

Institute of Space Technology

Project Report



Exam Schedule Generator Using Local Search Algorithms



Submitted by

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Introduction:

The Exam Scheduling System is a project aimed at addressing the complex task of generating optimized examination timetables for universities. The process of creating exam schedules involves considering numerous constraints, such as ensuring fairness for students, accommodating teachers' availability, avoiding exam overlaps, and adhering to specific time slots and room allocations. Manual scheduling of exams is time-consuming and prone to errors, necessitating an automated solution to streamline the process. Effective exam scheduling is a crucial task for educational institutions, as it ensures a smooth and fair examination process for students, optimizes resource utilization, and minimizes conflicts. Our exam scheduling system offers a robust solution to automate and streamline this complex process.

Aim:

The aim of the Exam Scheduling System is to develop a generic solution that automates the process of generating optimized examination timetables for universities. The system must adhere to various hard and soft constraints, ensuring fairness, efficiency, and convenience for students, teachers, and administrators involved in the exam scheduling process.

Objectives:

The objectives of the Exam Scheduling System are as follows:

- Develop an algorithm to generate exam schedules considering hard and soft constraints.
- Implement a local search algorithm to optimize the generated schedules.
- Create a user-friendly interface for inputting and displaying exam schedule information.
- Evaluate the solution based on fulfilled constraints and overall fitness of the schedule.
- Provide a comprehensive documentation outlining the project's design, implementation, and findings.

Problem Statement:

The problem addressed by the Exam Scheduling System is the manual and time-consuming process of creating exam timetables for universities. The system aims to automate this process by generating optimized schedules that adhere to various constraints, such as scheduling exams for each course, avoiding exam overlaps for students, ensuring teachers' availability, and considering preferences like breaks and course sequencing.

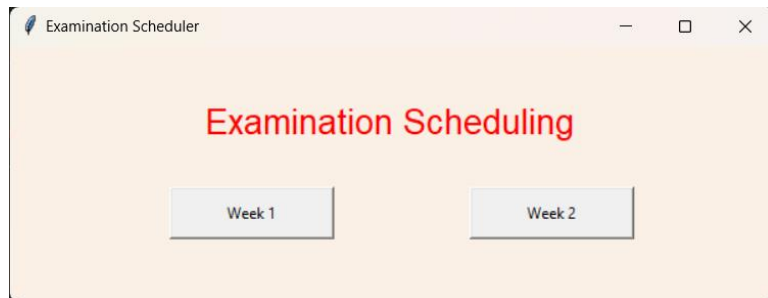
Requirements:

- **Input:** The system requires datasets containing information about teachers, students, rooms, courses, and registered courses for each student. The data will be provided in Excel files.
- **Constraints:** The system must adhere to hard constraints, such as scheduling exams for each course, avoiding exam overlaps for students, and ensuring teachers' availability. Soft constraints, such as breaks and course sequencing, should also be considered.
- **Local Search Algorithm:** The system should implement a suitable local search algorithm to optimize the generated schedules.
- **User Interface:** The system should provide a user-friendly interface for displaying the exam schedule, and showcasing fulfilled constraints.

Methodology:

- **Data Preparation:** The system collects and preprocesses the input datasets containing information about teachers, students, rooms, courses, and registered courses.
- **Constraint Evaluation:** The system evaluates the hard constraints, such as ensuring each course has an exam, avoiding exam overlaps for students, and meeting time and invigilation constraints.
- **Local Search Algorithm:** The system applies a suitable local search algorithm to optimize the generated schedules by iteratively adjusting the exam time slots and room assignments.
- **Soft Constraint Consideration:** The system incorporates soft constraints, such as breaks and course sequencing, to improve the overall quality of the exam schedules.
- **User Interface Development:** The system develops a user-friendly interface for users to view the generated exam schedules, and analyze the fulfilled constraints.

User Interface:



Day	Date	Time	Student Name	Course ID	Room
Monday	02/06/2023	09:00 AM	Razan Ishtiaq	MG220	ROOM # 1
Monday	02/06/2023	09:00 AM	Ramish R. Singh	MG220	ROOM # 1
Monday	02/06/2023	09:00 AM	Mohamed A. Badoukh	MG220	ROOM # 1
Monday	02/06/2023	09:00 AM	Maria Osman	MG220	ROOM # 1
Monday	02/06/2023	09:00 AM	Shimen Dawud Bebejirum	MG220	ROOM # 1
Monday	02/06/2023	09:00 AM	Sarah J. Hamman	MG220	ROOM # 1
Monday	02/06/2023	09:00 AM	Zahra Faraj Rad	MG220	ROOM # 1
Monday	02/06/2023	09:00 AM	Anda Hadler	MG220	ROOM # 1
Monday	02/06/2023	09:00 AM	Eileen Haynes	MG220	ROOM # 1
Monday	02/06/2023	09:00 AM	Kamal Anwar	MG220	ROOM # 1
Monday	02/06/2023	09:00 AM	Adam Green	MG220	ROOM # 1
Monday	02/06/2023	09:00 AM	Yus Khalid	MG220	ROOM # 1
Monday	02/06/2023	09:00 AM	Shahon Adaghye	MG220	ROOM # 1
Monday	02/06/2023	09:00 AM	Adam Selby	MG220	ROOM # 1
Monday	02/06/2023	09:00 AM	Mohammed Sulkan	MG220	ROOM # 1
Monday	02/06/2023	09:00 AM	Irem Matloob	MG220	ROOM # 1
Monday	02/06/2023	09:00 AM	Eileen Harris	MG220	ROOM # 1
Monday	02/06/2023	09:00 AM	Sarah Austin	MG220	ROOM # 1
Monday	02/06/2023	09:00 AM	Leanne M Taylor-Smith	MG220	ROOM # 1
Monday	02/06/2023	09:00 AM	Saleem Abubakar	MG220	ROOM # 1
Monday	02/06/2023	09:00 AM	Maria Lythe	MG220	ROOM # 1
Monday	02/06/2023	09:00 AM	Parvathi Jambhdi	MG220	ROOM # 1
Monday	02/06/2023	09:00 AM	Manal Alshamsi	MG220	ROOM # 1
Monday	02/06/2023	09:00 AM	Ivan Mikhailov	MG220	ROOM # 1
Monday	02/06/2023	09:00 AM	Bibi A Khan	MG220	ROOM # 1

