Using GA
To solve bank lending problem

A guide by Erfan Varedi

What is the problem

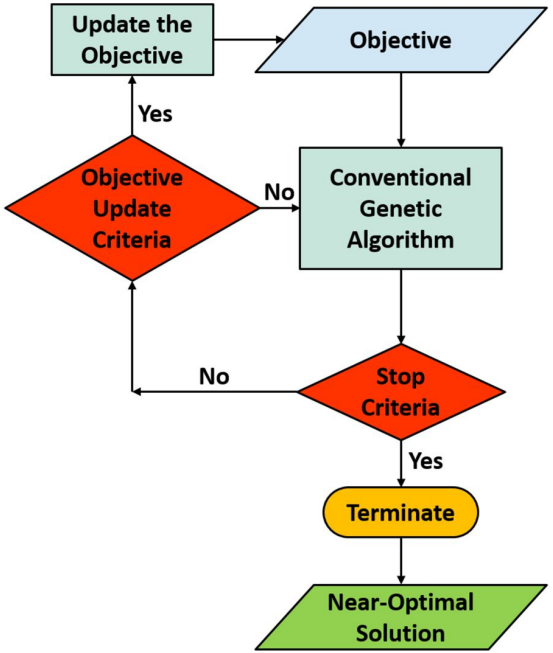
The main contribution of this paper is the creation of a GA model that facilitates how banks would make an efficient decision in case of a cut back on lending supply when faced with a liquidity shock, while staying focus on the main objective of bank profit maximization

What is GA going to solve

The main focus of the GA model is two-fold:

A- to stabilize systemically banks while achieving maximum profit

B- to establish the capital base so that banks would increase lending efficiently

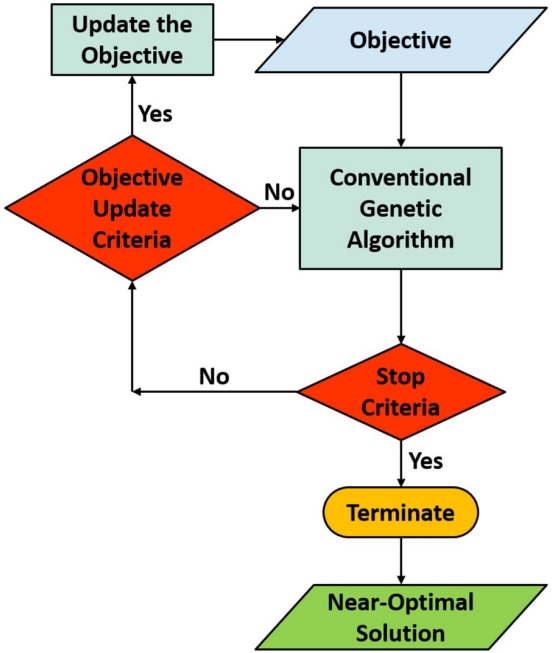


What was my problem

SO the request of bringing dataset of this problem has been sent to authors but they have NOT respond me

:(

Consequently, i have been forced to create random dataset.



1. Introduction

➔ **Problem Variables**

Describe the main vars of problem containimg main aspect

➔ **Variables Detail**

Clarify the main vars detail

➔ **Algorithm**

Explain the Algorithm and how it works

➔ **Results**

Provide result of the problem

Problem Variables

A- CUSTOMER

B- BANK

C- RESULT OBJECT

Tip

In this section we are going to describe the main vars and in the next section we discuss about other vars

;)

CUSTOMER!

ID

LOAN_AGE ,LOAN_SIZE , LOAN_TYPE

CREDIT_RATING, CREDIT_LIMIT

'ID', 'Loan Age', 'Loan Size', 'Loan Type', 'Credit Rating', 'Credit Limit'

BANKS!

LOAN INTEREST RATE ,EXPECTED LOAN LOSS

DEPOSIT RATE, RESERVE RATIO

TRANSACTION COST

['Loan Interest Rate', 'Expected Loan Loss', 'Deposit Rate', 'Reserve Ratio', 'Transaction Cost']

RESULTS!

M% P% A%

D POP_SIZE

AAA% AA% A% BBB% BB%

ACCEPTED CUSTOMERSGENERATION_SIZE

```
['M%', 'P%', 'A%', 'D', 'POP_SIZE', 'AAA%', 'AA%', 'A%', 'BBB%', 'BB%', 'ACCEPTED_CUSTOMERS',
    'GENERATION_SIZE']
```

LETS GO INTRO

CUSTOMER

VARIABLES

Tip

Clarifying the customer vars and its equations

:)

