Video Super-Resolution via Draft-Ensemble Learning

Supplementary Material

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Experiment Details

- TVL1 flow parameter α set:

1	2	3	4	5	6	7	8	9	10
0.002	0.005	0.012	0.015	0.020	0.025	0.030	0.035	0.040	0.050
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
0.080	0.100	0.120	0.150	0.180	0.200	0.250	0.300	0.400	0.500

  - Totally 20 candidate α

Experiment Details

- TVL1 flow parameter α set:

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0.002	0.005	0.012	0.015	0.020	0.025	0.030	0.035	0.040	0.050
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
0.080	0.100	0.120	0.150	0.180	0.200	0.250	0.300	0.400	0.500

  - Totally 20 candidate α
  - Most representative 9 candidate α are chosen (orange background)

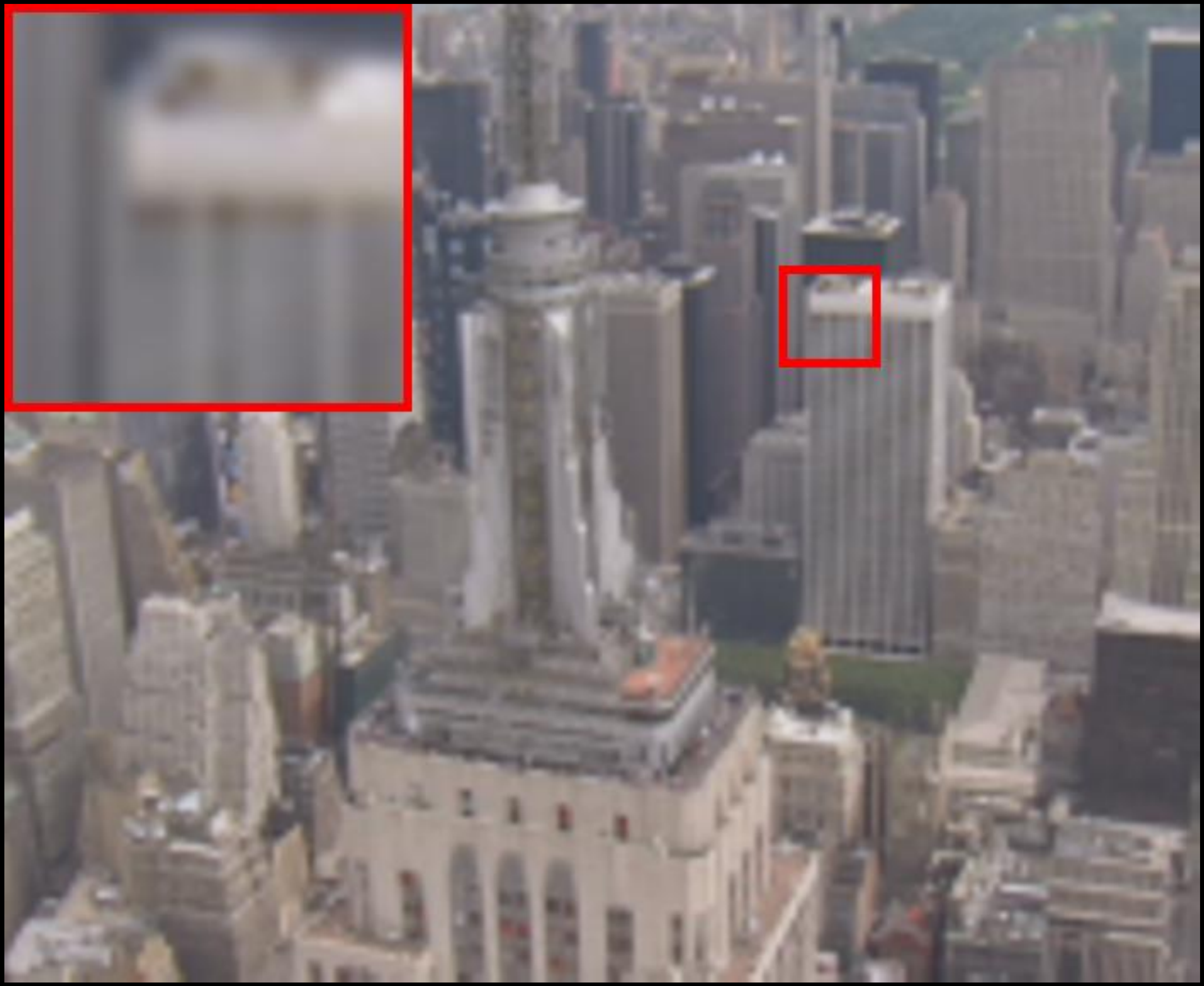
Experiment Details

- Flow algorithms we used:
  - TVL1 Optical Flow: C. Liu. Beyond Pixels: Exploring New Representations and Applications for Motion Analysis. Doctoral Thesis. Massachusetts Institute of Technology. May 2009.
    http://people.csail.mit.edu/celiu/OpticalFlow/
  - MDP Optical Flow: L. Xu, J. Jia, and Y. Matsushita. Motion detail preserving optical flow estimation. TPAMI, 34(9):1744–1757, 2012. 3
    http://www.cse.cuhk.edu.hk/leojia/projects/flow/

Comparisons

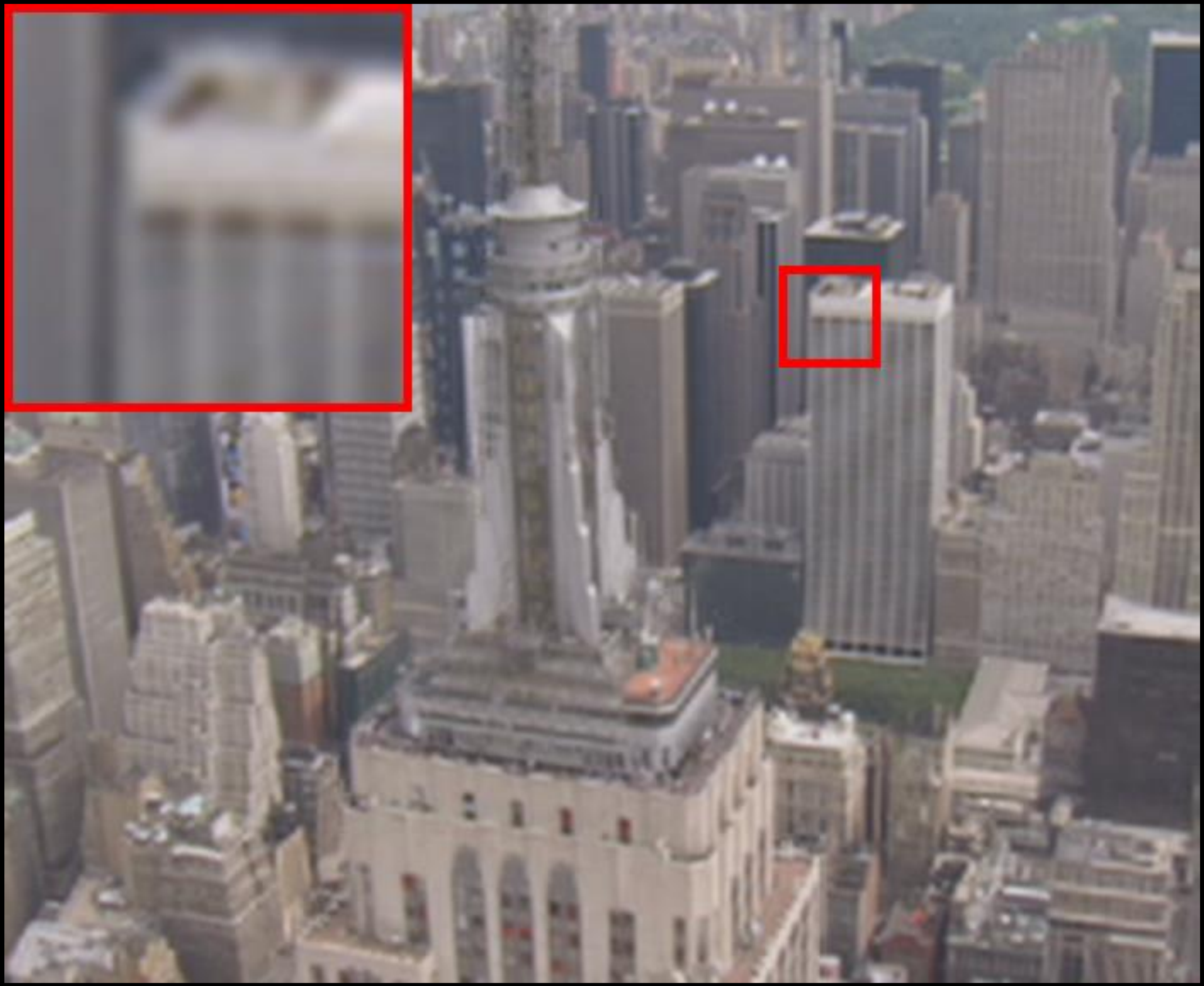
- Methods for comparison
  - Bayesian Video Super Resolution: C. Liu and D. Sun. On bayesian adaptive video super resolution. TPAMI, 2013.
  - Fast Video Upsampling: Q. Shan, Z. Li, J. Jia, and C.-K. Tang. Fast image/video upsampling. ACM TOG, 27(5): 153, 2008.
  - Video Enhancer v1.9.10: http://www.infognition.com/videoenhancer/
  - Note: Due to different implementation details, there exists pixel shift in results of Video Enhancer and Fast Video Upsampling.

Synthetic Video



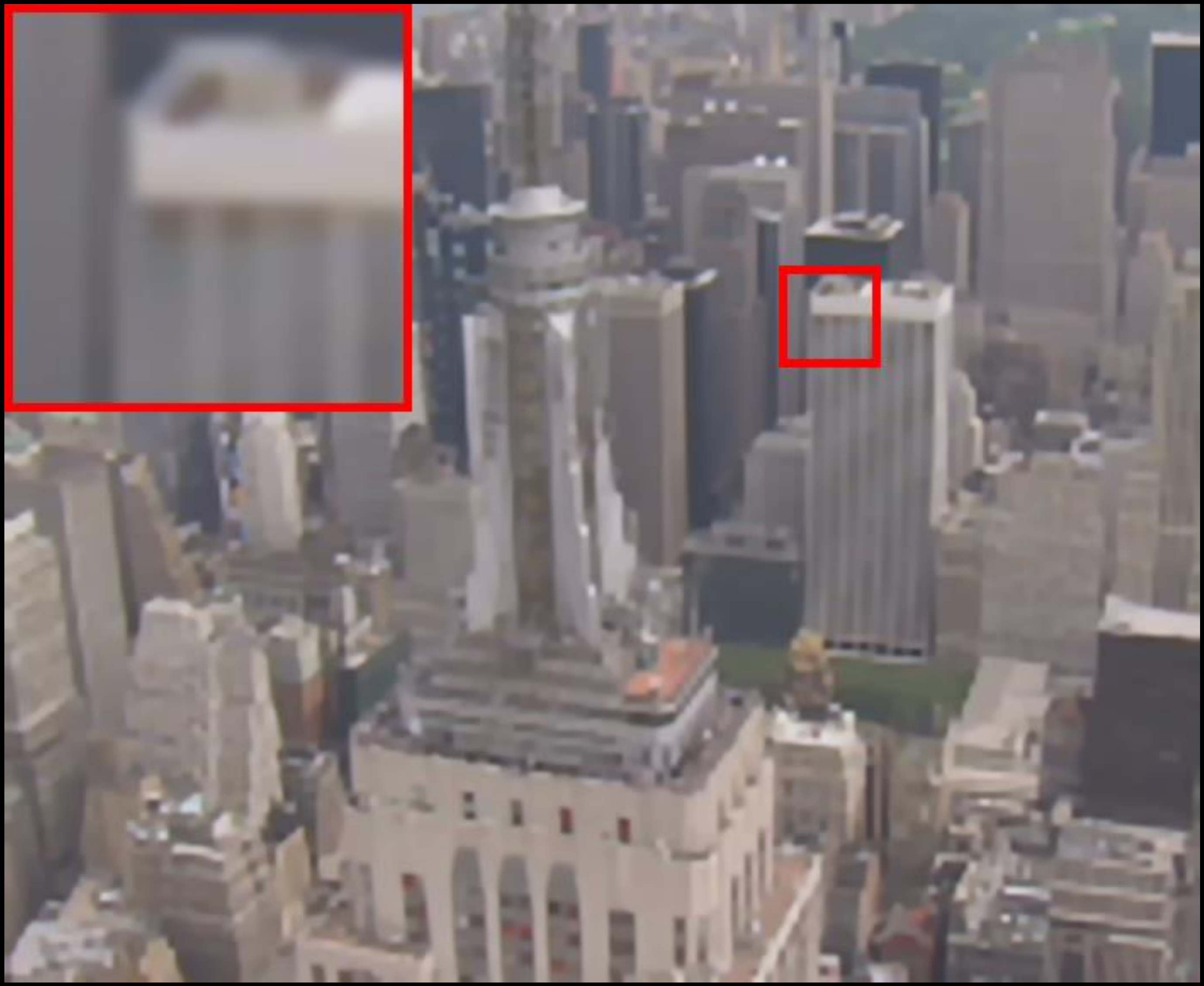
Input (Bicubic x4)

