

# Super-Resolution

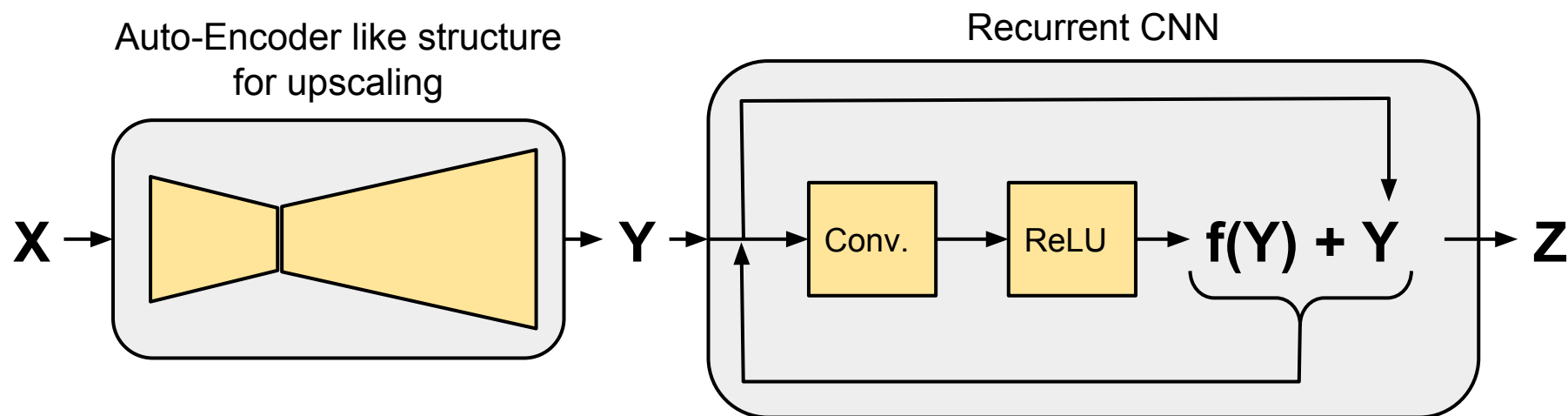
Planned Experiments

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# Our Proposed Solution



$X$ : Low resolution input

$Y$ : Intermediate upscaling result

$Z$ : High resolution output

# Hyperparameters

- Learning rate
- Depth of upscale network
- Depth of recurrent block
- Number of recursions

# Dataset

- **Urban100** (Buildings)

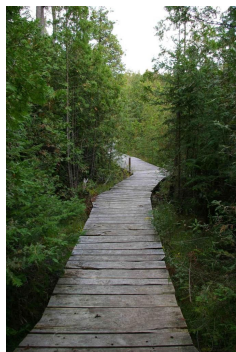


- **BSD100** (Natural images, mostly with animals/humans)



# Dataset

- **SunHays80** (Mostly buildings and landscapes)

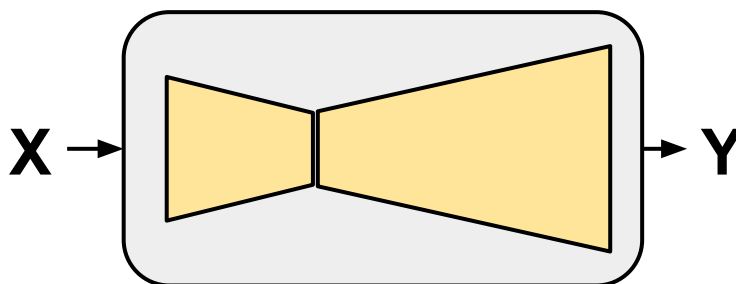
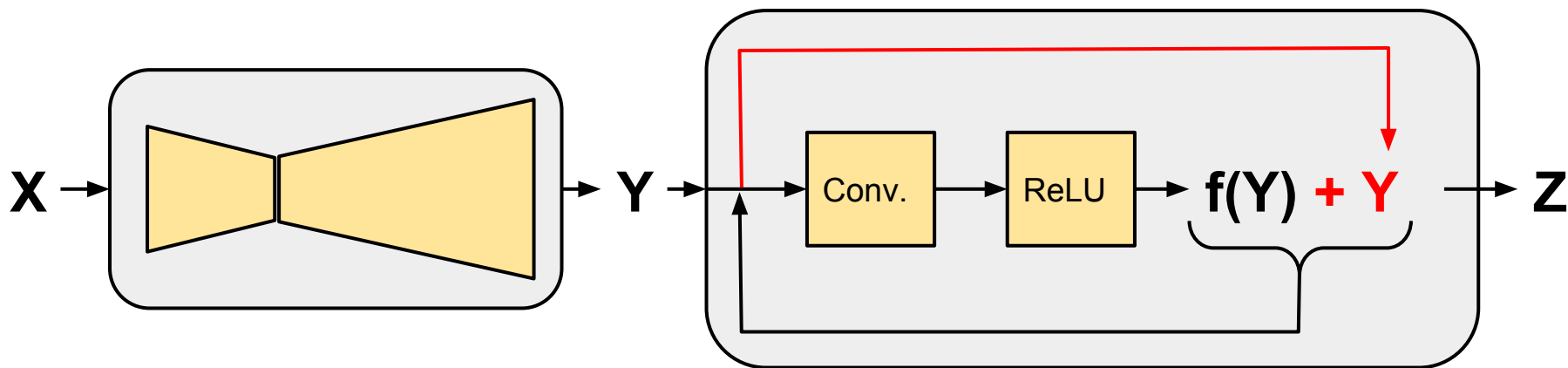


