MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE GWALIOR

(A Govt. Aided UGC Autonomous Institute Affiliated to RGPV, Bhopal)

NAAC Accredited with A++ Grade

Project Report

on

SCHEDULING WITH AI

(270506)

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CENTRE FOR ARTIFICIAL INTELLIGENCE

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE

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CERTIFICATE

This is certified that **Shivendra Singh(0901AM211055) and Harikant Bilthare(0901AM223D02)** has submitted the project report titled "**Scheduling with AI**" under the mentorship of **Dr. Tej Singh**, in partial fulfilment of the requirement for the award of degree of Bachelor ofTechnology in **Artificial Intelligence And Machine learning** from Madhav Institute of Technology and Science, Gwalior.

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DECLARATION

I hereby declare that the work being presented in this project report, for the partial fulfilment of requirement for the award of the degree of Bachelor of Technology in **Artificial Intelligence And Machine Learning** at Madhav Institute of Technology & Science, Gwalior is an authenticated and original record of my work under the mentorship of **Dr. Tej Singh**, Assistant Professor, Centre for Artificial Intelligence.

I declare that I have not submitted the matter embodied in this report for the award of any degree or diploma anywhere else.

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3rd Year

Centre for Artificial Intelligence

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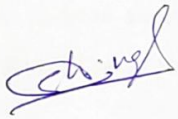

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ABSTRACT

The Scheduling with AI aims to revolutionize the professors experience by integrating innovative features beyond the traditional way of making timetable for any branch or whole college.

This paper introduces an innovative AI-driven scheduling model tailored for optimizing the allocation of time periods in educational institutions such as schools and colleges. Traditional manual scheduling processes often face challenges in balancing various constraints, including teacher availability, classroom capacity, and curriculum requirements. The proposed AI model employs advanced algorithms to intelligently generate schedules that maximize resource utilization, minimize conflicts, and enhance overall educational efficiency.

The core features of the AI scheduling model include machine learning algorithms that adapt to the dynamic nature of educational environments. The system considers diverse factors, including teacher preferences, subject requirements, and student load distribution, to generate schedules that align with the unique needs of each institution. The model is designed to accommodate last-minute changes, ensuring adaptability in response to unexpected events or modifications to the academic calendar.

Additionally, the AI scheduling system incorporates feedback loops, learning from past scheduling experiences to continuously refine and improve its performance over time. This adaptive learning capability enhances the model's ability to address evolving educational needs and preferences, fostering a more responsive and agile scheduling process.

The implementation of the proposed AI scheduling model is expected to streamline administrative efforts, reduce scheduling conflicts, and enhance overall educational productivity. Through a case study conducted in a real-world educational setting, the paper demonstrates the model's effectiveness in achieving optimized schedules that meet the diverse requirements of both educators and students. As educational institutions increasingly embrace technological advancements, the integration of AI-driven scheduling promises to revolutionize time management practices, contributing to a more efficient and productive learning environment.

सार

ए.आई. के साथ समय सारणीकरण का उद्देश्य शिक्षकों के अनुभव को क्रांति करना है, पारंपरिक समय सारणी बनाने के सामान्य तरीके से परे नवाचारी सुविधाओं को शामिल करके।

यह लेख एक नई आर्टिफिशियल इंटेलिजेंस (AI) द्वारा चलाए जाने वाले समय सारणीकरण मॉडल की परिचय प्रस्तुत करता है जो शिक्षा संस्थानों जैसे स्कूल और कॉलेजों में समय अवधि का आवंटन को अनुकूलित करने के लिए डिज़ाइन किया गया है। पारंपरिक मैनुअल समय सारणीकरण प्रक्रियाएँ अक्सर शिक्षक की उपलब्धता, कक्षा क्षमता, और पाठ्यक्रम की आवश्यकताओं को संतुलित करने में चुनौतियों का सामना करती हैं। प्रस्तुत किए गए AI मॉडल ने उन्नत एल्गोरिदम का उपयोग करके समय सारणी तैयार करने के लिए सुधार किया है, जिससे संसाधन उपयोग को अधिकतम किया जा सकता है, टकराएँ को कम किया जा सकता है, और कुल में शिक्षा दक्षता को बढ़ावा मिल सकता है।

