



# Timetable Generator For Educational Institution

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**Abstract:** An timetable generator is a software tool that uses genetic algorithms to create an optimized schedule of events or activities within a specified timeframe. This tool is particularly useful for educational institutions, where it is necessary to schedule classes, lectures, exams, and other academic events in a way that maximizes student and teacher availability while minimizing conflicts and overlaps. The automatic timetable generator considers various parameters, such as the availability of teachers and classrooms, the duration and frequency of classes, and the preferences of students and faculty members, among others. The generated timetable is designed to be feasible and efficient, with minimal conflicts and maximum utilization of resources. The use of an automatic timetable generator saves time, reduces errors, and ensures a fair and equitable distribution of resources, thereby improving the overall quality of the educational experience.

**Keywords:** Genetic algorithm, Fitness score, Constraints, Timetable.

## I. INTRODUCTION

In today's world, most tasks are automated. However, many routine tasks have not yet been automated. One of them is the scheduling of courses in educational institutions. Many educational institutions still operate with complex and time management manual programming processes. Programming an education system, even the smallest process, requires a lot of planning time and can sometimes lead to human errors . In such cases, an automatic program generator can reduce manual work. Many educational institutions have many courses and all must be well planned to reduce manual work in the institution.

Faculties are now limited and each faculty teaches one or more subject .There is therefore a need for a timetable that schedules faculty at specific time intervals to ensure that all faculty subject requirements are fully utilized and that timetables do not overlap .We use genetic algorithms to do that .When I create this table, I use it using the table .A time slot has an address containing the topic, a meeting of students attending the address and a teacher presenting the topic .During further discussion of the requirements, it was scalable so that more commitments could be added or removed using a composite configuration design.

## II. RELATED WORKS

V. Abhinaya and team have discussed about an online application for time table generation. the author specially developed this system based on Heuristics and context-based reasoning methods for achieving realistic timetables in minimum time. A combinatorial optimization problem developed to solve the university timetabling problem where a set of measures must be planned into time periods and established into suitable rooms. The disadvantage of this model is that the transaction is executed in offline mode, hence online data for room Student to capture and modification is not possible.

S.Alagu Lakshmi and team have discussed about Time table generation using back tracking technique. The author specially developed this project to take the constraints of the user and schedule an algorithm based on them. Backtracking Technique can reduce the time require to generate time table and generate a timetable which is more accurate, precise, and free of human errors. The main disadvantage of the system is that it may get slower when there is large number if classes that needs to be scheduled.

Hans-Joachim Goltz and team have discussed a project on university time tabling based on constraint logic programming. Constraint Logic Programming and methods are developed, techniques and concepts for a combination of interactive and automatic timetabling of university courses and school curricula. A graphical user interface is built to be flexible to take all user constraints. The main disadvantage of the system is that the system should be flexible to take special user constraints, the constraints should be in a manner that no other hard constraints are violated.



Dipesh Mittal and team have discussed a project automatic time table generation using genetic algorithm. The author specially developed this system to produce a time table which is more feasible by taking all the soft and hard constraints of the user. The main disadvantage of the system is that the efficiency of the system may be low and needs to be improved.

A.M.Hambali and team have discussed a project on Automatic university lecture time table using Heuristic approach. The main goal of the author is to achieve an optimum output design. The researchers adopt Charles's Darwin theory on survival of the fittest (genetic algorithm), simulated annealing along with graph colouring heuristic to generate a multidimensional array as space for referencing the entire courses in any given semester. The main disadvantage of the system is that the lecture length is calculated based on credit score of the paper, there may be some problem based on this as some paper with less credit score may need a long time to complete.

K.Gandhi and team have discussed a project on time table generator . The author specially developed this system using PHP as front end and MYSQL as back end. Administrator adds the following details for the Student, Staff, Subject, Time Table Entry, Time Table Update. Student and Staff View the time Table details. The main disadvantage of this system is the system is designed in a very simple and it cannot manage the needs of a big institution with more students and needs more improvement in it.