V [Loan Revenue]

$$\vartheta = \sum_{i=0}^{n} (r_L L - \lambda)$$

Mue [Loan cost]

$$\mu = \sum_{i=0}^{n} L\delta$$

W_bar [Total transaction cost]

$$\varpi = \sum_{i=0}^{n} r_L T$$

Others

Beta	N
rD	rT
Landa	D
rL	K
T	gama

FITNESS FUNCTION

$$F_x = \vartheta + \varpi - \beta - \sum_{i=0}^{n} \lambda$$

Category Loan Size

Category	value
Micro	0-13k
Small	13k-50k
Medium	50k-100k
Large	100k-250k

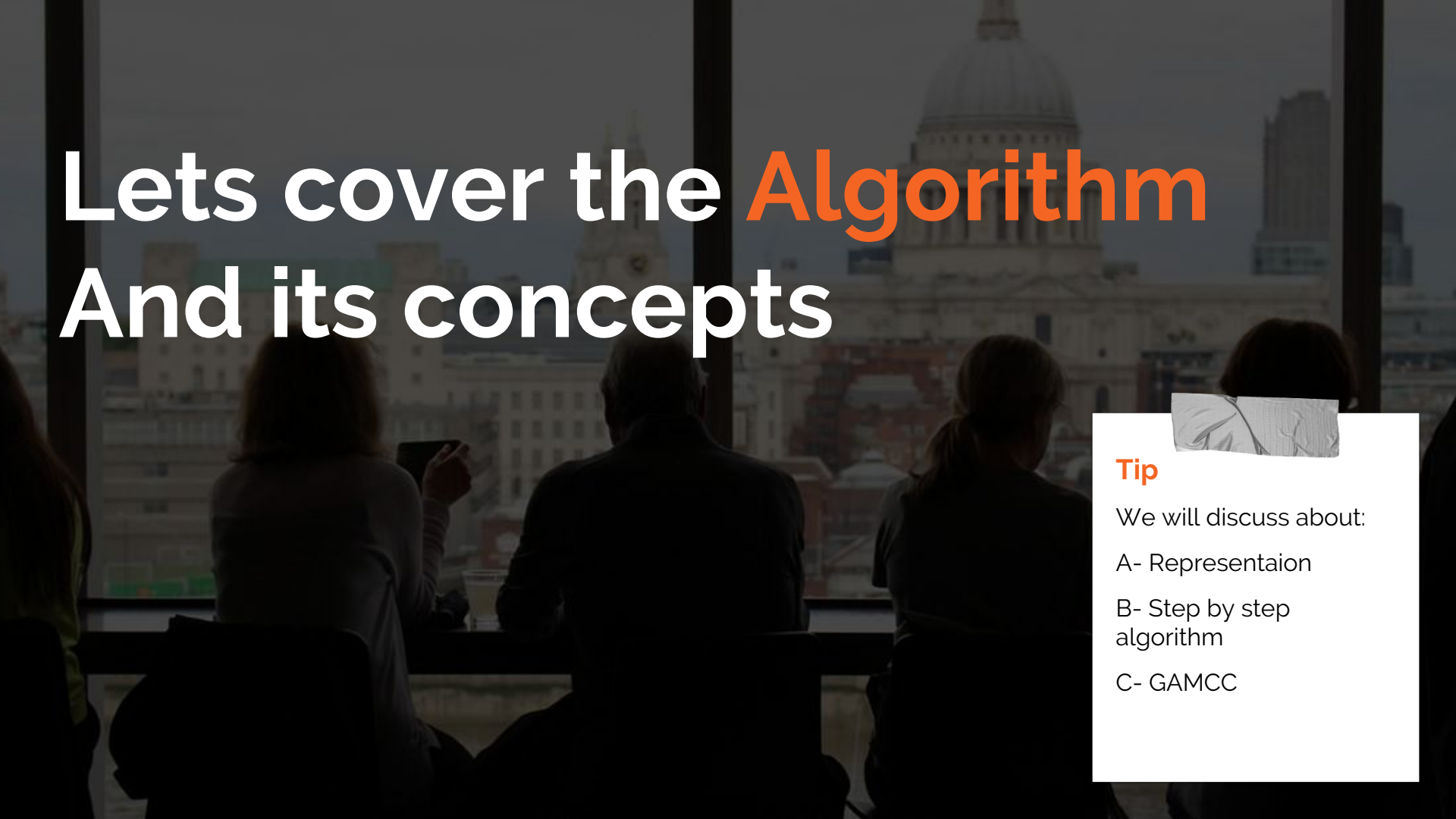
Category Loan Age

Category	value
1	1-3
2	3-5
3	5-10
4	10-20

Category Credit Rating

Category	value
AAA	$0.0002 \leq \lambda \leq 0.0003$
AA	$0.0003 \leq \lambda \leq 0.001$
A	$0.001 \leq \lambda \leq 0.0024$
BBB	$0.0024 \leq \lambda \leq 0.0058$
BB	$0.0058 \leq \lambda \leq 0.0119$

Lets cover the Algorithm And its concepts



Tip

We will discuss about:

A- Representaion

B- Step by step algorithm

C- GAMCC

REPRESENTATION!