Synthetic Video



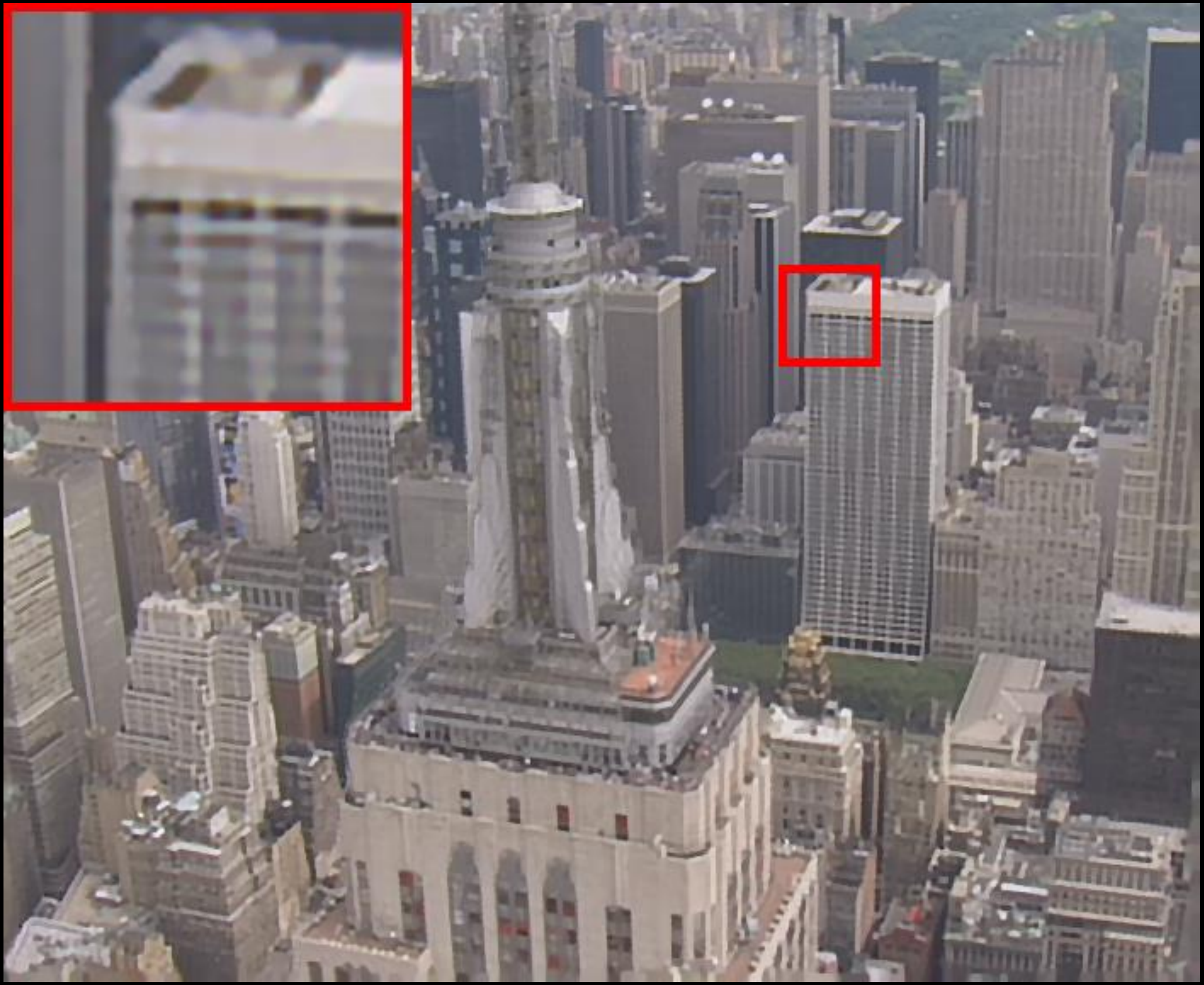
Video Enhancer

Synthetic Video



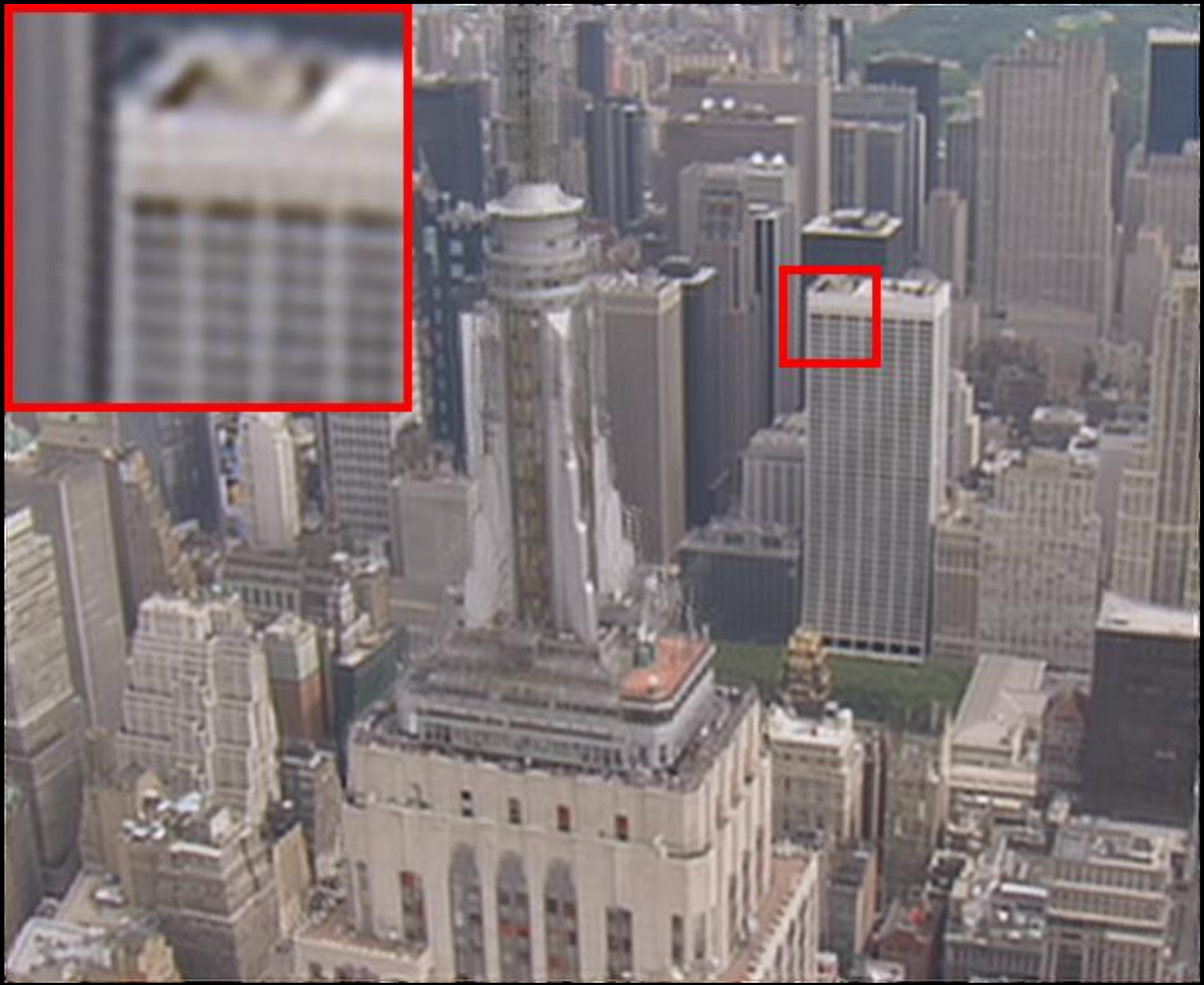
Shan et al

Synthetic Video



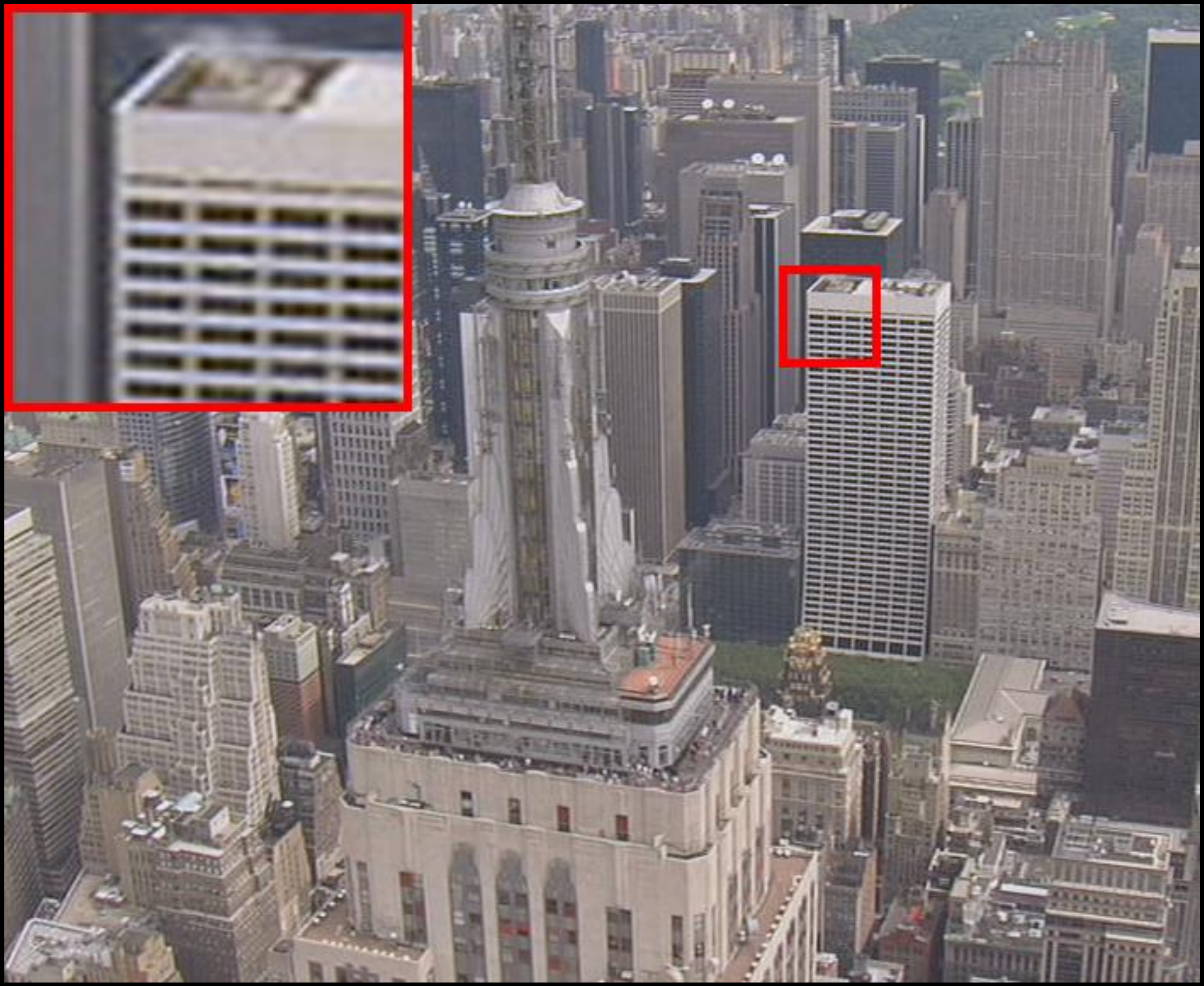
Liu et al

Synthetic Video



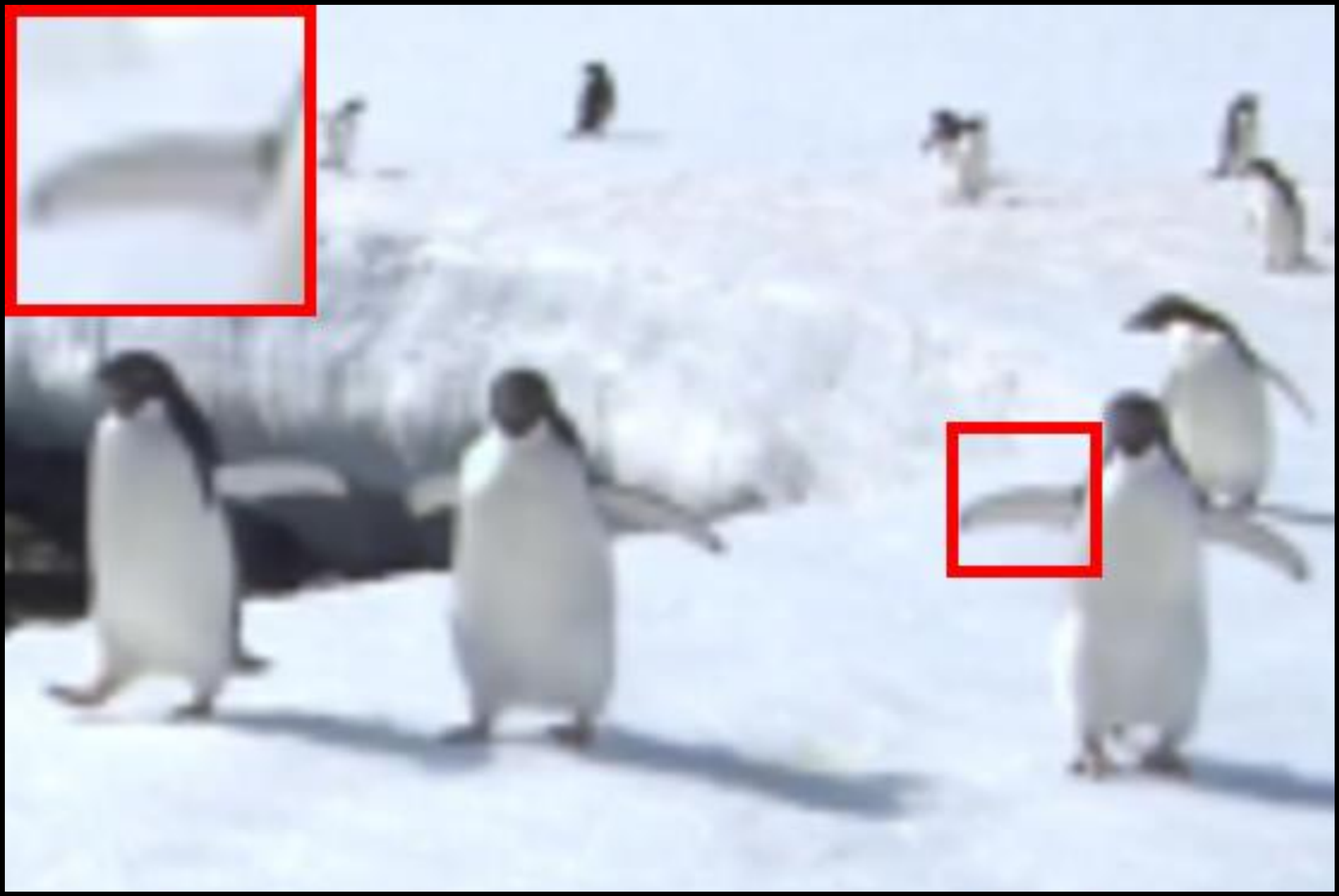
Ours

Synthetic Video



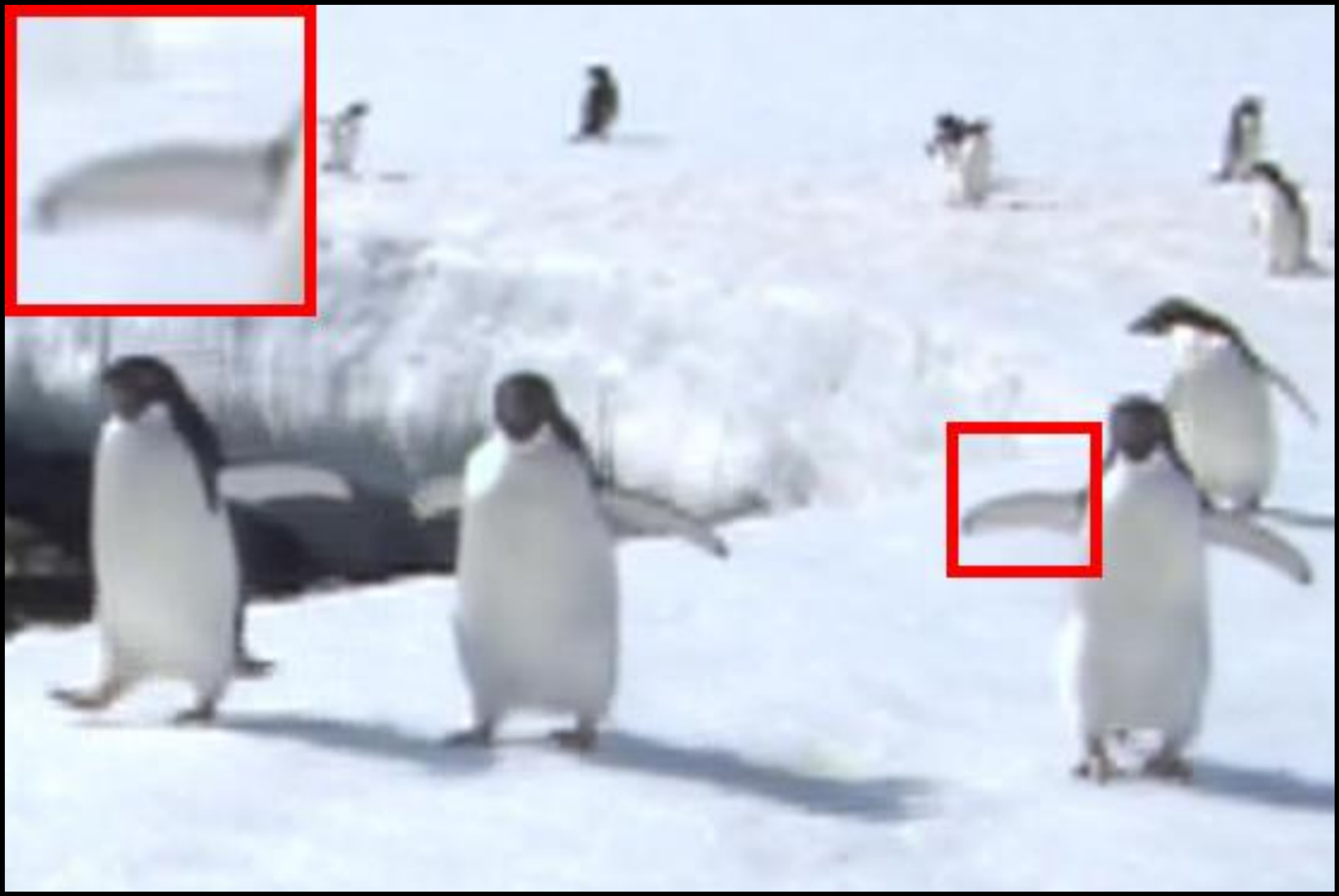
Ground Truth

Synthetic Video



Input (Bicubic x4)

