南京大学 NANJING UNIVERSITY

智能科学与技术学院 School of Intelligence Science and Technology

One-to-More: High-Fidelity Training-Free Anomaly Generation with Attention Control

CVPR 2026 Highlight

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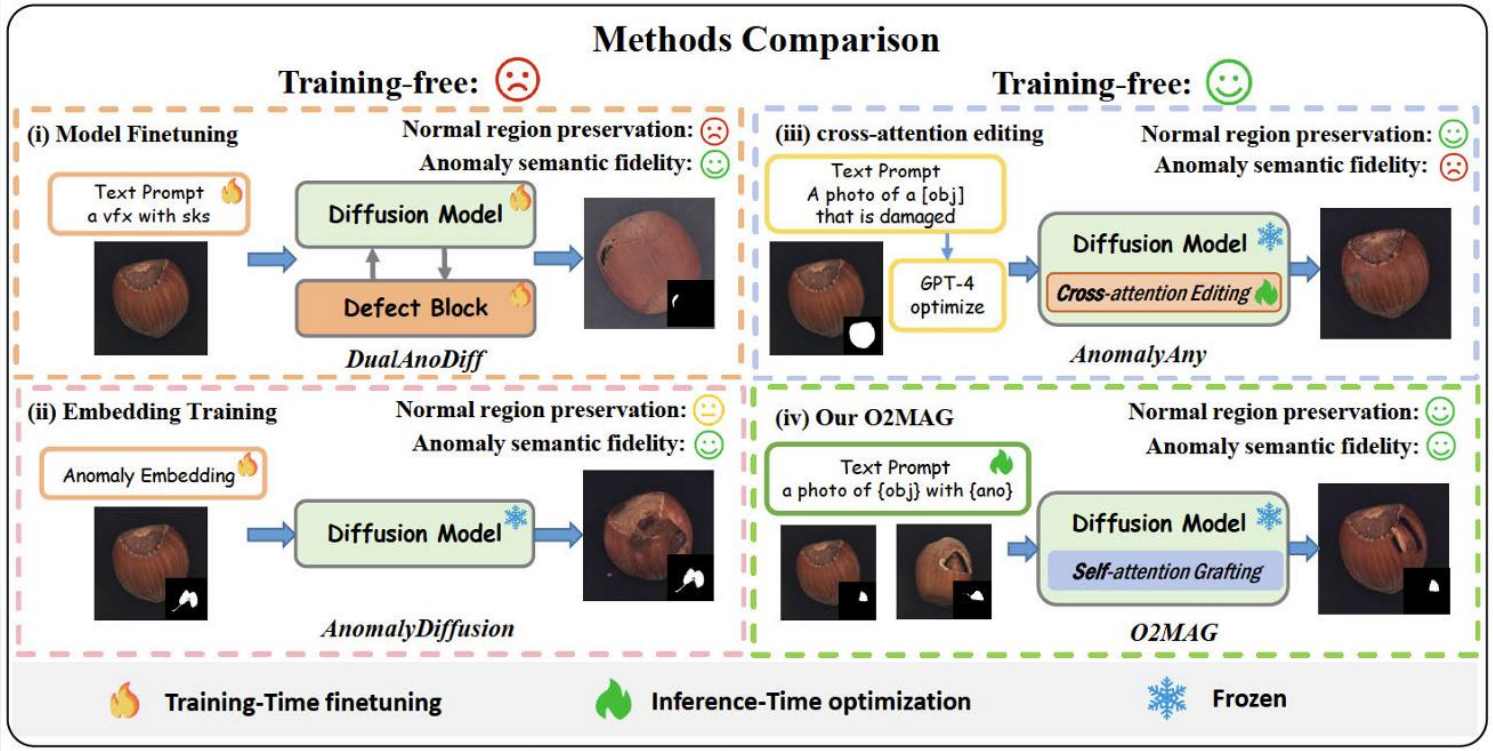
1.1 Background