### III. OBJECTIVES

- To develop an application that can automatically generate time table for educational institutions using genetic algorithm.
- To get all the data and constraints that needs to be input from the user (admin) to generate time table.
- To apply the genetic algorithm to our problem which takes the various constraints from the user and processes the input and gives a solution to our problem.
- To check the final output produced with real time scenario and verify it whether there is any overlap in classes for any staffs.

### IV. EXISTING SYSTEM

The system is based on paperwork. This process is very inefficient because of the amount of work. A lot of documents are required by the system. Handling important documents is not easy. Wrong generation of page can be caused by mistake in one detail, since there is a lot of manual work involved in current system. There is no collection of requirements for this system. More energy is wasted to allocate the seating arrangement because this system is to enhance manual work.

### V. PROPOSED SYSTEM

The proposed system is to be designed to automate the process of generating time table for educational institutions. The system will take various inputs like information of classes, number of faculties and courses. Depending upon the inputs it will generate the possible output making optimal utilization of all resources that will best suit to any of constraints or college rules. For this process we are using genetic algorithm which determines the best schedule using fitness score which compare the quality of one schedule over the other. The genetic algorithm combines the schedules of two or more classes crossovers them and produces the result with good accuracy.

#### Advantages: -

- It Provides multiple optimal solutions.
- A larger set of solution space.
- The concept is easy to understand

### VI. SYSTEM MODEL

The admin starts the system by taking the various subject names and credit score as input, various staff and class details. The system also asks the user to input the various constraints of the college that needs to be satisfied.

Then the time table is generated and evaluated to get a fitness score which is generated by comparing two or more results. The time table with the highest fitness score is taken as the final output. Finally, a set of mutation or small changes are done in the time table like swapping of class changing time of breaks etc.

Finally, the time table is generated by taking all the constraints of the user, thus satisfying the needs of the user.

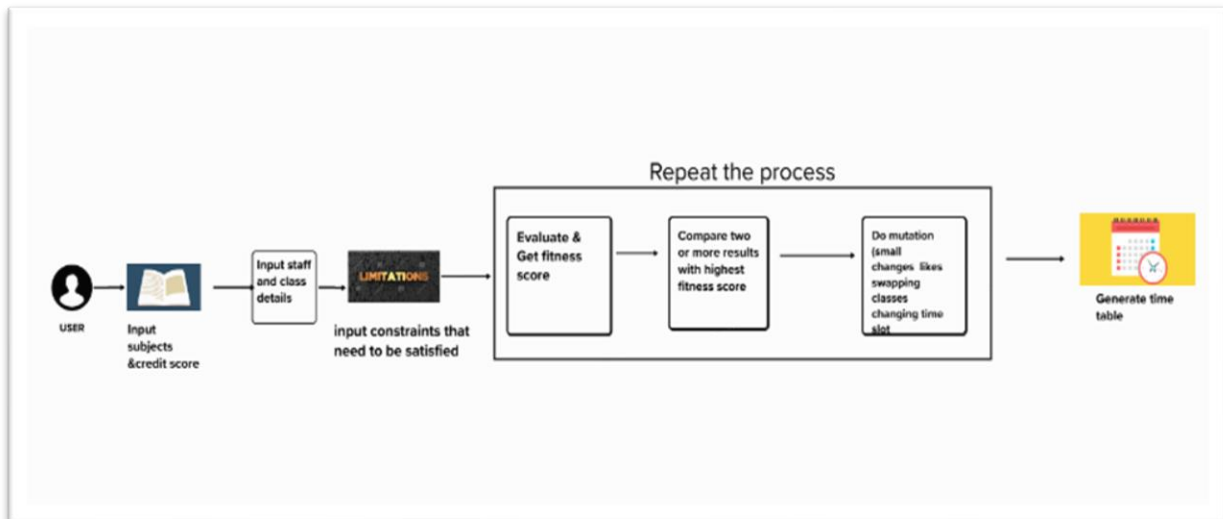


Fig 6.1 Overall Architecture

## VII. MODULES

- Input Gathering
- Processing data
- Generating result

### Input Gathering:

The main part of the system is to collect the data of number of classes, faculties and subjects that needs to be scheduled. The constraints of the user are also taken as an input before processing the data by the user genetic algorithm. The inputs from the user needs to be accurate in order to get a flexible time table for all classes.