Synthetic Video

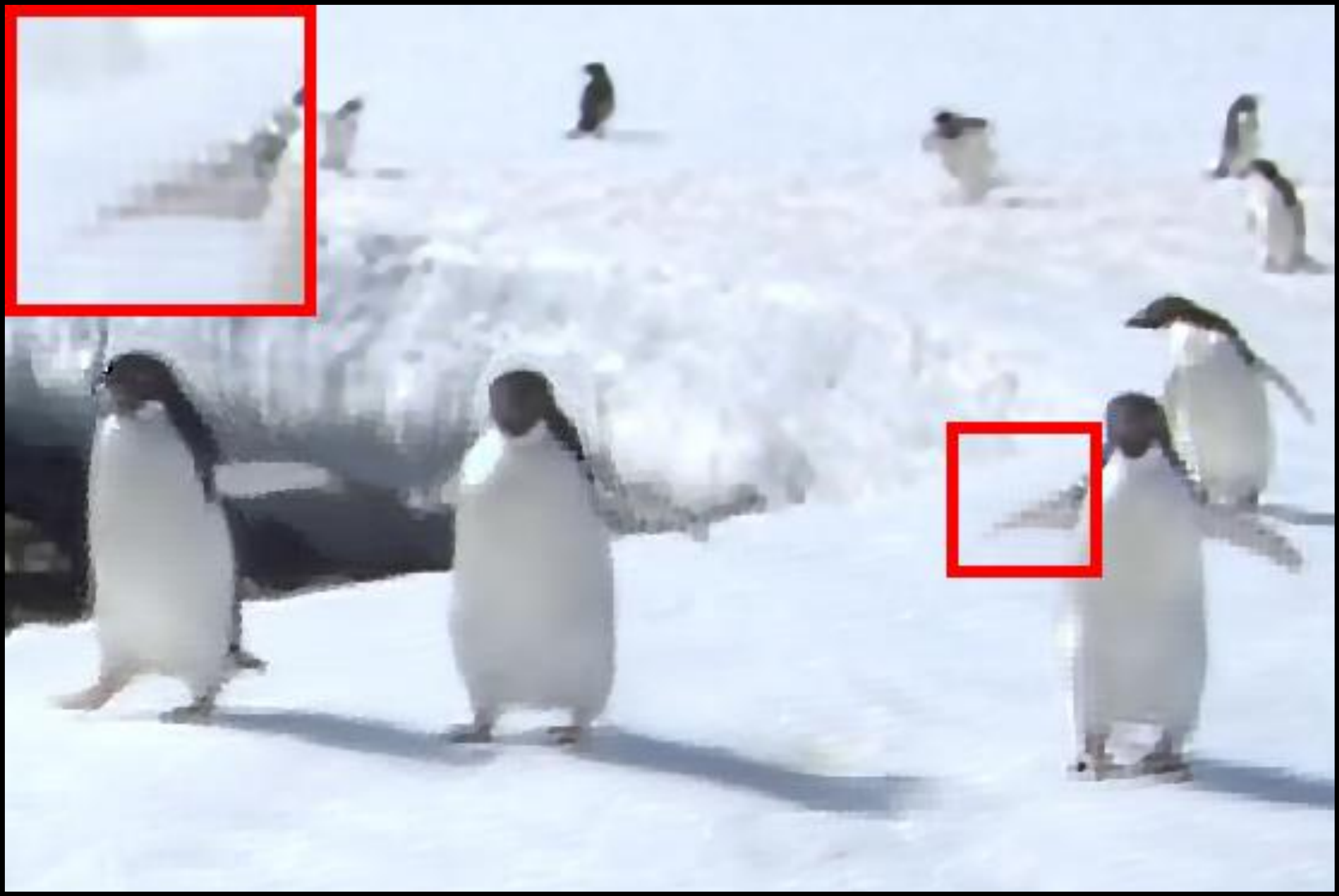


Video Enhancer

Synthetic Video

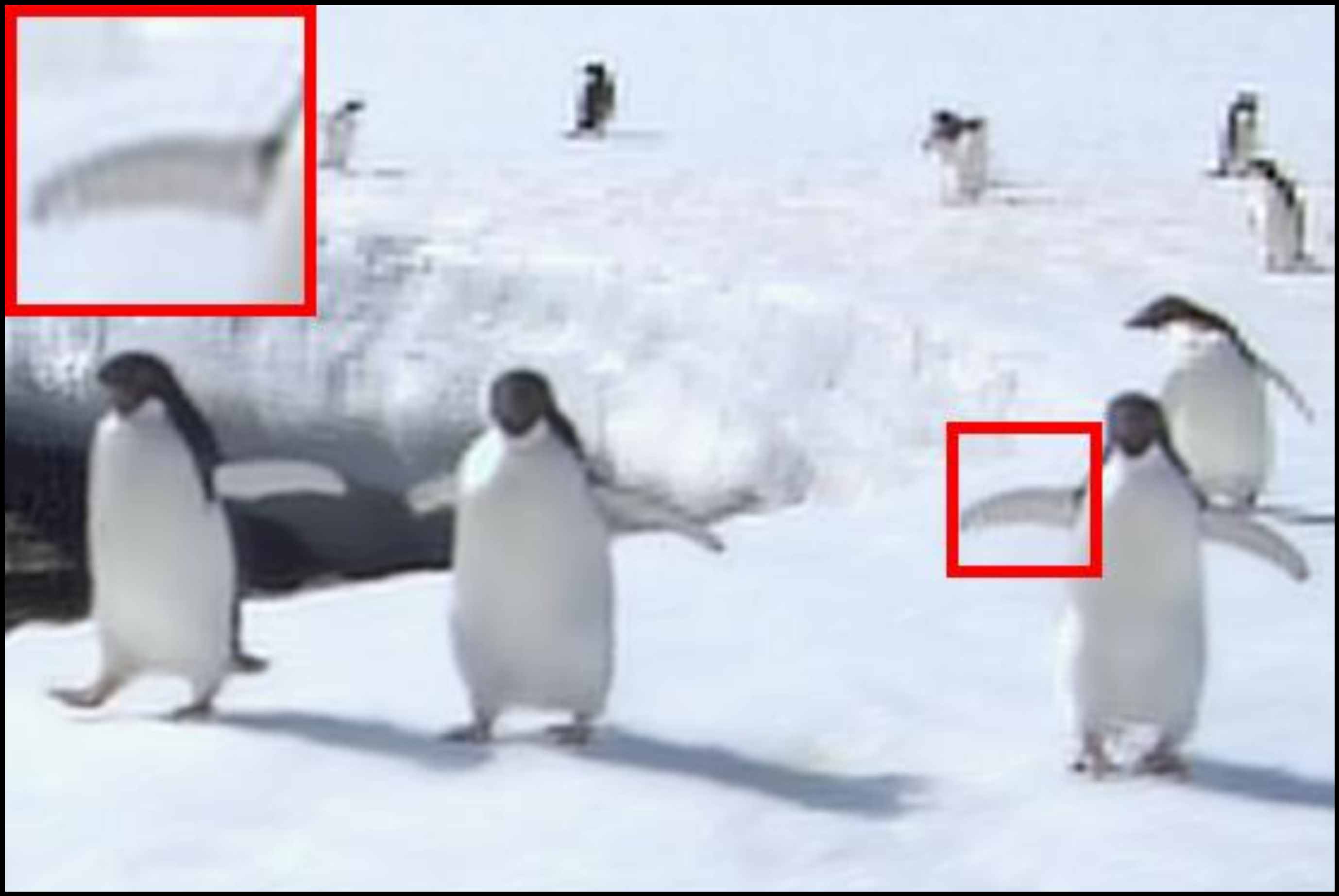
Shan et al

Synthetic Video



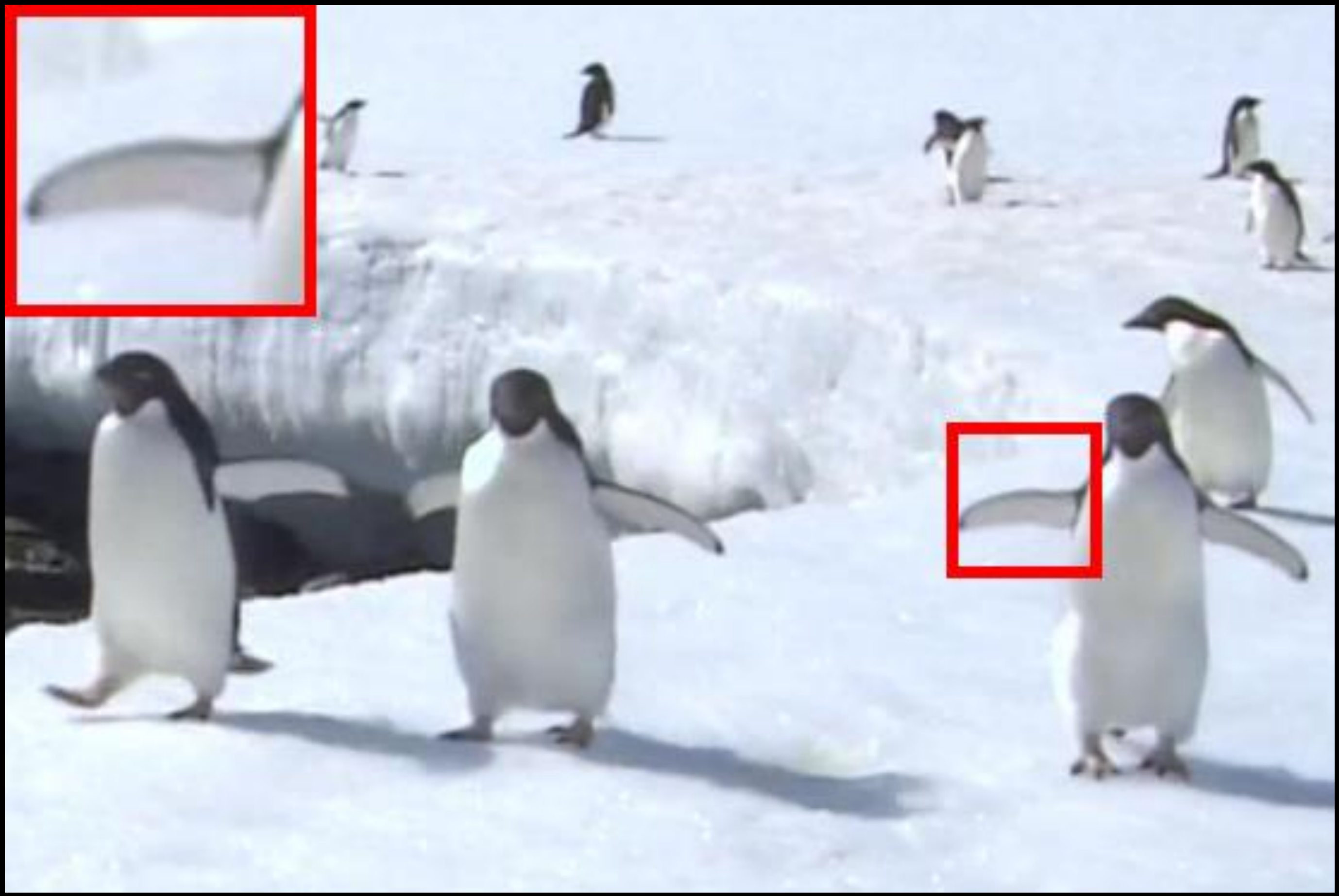
Liu et al

Synthetic Video



Ours

Synthetic Video



Ground Truth

Synthetic Video

Input (Bicubic x4)

Synthetic Video

Video Enhancer