AI समय सारणीकरण मॉडल की मुख्य विशेषताएँ मशीन लर्निंग एल्गोरिदम्स को शामिल करती हैं जो शिक्षा पर्यावरण की गतिशील प्रकृति को अनुकूलित करते हैं। यह सिस्टम शिक्षक की पसंद, विषय की आवश्यकताएँ, और छात्र बोझ वितरण जैसे विभिन्न कारकों को ध्यान में रखता है, ताकि प्रत्येक संस्थान की विशेष आवश्यकताओं के साथ समय सारणी तैयार की जा सके। मॉडल का यह डिज़ाइन आधिकारिक अकादमिक कैलेंडर में अनपेक्षित घटनाओं या संशोधनों के प्रति अनुकूलन की सुनिश्चित करने के लिए अंतिम-मिनट परिवर्तनों को समर्थन करने के लिए किया गया है।

इसके अलावा, AI समय सारणीकरण सिस्टम पूर्व समय सारणीकरण अनुभवों से सीखता है और समय के साथ अपने प्रदर्शन को सतत रूप से सुधारने और बेहतर बनाने की क्षमता शामिल करता है। यह आड़ृष्टिव लर्निंग क्षमता मॉडल की क्षमता को बढ़ाती है कि यह आगामी शिक्षा आवश्यकताओं और पसंदों का समर्थन करने में सुधार कर सकता है, जो एक और उत्तरप्रदाता और लचीला समय सारणी प्रक्रिया को प्रोत्साहित करता है।

TABLE OF CONTENTS

Chapter 1: Project Overview

1.1 Introduction

The Scheduling with AI makes use of Artificial intelligence (AI) to auto schedule the timetable while taking care of all the constraints and preferences. It starts with entering some inputs related to scheduling needs then using these input parameters, it starts filling the periods/lectures. The users can define their own rules of scheduling such as the total no. of periods required in a week. Allowing two continuous periods, maintaining same slots everyday etc. And within a few seconds it will give you a magical timetable.

1.2 Project Aim

The aim of the project is to leverage Artificial Intelligence (AI) to automate the scheduling of timetables, taking into consideration various constraints and user preferences. The primary goal is to streamline the process of creating timetables by allowing users to input scheduling needs and preferences. The project aims to empower users to define their own rules for scheduling, such as specifying the total number of periods required in a week, allowing for two continuous periods, maintaining consistent slots every day, and more. By utilizing these input parameters, the AI-driven system will autonomously generate a well-optimized timetable within seconds, providing a seamless and efficient solution for educational scheduling needs. The overarching objective is to introduce a user-friendly and efficient tool that harnesses the power of AI to revolutionize the traditional and often complex process of timetable creation in educational institutions.

1.3 Objective

The primary objective of the project is to leverage Artificial Intelligence (AI) in the development of an intelligent scheduling system, known as "Scheduling with AI." The project aims to automate the process of timetable creation by utilizing advanced AI algorithms. The key objectives include:

Automated Timetable Creation:

- Develop a system that automates the creation of timetables for educational institutions using AI.

Constraint Handling:

- Implement algorithms that consider various constraints such as teacher availability, classroom capacity, and curriculum requirements during the scheduling process.

User-Defined Rules:

- Allow users to define their own scheduling rules, including parameters like the total number of periods required in a week, allowing two continuous periods, and maintaining consistent time slots every day.

Efficiency and Speed:

- Ensure that the AI-driven scheduling system operates efficiently and swiftly, providing a completed timetable within seconds.