(a) Limitations of existing anomaly generators

(b) Comparison of Training-free generation results

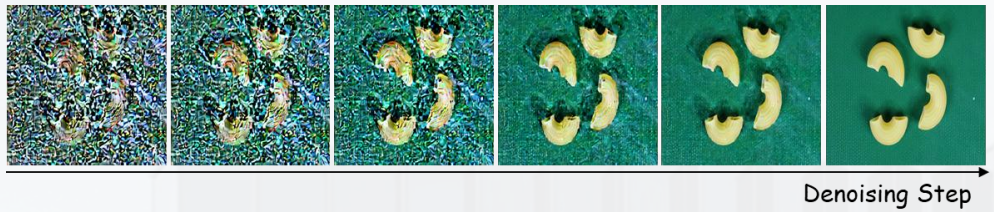
1 The Challenge in Anomaly Detection:
Scarcity of anomalous data samples

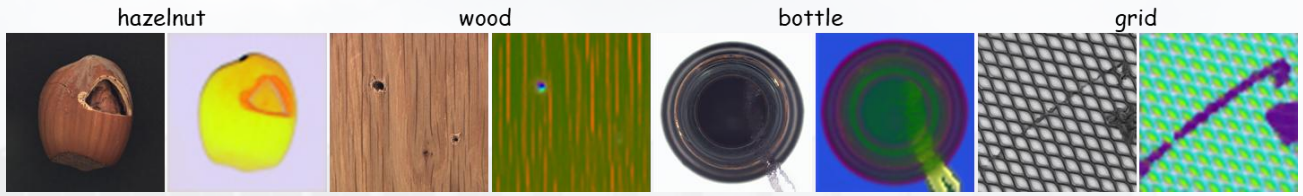
2 Bottlenecks in Current Anomaly Generation:

- Training-based: High compute overhead and Distorted normal regions
- Training-free: Misalignment with target data distributions.

1.2 Method

Motivations of Our Approach



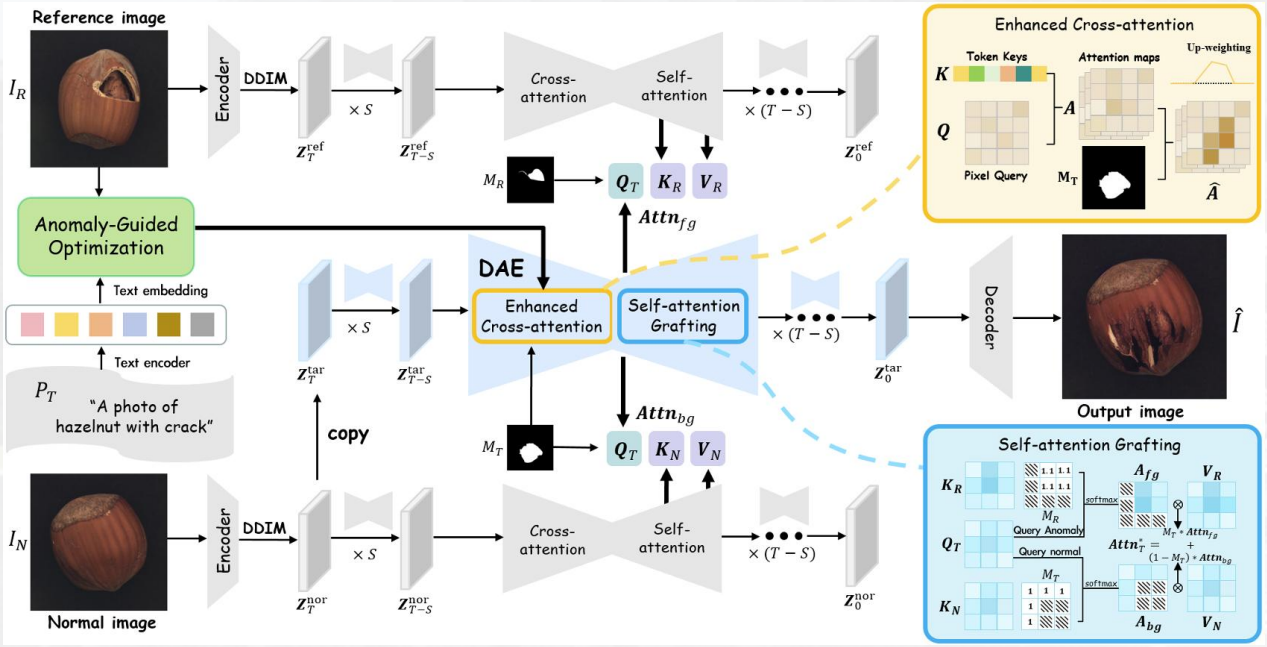


- Early Structural Emergence: Object structures materialize in the early stages of the denoising process.
- Attention-Space Disentanglement: Anomalous foregrounds and normal backgrounds are decoupled within the attention space.