Synthetic Video

Shan et al

Synthetic Video

Liu et al

Synthetic Video

Ours

Synthetic Video

Ground Truth

Real Video

Input (Bicubic x4)

Real Video

Video Enhancer

Real Video

Shan et al

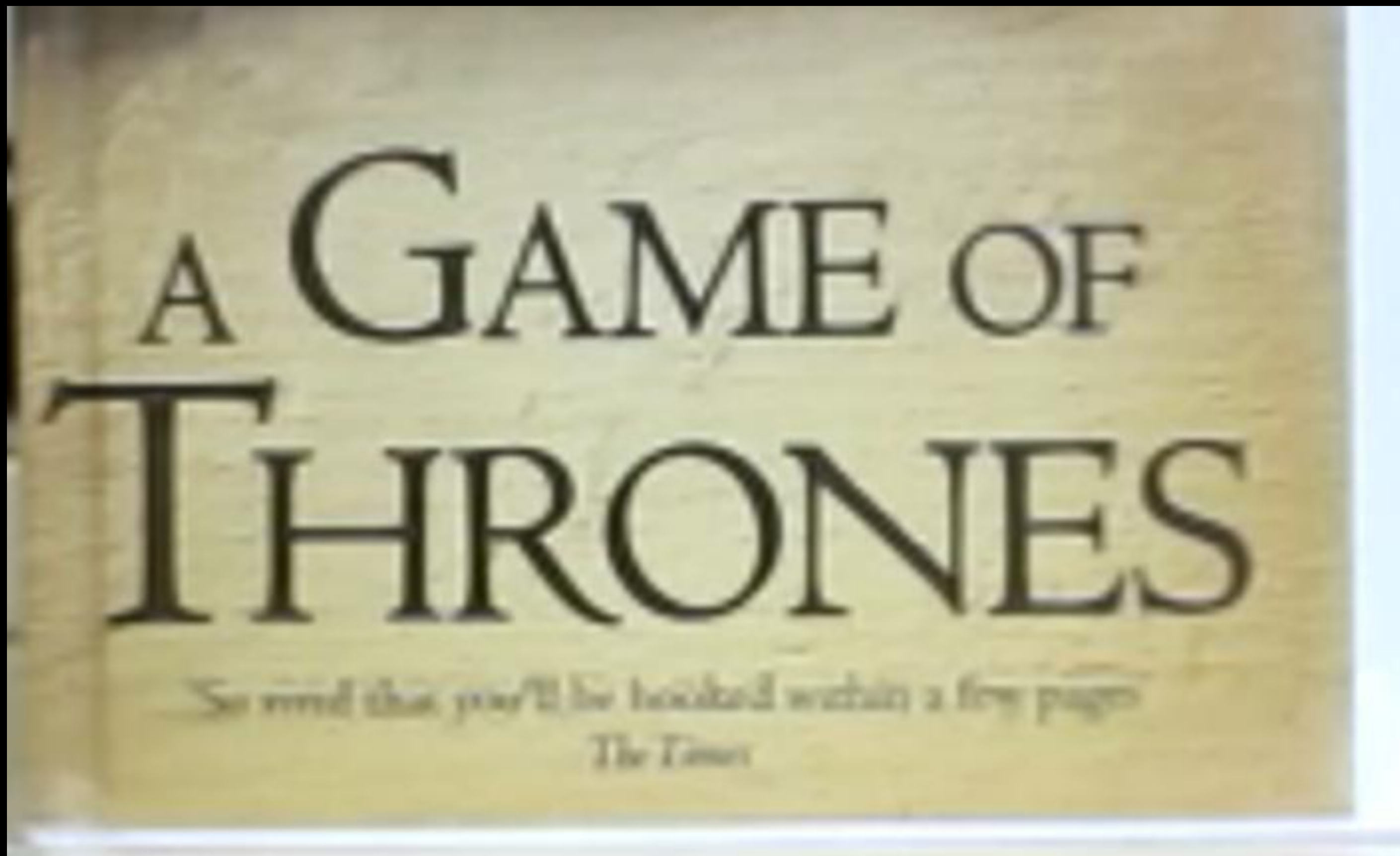
Real Video

Liu et al

Real Video

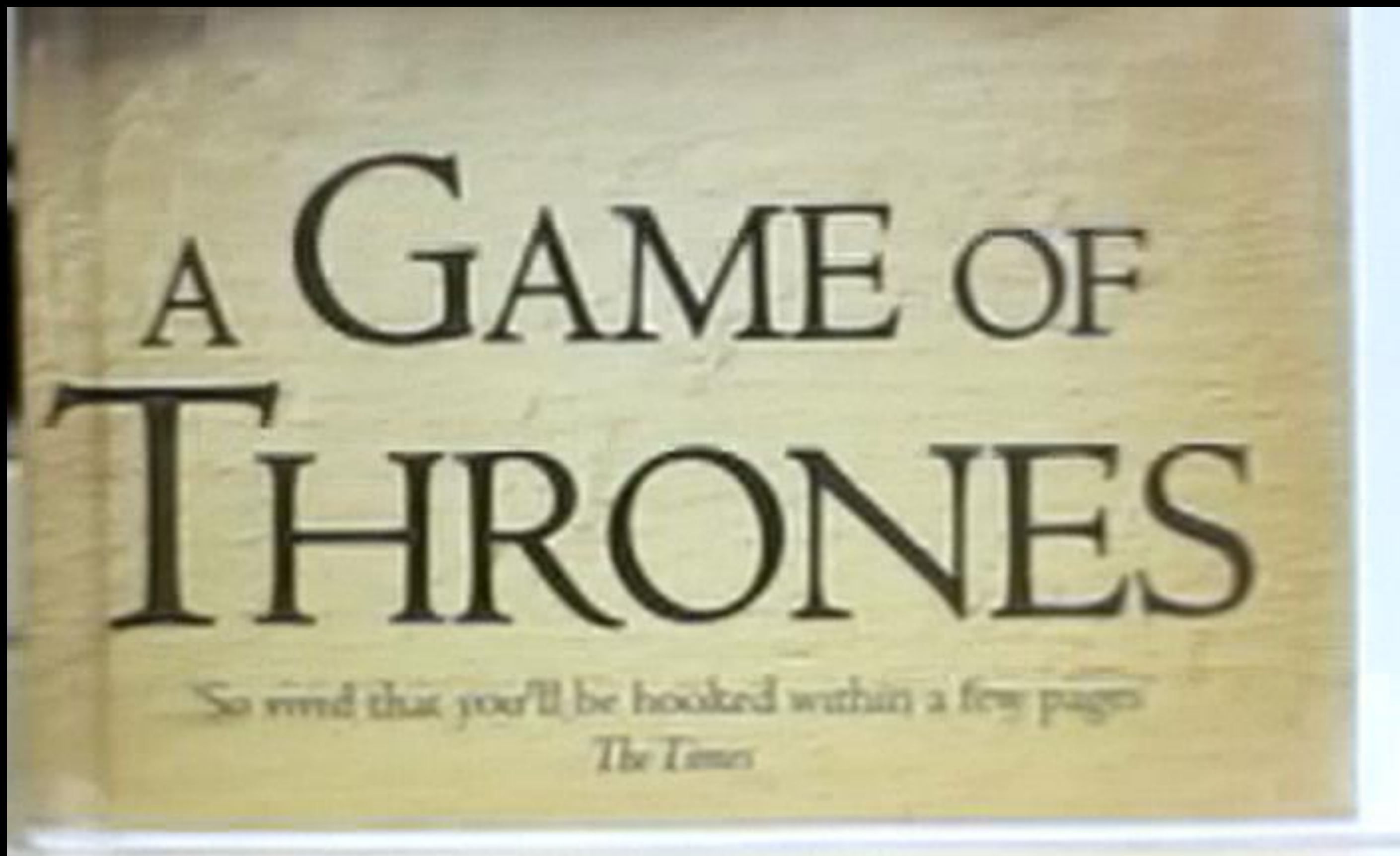
Ours

Real Video



Input (Bicubic x4)