N: Customer size

1: Customer has been elected

Algorithm!

1- init population
    1.1 - GAMCC

2- Reproduction

3- XOver
    3.1 - one-point
    3.2 - point will be selected in range(0, customer_size)
    3.3 - for binary chromo
    3.4 - p_xover = 0.8

4- Mutation
    4.1 - p_mute = 0.006
    4.2 - randomly reverse a gene on chromo

And it is GENERATIONAL

GAMCC!

1- init population
    1.1 - GAMCC
    1.2 - p_i

2 - Validating

3 - In each generation

Benefits of this solution

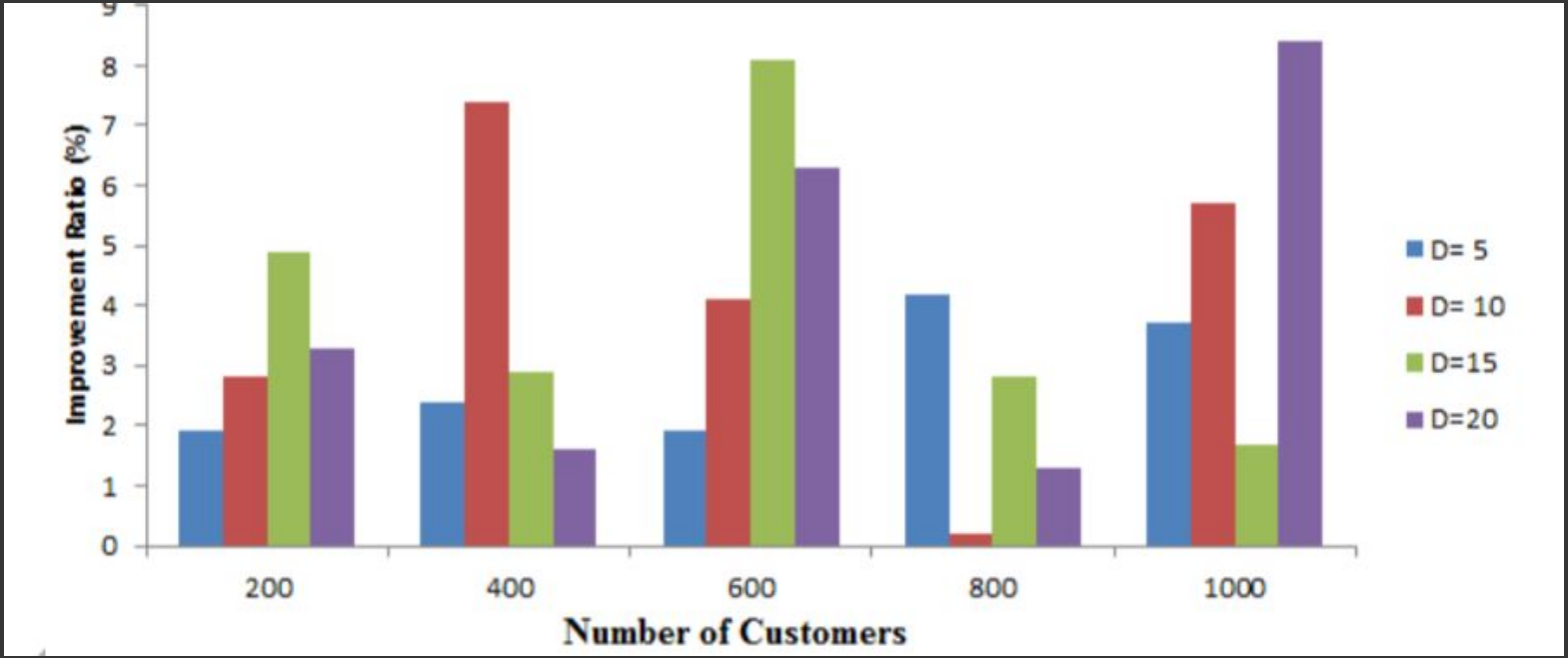
Find the best Solution better than TLP

Traditional linear programming

Best soultions which has more benefits for banks

Based on customer resume and portfolio

Results


Improvement Ratio (%)
0
1
2
3
4
5
6
7
8
200
400
600
800
1000
Number of Customers
D= 5
D= 10
D=15
D=20

Results By My custom Dataset

	AAA%	AA%	A%	BBB%	BB%	ACCEPTED_CUSTOMERS
0	0	0	0	0	0	3.0
1	0	0	0	33	0	3.0
2	33	0	0	33	0	3.0
3	0	0	0	0	0	1.0
4	25	0	0	25	0	4.0
5	20	0	0	0	0	5.0

Results By My custom Dataset

	M%	P%	LA%	ACCEPTED_CUSTOMERS
0	66	33	0	3.0
1	33	66	0	3.0
2	33	66	0	3.0
3	100	0	0	1.0
4	25	50	0	4.0
5	20	80	0	5.0