- **Set5, Set14** (Random images)



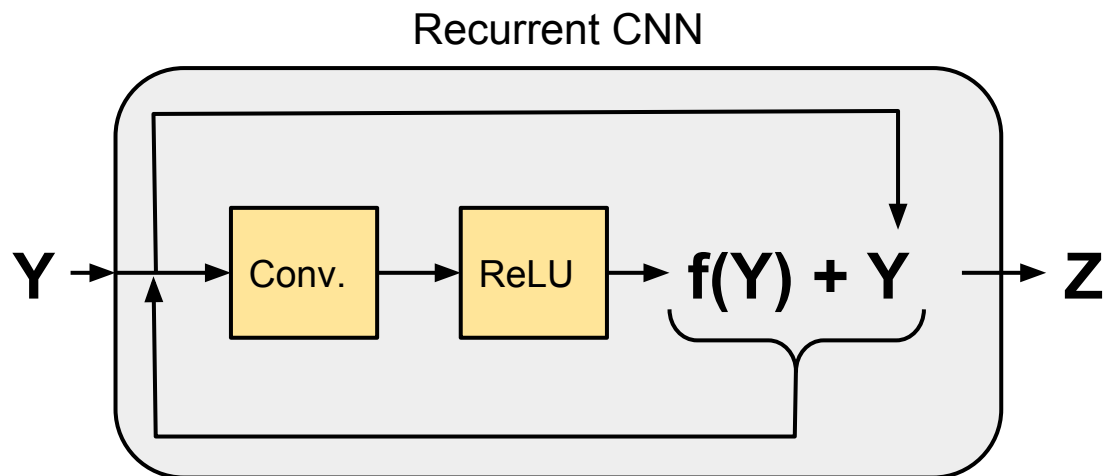
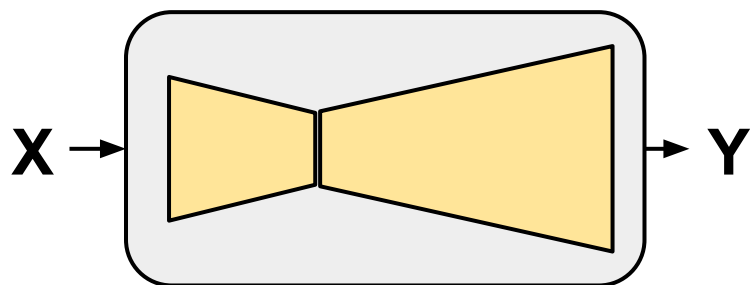
# Ablation Study