Real Video



Video Enhancer

Real Video

Shan et al

Real Video

Liu et al

Real Video

Ours

More Results - Synthetic Video

Input (Bicubic x4)

Ours

Input (Bicubic x4)

Ours

Input (Bicubic x4)

Ours

Input (Bicubic x4)

Ours

Input (Bicubic x4)

Ours

More Results - Real Video

Input (Bicubic x4)

Ours

Input (Bicubic x4)

Ours

Input (Bicubic x4)

Ours

Input (Bicubic x4)

Ours

Input (Bicubic x4)

Ours

Input (Bicubic x4)

Ours

Input (Bicubic x4)

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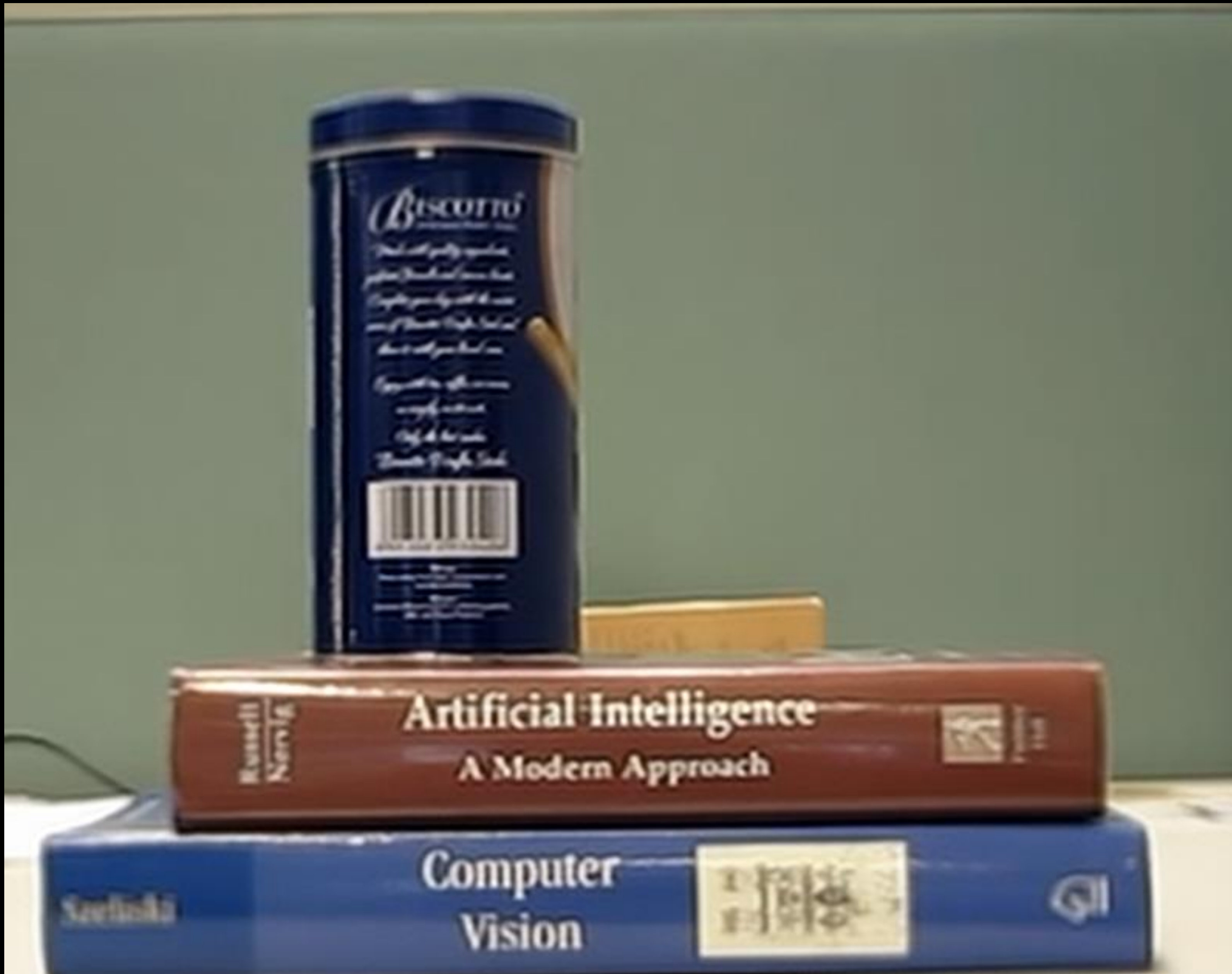
Input (Bicubic x4)

Ours

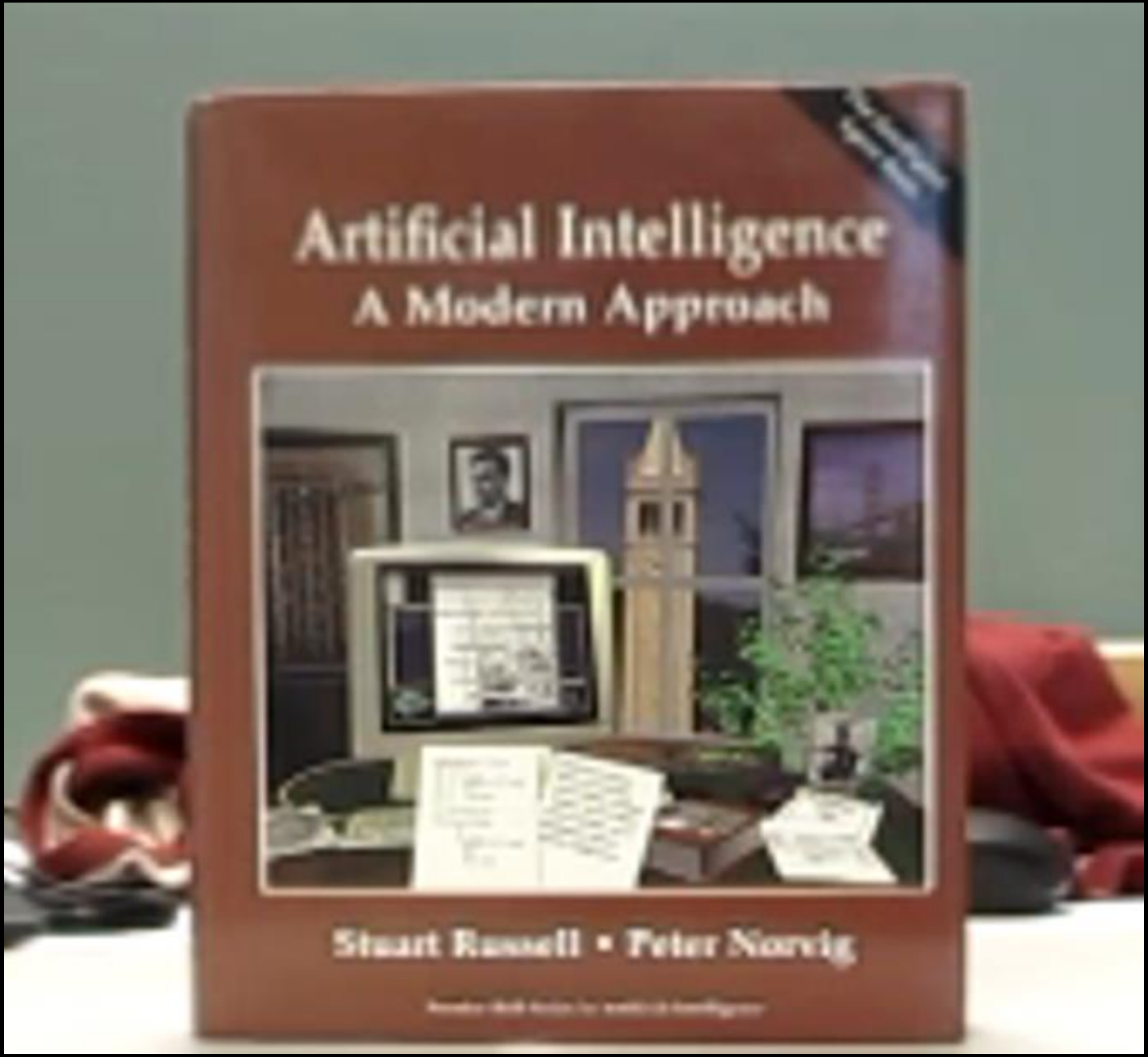
Input (Bicubic x4)

Ours

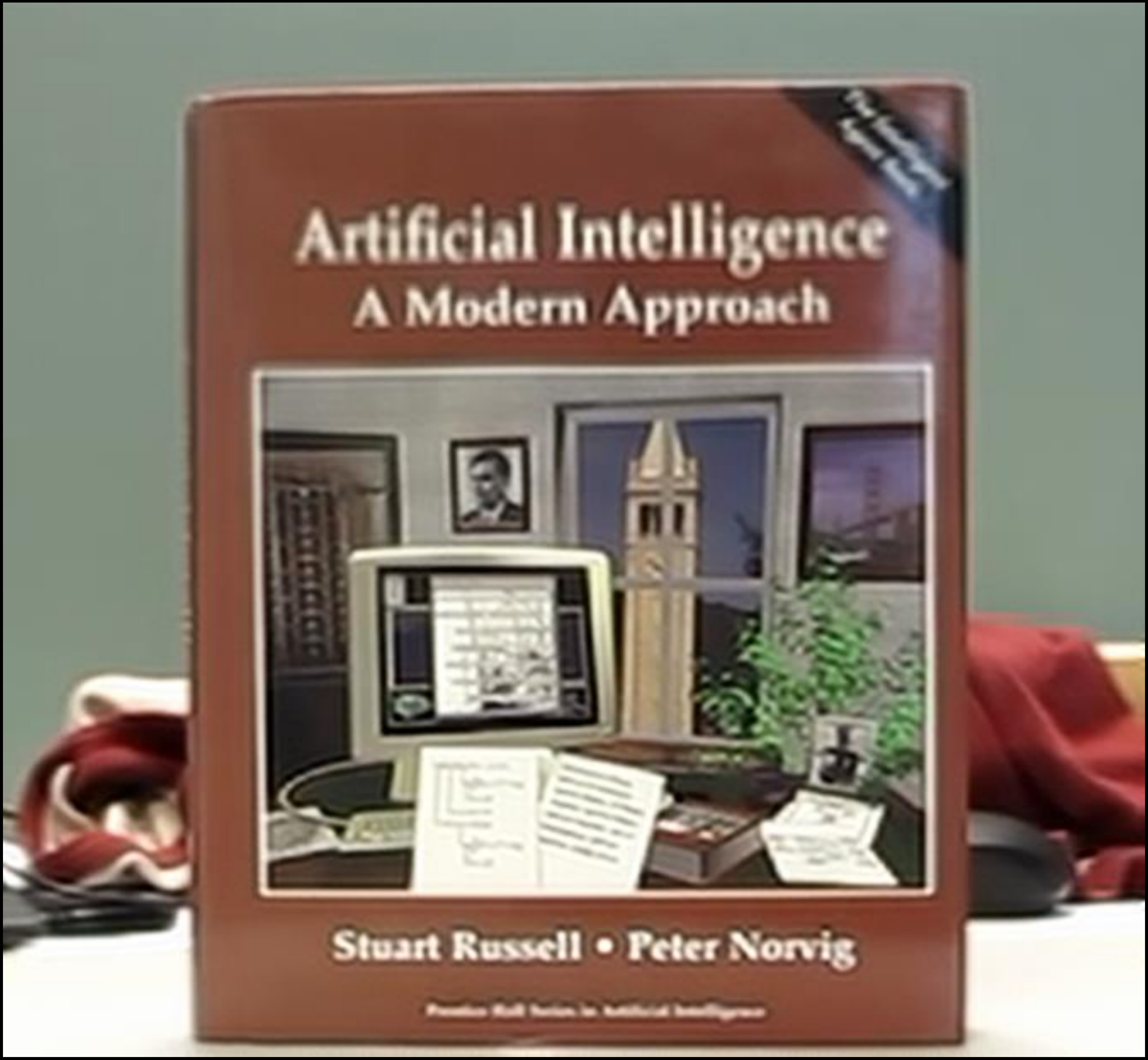
Input (Bicubic x4)

