

# A Recommender system Based on Interactive Evolutionary Computation



**SEAL**

Sungkyunkwan Evolutionary Algorithm Lab

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# Introduction

# What is This ?

In daily life...



I'm wondering  
which one is **BEST** for me?

It is hard to **make decision**.  
Is there any one who **help** me?

*Recommender System* said...

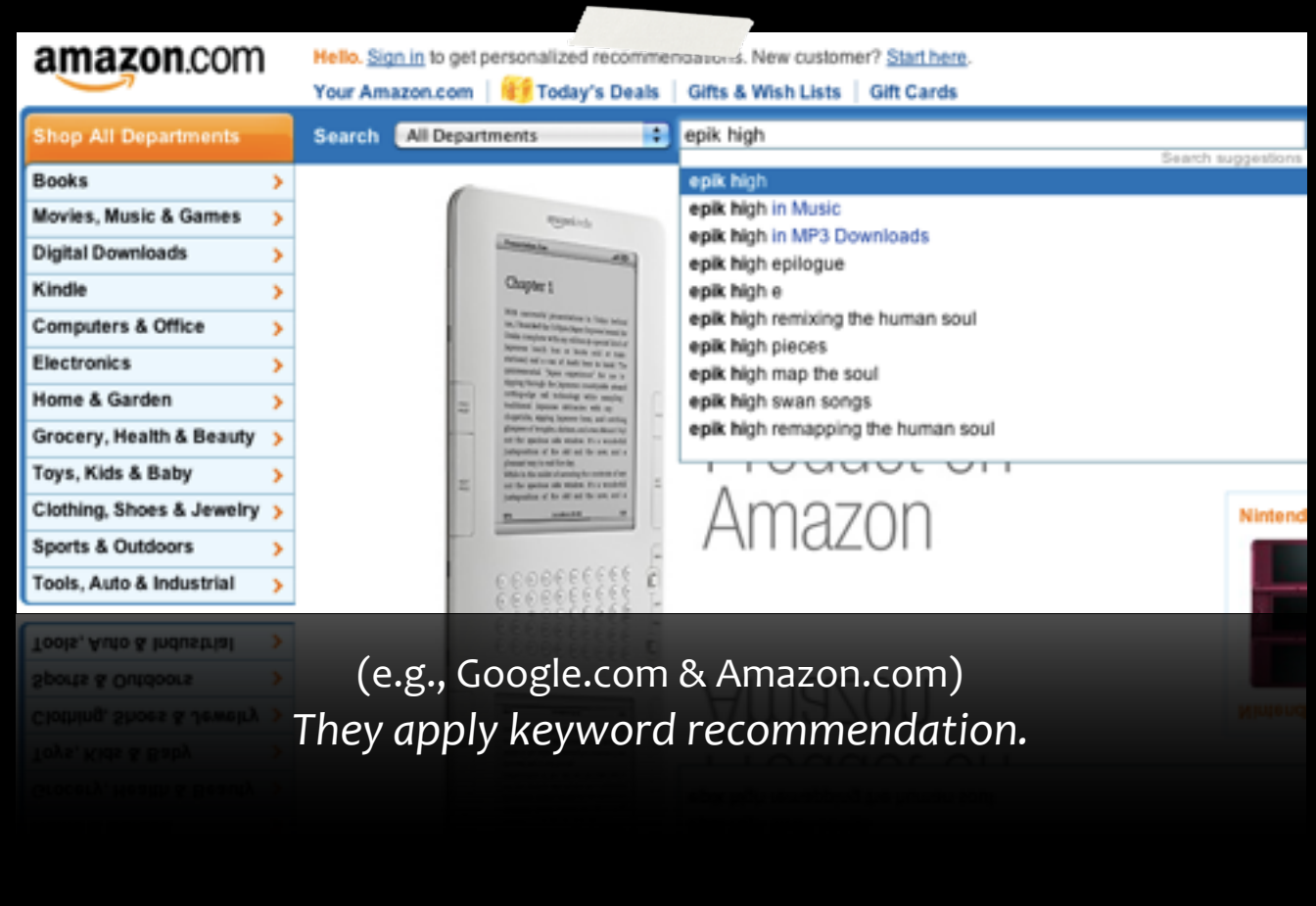
Don't worry! I can help you.

# What is This ?

## Recommender System

This System's Purpose is that

- ▶ recognizes **user's preference**
- ▶ recommends items that are **interesting** and **useful** to user.



