Recurrent Back-Projection Network for Video Super-Resolution

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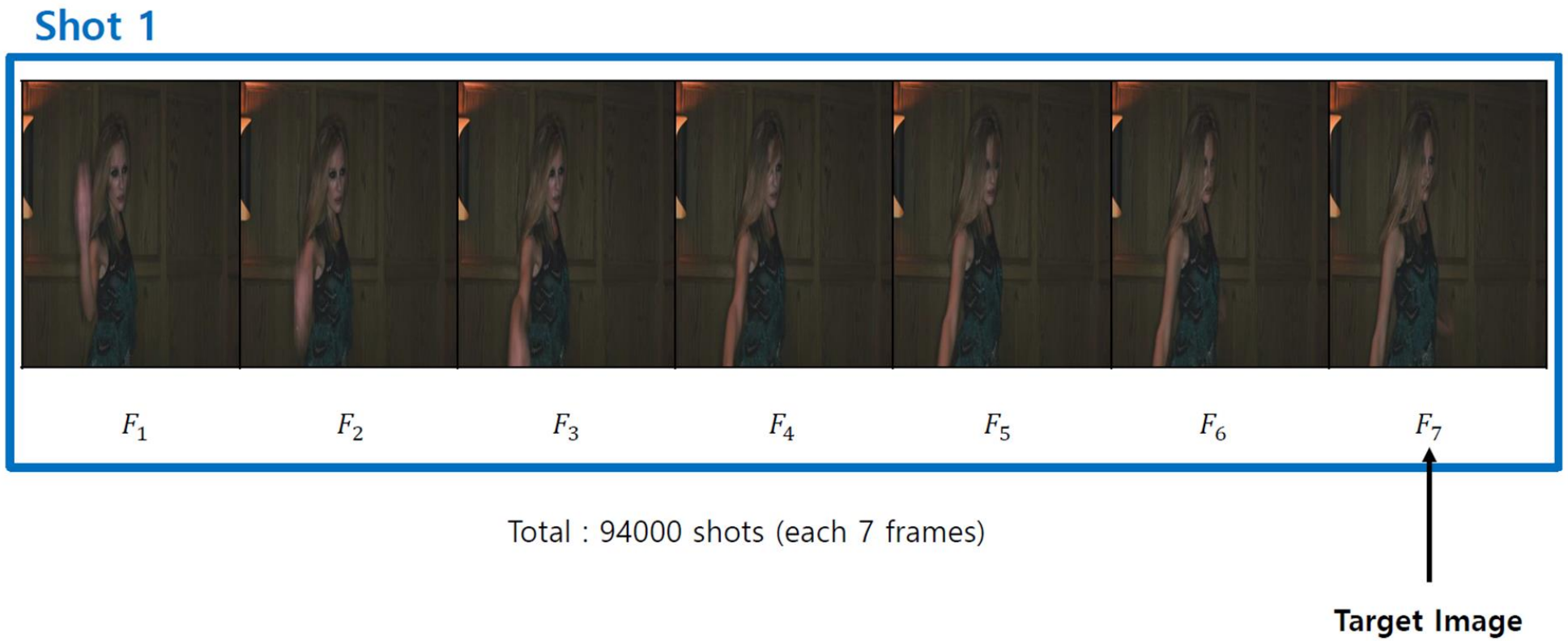
RBPN

