Title, Authors, Venue, and Publication Year

- **Title**: Rain Streak Removal via Dual Graph Convolutional Network
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Problem Statement

This paper deals with the problem of rain streak removal in single images, which is crucial for enhancing the performance of various computer vision systems, especially in fields such as road surveillance, autonomous driving, and photography. Most existing methods use convolutional neural networks (CNNs) that model only local relationships, missing long-range contextual dependencies required to effectively handle complex and spatially distributed rain streaks.

Cost Function

The paper optimizes the Mean Absolute Error (MAE) as the cost function, defined as:

$$L = \frac{1}{M} \sum_{i=1}^{M} \|Y_i - Y_{\text{gt},i}\|_1$$

where:

- M is the number of training samples,
- Y_i is the de-rained output image for sample i,
- $Y_{\text{gt},i}$ is the ground truth (clean) image for sample i,
- $\|\cdot\|_1$ denotes the L_1-norm, which helps to minimize over-smoothing, thus preserving image details while removing rain streaks.

where:

- $Y = X + R = X + f(X)$
- Here f(X) is computed by our DCGN neural network which will be trained.
- Our neural network contains multiple layers of modules where each layer has a DCM (Dilated Convolutional Module, sGCN (Spatial GCN Module), cGCN(Channel GCN Module) which are basic recurring units in DGCN(Dual Graph Convolutional Network).

This approach is chosen over Mean Squared Error (MSE) to balance rain removal with detail preservation, as MAE avoids the over-smoothing tendency of MSE.