The input and constraints data are received and processed to produce a time table which can solve all the user needs and make the scheduling process easier.

### Processing data:

The processing of genetic algorithm Is spread across five different steps such as,

- 1-Initial Population
- 2-Selection
- 3-CrossOver
- 4-Mutation
- 5-Fitness Function

### Initial Population:

The step is to basically create an initial population (i.e., time table) that adheres to certain constraints, such as avoiding clashing of classes for a staff, evenly distributing the classes for all the staffs, and satisfying all the constraints specified by the user.

### Selection:

Based on initial population created the more fitter time table is selected for further processing in the genetic algorithm. During each time the process is running a part of the population is selected to produce a new and better time table.

### Cross Over:

This step combines two or more solutions of initial population and produce a better solution by combining and comparing them. This process of genetic algorithm makes the generated time table better and more flexible towards the requirements of the user.

**Mutation:**

Mutation is the process of altering or making small changes to the time table before the final output is produced. This process actually does swap of classes done to reduce clash of two classes or reduce the load of staff, shifting of classes usually done to make change in time slot of classes, constraints handling and random changes are done to check out for all best possibilities.

**Fitness Function:**

The fitness function plays a vital role in guiding the genetic algorithm to find optimal or near-optimal solutions by evaluating the time table based on the user constraints. The fitness function is evaluated by measuring how well it satisfies certain objectives and constraints of the user such as minimizing clashes, balancing staff's workload, maximizing period and class utilization.

**Generating output:**

The process of selection, cross over, mutation is repeatedly iterated to produce a better time table. It evolves the time table towards better solutions and produce a better solution. The final time table generated should satisfy all the requirements of the user and have a maximum utilization of resources such as class , staff etc.