1. Recurrent Architecture for Video Super Resolution published at 2019 CVPR
2. Using N Frames (including Target)



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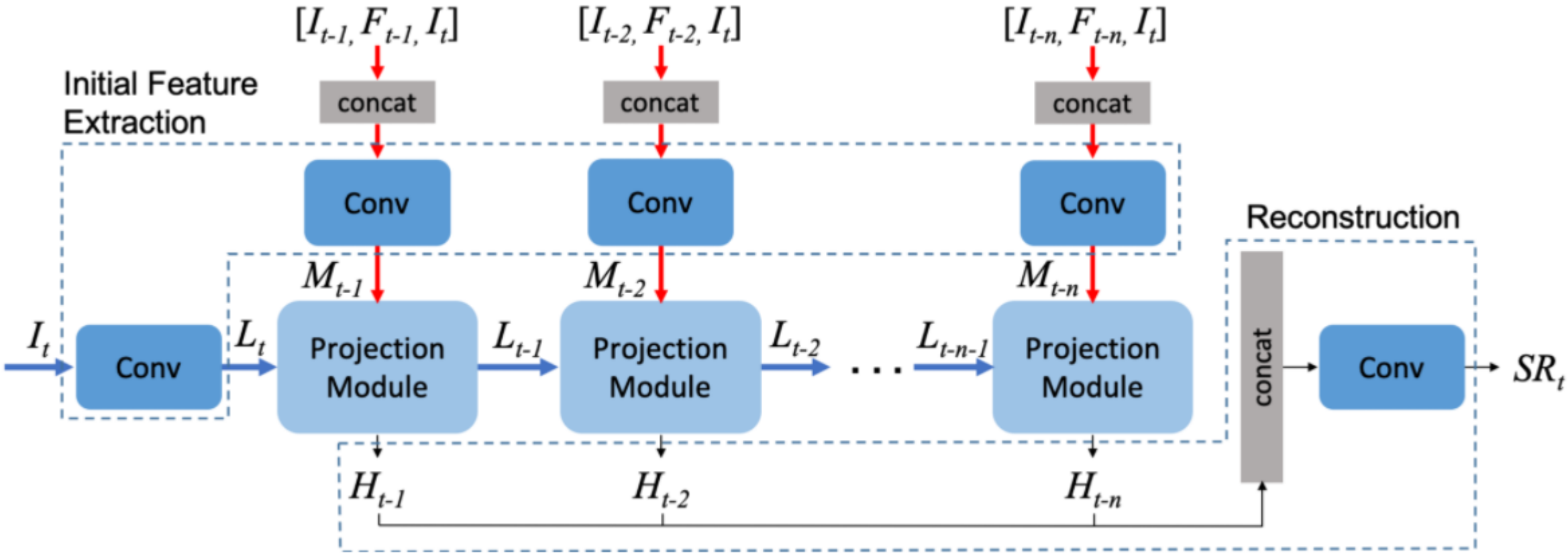
1. **Feature Extraction**
2. **Fusing**
3. **Reconstruction**



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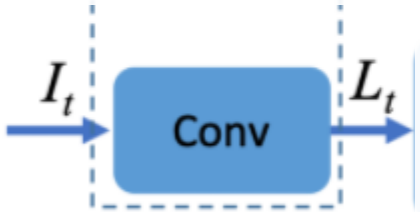

$I_t : m \times n \times 3$ *Low Resolution Image at* t

$L_t : m \times n \times 256$ *Image Featrue Map at* t

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I_{t-1}

I_t

$I_t : m \times n \times 3$ *Low Resolution Image at* t

$F_t : m \times n \times 2$ *Optical Flow Map at* t

$M_t : m \times n \times 256$ *Temporal Featrue Map at* t

$H_t : m \times n \times 64$ *Hidden State at* t

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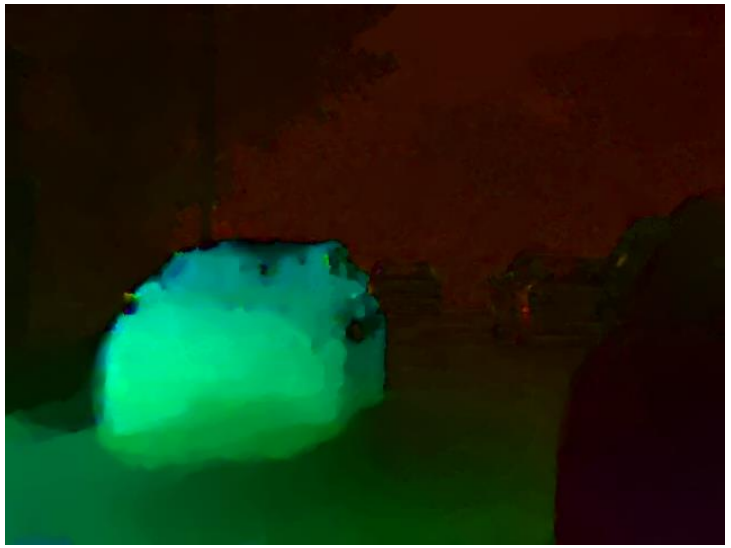
Image_1

