Dual Heterogeneous Complementary Networks for Single Image Deraining

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Research Background and Purpose:

Deraining

Visibility degradation of images captured in adverse weather

Harmful effect on various visual systems

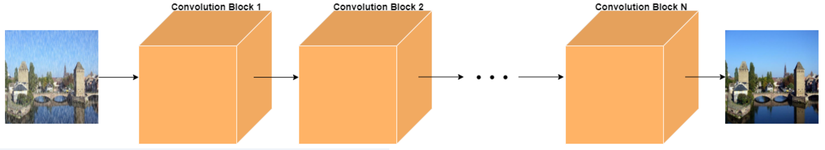
Image deraining: a fundamental and challenge low-level vision task

Purpose: Exploit a dual heterogeneous complementary network for improving deraing performance

Related Work :

For example:
DerainNet, JORDER, SEMI, RCDNet, RESCAN

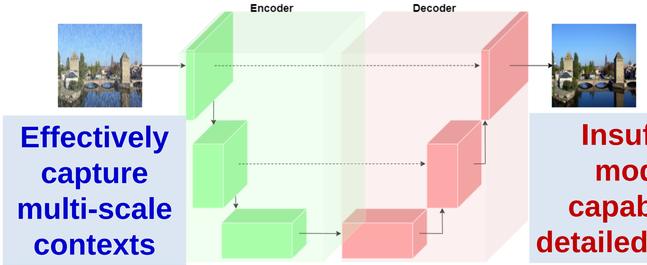
Single scale CNN models



Pros:
- Learn representative feature in the original resolution
- Simply increase the network depth by serialy piling up the conv blocks

Cons:
- Insufficiency in capturing the multi-scale representative features and different patterns of rain structures

Multi scale CNN models

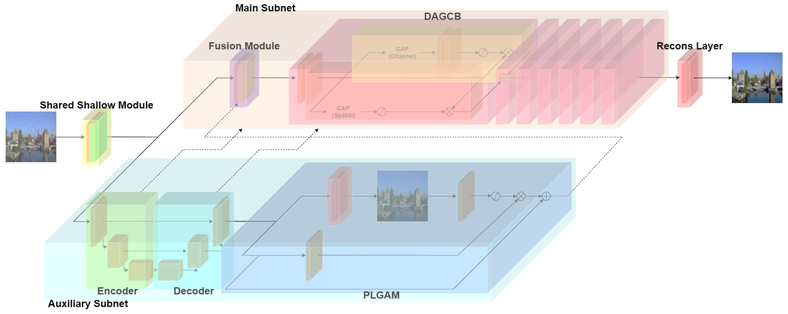


Effectively capture multi-scale contexts

Insufficient modeling capability for detailed structure

Proposed method:

Dual Heterogeneous Complementary Deraining Network : **DHCDN**

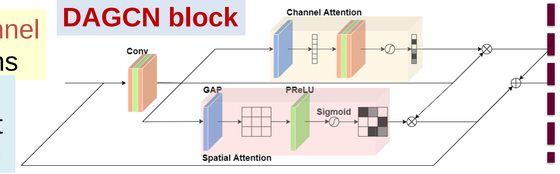


Main Subnet (MainNet): Learn the representative features of the original resolution (**A serial of DAGCN blocks**)
Auxiliary Subnet (AuxNet): Learn multi-scale semantic contexts for enhancing the modeling capability of the main subnet
PLGAM Module: Leverage the pseudo label of the AuxNet to enforce the representative ability of the MainNet

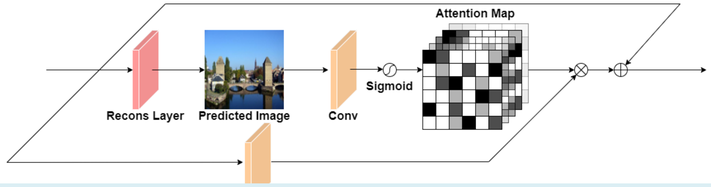
Incorporate both channel and spatial attentions

Automatically emphasize important and effective feature

DAGCN block



Pseudo-label Guided Attention Module : **PLGAM**



Leverage the pseudo label of the AuxNet to automatically learn a **supervision attention** map

Refine the Mainnet's contextual feature

Multiple Losses: MSE, edge-enhanced loss and Perceptual loss

Experimental Results:

Construct a **Common model** using 13700 image pairs from several datasets

Comparison with SoTA methods

Methods	Rain1200	Rain200L	Rain200H	Rain800
Rainy	23.64/0.727	26.71/0.834	13.79/0.367	22.18/0.663
DDN	23.39/0.832	34.46/0.957	26.11/0.792	22.78/0.803
SEMI	26.06/0.822	25.03/0.842	16.56/0.486	22.35/0.788
DIDMDN	29.66/0.899	35.40/0.962	26.61/0.824	22.53/0.812
RESCAN	30.57/0.909	33.83/0.957	23.01/0.744	24.99/0.869
UMRL	30.57/0.909	33.83/0.957	23.01/0.744	24.99/0.869
PReNet	31.49/0.910	37.25/0.978	28.57/0.887	24.79/0.849
SPANet	31.94/0.902	35.79/0.965	26.27/0.865	22.41/0.838
MSPFN	32.06/0.913	31.64/0.925	27.39/0.843	27.01/0.851
Ours	31.85/0.900	36.37/0.970	29.56/0.883	29.46/0.896

Visualization Results