(e.g., Google.com & Amazon.com)  
They apply keyword recommendation.

# System Overview

# System Overview

Purpose of the system

## Motivations

- ▶ Using mechanism of **genetic inheritance** for individuals (e.g., music tracks)
- ▶ Is it possible ?

The offsprings are inherited **parent's properties**.

In other words,  
the offsprings may have some properties that user likes.

# System Overview

Structure of the system

Our Proposed System are composed 3 Phases.

## 1) Preprocessing

Initialize  
Population

Feature Extraction

Data Grouping

## 2) User Evaluation

Update List

Item List



Song Name	Artist	Duration
Just For Me	Al Green	3:58
You're Got The Love I Need (Pt. 1)	Al Green	4:24
Hey Now (Live)	Al Green	4:25
What More Do You Want From Me	Al Green	4:25
Take Your Time (Pt. 1) - Can't Be	Al Green	4:27
Too Much	Al Green	3:50
Stay With Me (By The Sea) (Pt. 1)	Al Green	3:23
Let's Head	Al Green	3:42
It's Not About You	Al Green	4:10
Wondering In The Rain	Al Green	3:59
You're The Inspiration	Chicago	3:48
If You Leave Me Now (Live 2005)	Chicago	4:24
Hard To Say I'm Sorry (Live)	Chicago	3:28
Here In My Heart	Chicago	4:24
I Call On Me	Chicago	4:09
Colour My World	Chicago	3:59
Just You 'n' Me	Chicago	3:40
After The Love Has Gone (Live)	Chicago	5:18

Evaluation

Human (subjective)

## 3) Interactive EC

Generate  
New Population

Content-Filtering

Genetic Operators



# System Overview

Process of the system

- 1) Preprocessing
- 2) User Evaluation
- 3) Interactive EC



Music Objects



CLAM\*\*



Musical Feature  
Extraction Tool



Initial Individuals

Number	Artist	Title	<i>Extracted Features</i>
28	Casiopea	Looking Up	

1) general features

Tempo	Pitch	Octave	Root	Mode
0.01132	0.04032...	0.02032...	0.74032...	0.12932...

2) profile matching features

Desc	Simil
0.11142...	0.04332...

3) grouping features

# Experiment

# Experiment

In the previous work

In the previous work, we tried to perform the experiment on the web-site.