Image_2

움직임의 방향 : 색상

움직임의 크기 : 진하기



Dense Flow Map

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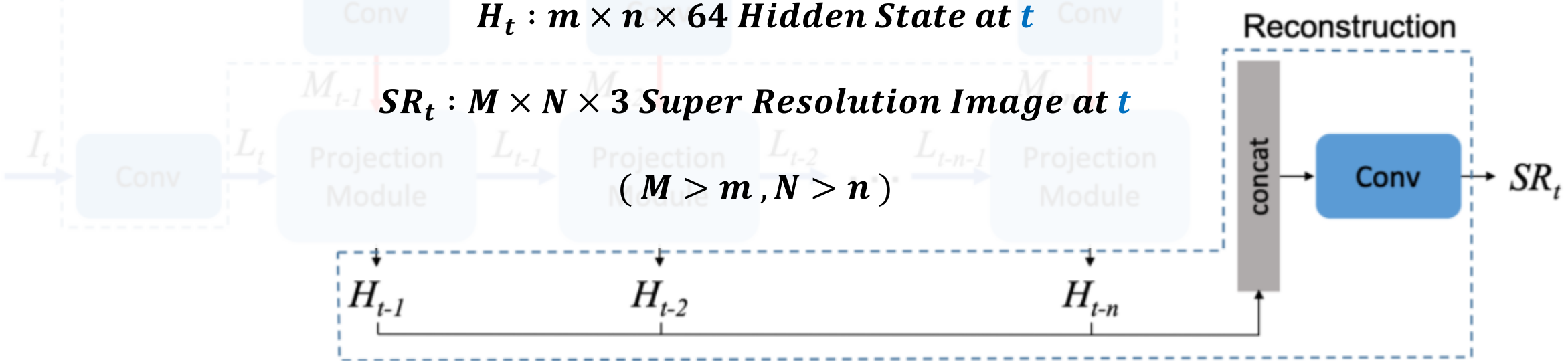
$$H_t : m \times n \times 64 \; Hidden \; State \; at \; t$$