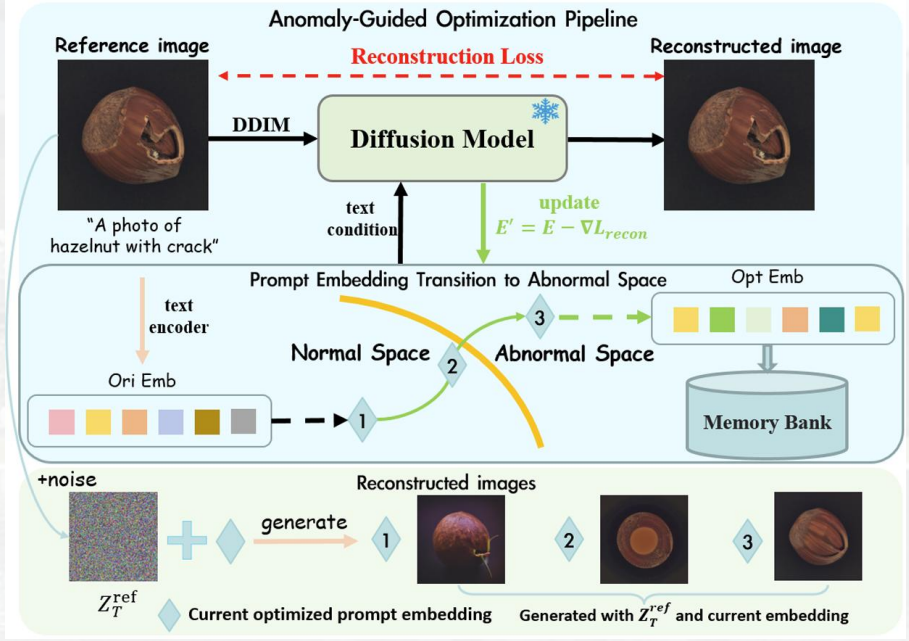
Overview of Our Approach

Given one reference anomaly image-mask pair (I_R, M_R), a normal image I_N, and a target anomaly mask M_T,our goal is to synthesize more anomaly images $\hat{I}$

O2MAG's Pipeline



Anomaly-Guided Optimization



1.3 Results

Quantitative results: Anomaly detection and localization

Table 1. Comparison on a trained U-Net segmentation model [31] for anomaly detection and localization on MVTec-AD dataset.