► <http://arkii.skku.edu:8080/mrs/>

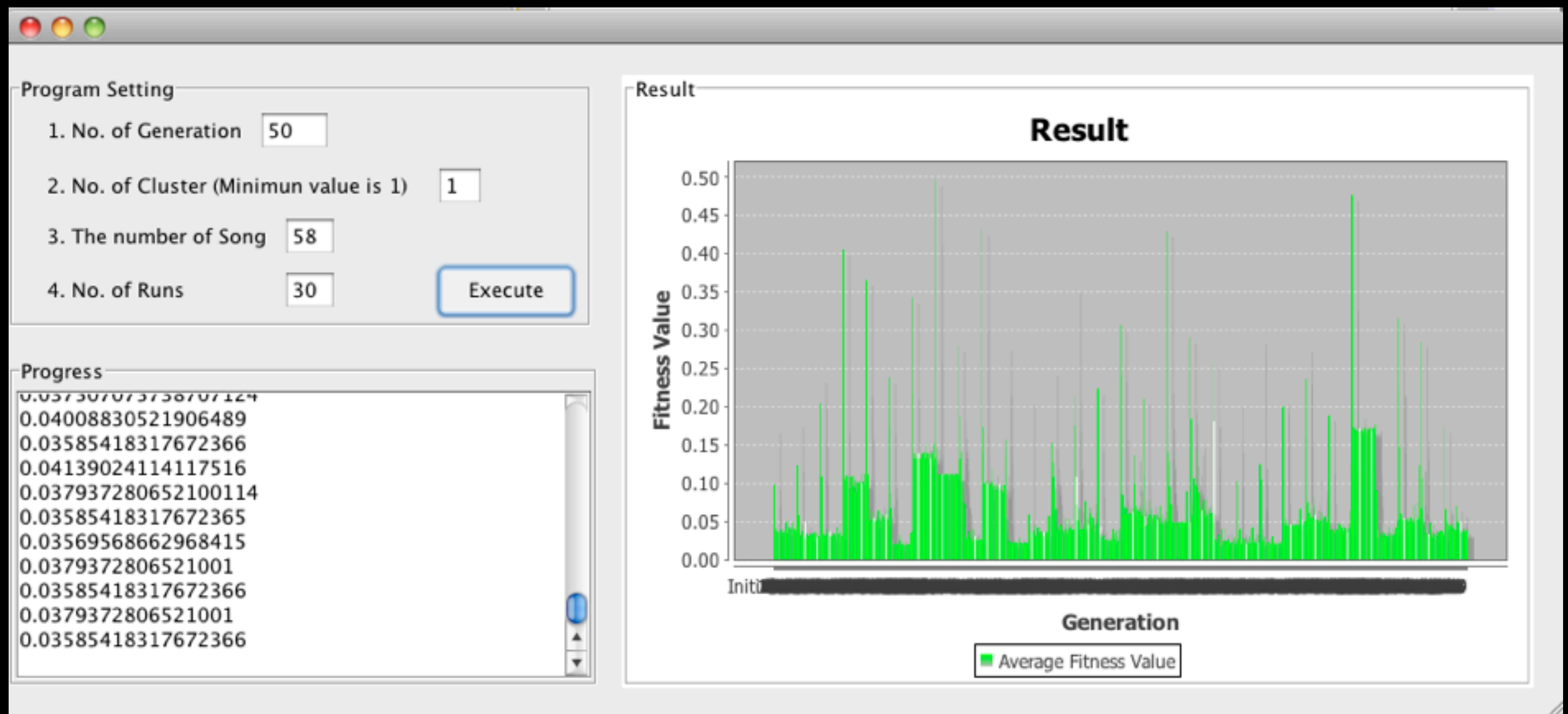
No	Artist Name	Song Title	Rating	Listen
25	Lyn	My love (Feat. MC Mong)	★ ★ ★ ★ ★	
34	K.Will	Love 119 (Feat. MC Mong)	★ ★ ★ ★ ★	
55	Someday	Did you know that?	★ ★ ★ ★ ★	
78	Super Junior	Sorry Sorry	★ ★ ★ ★ ★	
3	Big Bang	Day by day	★ ★ ★ ★ ★	
67	4 Minuate	Muzik	★ ★ ★ ★ ★	
9	After School	Diva	★ ★ ★ ★ ★	
13	Dynamic Duo	Beyond The Wall	★ ★ ★ ★ ★	
25	SG Wannabe	I love you	★ ★ ★ ★ ★	
11	Kara	Hoeny	★ ★ ★ ★ ★	
				Go Next

The experiment website (In the previous work)

# Experiment

The test agent

The test agent has developed for the experiment.