$$SR_t : M \times N \times 3 \; Super \; Resolution \; Image \; at \; t$$

$$(M > m, N > n)$$



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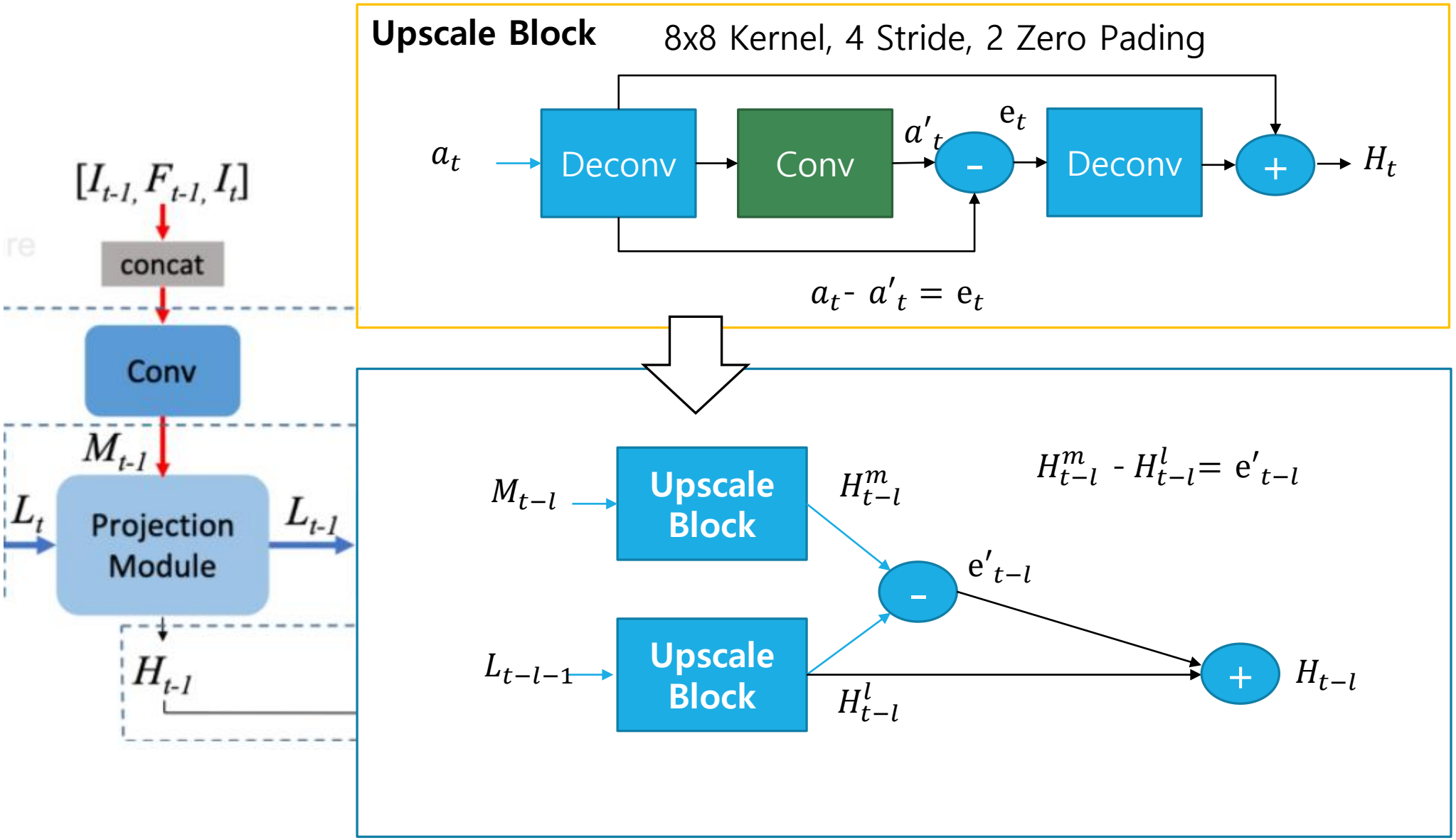
Upscale Block
8x8 Kernel, 4 Stride, 2 Zero Pading
a_t
Deconv
Conv
a'_t
e_t
-
Deconv
+
H_t
a_t- a'_t = e_t
$[I_{t-1}, F_{t-1}, I_t]$
concat
Conv
M_{t-1}
L_t
Projection Module
L_{t-1}
H_{t-1}
M_{t-l}
Upscale Block
H^m_{t-l}
H^m_{t-l} - H^l_{t-l}= e'_{t-l}
e'_{t-l}
-
L_{t-l-1}
Upscale Block
H^l_{t-l}
+
H_{t-l}