Sr	Day	Date	Course ID	Course Name	Time	Room	Instructor
1	Monday	02/06/2023	MG220	Marketing Management	09:00 AM	ROOM # 1	Bushra Naz
1	Monday	02/06/2023	DS217	Big Data Analytics	09:00 AM	ROOM # 2	Auf Anwer
1	Monday	02/06/2023	SS113	Pakistan Studies	09:00 AM	ROOM # 3	Tahir Farooq
1	Monday	02/06/2023	EE227	Digital Logic Design	09:00 AM	ROOM # 4	Maham Naeem
1	Monday	02/06/2023	SS152	Communication & Presentation	02:00 PM	ROOM # 1	Dr. Muhammad Fayaz
1	Monday	02/06/2023	EE229	Computer Organization and A.	02:00 PM	ROOM # 2	Hafiz Tayyab
1	Monday	02/06/2023	MT205	Probability and Statistics	02:00 PM	ROOM # 3	Uman Joyia
2	Tuesday	03/06/2023	MG223	Fundamentals of Manager	09:00 AM	ROOM # 1	Muhammad Iqbal
2	Tuesday	03/06/2023	SS113	Pakistan Studies	09:00 AM	ROOM # 2	Hayat Ali
2	Tuesday	03/06/2023	DS2011	Big Data Analytics	09:00 AM	ROOM # 3	Dr. Mushtaq Ahmed
2	Tuesday	03/06/2023	MT205	Probability and Statistics	09:00 AM	ROOM # 4	Munazza Akhtar
2	Tuesday	03/06/2023	CS217	Object Oriented Programming	02:00 PM	ROOM # 1	Dr. Usan Iqbal
2	Tuesday	03/06/2023	EE227	Digital Logic Design	02:00 PM	ROOM # 2	Azeem Wkhar
2	Tuesday	03/06/2023	CS220	Operating Systems	02:00 PM	ROOM # 3	Adel Ashraf Cheema
3	Wednesday	04/06/2023	MG220	Marketing Management	09:00 AM	ROOM # 1	Maham Naeem
3	Wednesday	04/06/2023	CS218	Data Structures	09:00 AM	ROOM # 2	Auf Anwer
3	Wednesday	04/06/2023	SS113	Pakistan Studies	09:00 AM	ROOM # 3	Amped Hussain
3	Wednesday	04/06/2023	MT205	Probability and Statistics	09:00 AM	ROOM # 4	Mughes Iqbal
3	Wednesday	04/06/2023	DS217	Differential Equations	02:00 PM	ROOM # 1	Maham Naeem
3	Wednesday	04/06/2023	CS219	Database Systems	02:00 PM	ROOM # 2	Saba Naeem
3	Wednesday	04/06/2023	SS118	Psychology	02:00 PM	ROOM # 3	Dr. Shahzad Sarfaraz
4	Thursday	05/06/2023	MG223	Fundamentals of Manager	09:00 AM	ROOM # 1	Amped Hussain
4	Thursday	05/06/2023	CS202	Design & Analysis of Algorith	09:00 AM	ROOM # 2	Amped Hussain
4	Thursday	05/06/2023	CY2012	Digital Forensics	09:00 AM	ROOM # 3	Dr. Saqib Ahmed
4	Thursday	05/06/2023	CS220	Operating Systems	09:00 AM	ROOM # 4	Auf Anwer

Conclusion:

The Exam Scheduling System provides a robust solution to the challenging task of generating optimized exam schedules for universities. By employing a local search algorithm and considering various hard and soft constraints, the system automates the process, ensuring fairness, efficiency, and convenience for all stakeholders. The system's user-friendly interface and comprehensive documentation further enhance its usability and understanding. Overall, the Exam Scheduling System streamlines the exam scheduling process, leading to improved academic operations within universities.

Code:

<https://github.com/fasihmuhammadvirk/Exam-Scheduler.git>