The test agent for experiment

# Experiment

Test Case #1

## The experimental condition

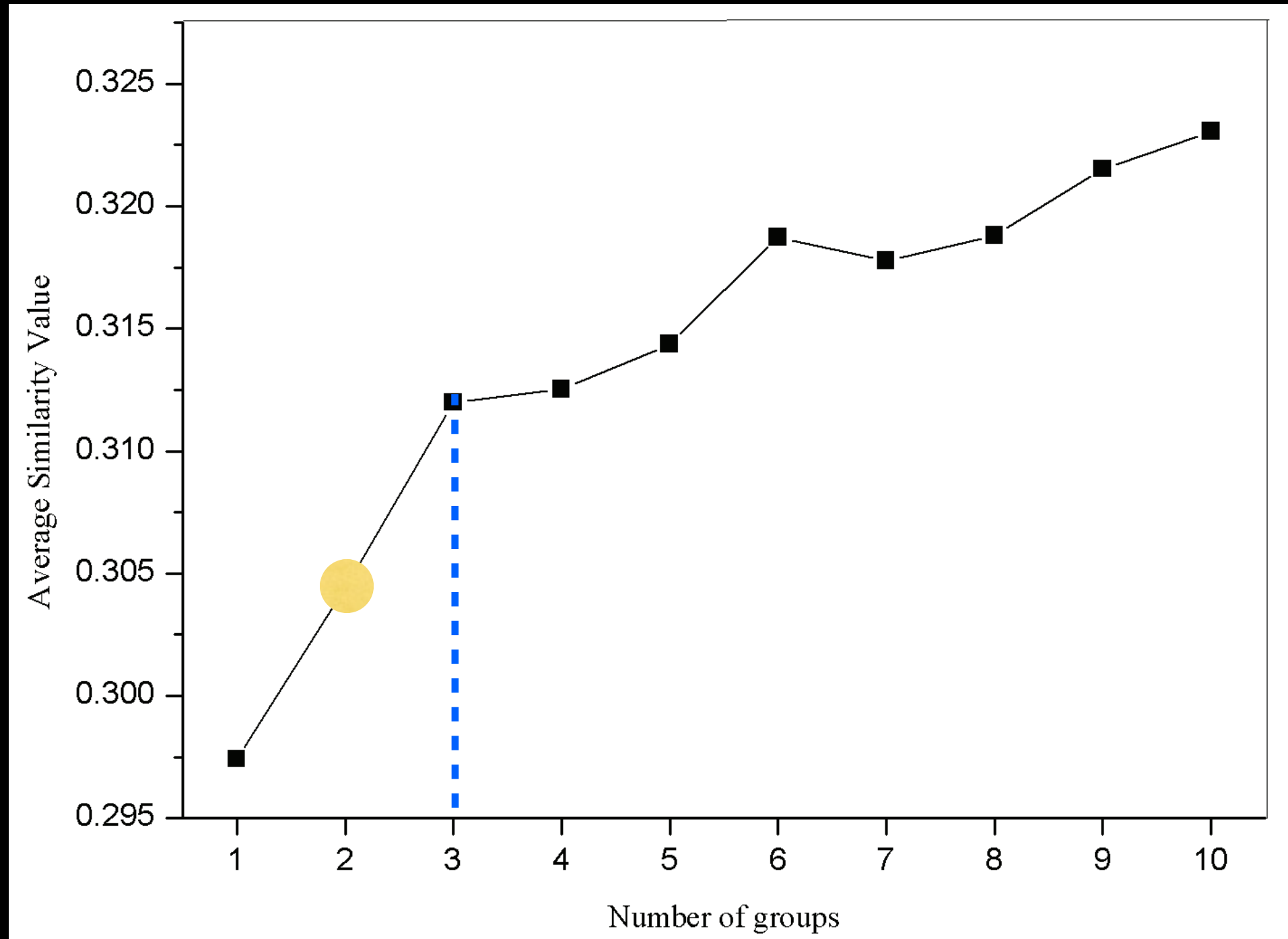
- ▶ 400 music tracks
- ▶ A list contains 10 items (i.e., music tracks)
- ▶ Run 100 times and 50 lists
- ▶ Num. of cluster : 1 ~ 10

## Criteria (to minimize)

- ▶ Average Similarity Value (using Euclidian distance)
- ▶ Execution Time (ms)