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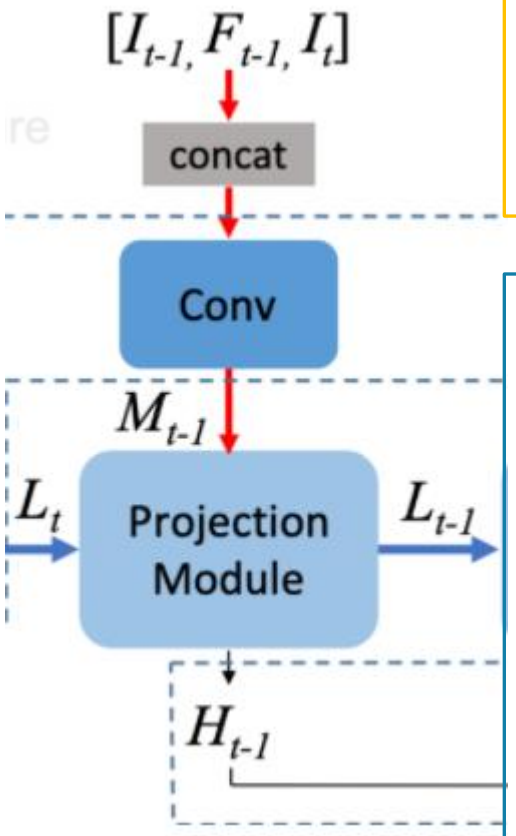