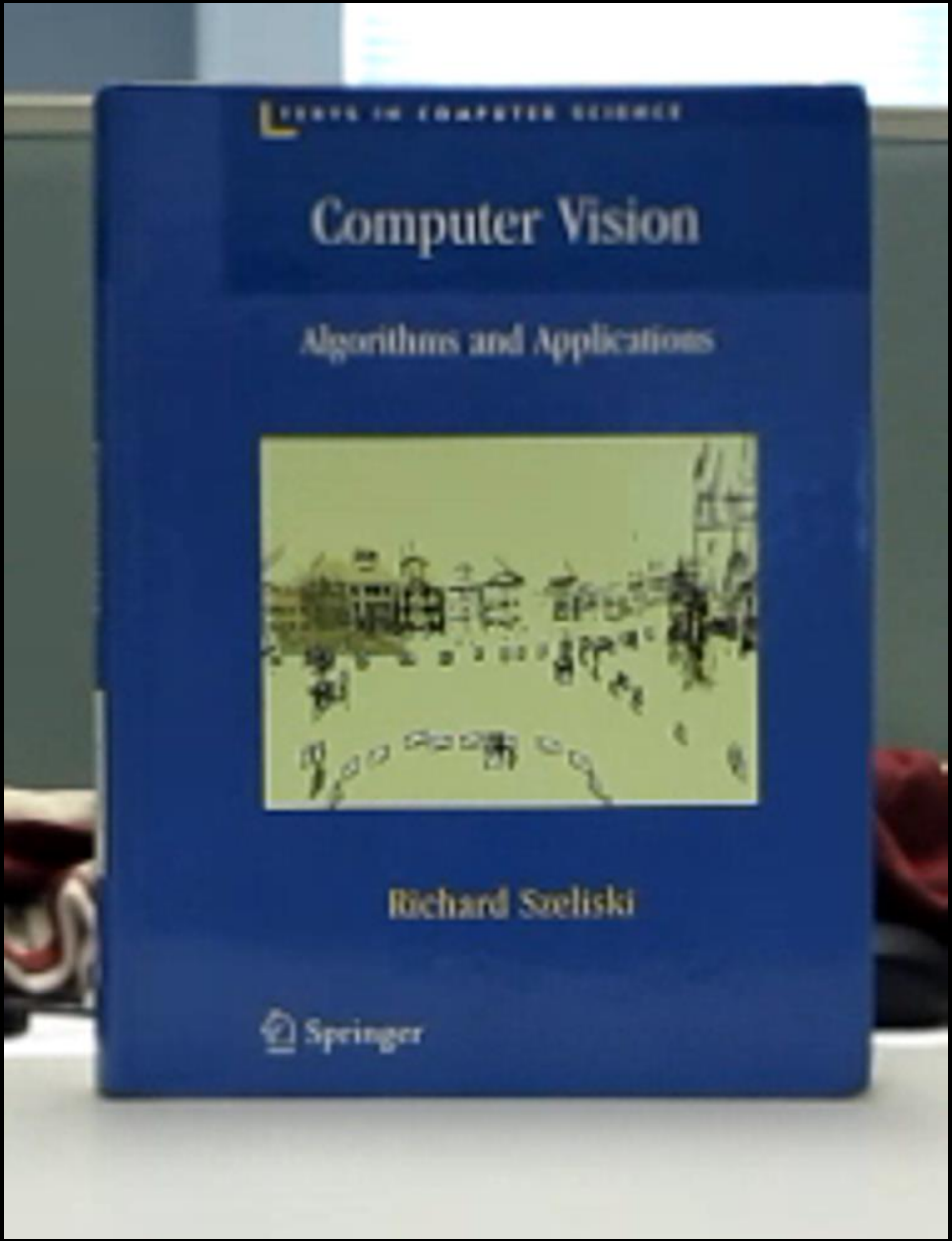

Artificial Intelligence
A Modern Approach
Computer
Vision

Ours

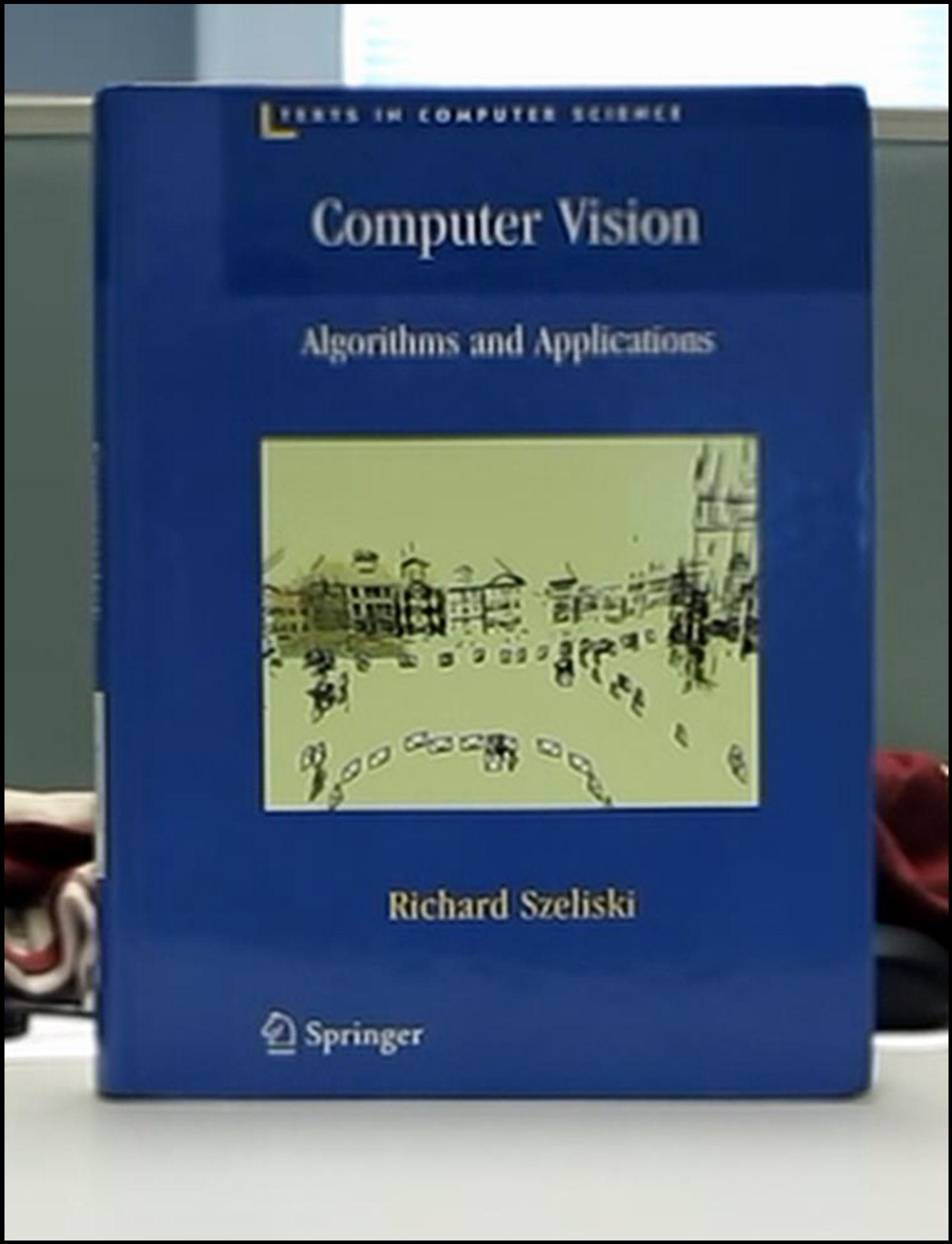


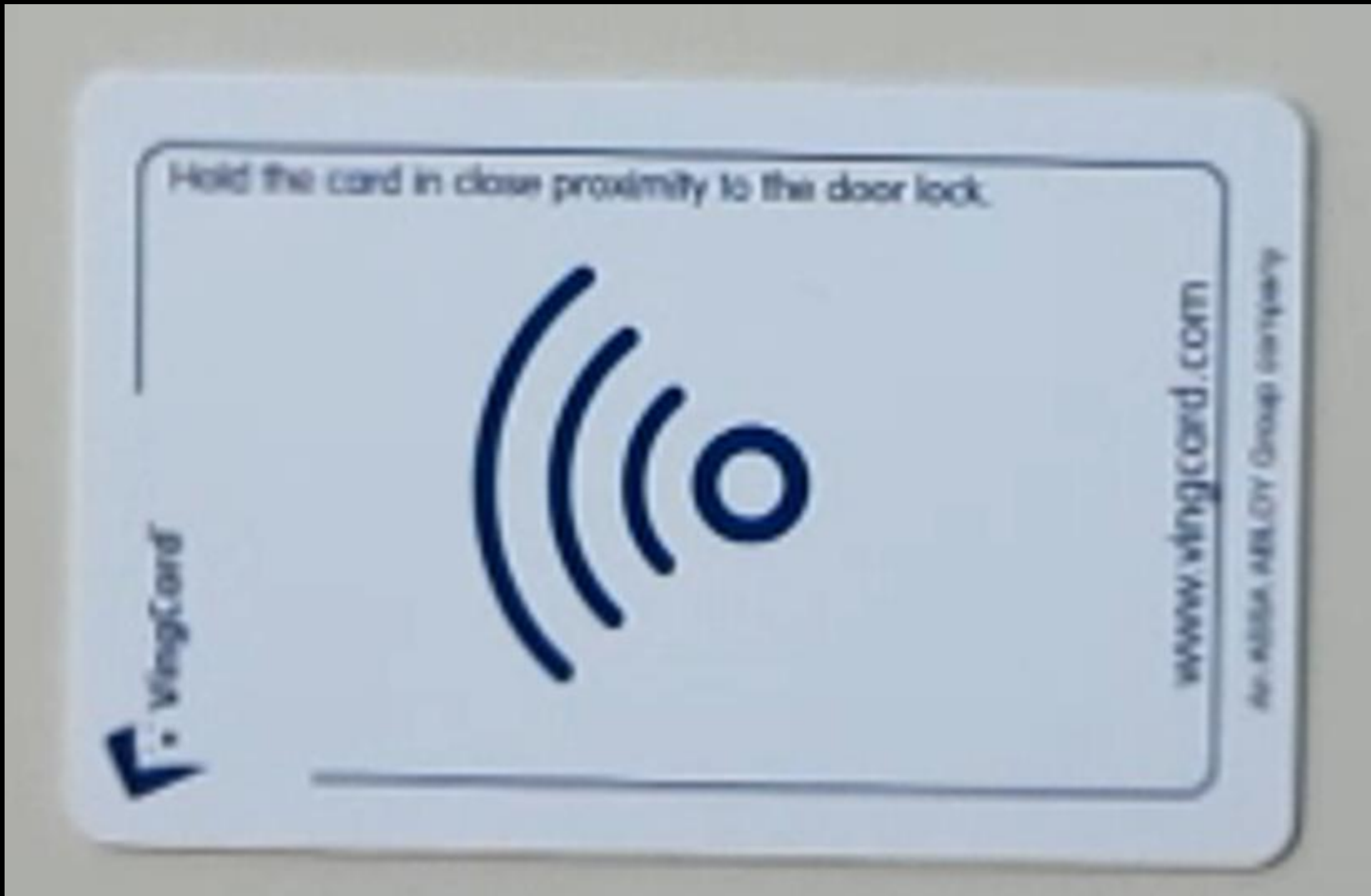
Input (Bicubic x4)


