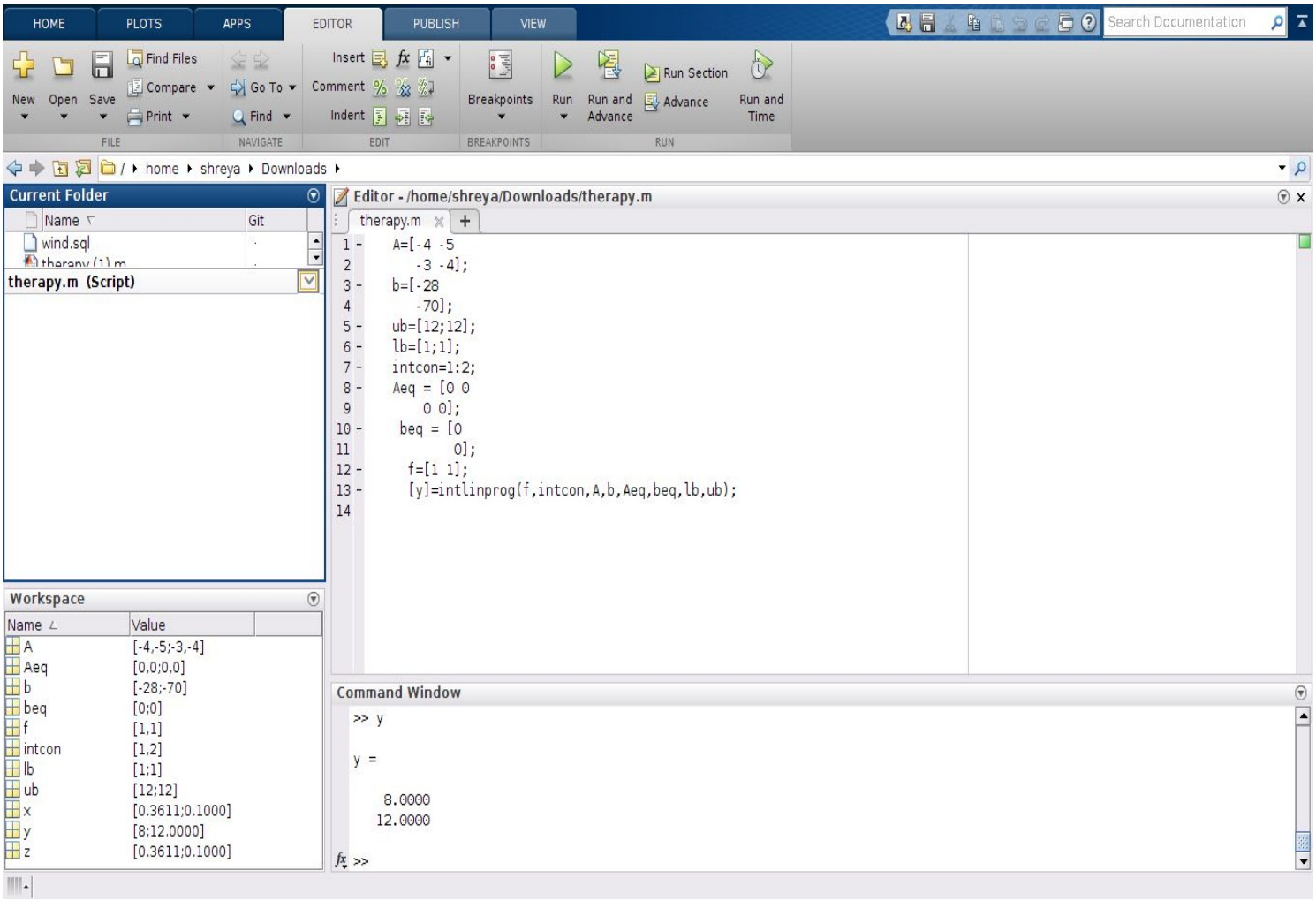
Code :

```
A=[-4   -5
    -3   -4];
b=[-28
    -70];
ub = [12;12];
lb = [1;1];
intcon=1:2;
Aeq = [0    0
          0    0];
 beq = [0
           0];
  f =  [1    1];
  [y] = intlinprog(f,intcon,A,b,Aeq,beq,lb,ub);
```

Result :

Y_1=8

Y_2=12


HOME
PLOTS
APPS
EDITOR
PUBLISH
VIEW
Search Documentation
New
Open
Save
Find Files
Compare
Print
Go To
Find
Insert
Comment
Indent
Breakpoints
Run
Run and Advance
Run Section
Advance
Run and Time
FILE
NAVIGATE
EDIT
BREAKPOINTS
RUN
/ ▸ home ▸ shreya ▸ Downloads ▸
Current Folder
Name
Git
wind.sql
therapy.m (Script)
Editor - /home/shreya/Downloads/therapy.m
therapy.m
1 - A=[-4 -5
2 -3 -4];
3 - b=[-28
4 -70];
5 - ub=[12;12];
6 - lb=[1;1];
7 - intcon=1:2;
8 - Aeq = [0 0
9 0 0];
10 - beq = [0
11 0];
12 - f=[1 1];
13 - [y]=intlinprog(f,intcon,A,b,Aeq,beq,lb,ub);
14
Workspace
Name
Value
A [-4,-5;-3,-4]
Aeq [0,0;0,0]
b [-28;-70]
beq [0;0]
f [1,1]
intcon [1,2]
lb [1;1]
ub [12;12]
x [0.3611;0.1000]
y [8;12.0000]
z [0.3611;0.1000]
Command Window
>> y
y =
8.0000
12.0000
fx >>

Conclusion

1. The total life expectancy after therapy is 0.4611.
2. The optimum number of the caretaker needed for caretaker agency 1 is 2 and for caretaker agency 2 is 1.
3. The total hours per day of each therapist required are 8 and 12 respectively.

Working Contribution :

- ❑ Problem definition : Kajol Choudhary (16ucs224), Rakshita Porwal(16ucs153), Parul Shandilya(16ucs126), Priyansi Singh(16ucs143), Shreya Chawla(16ucs176), Shreyansh Jain(16ucs177)
- ❑ Formulation : Kajol Choudhary (16ucs224), Rakshita Porwal(16ucs153), Parul Shandilya(16ucs126), Priyansi Singh(16ucs143), Shreya Chawla(16ucs176), Shreyansh Jain(16ucs177)
- ❑ Source Code : Kajol Choudhary (16ucs224), Rakshita Porwal(16ucs153), Parul Shandilya(16ucs126), Priyansi Singh(16ucs143), Shreya Chawla(16ucs176), Shreyansh Jain(16ucs177)
- ❑ Report layout : Kajol Choudhary (16ucs224), Rakshita Porwal(16ucs153), Parul Shandilya(16ucs126), Priyansi Singh(16ucs143), Shreya Chawla(16ucs176), Shreyansh Jain(16ucs177)