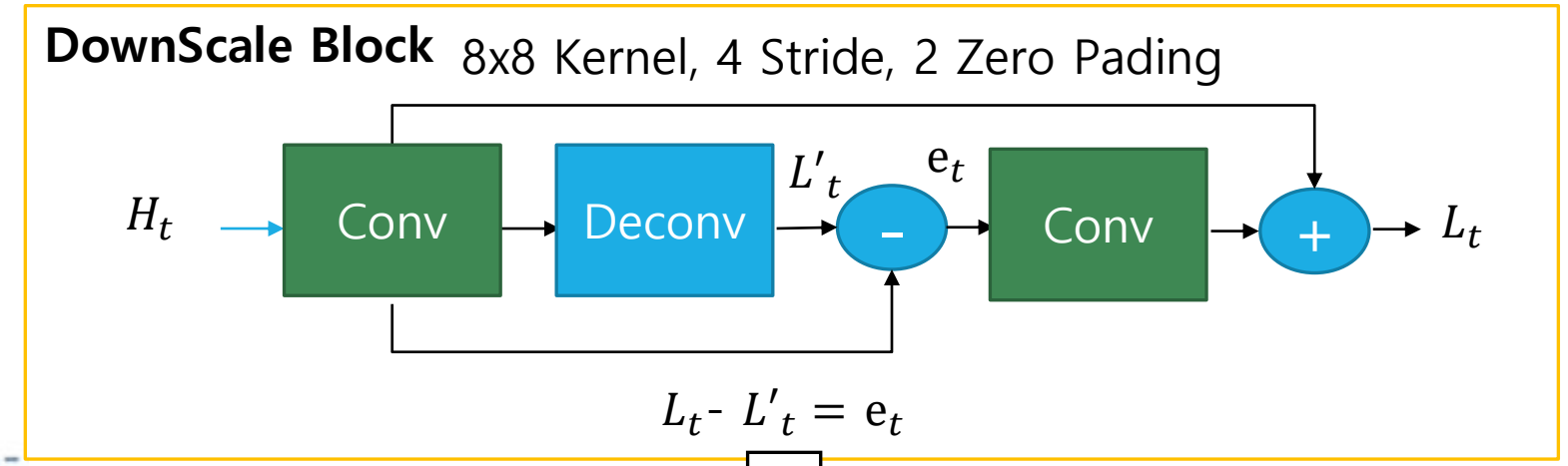
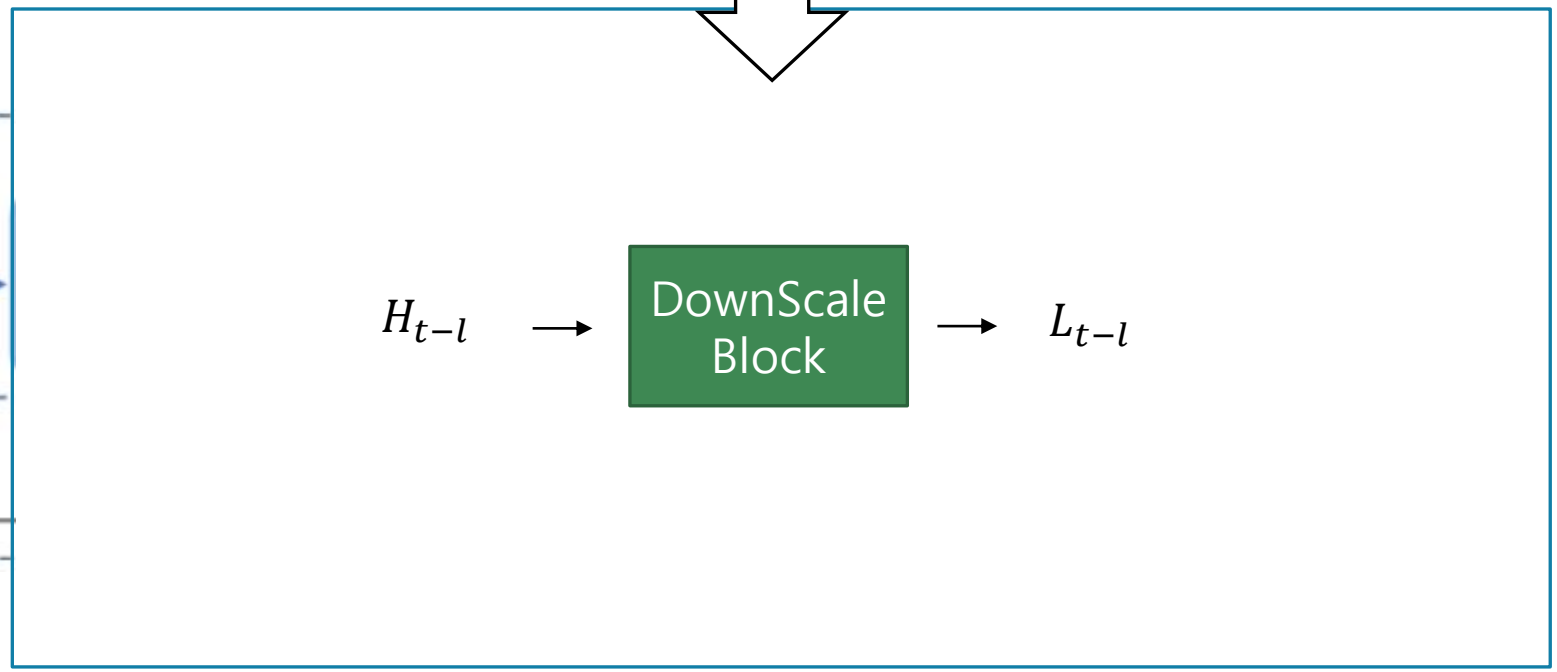
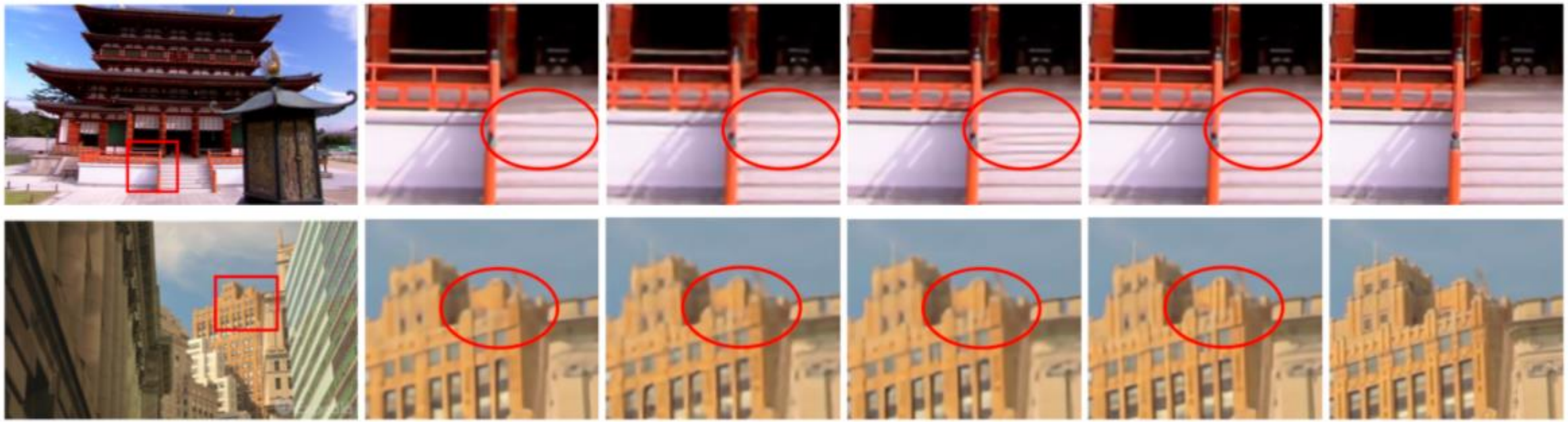