Artificial Intelligence
A Modern Approach
Stuart Russell • Peter Norvig
Ours



Input (Bicubic x4)


TEXTS IN COMPUTER SCIENCE
Computer Vision
Algorithms and Applications
Richard Szeliski
Springer
Ours



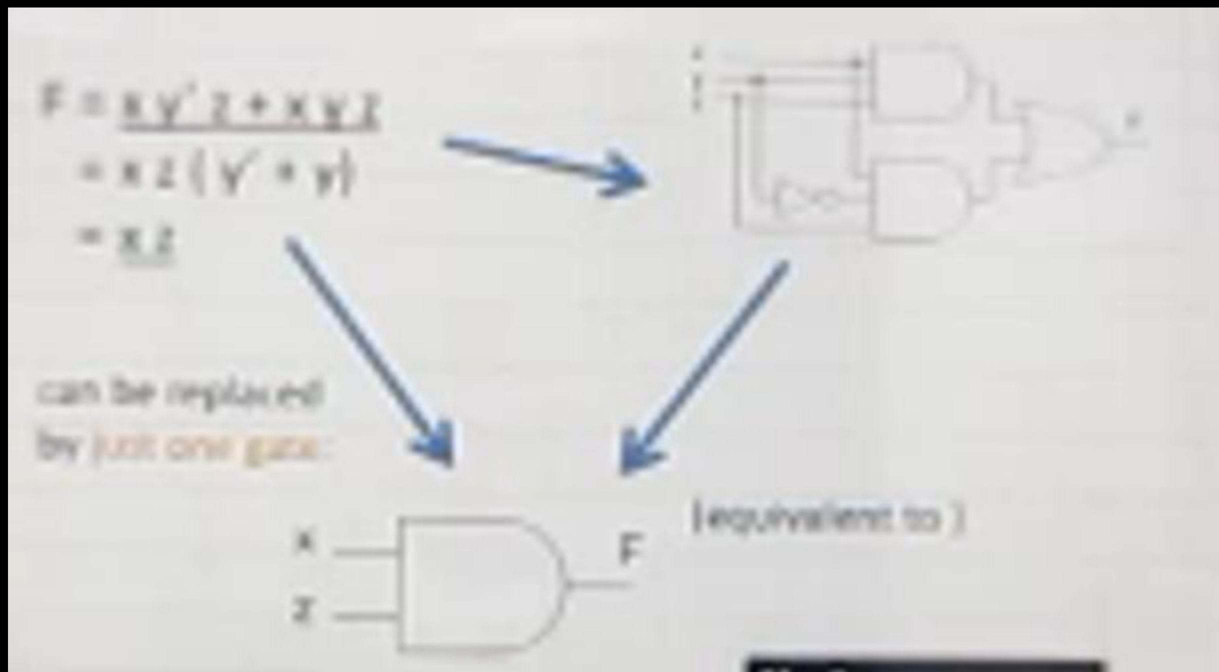
Input (Bicubic x4)


Hold the card in close proximity to the door lock.
VingCard
www.vingcard.com
An ASSA ABLOY Group company

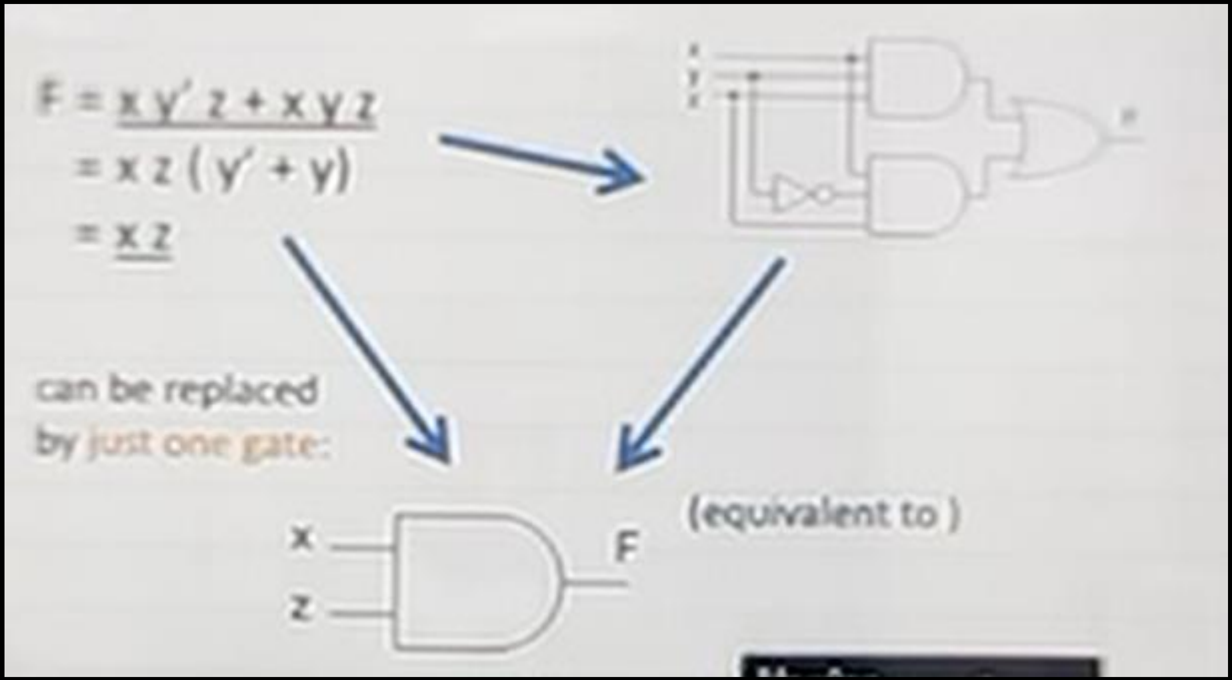
Ours

Input (Bicubic x4)

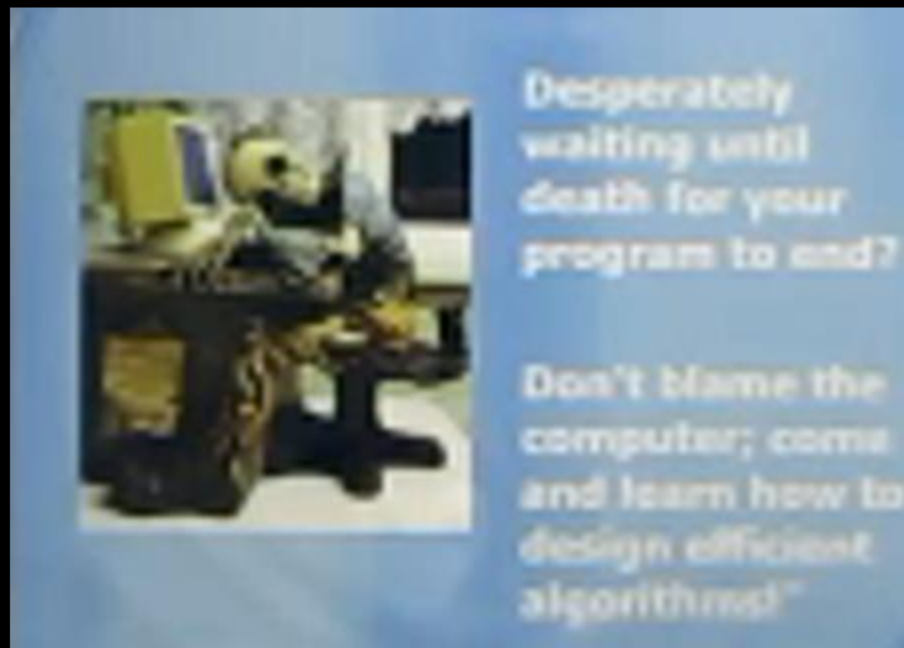
Ours



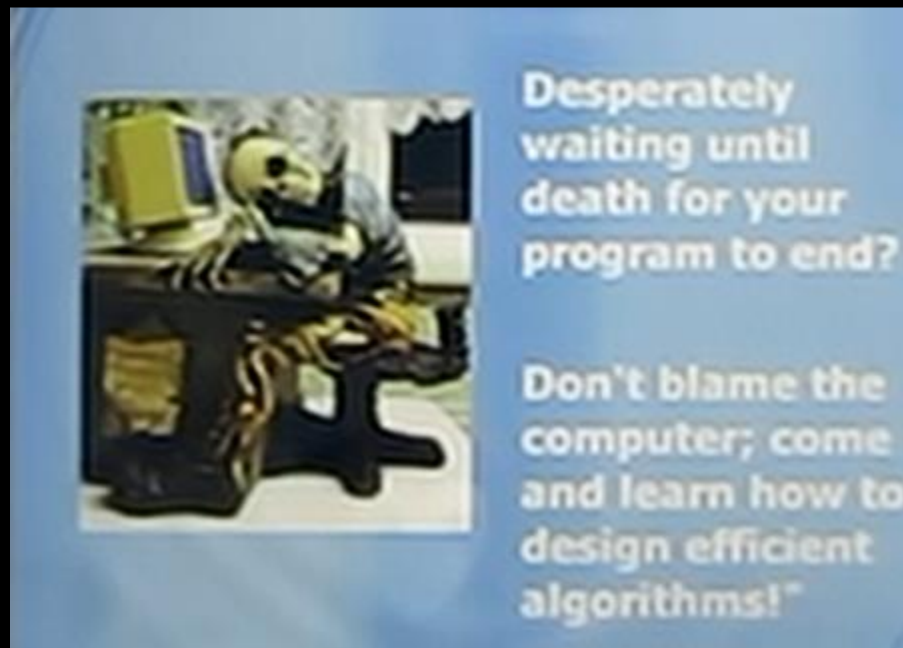
Input (Bicubic x4)


F = x y′ z + x y z
= x z (y′ + y)
= x z
can be replaced
by just one gate:
(equivalent to)
x
z
F

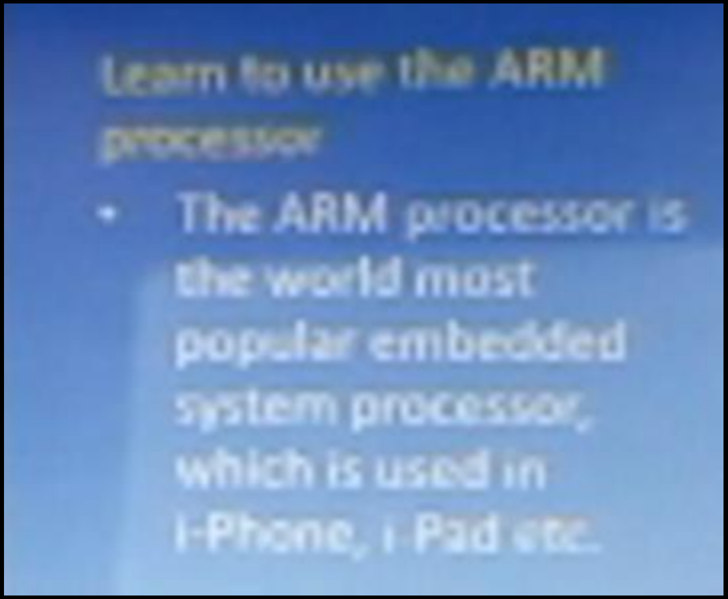
Ours



Input (Bicubic x4)


Desperately waiting until death for your program to end?
Don't blame the computer; come and learn how to design efficient algorithms!"

Ours



Input (Bicubic x4)


Learn to use the ARM processor
• The ARM processor is the world most popular embedded system processor, which is used in i-Phone, i-Pad etc.

