PROJECT DOCUMENTATION: SMART SALOON ENTERPRISE SYSTEM

Project Title: Smart Saloon Management System (SSMS) **Version:** 1.0 (Enterprise Edition) **Domain:** SaaS / Business Automation / Artificial Intelligence **Proposed Tech Stack:** Python (Django), React.js, IoT, AI (OpenCV)

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1. Executive Summary

The **Smart Saloon Management System (SSMS)** is a high-performance digital solution designed to modernize operations for large-scale beauty parlours (15+ employees). The system addresses critical industry pain points: unpredictable wait times during peak seasons (e.g., Eid), manual payroll inefficiencies, and lack of customer retention data.

By integrating **Biometric IoT**, **Artificial Intelligence**, and **Real-time WebSockets**, the system transforms a traditional saloon into a data-driven smart business.

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2. System Architecture

The system operates on a Micro-Monolithic architecture to ensure low latency and high reliability.

- **Frontend (User/Staff):** React.js with Tailwind CSS (PWA Support).
- **Backend API:** Django REST Framework (Python).
- **Real-Time Layer:** Django Channels + Redis (for live queue updates).
- **Database:** PostgreSQL (Relational Data Integrity).
- **AI Engine:** Scikit-Learn (Time Prediction) & MediaPipe (Face Analysis).
- **Hardware Interface:** Python `pyzk` library for ZKTeco Biometric integration.

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3. Detailed Module Specifications

This system is divided into **5 Core Modules**.

🟢 Module 1: The Super Admin & Manager Dashboard

Target User: *Owner / Shop Manager* ***Platform:*** *Desktop / Web*

This is the "Control Room" of the saloon. It provides granular control over the entire business.

- **1.1. Live Floor Monitor:**
  - A visual representation of all 15 chairs.
  - **Status Indicators:** Green (Available), Red (Occupied), Yellow (Break).
  - **Real-time Metrics:** Total revenue today, Total active customers, Estimated closing time based on current queue.
- **1.2. Biometric HR & Payroll System:**
  - **Integration:** Connects directly to the shop's Biometric Attendance Device via IP.
  - **Automated Sync:** Fetches "Check-In" and "Check-Out" logs every 30 minutes.
  - **Salary Engine:** Automatically calculates monthly payout based on: `Net Salary = (Base Pay) + (Commission % of Service Revenue) - (Late Penalties)`.
- **1.3. Financial Reports:**
  - Daily, Weekly, and Monthly Revenue Charts.
  - **Expense Tracker:** Log shop expenses (electricity, rent, consumables) to calculate Net Profit.
- **1.4. Inventory Management:**
  - Track usage of saloon products (Shampoos, Creams).
  - **Low Stock Alert:** Admin gets notified when inventory dips below the threshold.
- **1.5. CRM & Marketing:**
  - View detailed Customer Database.
  - **Campaign Manager:** Send bulk WhatsApp offers to customers who haven't visited in 45+ days.

🔵 Module 2: Customer Experience Portal (Web & PWA)

Target User: *Customers* ***Platform:*** *Mobile Web / App*

This serves as the public face of the brand and the primary booking engine.

- **2.1. AI Style Consultant (The "Viral" Feature):**
  - **Face Shape Analysis:** Users upload a photo or use the camera. The AI (OpenCV) detects facial landmarks to classify the face as Round, Oval, Square, or Diamond.
  - **Recommendation Engine:** Suggests hairstyles that mathematically suit the user's face shape.
- **2.2. Smart Booking & Queueing:**
  - **Remote Booking:** Customers book slots from home.
  - **"Uber-style" Tracking:** Shows the exact position in the queue (e.g., *"You are 5th in line. Est. wait: 42 mins"*).
  - **Dynamic Rescheduling:** If a user is late, they can push their slot back by 15 mins (limit 1 time) via the app.
- **2.3. Gamified Loyalty (Digital Passport):**

    - **Points System:** 1 Haircut = 10 Points.
    - **Tier Levels:** Silver, Gold, Platinum status based on visits.
    - **Redemption:** Users can convert points into free services directly in the app.
- **2.4. Walk-in Kiosk Mode:**
    - A simplified version of this module runs on a tablet at the shop entrance for users who do not use the app. They scan a QR code to join the queue.