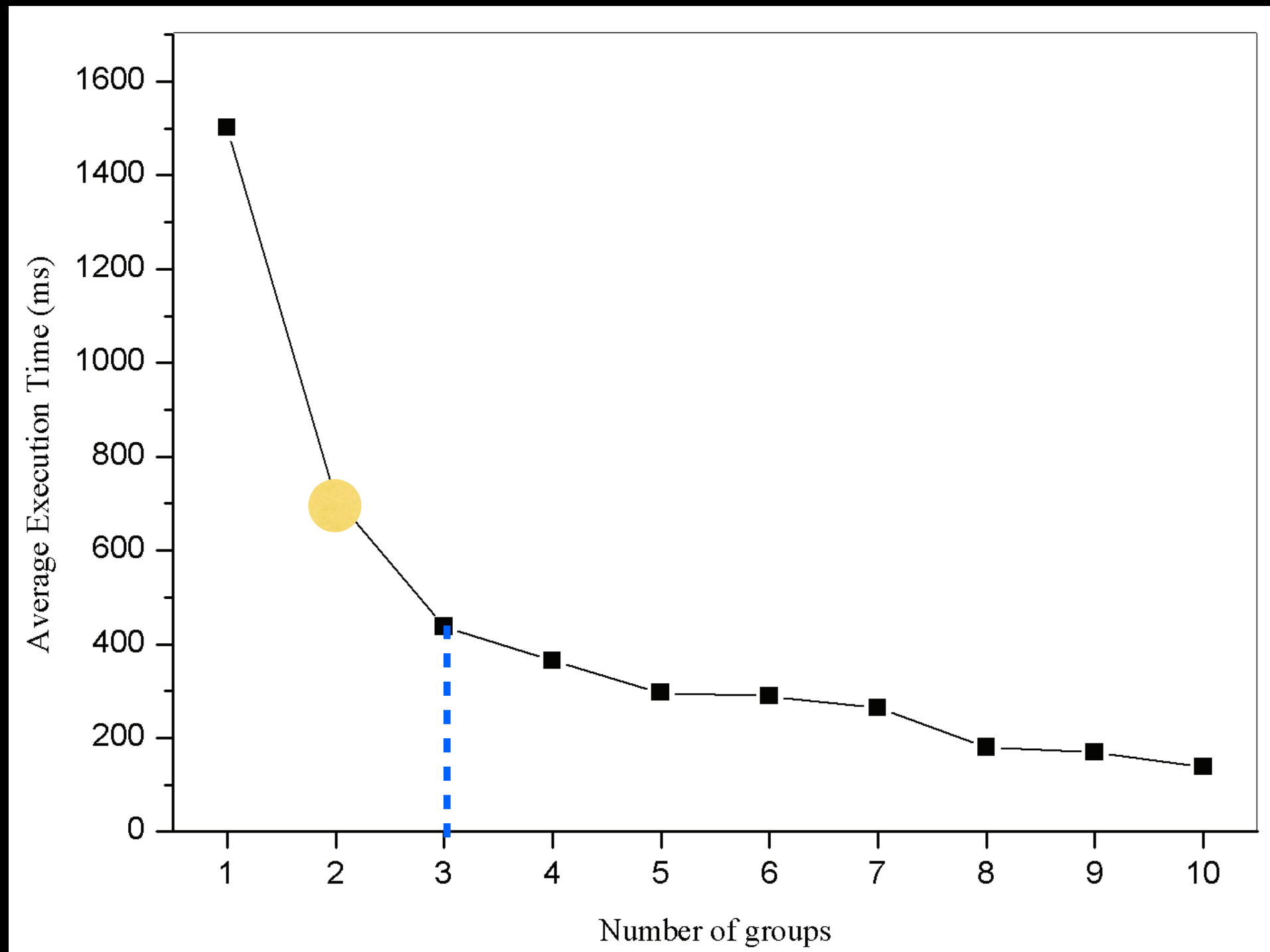
# Experiment

Result - Similarity value



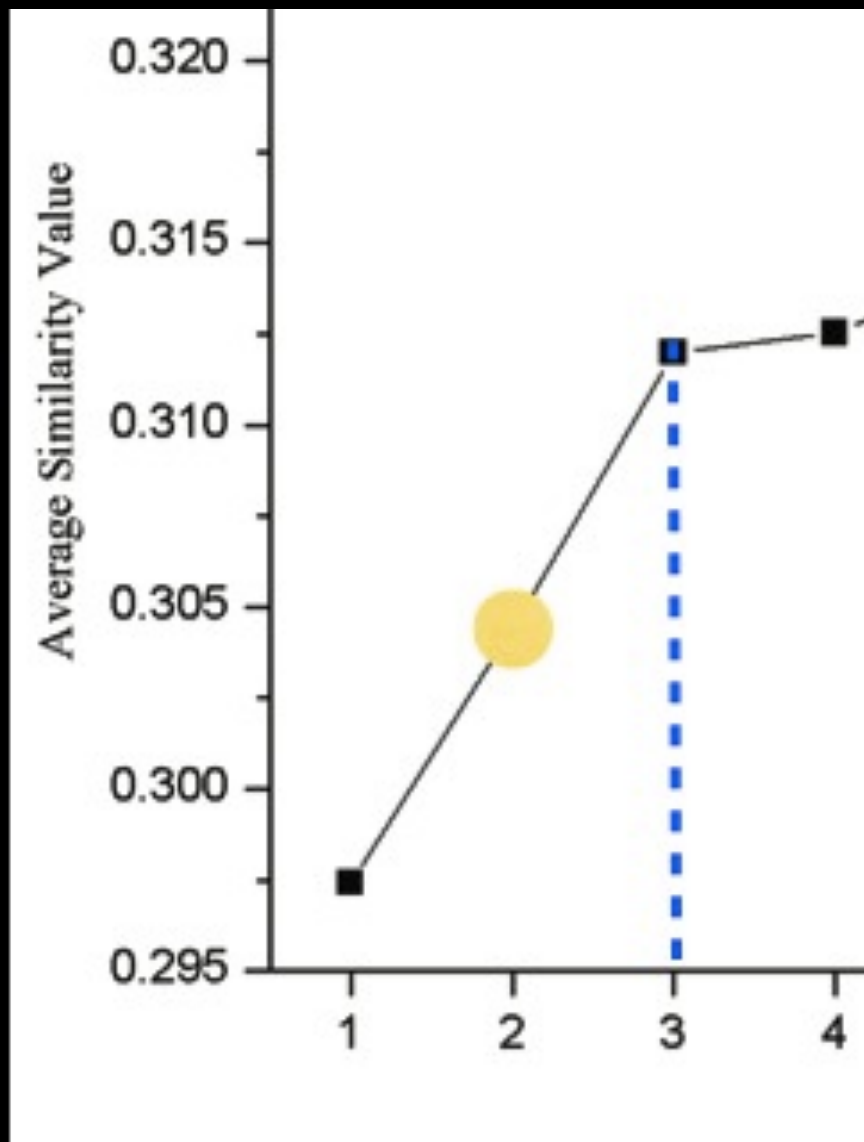
# Experiment

Result - Execution Time

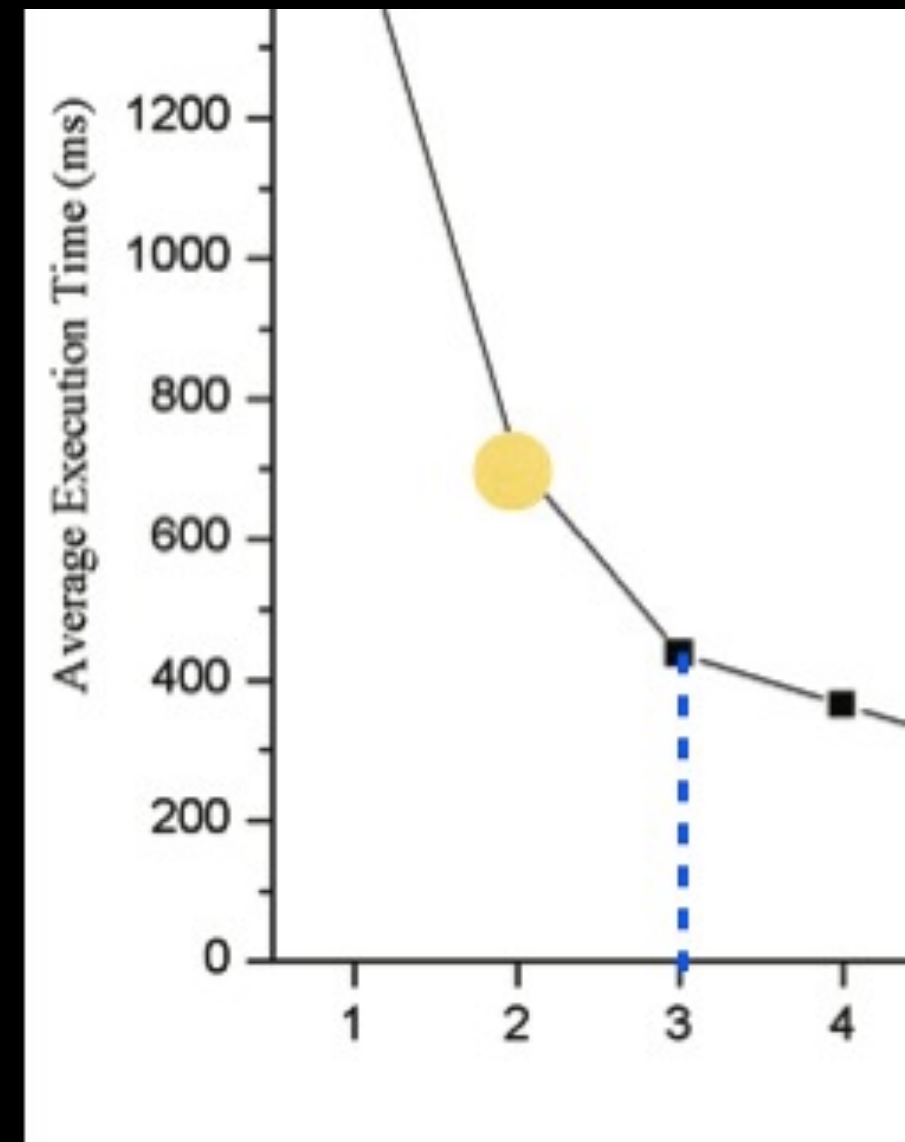


# Experiment

Result - Fitness value and Time



► Ave. Similarity value



► Ave. Execution time



