AI Co-Innovation Program
برنامج الابتكار المشترك للذكاء الاصطناعي

Waterless PV Panel Cleaning Optimization

1. **Challenge Description**:

To maintain optimal energy generation from photovoltaic (PV) systems in KSIA's desert environment, the airport seeks AI-powered waterless or minimal-maintenance cleaning solutions. These systems must reduce reliance on water, cut manual labor, and maintain performance despite dust and sand accumulation. The AI solution can enhance cleaning schedules, monitor panel efficiency, and predict maintenance needs based on environmental data and system performance.

2. **Available Data Types**:
   See attached.

3. **Expected Outcomes**:
   - AI system capable of predicting optimal cleaning intervals
   - Automated cleaning activation or alerts based on dust levels
   - Maintain ≥90% panel efficiency with ≤4 cleanings per year
   - Demonstrated water use reduction ≥80%
   - ROI model comparing AI-supported vs. manual cleaning operations

4. **Constraints & Requirements**:
   - Must use ≤0.2 L/m^2/year of water (or none at all)
   - Cleaning system should last ≥5 years with <10% effectiveness loss

5. **Potential Impact**: The expected benefits or impact of solving the challenge.
   - Significant water conservation in a water-scarce environment
   - Lower operational costs and reduced manual labor
   - Higher, more consistent PV efficiency and output
   - Improved sustainability metrics for KSIA's clean energy strategy
   - Scalable model for airports and facilities across the Kingdom