Magical Timetable Generation:

- Develop a system that, through the intelligent application of AI algorithms, creates timetables that are not only optimized but also seemingly "magical" in their ability to meet various user-defined criteria.

User-Friendly Interface:

- Design an intuitive and user-friendly interface that allows users to interact seamlessly with the system, input their preferences, and obtain the desired timetables effortlessly.

The objective is to deliver a sophisticated AI-driven scheduling solution that significantly reduces the time and effort traditionally associated with manual timetable creation, providing educational institutions with a streamlined and

optimized scheduling process. Additionally, the project introduces few key functionalities:

1. Automatic scheduling of class-wise timetable
2. Flexibility to edit the auto-generated timetable through an easy-to-use interface
3. Generate four different kinds of views of timetable:
   - Class Wise timetable Report
   - Teacher wise Timetable Report
   - Room wise occupancy Report
   - Subject wise Timetable Report

Chapter 2: Micro Level Analysis

2.1 Functionality

The project, "Scheduling with AI," leverages Artificial Intelligence (AI) to automate the creation of timetables, addressing various constraints and preferences within educational institutions. By initiating the process with user-input parameters related to scheduling needs, the system efficiently generates timetables by intelligently filling in periods or lectures. Users have the flexibility to define their own scheduling rules, such as specifying the total number of periods per week, allowing for two continuous periods, and maintaining consistent time slots each day. The result is a seamlessly generated timetable, a process that unfolds within seconds, offering a practically "magical" solution to the complex task of timetable creation.

One of the standout features of the project is its user-friendly interface, providing the flexibility to edit the auto-generated timetable effortlessly. This ensures that users can fine-tune the schedule according to specific preferences or unforeseen changes, offering a dynamic and adaptable solution to the ever-evolving needs of educational institutions. Furthermore, the project goes beyond mere timetable creation by offering four distinct views: Class Wise Timetable Report, Teacher Wise Timetable Report, Room Wise Occupancy Report, and Subject Wise Timetable Report. This multifaceted functionality caters to different stakeholders, providing comprehensive insights and reports that contribute to effective management and organization within the educational environment.

2.2 Speed and Efficiency

The Automatic Scheduling of class-wise timetable leveraging Artificial Intelligence (AI) demonstrates a remarkable fusion of efficiency and user-friendly flexibility. By utilizing AI, the system autonomously generates

timetables, adeptly managing constraints and user preferences. The process initiates with user inputs regarding scheduling requirements, allowing customization through defining rules like the total number of periods per week or preferences for continuous periods. The system rapidly generates a comprehensive timetable, embodying a touch of magic, seamlessly aligning with user-defined parameters.

The speed and efficiency of this project are noteworthy. The rapid generation of a well-optimized timetable within seconds not only enhances productivity but also reduces the administrative burden associated with manual scheduling. The ability to swiftly adapt to user-defined rules and preferences showcases the adaptability and intelligence of the AI-driven system. Overall, the project stands as a testament to the marriage of cutting-edge technology, user empowerment, and efficiency in addressing the intricate task of timetable scheduling in educational institutions.