# Experiment

Test Case #2

## The experimental condition

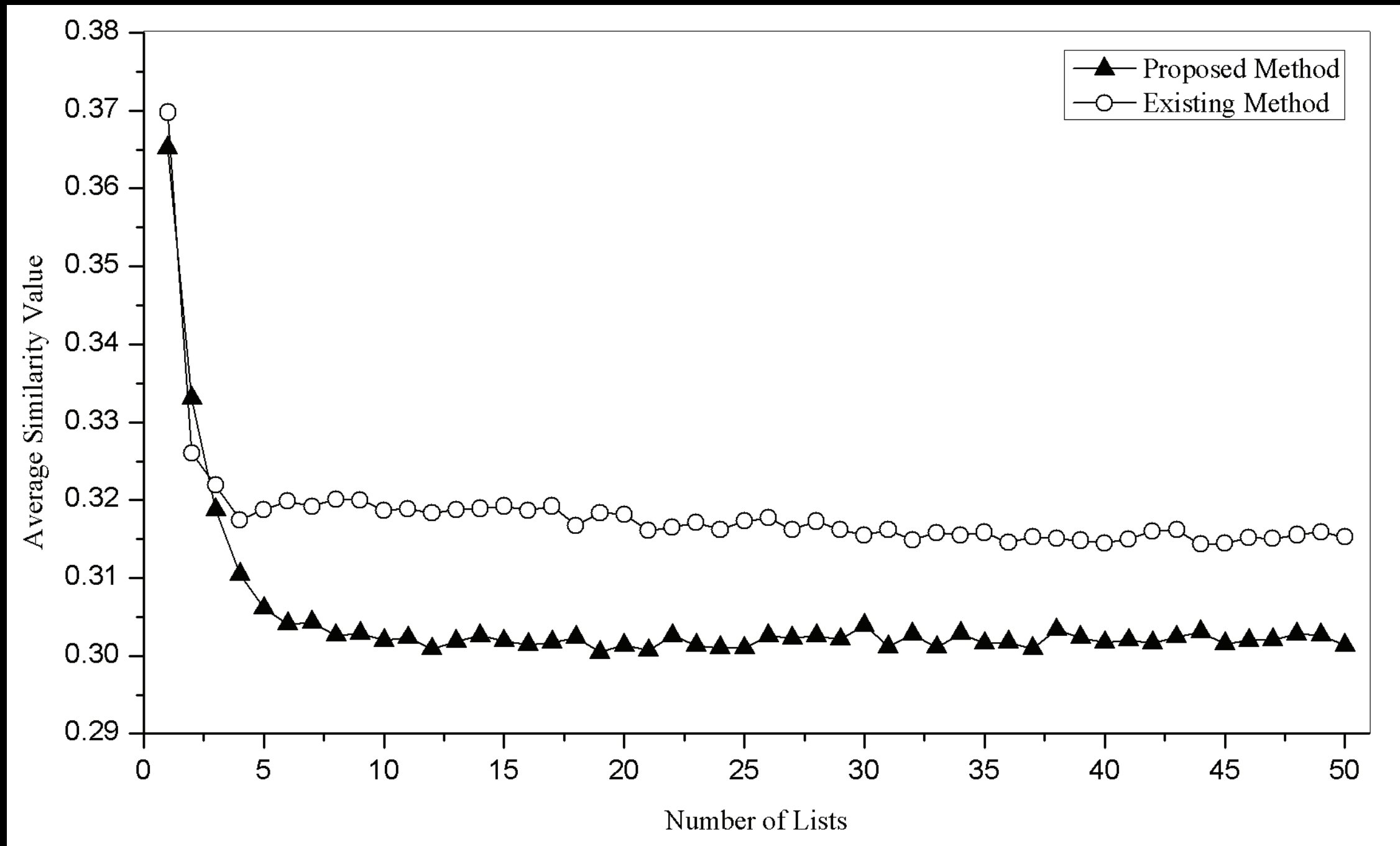
- ▶ variable size of music tracks
- ▶ A list contains 10 items (i.e., music tracks)
- ▶ Run 100 times and 50 lists
- ▶ Num. of cluster : 2

## Criteria

- ▶ Average Similarity Value (compare to existing method, CF method)

# Experiment

Result - Similarity value



# Experiment

## Test Case #3

### The experimental condition

- ▶ variable size of music tracks
- ▶ A list contains 10 items (i.e., music tracks)
- ▶ Run 100 times and 150 lists
- ▶ Num. of cluster : 3

No. of Lists	Size
0 (Initial)	200
50	300 (+100)
100	400 (+100)

