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CLASH of CLASS

Introduction

Our objective is to make an **optimal timetable for students** which considers the **courses that students wish to take**, **limited time slots** and **limited number of classes per timeslot**, to maximize the happiness of students. Our method generates timetable using **static greedy algorithm**, **dynamic greedy algorithm**, and **graph coloring algorithm**, which uses forward checking and backtracking. After all courses had been colored, each color is mapped to a timeslot in the timetable. For evaluation, the **happiness level** of students is computed based on their initial wish lists and the consequent timetable.

# Process

Data Collection
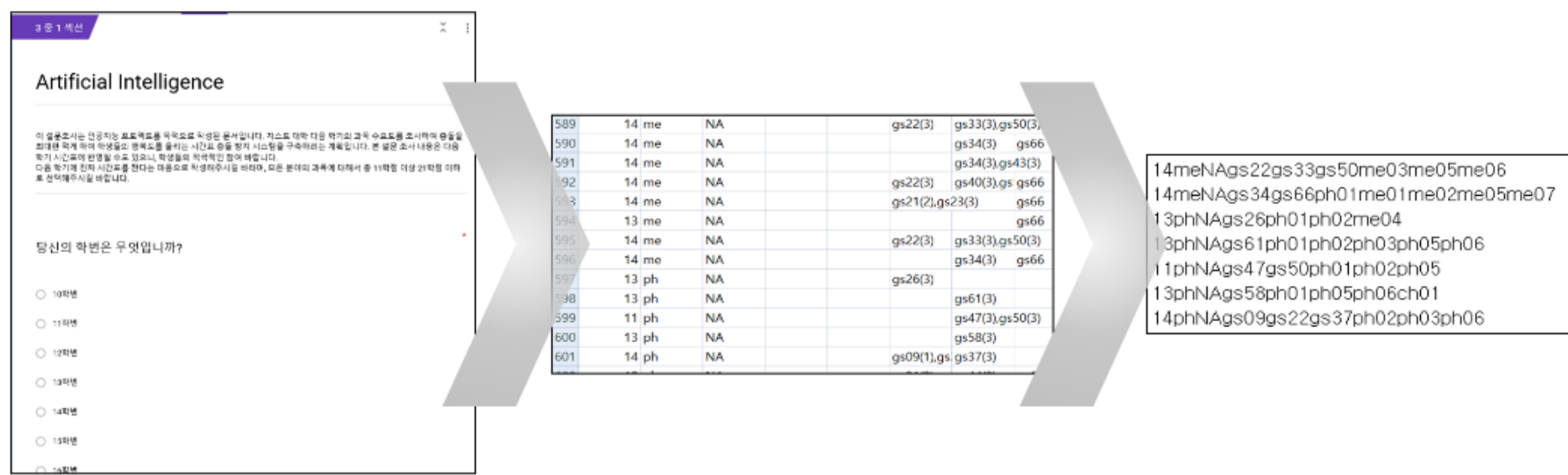
- The survey is based on 2015 Fall semester course schedule which has 117 courses and 179 students took the survey.
- The survey result is then refined to remove NULL values and then parsed.
- From the parsed result, correlation between any two courses can be defined.

Data type

Student	Contains student ID, major, minor, and wish list (courses that he or she wishes to register)
Course	Contains popularity, availability, color, timeslot and the list of students who wish to enroll in the course
Graph	Contains correlation values between each pair of courses as edge weights and current threshold value of the graph
Tree	Represents a spanning tree created from the graph, based on the correlation-ordered depth-first search
Time Slot	Contains courses that are directly mapped when using greedy algorithm or color-mapped when using graph coloring algorithm

