CCTV Video Stream Analysis for Footfall Tracking

Business Use Case

In retail environments, understanding customer movement and density patterns is essential for optimizing store layouts, improving customer experience, and increasing sales. Your task is to create an API that parses CCTV video streams to track footfall, identify high-density and low-density areas, and analyze traffic patterns.

Assignment Details

Your goal is to build and host an API that can:

1. **Input Video Stream**:
    - Accept a video stream URL from a CCTV camera.
    - Optionally, specify analysis zones in the store layout (coordinates of areas to monitor).
2. **Footfall Tracking**:
    - Analyze the video to:
        - Count the number of people entering, exiting, and moving within specified zones.
        - Track movement paths to detect customer behavior patterns.
3. **Density Analysis**:
    - Identify and classify high-density and low-density areas within the video.
    - Generate heatmaps to visually represent density distribution over time.
4. **Output Data**:
    - Provide a summary report including:
        - Total footfall numbers (entry, exit, and within zones).
        - High-density time periods and areas.
        - Heatmaps (as image URLs).

API Requirements

Input Contract:

```
{
    "video_stream_url": "<stream_url>",
    "zones": [
        {
            "zone_id": "<string>",
```

```
            "coordinates": {
                "x_min": <integer>,
                "y_min": <integer>,
                "x_max": <integer>,
                "y_max": <integer>
            }
        }
    ]
}
```

1.
2. **Output Contract**:

Success response:

```
{
    "footfall_summary": {
        "total_footfall": <integer>,
        "zone_footfall": {
            "zone_id_1": <integer>,
            "zone_id_2": <integer>
        },
        "high_density_times": [
            {
                "start_time": "<HH:MM>",
                "end_time": "<HH:MM>",
                "zone_id": "<string>"
            }
        ]
    },
    "heatmap_urls": [
        "<url_to_heatmap_image>"
    ]
}
```

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Error response:

```
{
```

```
    "error": "<error_message>"
}
```

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Evaluation Criteria

1. **Functionality**:
   - Accurate footfall counts and zone tracking.
   - Correct identification of high/low-density areas and generation of heatmaps.
2. **Code Quality**:
   - Clear, efficient, and modular code.
   - Effective use of image/video processing libraries or pre-trained models.
3. **Deployment**:
   - API hosted and accessible via the provided link.
   - Capable of processing real-time video streams or pre-recorded footage.
4. **Documentation**:
   - Instructions for setting up the API and its dependencies.
   - Clear input/output format explanation with examples.
5. **Innovation**:
   - Bonus for using AI-based solutions (e.g., OpenCV, YOLO, or pre-trained crowd analytics models).
   - Bonus for integrating real-time alerting for high-density zones.

Submission Guidelines

1. **Video Submission**:
   - Upload your video of your presentation to a cloud storage service (e.g., Google Drive, Dropbox) and share the link.
2. **Storyboard and Explanation**:
   - Provide a PDF document outlining your creative approach and choices.
3. Upload code to github account and provide access to hackathon@onlinesales.ai. Once uploaded send an email to the same email address. Do add team name in the subject line.
4. **Deadline**:
   - Submit your assignment by **23-12-2024**