Chapter 3: Macro Level Analysis

3.1 STEPS

- USER INPUT
- DATA DISTRIBUTION

3.2 CONSTRAINTS DEFINING

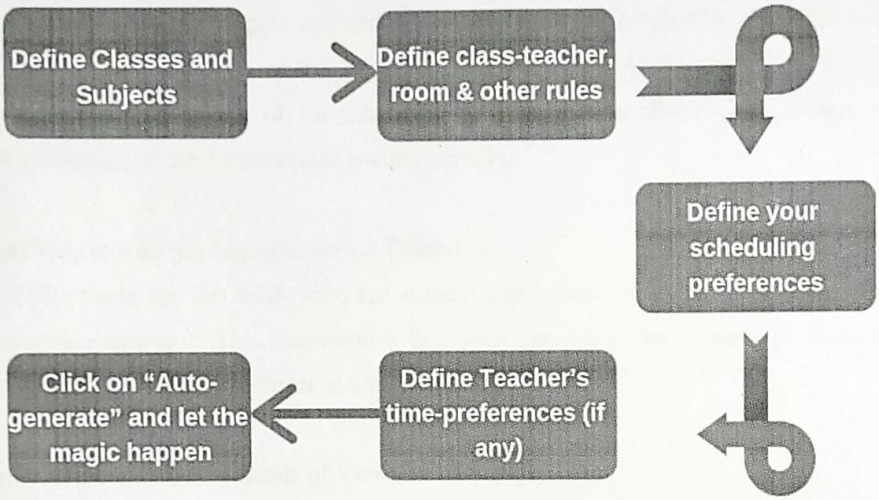
- SECTION
- INSTRUCTOR
- SLOT
- CLASSROOM

3.3 LIBRARIES

- NUMPY
- PANDAS

HOME PAGE

USER FLOW



Define Classes and Subjects:

- Start by inputting details about the classes and subjects involved in the scheduling process. This information lays the foundation for the system to understand the scope and structure of the timetable.

Define Class-Teacher, Room & Other Rules:

- Specify rules governing the allocation of classes, teachers, and rooms. This could include defining relationships between classes and teachers, ensuring specific rooms are assigned to particular classes, and any other constraints essential for a well-organized timetable.

Define Scheduling Preferences:

- Allow users to set preferences based on specific scheduling needs. This could involve determining the total number of periods required in a week for each class, specifying preferences for continuous periods, or maintaining consistent time slots every day. These preferences serve as guidelines for the AI system.

Chapter 5: Conclusion

Define Teacher's Time-Preferences (if any):

- Provide a mechanism for teachers to input their time preferences, considering factors such as preferred teaching hours, breaks, or specific days with scheduling constraints. This ensures that the system takes into account the individual preferences and constraints of each teacher.

Click on "Auto-Generate" and Let the Magic Happen:

- Once all necessary inputs and preferences are defined, initiate the automatic scheduling process by clicking on the "Auto-Generate" button. This prompts the AI-driven system to leverage its advanced algorithms to intelligently fill the timetable, ensuring optimal allocation of classes, teachers, and rooms while adhering to the defined rules and preferences.

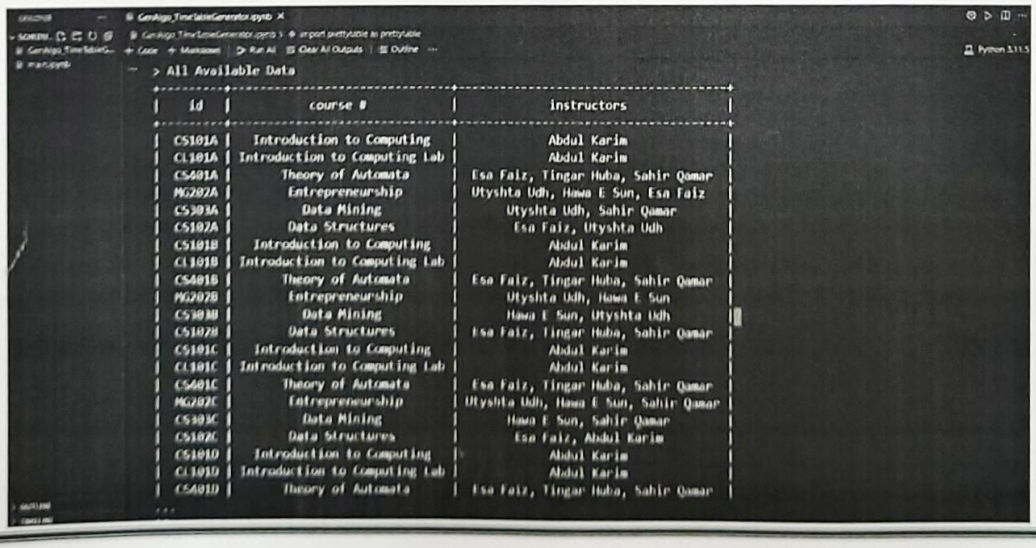
Flexibility to Edit the Auto-Generated Timetable:

- Offer users the flexibility to make manual adjustments to the auto-generated timetable through an easy-to-use interface. This step ensures that users can refine the schedule in real-time, accommodating any specific changes or unforeseen circumstances.