## Graph Construction

increase threshold
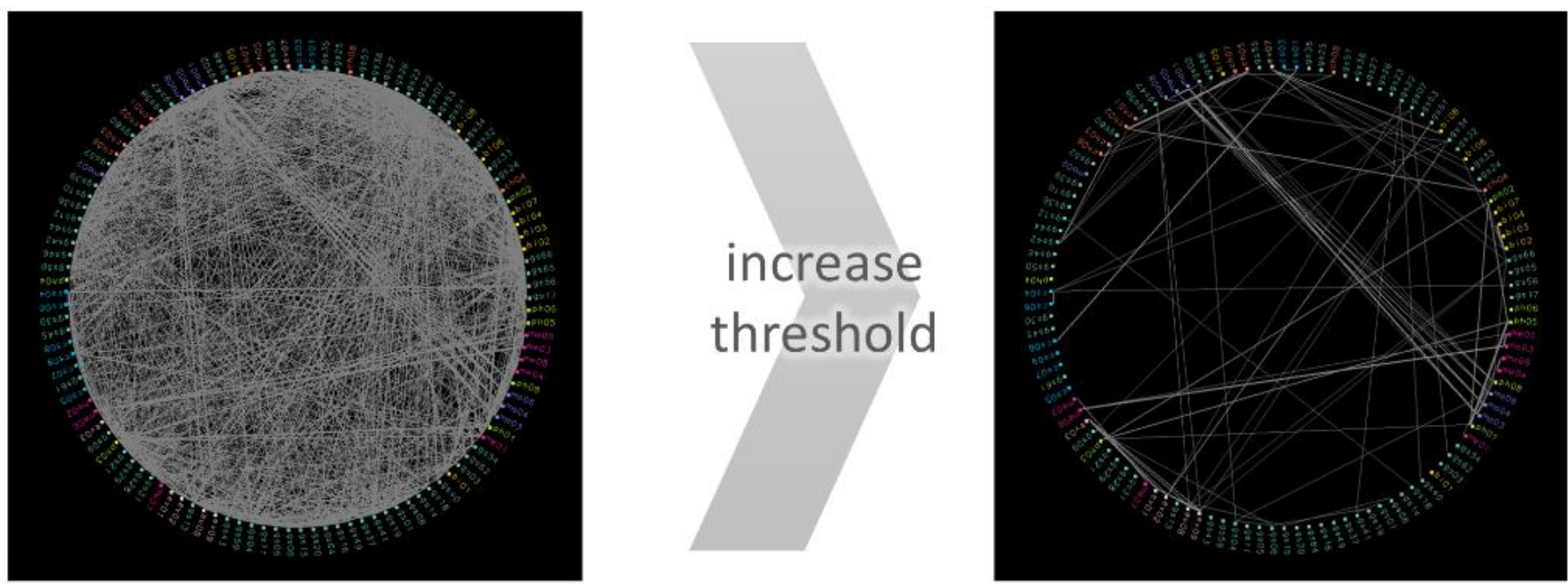
- A vertex represents a course and an edge represents the correlation of a pair of courses.
- The correlation value quantifies the interrelationship between two courses, which is the major factor that determines the order of coloring.
- Increasing the threshold removes the edges having correlation values less than or equal to the alternative threshold.


◀ Availability