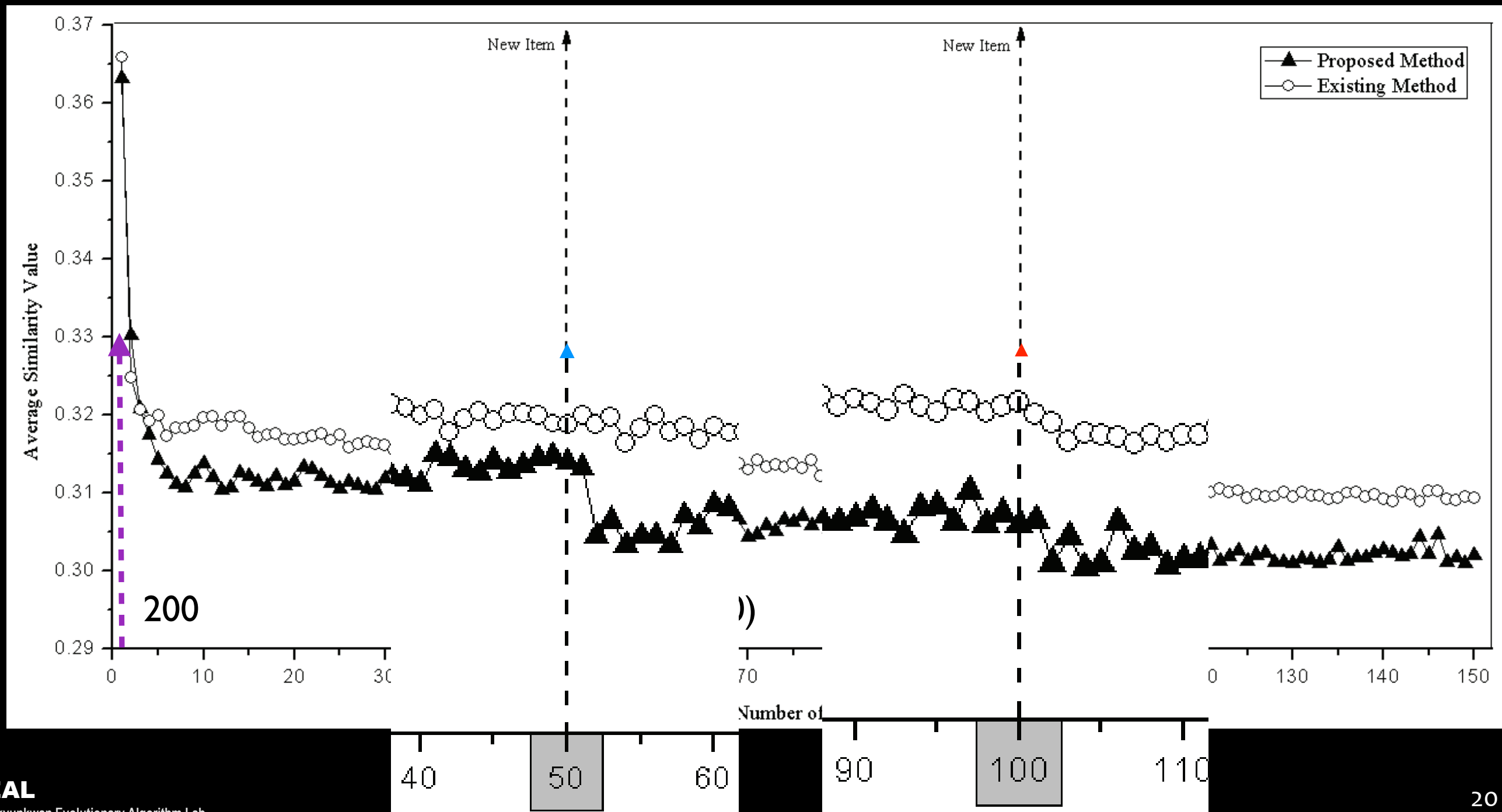
### Criteria

- ▶ Average Similarity Value (compare to existing method)
- ▶ Maintain the trend of previous results

(on the **specific point** which new items are added)

# Experiment

Result - Similarity value



# Discussion

# DÍSCUSSION

Recommender system

In this research,  
we introduce a **new type** of **recommender system**.

- ▶ interactive evolutionary computation  
with the content-based filtering method

From experimental result,  
proposed system can **recommend** new items which are tailored  
with user's preference and **response** quickly (i.e., time efficiency).

This system can be an **alternative way to improve** recommender system.  
(i.e., overcome limitations of existing methods)