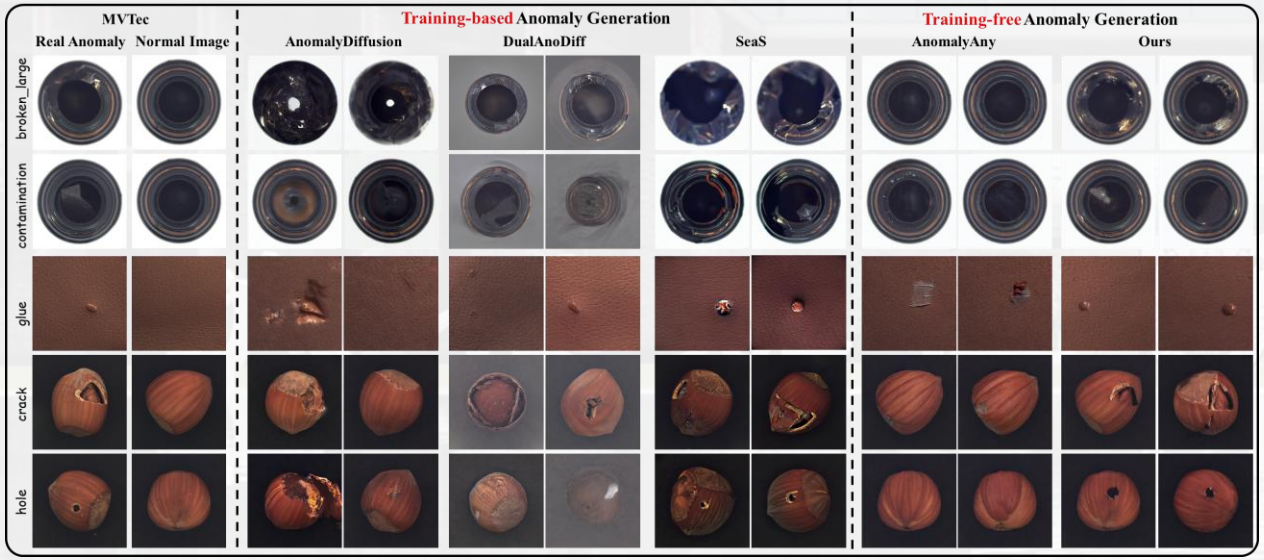
Category	DFMGAN [9]				AnomalyDiffusion [18]				DualAnoDiff [20]				SeaS [8]				Ours			
	AP-I	AUC-P	AP-P	F1-P	AP-I	AUC-P	AP-P	F1-P	AP-I	AUC-P	AP-P	F1-P	AP-I	AUC-P	AP-P	F1-P	AP-I	AUC-P	AP-P	F1-P
bottle	99.8	98.9	90.2	83.9	99.9	99.4	94.1	87.3	**100**	99.5	93.4	85.7	99.9	**99.7**	**95.9**	**88.8**	**100**	**99.7**	95.4	88.4
cable	97.8	97.2	81.0	75.4	**100**	99.2	90.8	83.5	98.3	98.5	82.6	76.9	98.8	96.0	83.1	77.7	**100**	**99.4**	**91.2**	**85.0**
capsule	98.5	79.2	26.0	35.0	**99.9**	98.8	57.2	59.8	99.2	**99.5**	**73.2**	**67.0**	99.2	93.7	41.9	47.3	99.8	97.0	60.6	59.0
carpet	98.5	90.6	33.4	38.1	98.8	98.6	81.2	74.6	99.9	99.4	**89.1**	**80.2**	99.0	99.3	86.4	78.1	**100**	**99.5**	88.5	80.0
grid	90.4	75.2	14.3	20.5	99.5	98.3	52.9	54.6	99.7	98.5	57.2	54.9	99.9	**99.7**	76.3	70.0	**100**	99.6	**78.6**	**71.6**
hazelnut	**100**	99.7	95.2	89.5	99.9	**99.8**	96.5	90.6	**100**	**99.8**	**97.7**	**92.8**	99.8	99.5	92.3	85.6	**100**	**99.8**	96.2	90.1
leather	**100**	98.5	68.7	66.7	**100**	99.8	79.6	71.0	**100**	**99.9**	**88.8**	78.8	**100**	99.8	85.2	77.0	**100**	99.7	88.0	**79.7**
metal_nut	99.8	99.3	98.1	94.5	**100**	**99.8**	98.7	94.0	99.9	99.6	98.0	93.0	**100**	**99.8**	**99.2**	**95.7**	**100**	**99.8**	**99.2**	**95.7**
pill	91.7	81.2	67.8	72.6	99.6	99.7	93.9	**90.8**	99.0	99.6	95.8	89.2	99.6	**99.9**	**97.1**	90.7	**99.7**	99.7	96.1	89.9
screw	64.7	58.8	2.2	5.3	97.9	97.0	51.8	50.9	95.0	98.1	57.1	56.1	98.0	98.5	58.5	57.2	**98.2**	**99.4**	**68.2**	**64.4**
tile	**100**	99.5	97.1	91.6	**100**	99.2	93.6	86.2	**100**	99.7	97.1	91.0	**100**	99.8	97.9	92.5	**100**	**99.9**	**98.2**	**92.7**
toothbrush	**100**	96.4	75.9	72.6	**100**	**99.2**	**76.5**	**73.4**	**99.7**	98.2	68.3	68.6	**100**	98.4	70.0	68.1	**100**	96.3	58.6	59.2
transistor	92.5	96.2	81.2	77.0	**100**	99.3	92.6	85.7	93.7	98.0	86.7	79.6	99.5	98.0	87.3	81.9	**100**	**99.9**	**98.2**	**93.2**
wood	99.4	95.3	70.7	65.8	99.4	**98.9**	84.6	74.5	**99.9**	99.4	**91.6**	**83.8**	99.6	99.0	87.0	79.6	99.8	99.4	89.4	81.1
zipper	99.9	92.9	65.6	64.9	**100**	99.6	86.0	79.2	**100**	99.6	**90.7**	**82.7**	**100**	**99.7**	88.2	81.6	**100**	99.5	88.5	82.0
Average	94.8	90.0	62.7	62.1	99.7	99.1	81.4	76.3	98.9	99.1	84.5	78.8	99.6	98.7	83.1	78.1	**99.8**	**99.2**	**86.3**	**80.8**