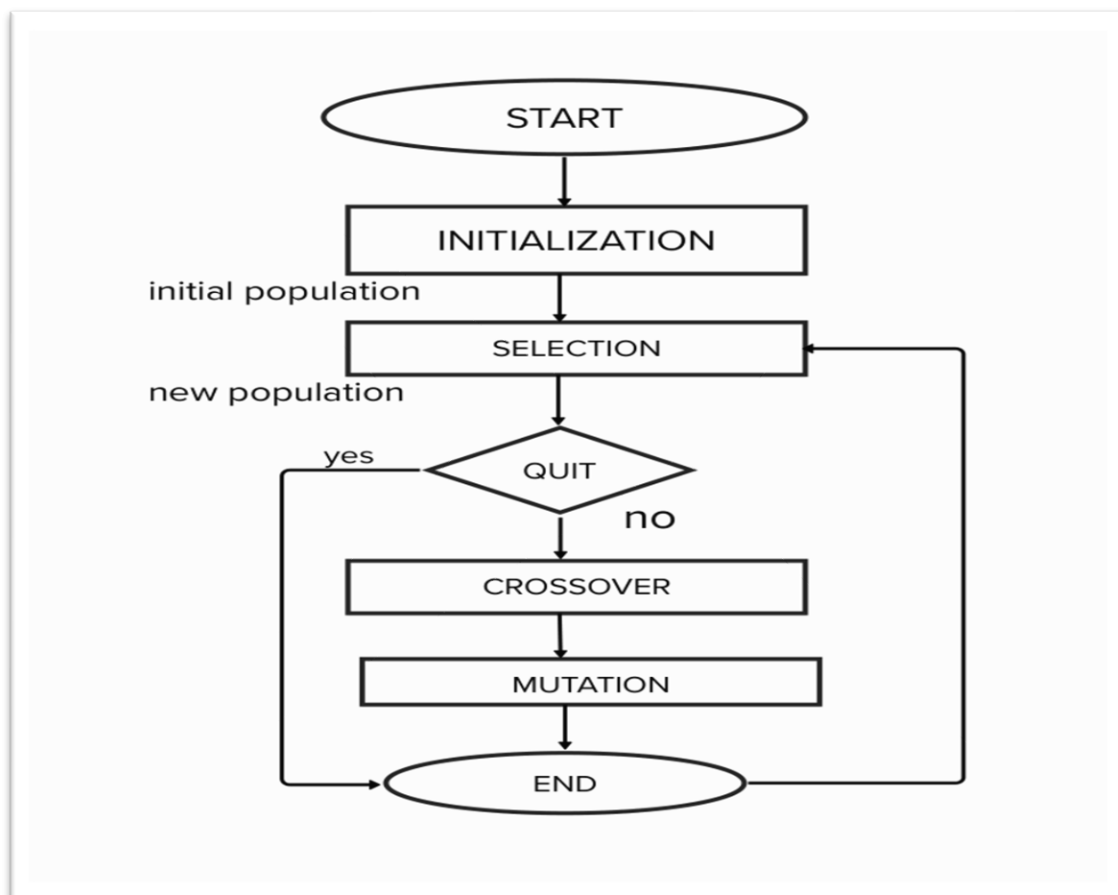


Fig 7.1 Flow Diagram

**VIII. RESULTS AND DISCUSSION****GENETIC ALGORITHM VS OTHER TIME TABLE GENERATION ALGORITHMS**

There are various algorithms that can be used for generating time table some of them are constraint satisfaction algorithm, hill climbing algorithm, simulated annealing algorithm, Tabu Search Algorithm, Ant Colony optimization algorithm etc. Among these algorithms the genetic algorithm can be better because,



**Handling Complex Constraints:** It can handle many complex constraints and objectives which the user needs to satisfy while scheduling a time table.

**Parallel Processing:** Genetic algorithm can process multiple solutions to be evaluated simultaneously and provide a fitness score for each solution.

**Can explore many possible solutions:** While using genetic algorithm it is possible to explore a wide range of solutions that are possible for a problem that needs to be satisfied.

**Evolutionary Nature:** Genetic Algorithm is inspired by the process of natural selection, which can be advantageous as it mimics the process of evolution and adaptation, and can lead to more robust and flexible solutions.

### Constraints and Fitness Score:

There may be different kinds of limitations that needs to be followed while scheduling a time table for an organization such as enough break for faculties, time of breaks, etc. These constraints can be classified into two soft and hard constraints. The soft constraints refer to the constraints that are desirable to be satisfied but not to be strictly satisfied. The soft constraints may include balancing of workload for staffs, enough utilization of room resources, maximize the use of time etc. The hard Constraints refer to the constraints that needs to be strictly satisfied in order to get a solution based on the user requirements. The hard constraints may include minimization of conflicts, duration of some activities such as break, each class time etc.

The fitness score measure of how well a particular solution can be feasible to a problem. The fitness score plays a major role in the generation of time table, the solution with the highest fitness score is taken as the result from the wide range of solutions produced in the process.

