Project Proposal: Hotel Data Analysis and Prediction System

1. General Idea

This project aims to design a data-driven system that analyzes and predicts hotel operations.
By integrating multiple datasets — Hotels, Customers, Bookings, and Payments — the
system will generate insights to support hotel managers in decision-making, improve
customer experience, and optimize financial performance. The project combines data
analysis, visualization, and AI models to deliver both business intelligence dashboards and predictive analytics.

2. Problem Statement

Hotels often encounter challenges such as:
- Difficulty in understanding customer booking patterns and preferences.
- High levels of cancellations without clear predictive insights.
- Limited visibility on financial performance (payments, refunds, pending amounts).
- Absence of interactive dashboards that support real-time decision-making.
- Lack of AI-powered systems for forecasting occupancy rates and revenues.

3. Proposed Solution

Datasets

- Hotels: Basic information about hotels, branches, star ratings, and capacity.
- Customers: Profiles of clients including demographics and contact details.
- Bookings: Reservation details (dates, room type, number of guests, status).
- Payments: Transactions related to each booking (amount, method, status).

Tools & Technologies

- SQL Server → Database management, data storage, and queries.
- Python (Pandas, Matplotlib, Seaborn) → Data cleaning, processing, and visualization.
- AI Model Training & Testing → Predict booking cancellations, occupancy, and revenues.
- Power BI → Business dashboards and KPIs for management.
- Visual Studio → Development and integration environment.
- Microsoft Word → Project documentation and reporting.
- Canva → Visual design for professional presentation

4. Workflow & Methodology

1. Data Storage: Load Hotels, Customers, Bookings, and Payments datasets into SQL Server.
2. Data Preparation: Clean and preprocess datasets using Python (Pandas).
3. Exploratory Data Analysis (EDA): Create descriptive statistics and visualizations with
Matplotlib & Seaborn.
4. AI Modeling:
- Predict cancellations based on customer and booking history.
- Forecast occupancy rates for different hotels and seasons.
- Estimate revenues based on past data.
5. Visualization: Build interactive dashboards in Power BI (KPIs, trends, cancellations,
revenues).
6. Reporting & Presentation: Document findings in Word and design a professional
presentation in Canva.

5. Expected Output

- A structured relational database with Hotels, Customers, Bookings, and Payments datasets.
- Dashboards in Power BI displaying:
- Occupancy rate.
- Customer demographics.
- Booking trends and cancellations.
- Financial performance and revenue insights.
- Python visualizations: charts, heatmaps, and trends.
- AI prediction model for cancellations and booking forecasts.
- Final documentation (Word report) and presentation (Canva/PowerPoint).

6. Target Audience

- Hotel Management → for strategic and operational decisions.
- Finance Teams → for revenue tracking, refunds, and payment analysis.
- Marketing Teams → for understanding customer profiles and preferences.
- Students & Data Analysts → as a case study in applied data science and AI.