Popularity ▶

- In the figures, the brightness of each vertex shows the degree of availability and popularity. The darker a vertex is, less popular or available a course is.
- The availability for each course combines some factors such as the number of class, class size, or the number of students who wish to take the course, while the popularity of a course is somewhat self explanatory.
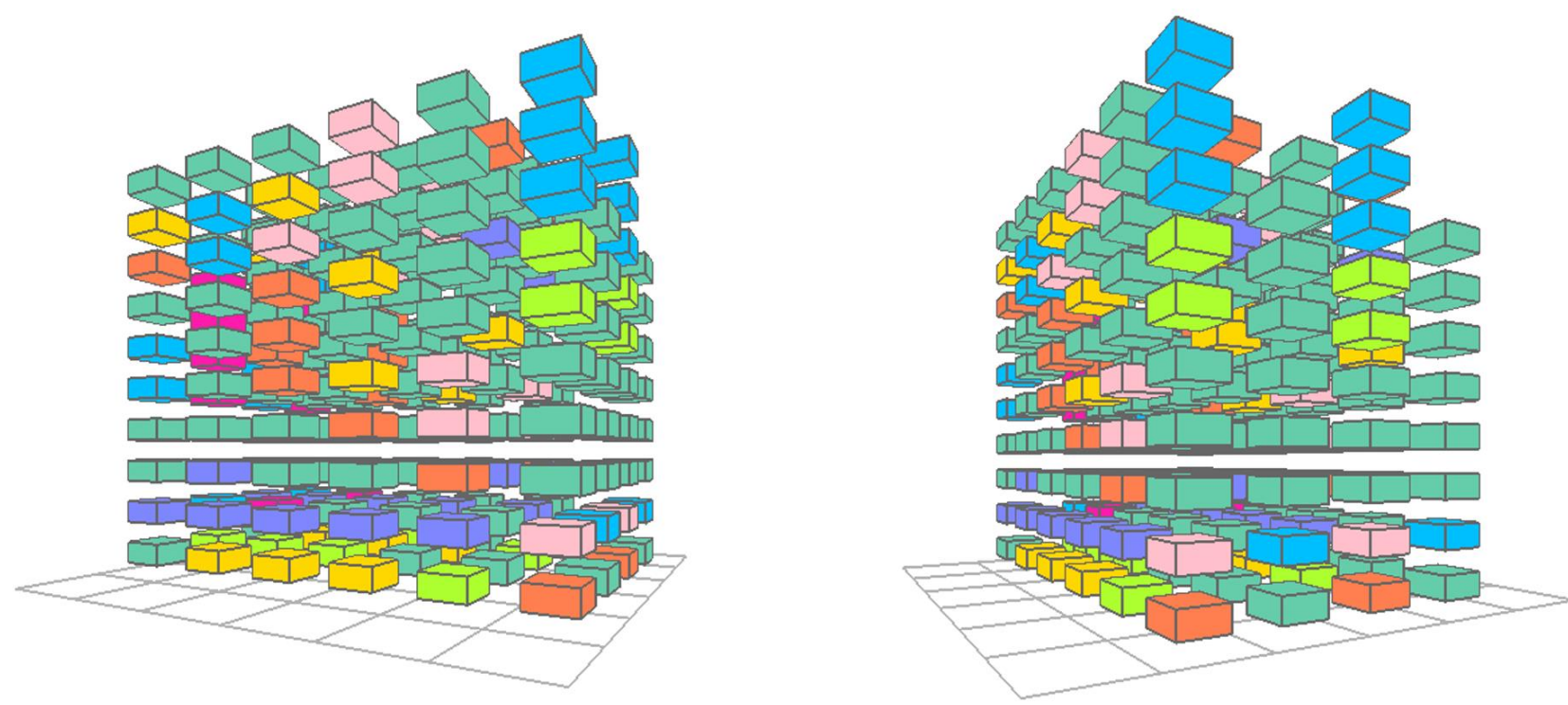
Greedy Algorithm