🟡 Module 3: Employee Station Interface

Target User: *Barbers / Stylists* ***Platform:*** *Tablets mounted at each styling station*

- **3.1. My Queue Management:**
    - Displays only the customers assigned to this specific barber.
    - Shows special notes (e.g., *"Customer prefers scissors only"*).
- **3.2. Job Timer (Critical for Data):**
    - **Action:** Barber taps **[Start Job]** when the customer sits and **[Finish Job]** when done.
    - **Purpose:** This data is sent to the backend to calculate the *Real-time Wait Time* for others and track the barber's efficiency.
- **3.3. Personal Earnings:**
    - Staff can view their own daily earnings and commission accumulation in real-time (motivates performance).

🔴 Module 4: The Smart Shop Display (TV)

Target User: *Waiting Customers* ***Platform:*** *Large Smart TV (Android TV OS)*

Transforms the waiting area into a digital experience similar to airport flight boards.

- **4.1. The "Queue Board":**
    - Visually attractive display of **"Now Serving"** and **"Next Up"** token numbers.
    - Audible Chime notification when a token number changes.
- **4.2. Infotainment:**
    - Splits the screen to show styling videos, shop offers, or live news alongside the queue status to reduce perceived waiting time.

🟣 Module 5: Automation & AI "Brain"

Target User: *System (Background Process)*

- **5.1. The "Eid Rush" Algorithm:**
    - **Problem:** During festivals, individual bookings cause chaos.
    - **Solution:** The system detects high traffic (Queue > 20). It automatically disables "Specific Barber Selection" and forces "First Available Barber" mode to maximize throughput.
- **5.2. WhatsApp Automation (Bot):**
    - **Booking Confirmation:** Sends PDF token immediately.
    - **"Your Turn" Alert:** Sends a message when the customer is #2 in the queue.

    - **Retention:** *"Hi Salman, it's been 30 days. You are due for a trim!"*
- **5.3. Predictive Time Modeling:**
    - The system learns that *Barber A* takes 20 mins for a haircut, but *Barber B* takes 30 mins. It adjusts wait time estimates dynamically based on who is working.

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4. Operational Workflows

A. The Customer Journey

1. **Discovery:** Customer visits website -> Uses AI Face Scan -> Chooses Style.
2. **Booking:** Selects Service -> Gets Token #45 -> Time: 4:30 PM.
3. **Waiting:** Checks App at home. Moves to shop when notification says "15 Mins Left".
4. **Service:** Arrives -> Barber presses [Start Job] -> Service Done -> Barber presses [Finish Job].
5. **Exit:** Customer pays (Auto-invoice on WhatsApp) -> Rates Barber 5 Stars.

B. The Employee Journey

1. **Morning:** Punches Biometric Machine (Auto-login to System).
2. **Working:** Tablet shows queue. Serves customers.
3. **Closing:** Punches out. System calculates Day's Commission + Base Salary.

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5. Database Schema (Key Entities)

To support the above, the database will handle complex relationships:

- **`User_Table`:** Stores Admin, Staff (with Shift details), and Customers (with Face Shape data).
- **`Service_Catalog`:** Service Name, Base Price, Approx Duration.
- **`Live_Queue`:** TokenID, CustomerID, AssignedStaff, Status (WAITING, IN-CHAIR, COMPLETED), Timestamp.
- **`Work_Logs`:** StaffID, ServiceID, Actual_Time_Taken (Used for AI Training).
- **`Attendance_Records`:** StaffID, CheckIn_Time, CheckOut_Time, Late_Flag.
- **`Finance_Ledger`:** TransactionID, Amount, Staff_Commission_Split, Payment_Method.

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6. Development Roadmap

1. **Phase 1 (Core):** Develop Admin Dashboard, Customer Booking (Web), and Basic Database.
2. **Phase 2 (Integration):** Connect Biometric Machine logic and Employee Tablet View.
3. **Phase 3 (Real-time):** Implement WebSockets for Live Queue & Shop TV Display.
4. **Phase 4 (Intelligence):** AI Face Scan implementation and WhatsApp Automation.

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7. Conclusion

The **Smart Saloon Enterprise System** is not just an operational tool; it is a business growth engine. By solving the "Waiting Game" through technology and ensuring precise automated management of the 15+ member workforce, this project sets a new standard for the grooming industry.

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