The following were obtained as a result of our system,

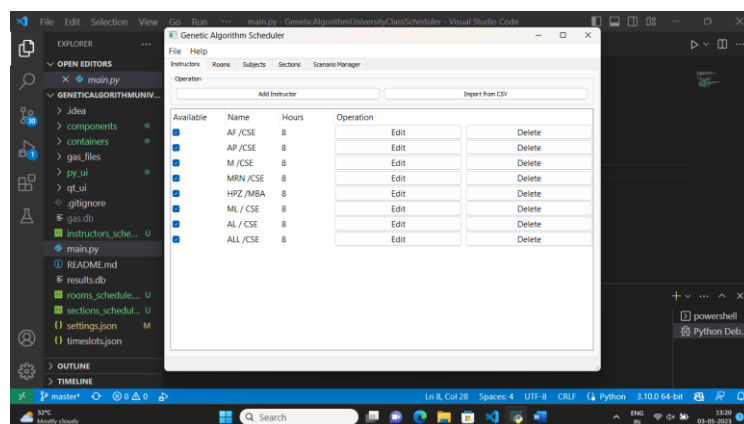


Fig 8.1 Adding Faculties

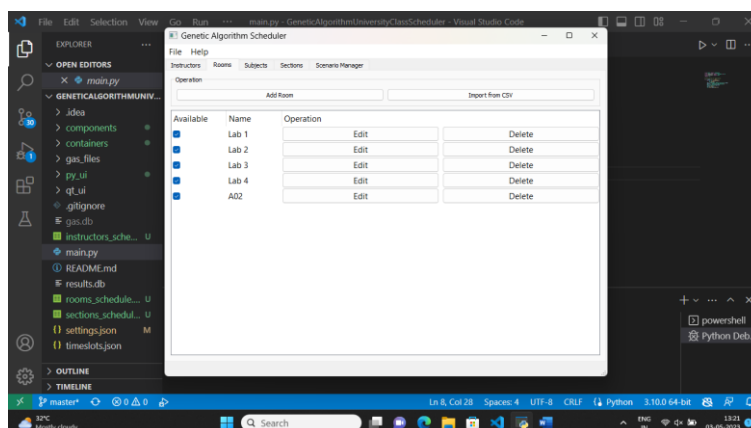


Fig 8.2 Adding Rooms

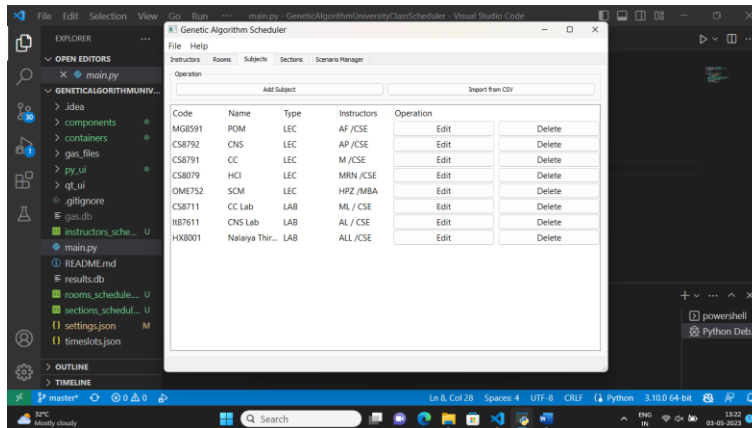


Fig 8.3 Adding Subjects and staffs for each subject

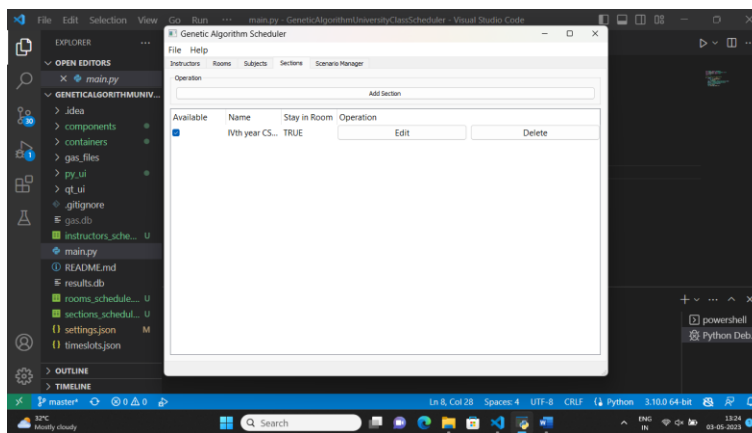


Fig 8.4 Adding Class and subjects for each class

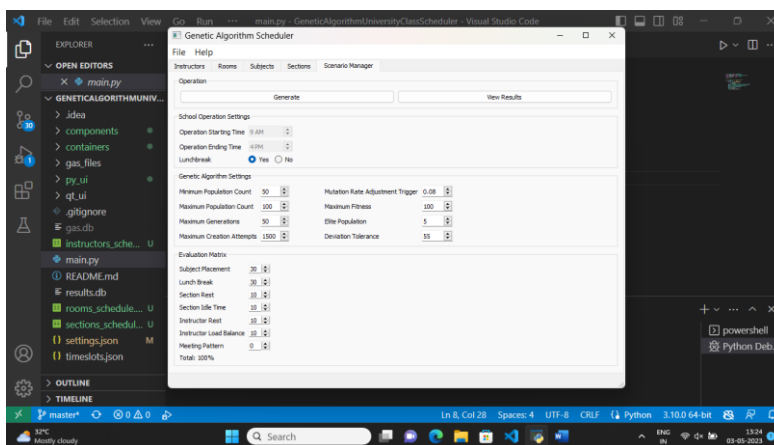


Fig 8.5 Settings for time table generation

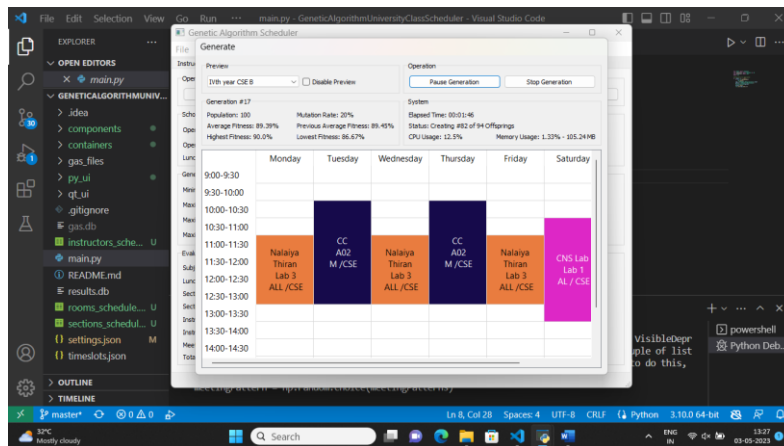


Fig 8.6 Generation Process

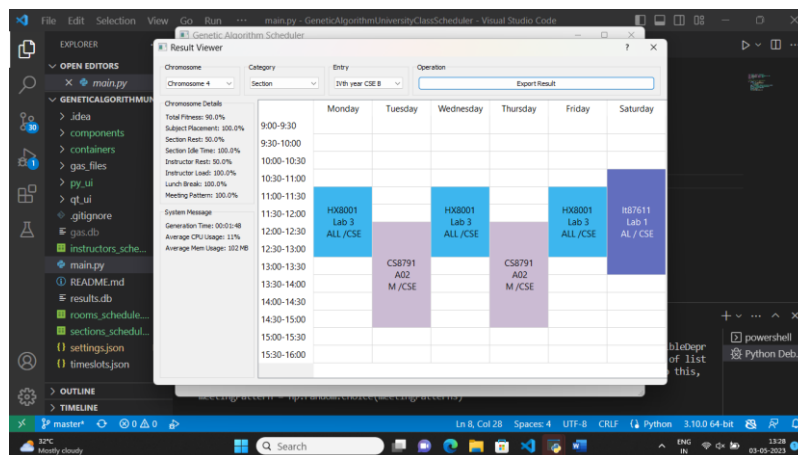


Fig 8.7 Final Results

## IX. CONCLUSION

This project has presented an idea for bringing automation into time table generation process to make the scheduling process easier. The system takes both the user inputs and constraints process the data using genetic algorithm by generating a fitness score and produces a result which has the highest fitness score.

The results generated by genetic algorithm can be verified with the real time and can make small changes if needed to get a suitable time table for the institution.

## X. FUTURE ENHANCEMENTS

In future the system can be improved in terms of managing heavy inputs and satisfying better user constraints. The system can be improved to take all subjects and staff details of a whole institution and time table for all the classes all at once.

It can also be improved in terms of generation speed and more suitable time table with minimal changes.

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