Generate Four Different Kinds of Views of Timetable:

- After the auto-generation, provide users with the ability to view the timetable in different perspectives. The four distinct views—Class-wise, Teacher-wise, Room-wise occupancy, and Subject-wise Timetable Reports—offer comprehensive insights into various aspects of the schedule, enhancing transparency and understanding.

OUTPUT:



> All Available Data

Id	course #	instructors
CS101A	Introduction to Computing	Abdul Karim
CL101A	Introduction to Computing Lab	Abdul Karim
CS401A	Theory of Automata	Esa Faiz, Tingar Huba, Sahir Qamar
MG202A	Entrepreneurship	Utyshta Udh, Hawa E Sun, Esa Faiz
CS303A	Data Mining	Utyshta Udh, Sahir Qamar
CS102A	Data Structures	Esa Faiz, Utyshta Udh
CS101B	Introduction to Computing	Abdul Karim
CL101B	Introduction to Computing Lab	Abdul Karim
CS401B	Theory of Automata	Esa Faiz, Tingar Huba, Sahir Qamar
MG202B	Entrepreneurship	Utyshta Udh, Hawa E Sun
CS303B	Data Mining	Hawa E Sun, Utyshta Udh
CS102B	Data Structures	Esa Faiz, Tingar Huba, Sahir Qamar
CS101C	Introduction to Computing	Abdul Karim
CL101C	Introduction to Computing Lab	Abdul Karim
CS401C	Theory of Automata	Esa Faiz, Tingar Huba, Sahir Qamar
MG202C	Entrepreneurship	Utyshta Udh, Hawa E Sun, Sahir Qamar
CS303C	Data Mining	Hawa E Sun, Sahir Qamar
CS102C	Data Structures	Esa Faiz, Abdul Karim
CS101D	Introduction to Computing	Abdul Karim
CL101D	Introduction to Computing Lab	Abdul Karim
CS401D	Theory of Automata	Esa Faiz, Tingar Huba, Sahir Qamar

Chapter 5: Conclusion

In Conclusion , The AI-driven scheduling model offers a transformative solution to timetable management, integrating advanced technology with user-friendly features. It efficiently guides users through defining classes, subjects, and scheduling preferences, showcasing the intelligence of AI algorithms in generating optimized timetables. The system's flexibility, user empowerment through manual adjustments, and diverse timetable views contribute to a transparent and adaptable scheduling experience. Describing the auto-generation process as "magic" emphasizes the model's remarkable speed and efficiency. Ultimately, this AI model signifies a groundbreaking shift in educational timetable management, promising increased productivity and organization.

Chapter 6: Future scope

Integration of Additional Constraints:

- Accommodate specific subject-teacher preferences, special events, and extracurricular activities.
- Provide a more comprehensive scheduling solution.

Adaptive Learning and Continuous Improvement:

- Implement mechanisms for continuous learning and improvement.
- Adapt dynamically to changing preferences and constraints.
- Ensure ongoing optimization of the scheduling model.

Intelligent Conflict Resolution:

- Enhance the model's ability to intelligently resolve conflicts during scheduling.
- Consider factors like teacher availability, room constraints, and subject requirements.
- Contribute to a more robust and error-resistant scheduling process.

Predictive Analytics for Resource Allocation:

- Incorporate predictive analytics to forecast resource utilization trends.
- Proactively address potential scheduling challenges.
- Optimize resource allocation over longer time frames for improved efficiency.