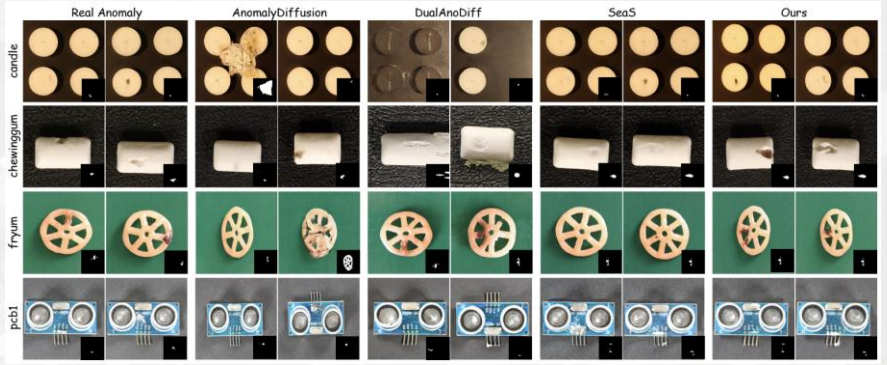
Quantitative results: Anomaly classification

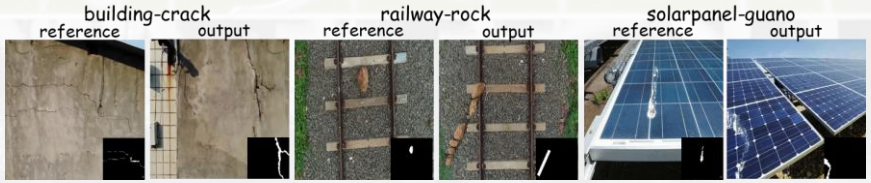
Table 4. Anomaly classification accuracy (%) with ResNet-34 [13] trained on images synthesized by each method.

Category	DFMGAN [9]	AnoDiff [18]	TF^2 [41]	DualAno [20]	SeaS [8]	Ours
bottle	56.59	**88.37**	79.36	67.44	81.40	86.05
cable	45.31	**76.56**	60.00	57.81	48.44	**76.56**
capsule	37.23	44.00	53.12	50.67	33.33	**77.33**
carpet	47.31	58.06	55.05	62.90	38.71	**74.19**
grid	40.83	60.00	47.36	67.50	47.50	**80.00**
hazelnut	81.94	81.25	88.88	79.17	81.25	**95.83**
leather	49.73	65.08	46.06	84.13	61.90	**92.06**
metal_nut	64.58	82.81	72.04	73.44	68.75	**84.38**
pill	29.52	64.58	34.75	41.67	18.75	**72.92**
screw	37.45	29.63	40.33	39.51	**56.79**	**56.79**
tile	74.85	92.98	88.09	**100.0**	89.47	**100.0**
transistor	52.38	75.00	67.50	78.57	57.14	**92.86**
wood	49.21	78.57	70.00	**90.48**	76.19	78.57
zipper	27.64	**86.59**	63.86	24.39	34.15	85.37
Average	49.61	70.25	61.88	65.55	56.70	**82.35**

Qualitative Results: Comparison of generated anomalous images with other anomaly generation methods





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