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# ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

**TOPIC :- VIRTUAL ROOM ACOUSTIC OPTIMIZER**

**COURSE CODE :- 24AD2001**

**GROUP MEMBERS:**

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Title of the Project :  
Virtual Room Acoustic Optimizer;

Problem Statement-  
In contemporary architectural design, acoustic optimization plays a vital role in ensuring clarity, comfort, and quality of sound in enclosed spaces. Poorly designed acoustics can lead to excessive reverberation, sound distortion, and uneven sound distribution, negatively impacting communication, music performance, and overall user experience. Traditional methods of improving acoustics often involve expensive physical modifications or on-site trials, which are both time-consuming and cost-inefficient. A virtual, simulation-based solution can address these challenges by allowing acoustic analysis and optimization before physical implementation.

## Objectives

* To develop a virtual tool for simulating and analyzing room acoustics.
* To evaluate reverberation time, echo control, and sound dispersion in different room layouts.
* To recommend optimal designs and materials for enhanced sound performance.
* To minimize cost and time by reducing the need for repeated physical testing.

Proposed Methodology/Approach  
The system will combine 3D modeling with advanced acoustic simulation techniques such as ray tracing and wave-based modeling. Input parameters will include room geometry, surface materials, sound source positions, and listener locations. Acoustic performance metrics will be calculated, including reverberation time, sound pressure levels, and clarity. Machine learning algorithms will be integrated to process simulation results and suggest design improvements. The tool will feature a graphical interface to visualize sound behavior and provide actionable recommendations for optimal configurations.

Expected Outcome  
A comprehensive, user-friendly software capable of predicting and optimizing acoustic conditions for various room types. This tool will assist architects, engineers, and audio professionals in making informed decisions before construction, ensuring superior sound quality, cost-effectiveness, and reduced project timelines.