Ours

Input (Bicubic x4)

Ours

Input (Bicubic x4)

Ours

Input (Bicubic x4)


MADE IN AUSTRALIA
9 310036 002857
FABRIQUÉ EN AUSTRALIE
A CONSOMMER AVANT : VOIR LA DATE
FIGURANT AU DESSUS DE L'EMBALLAGE

Ours

Challenging Cases

- Super-resolution in extremely small regions
- Super-resolution in low-quality surveillance videos

SR in Extremely Small Regions

Input (Bicubic x4)

$26 \times 52 \rightarrow 104 \times 208$

SR in Extremely Small Regions

Ours

26×52 → 104×208

SR in Extremely Small Regions

Input (Bicubic x4)

25×50 → 100×200

SR in Extremely Small Regions

Ours

25 × 50 → 100 × 200

SR in Extremely Small Regions

Input (Bicubic x4)

$33 \times 34 \rightarrow 132 \times 136$

SR in Extremely Small Regions

Input (Bicubic x4)

33×34 → 132×136

SR in Extremely Small Regions

Input (Bicubic x4)

43×31 → 172×124

SR in Extremely Small Regions

Ours

43 × 31 → 172 × 124

SR in Extremely Small Regions

Input (Bicubic x4)

36 × 50 → 144 × 200

SR in Extremely Small Regions

Ours

36×50 → 144×200

SR in Extremely Small Regions

Input (Bicubic x4)

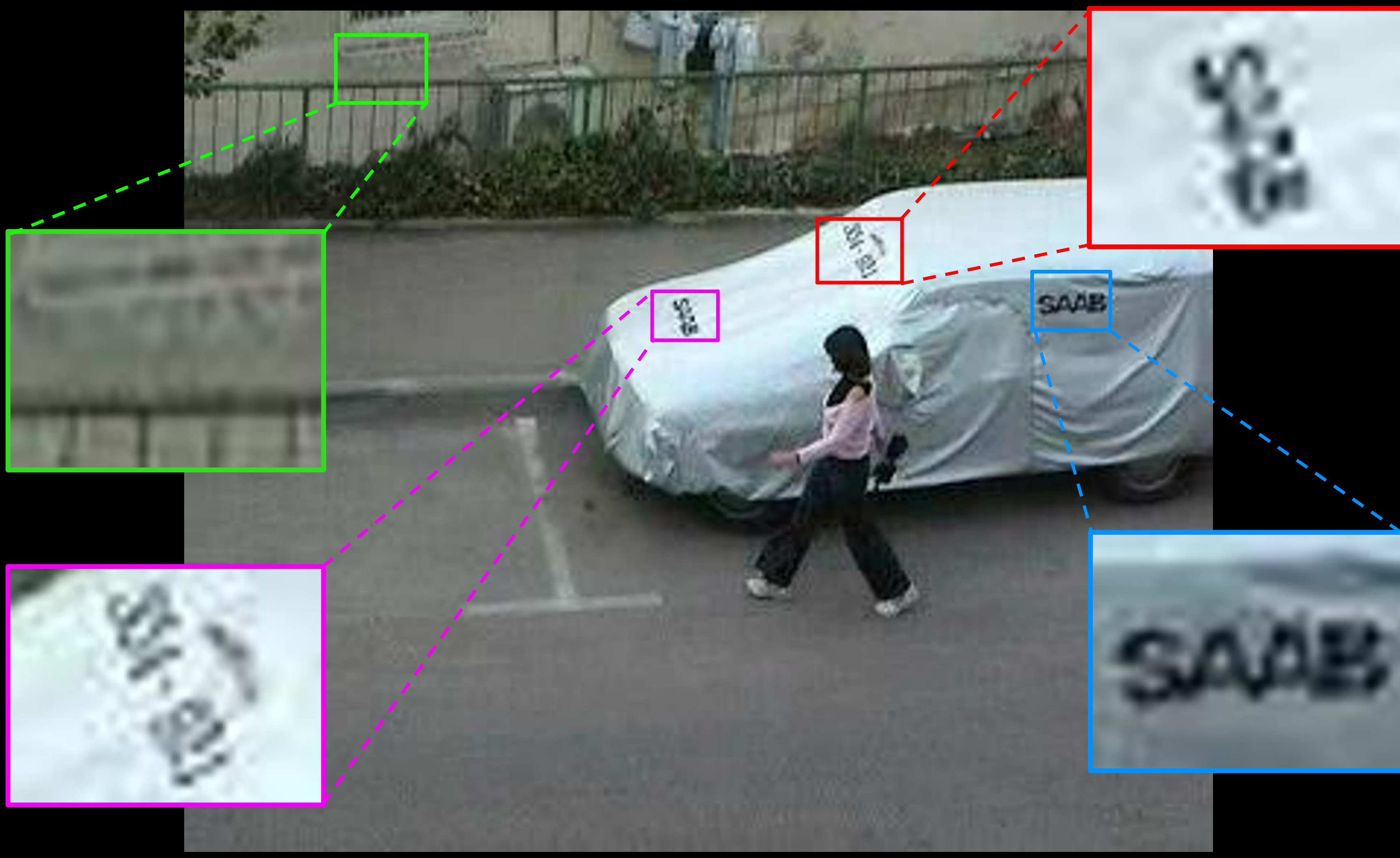
28×57 → 112×228

SR in Extremely Small Regions

Ours

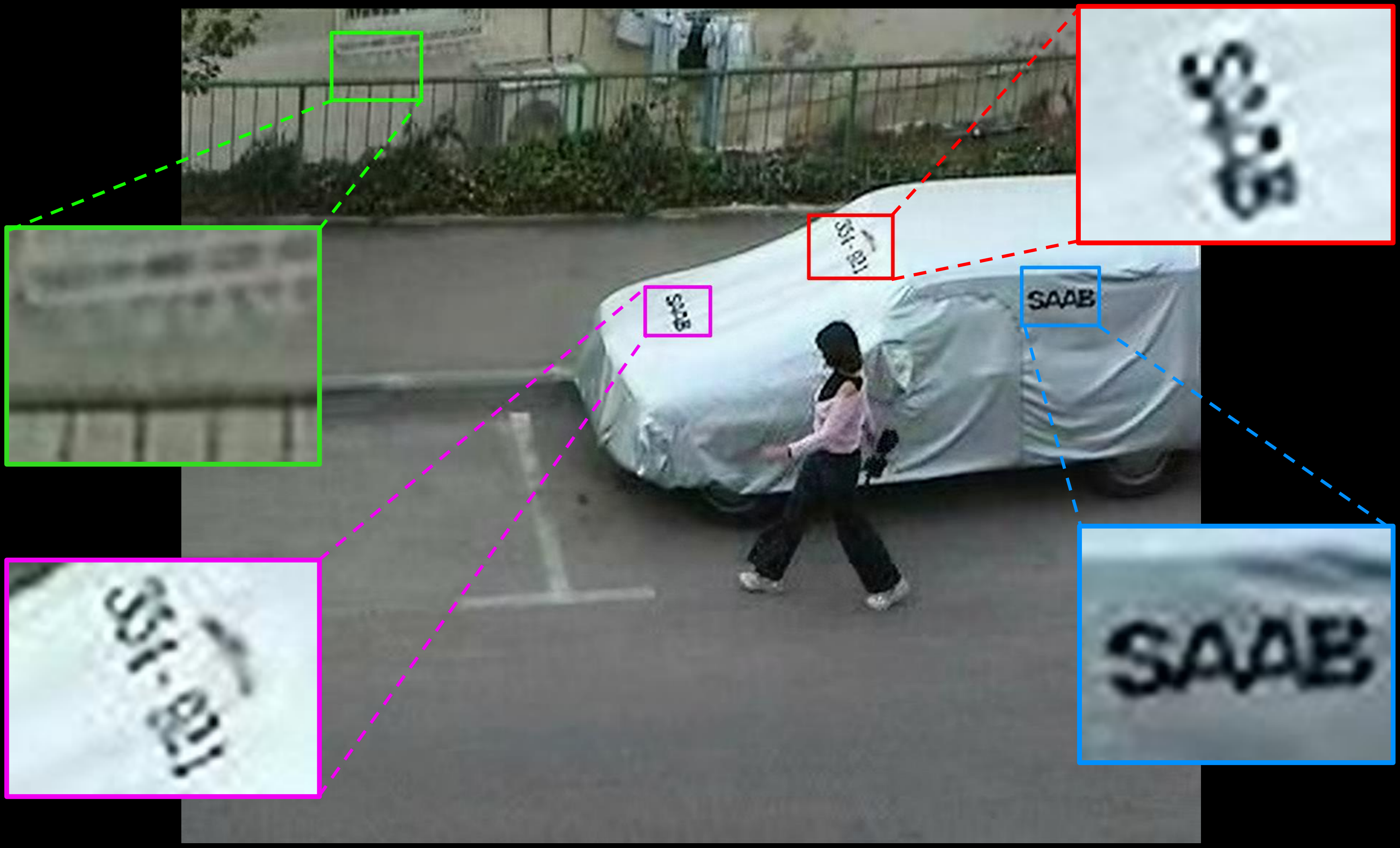
28 × 57 → 112 × 228

SR in Low-Quality Surveillance Videos



Input (Bicubic x4)

SR in Low-Quality Surveillance Videos

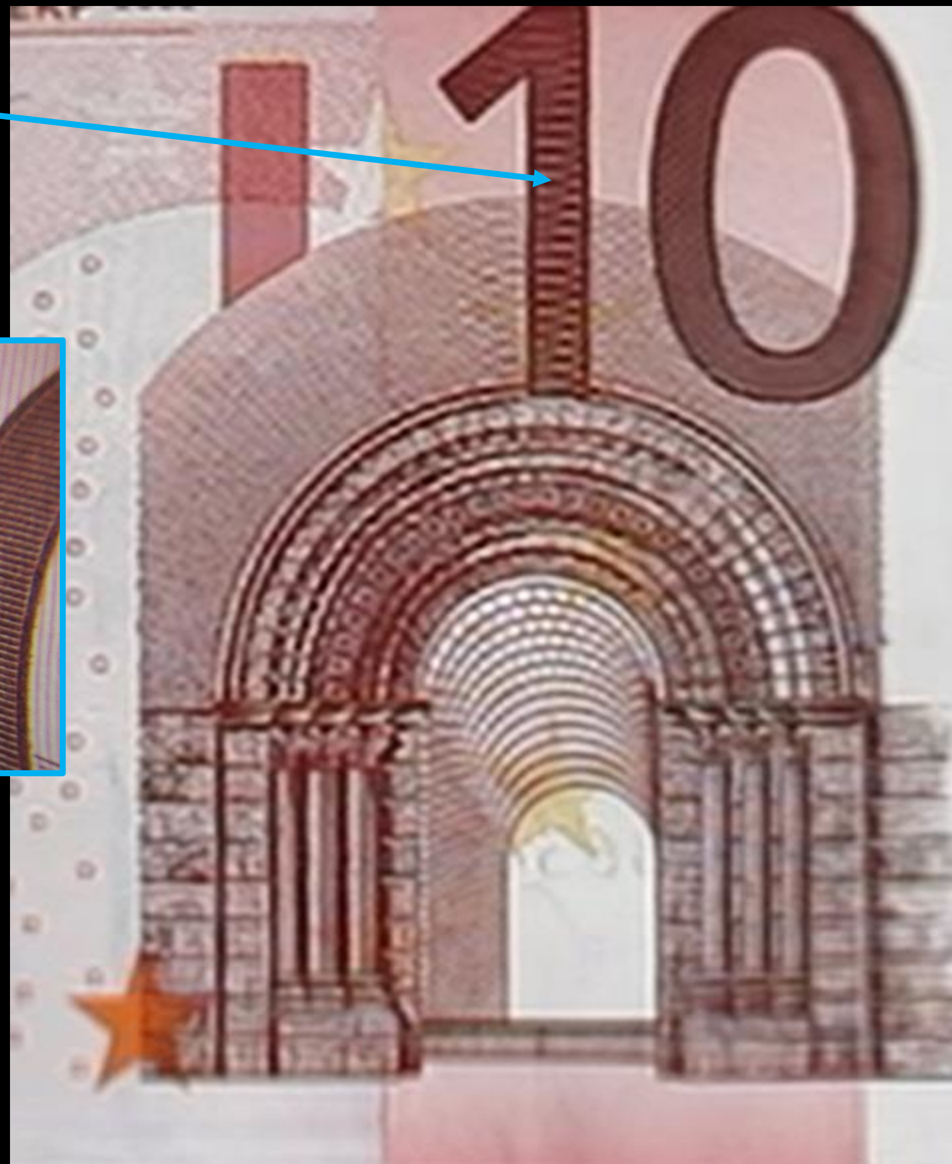


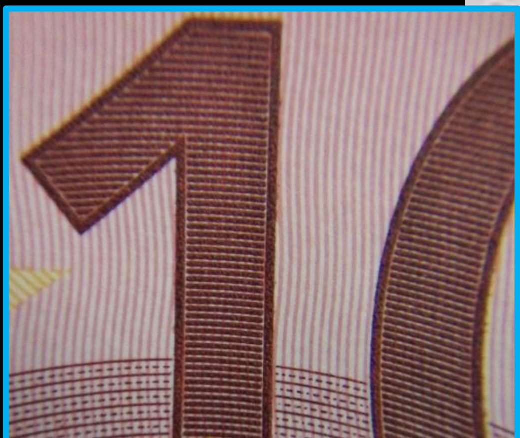
Ours

Failure Cases

- Extremely tiny structures are not revealed due to information loss.

Input (Bicubic x4)





HR Version
via Macro Lens

Ours

Input (Bicubic x4)

Ours

End