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Evaluate CNN Accuracy for Crowd Counting and Density Mapping

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Abstract: *In fields including public safety, urban infrastructure planning, and large-scale event management, precise crowd counts and density estimation are essential. Because of occlusions, scale differences, and intricate spatial distributions, traditional methods frequently have drawbacks. In order to overcome these obstacles, we provide a thorough analysis and use of Convolutional Neural Network (CNN)-based techniques for crowd counting in this paper, utilizing contemporary designs. We assess the effectiveness of sophisticated models, such as attention-enhanced networks and Multi-column CNNs (MCNNs), which are intended to highlight important crowd locations and capture multi-scale properties. The resolution of generated density maps is improved by using deconvolution layers to restore spatial detail lost during downsampling. Mean Absolute Error (MAE) and Root Mean Squared Error (RMSE) are two measures used to evaluate the performance of our models, which are trained and verified using benchmark datasets like ShanghaiTech (Parts A and B) and UCF CC 50. The outcomes show notable gains in accuracy and resilience in a variety of crowd situations. We also go into ethical issues, real-time optimization techniques, and existing constraints like dataset variety and environment-specific generalization. This work offers a more sophisticated viewpoint on CNN-based crowd analysis and lays the groundwork for upcoming improvements in crowd monitoring systems that are scalable, effective, and morally sound*

Keywords: Convolutional Neural Networks, Crowd Counting, Density Estimation, Multi-column CNN, Attention Mechanism, Real-time Processing.

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