**1. Product Overview**

**Introduction**

**Problem Statement:**

Urban light pollution disrupts natural sleep cycles, increases anxiety, and contributes to long-term mental health issues. Current urban lighting systems prioritize visibility and energy efficiency but overlook their psychological impact.

**Solution:**

Our product, Lumi Shield, is an AI-powered smart lighting system that dynamically adjusts streetlight brightness and colour temperature based on real-time environmental and human activity data. It minimizes excessive artificial lighting while ensuring safety and well-being.

**Target Audience:**

- City planners & municipalities

- Environmental agencies

- Residential communities & smart city developers

- Individuals affected by sleep disorders

**Unique Selling Proposition (USP)**

- AI-Driven Light Optimization– Unlike static streetlights, Lumi Shield adapts lighting based on traffic, weather, and circadian-friendly settings.

- Mental Health Integration– Reduces blue light exposure in urban areas, promoting better sleep and mental well-being.

- Energy Efficiency + Well-being – Lowers energy consumption while enhancing public health, a unique combination in smart city solutions.

**2. Features & Functionalities Key Features**

- Adaptive Street Light – Lights dim or brighten based on real-time pedestrian and vehicle activity.

- Circadian-Friendly Mode – Uses warm light at night to support healthy sleep cycles.

- Light Pollution Heatmap – AI-based tracking system that maps areas with excessive artificial light.

- Mobile & Dashboard Control – Allows users (residents & city officials) to monitor and adjust

lighting preferences.

- Eco-Mode for Wildlife – Special settings to reduce disruption to nocturnal animals in green zones.

**Technical Details:**

- Tech Stack: Python (AI), Node.js (backend), React (frontend), TensorFlow (AI model), MongoDB (database).

- APIs & External Services: Open Weather API (for adaptive lighting based on weather), IoT sensor integration for real-time adjustments.

- Cloud Infrastructure: AWS Lambda (serverless processing), Firebase (real-time updates), Google Cloud for AI model deployment.

**3. App Flow / System Workflow**

1. Data Collection – IoT sensors detect ambient light levels, pedestrian/vehicle movement, and air quality.

2. AI Processing – The AI model predicts optimal lighting conditions using collected data.

3. Lighting Adjustment – Streetlights adjust brightness and colour temperature in real time.

4. User Interaction– City officials & residents can monitor and customize settings via a web/mobile dashboard.

5. Reporting & Optimization– The system continuously learns and improves light settings based on usage patterns.

**4. Future Plans & Scalability**

- Integration with Smart City Networks – Connect with existing smart traffic and energy grids.

- AI Enhancements– Improve prediction models for more precise lighting adjustments.

- Expansion to Residential & Commercial Areas – Adapt the system for homes, office buildings, and shopping corner.

- Global Scalability– Partner with urban development programs worldwide to promote healthier city lighting.