$[I_{t-1}, F_{t-1}, I_t]$
concat
Conv
M_{t-1}
L_t
Projection Module
L_{t-1}
H_{t-1}


DownScale Block 8x8 Kernel, 4 Stride, 2 Zero Pading
H_t
Conv
Deconv
L'_t
e_t
-
Conv
+
L_t
$L_t - L'_t = e_t$


H_{t-l}
DownScale Block
L_{t-l}

RBPN

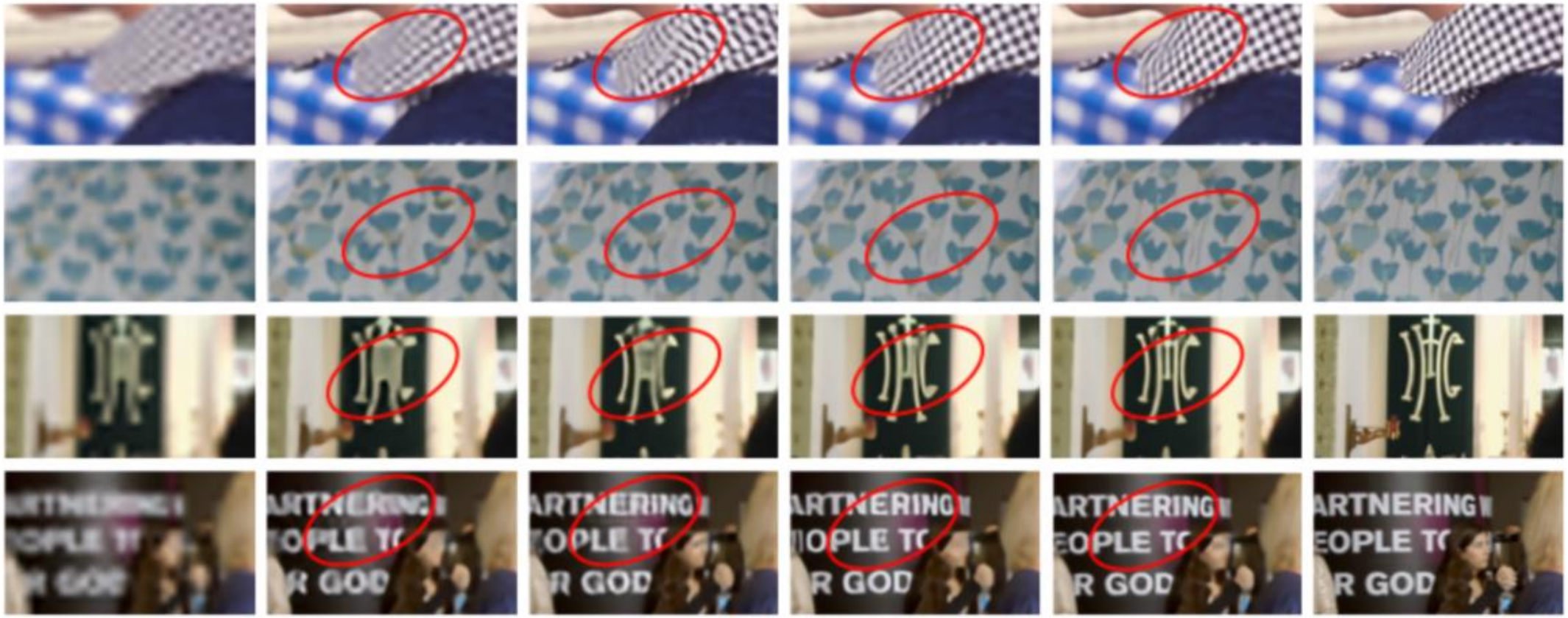
SPMCS



(a) DBPN [8] (b) DRDVSR [30] (c) VSR-DUF [16] (d) RBPN/6-PF (e) GT

RBPN

Vimeo90k



(a) Bicubic (b) TOFlow [34] (c) VSR-DUF [16] (d) RBPN/3-P (e) RBPN/6-PF (f) GT

RBPN

Clip Name	Flow Magnitude	Bicubic	DBPN [8]	BRCN [13]	VESPCN [2]	$B_{123}+T$ [25]	DRDVSR [30]	FRVSR [27]	VSR-DUF [16]	RBPN/6-PF
Calendar	1.14	19.82/0.554	22.19/0.714	-	-	21.66/0.704	22.18/0.746	-	(24.09/0.813*)	23.99/0.807 (23.93/0.803*)
City	1.63	24.93/0.586	26.01/0.684	-	-	26.45/0.720	26.98/0.755	-	(28.26/0.833*)	27.73/0.803 (27.64/0.802*)
Foliage	1.48	23.42/0.575	24.67/0.662	-	-	24.98/0.698	25.42/0.720	-	(26.38/0.771*)	26.22/0.757 (26.27/0.757*)
Walk	1.44	26.03/0.802	28.61/0.870	-	-	28.26/0.859	28.92/0.875	-	(30.50/0.912*)	30.70/0.909 (30.65/0.911*)
Average	1.42	23.53/0.629	25.37/0.737	24.43/0.662	25.35/0.756	25.34/0.745	25.88/0.774	26.69/0.822	(27.31/0.832*)	27.12/0.818 (27.16/0.819*)

RBPN

1. Edit Network Flexibly (Upscale Factor, # of Stages, # of Frames etc.)
2. Computational Complexity
3. Setting Data Set