min(sum(correlation))
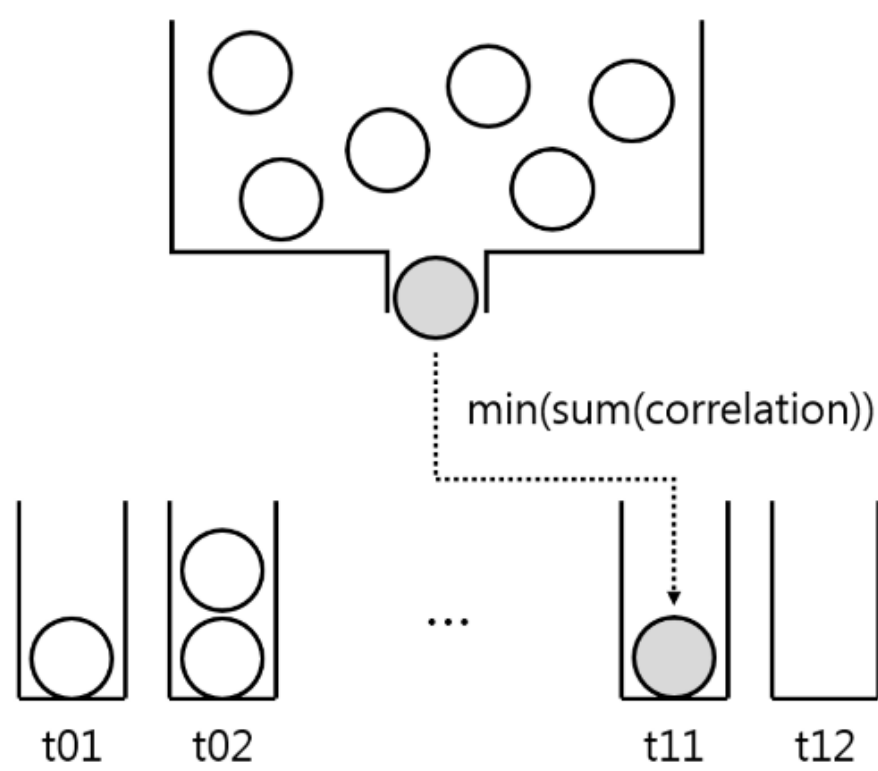
Coloring Algorithm
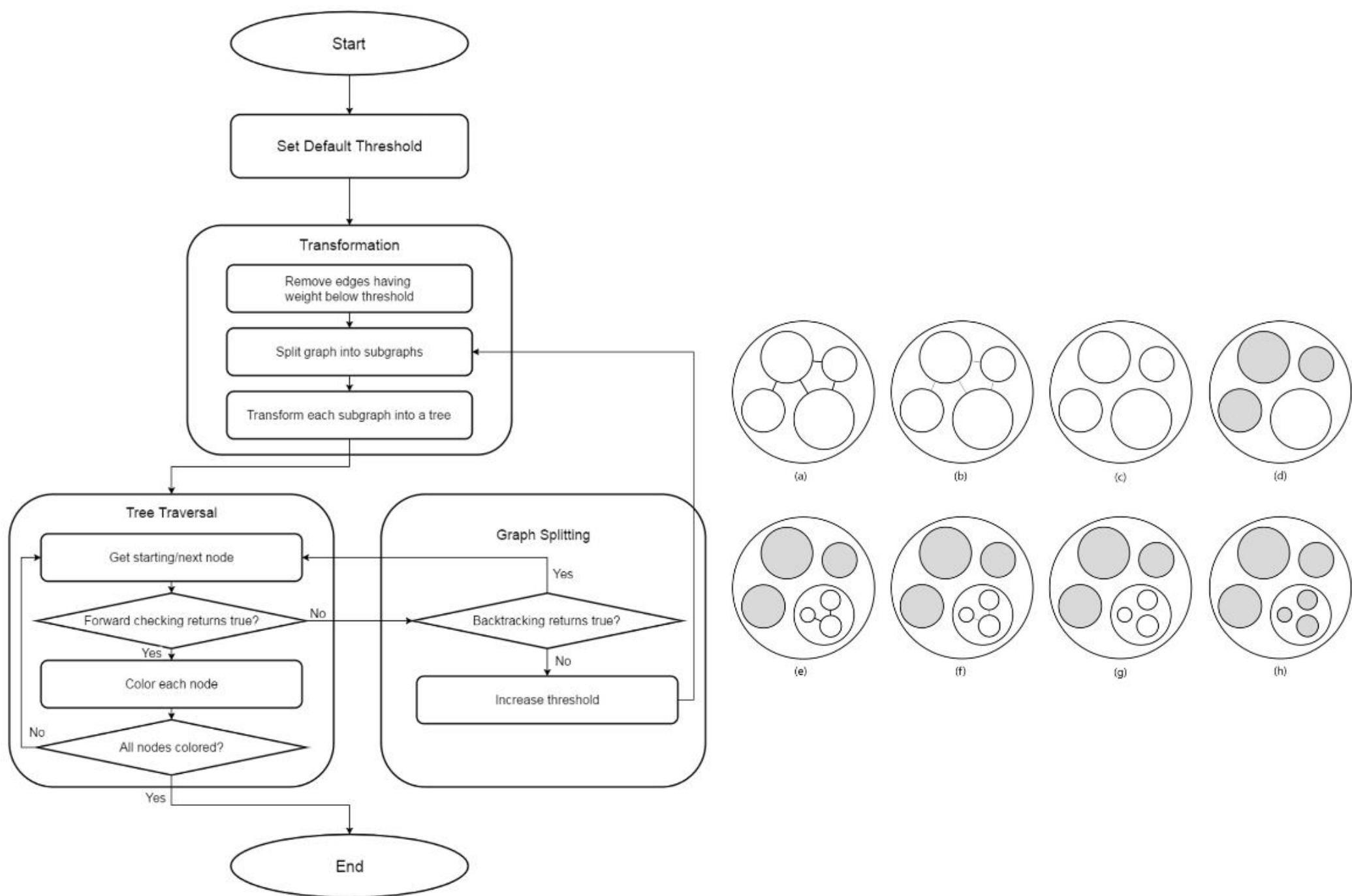
Timeslot allocation

- Each block represents a course and each square, a timeslot.
- The timetable shown above is limited to 10 classes per timeslot.

Result

Evaluation

- Above result is based on dynamic greedy algorithm.
- With the number of classes per timeslot fixed, students are generally happier when the threshold of correlations is low.
- With the threshold fixed, it depends on the threshold values if students are happier with more number of classes per timeslot or not.
- When the happiness standard is set to 80% and infinite classes per timeslot, static greedy algorithm gives 97.48%, dynamic greedy algorithm gives 99.53%, and graph coloring algorithm thresholded at 0.6 gives 52.99% of happy students.

Conclusion and Future Work

- By varying the factors such as **class number** or **class size**, happiness level can further be increased.

- Although the coloring of each courses is provided by our program, **specific time and location on the timetable are to be determined**, which leaves some flexibility.

- **The case where there are more than one class for each course** is to be implemented additionally, to provide more realistic solution, using the availability.