

Interface Design and Implementation

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This section presents the design and implementation of the web-based user interface developed for the CSRNet crowd counting system. The interface enables users to interact with the trained deep learning model through a browser-based platform.

A. Interface Objectives

The objective of the interface is to provide an intuitive mechanism for uploading images and videos, visualizing crowd density heatmaps, and displaying estimated crowd counts in real time.

B. Framework Selection

Flask is employed as the backend web framework due to its lightweight nature and ease of integration with Python-based deep learning models.

C. Input Module

The input module supports both image and video uploads using HTML forms. The server validates file formats and routes inputs to the appropriate processing pipeline.

D. Output Visualization Module

The output visualization module generates density heatmaps by normalizing the predicted density maps and applying color mapping. The heatmaps are overlaid on original frames for improved interpretability.

E. Backend Processing Workflow

Uploaded inputs undergo preprocessing including resizing and normalization before being passed to the CSRNet model. The resulting density map is summed to obtain the final crowd count.

F. Deployment and Usability

The interface is designed for CPU-based execution and local deployment, ensuring reliability and ease of demonstration in academic environments.

G. Summary

The proposed interface successfully bridges advanced deep learning techniques with user-friendly web technologies, enabling practical crowd monitoring solutions.