- Remove residual connection
- Remove recurrent block



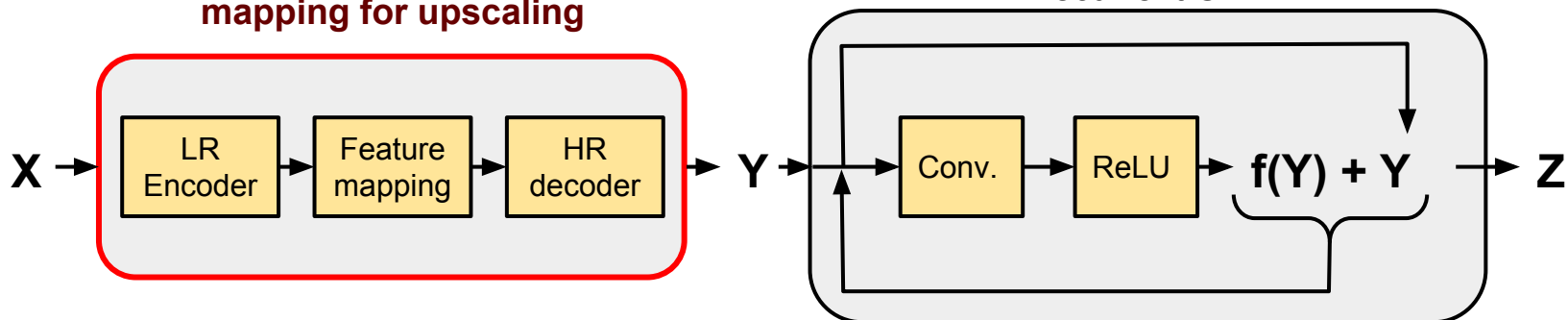
# Experiments with Training

- Pre-train upscale network
- Fix parameters
- Train recurrent block

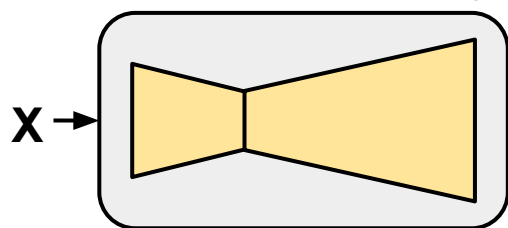


# Possible Modifications

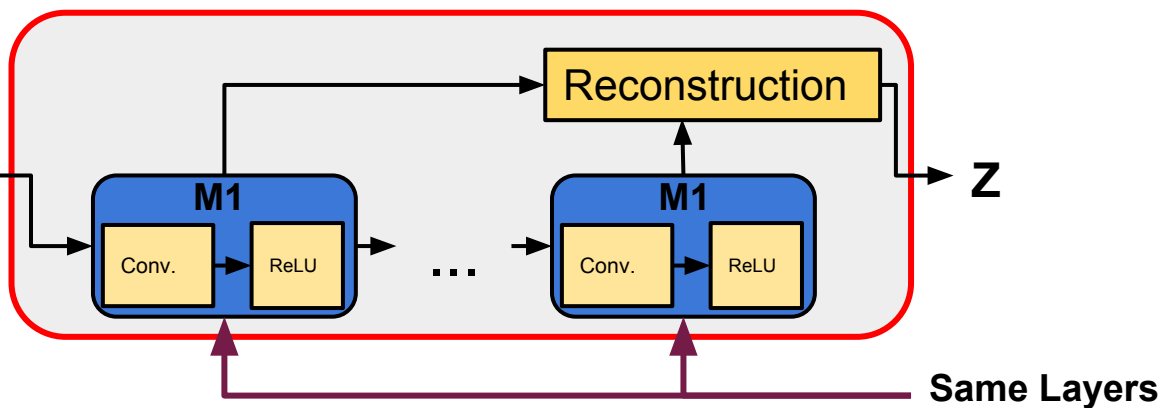
**Two Auto-Encoders with feature mapping for upscaling**



**Auto-Encoder like structure for upscaling**



**Recurrent CNN with skip connections**





# Comparison to Prior Work

Comparison similar to the one in “Deeply-Recursive Convolutional Network for Image Super-Resolution” by Kim et al.

- Comparison datasets: Set5, Set14, BSD100, Urban100
- Comparison metrics: PSNR, SSIM

Dataset	Scale	Bicubic PSNR/SSIM	A+ [29] PSNR/SSIM	SRCNN [5] PSNR/SSIM	RFL [23] PSNR/SSIM	SelfEx [10] PSNR/SSIM	DRCN (Ours) PSNR/SSIM
Set5	×2	33.66/0.9299	36.54/0.9544	36.66/0.9542	36.54/0.9537	36.49/0.9537	37.63/0.9588
	×3	30.39/0.8682	32.58/0.9088	32.75/0.9090	32.43/0.9057	32.58/0.9093	33.82/0.9226
	×4	28.42/0.8104	30.28/0.8603	30.48/0.8628	30.14/0.8548	30.31/0.8619	31.53/0.8854
Set14	×2	30.24/0.8688	32.28/0.9056	32.42/0.9063	32.26/0.9040	32.22/0.9034	33.04/0.9118
	×3	27.55/0.7742	29.13/0.8188	29.28/0.8209	29.05/0.8164	29.16/0.8196	29.76/0.8311
	×4	26.00/0.7027	27.32/0.7491	27.49/0.7503	27.24/0.7451	27.40/0.7518	28.02/0.7670
B100	×2	29.56/0.8431	31.21/0.8863	31.36/0.8879	31.16/0.8840	31.18/0.8855	31.85/0.8942
	×3	27.21/0.7385	28.29/0.7835	28.41/0.7863	28.22/0.7806	28.29/0.7840	28.80/0.7963
	×4	25.96/0.6675	26.82/0.7087	26.90/0.7101	26.75/0.7054	26.84/0.7106	27.23/0.7233
Urban100	×2	26.88/0.8403	29.20/0.8938	29.50/0.8946	29.11/0.8904	29.54/0.8967	30.75/0.9133
	×3	24.46/0.7349	26.03/0.7973	26.24/0.7989	25.86/0.7900	26.44/0.8088	27.15/0.8276
	×4	23.14/0.6577	24.32/0.7183	24.52/0.7221	24.19/0.7096	24.79/0.7374	25.14/0.7510

# Fun Experiments

- Try upscale factor 1
- Add noise to input

# Questions

