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Supplementary Material CONFLUX: A Latent Diffusion Model for 3D Chest-CT Synthesis with RL Post-Training

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A Training Parameters

Table 1. Training configuration for the three stages. Latent moments are cached; the post-training SDE uses the FLUX time-shifted Euler grid; the reward classifier and reference policy are frozen. Per-channel latent std is 1.27–2.48.

Stage	Hyperparameter	Value
Autoencoder	downsampling factor f	8
	latent channels C	16
Flow transformer	hidden width d	768
	depth L	12
	attention heads	12
	patch size p	2
	latent norm. scale s	0.5509
	latent norm. shift m	0.1869
GRPO post-training	prompts per step G	2
	rollouts per prompt N	16
	SDE steps T	10
	action noise $\sigma(t)$	$0.5\sqrt{t}$
	PPO clip ϵ	0.2
	KL weight β_{KL}	0.03
	inner epochs	1
	learning rate	3×10^{-6}

B Per-finding reward-classifier accuracy

Table 2. Per-finding AUROC on CT-RATE (real validation), all 18 findings: our latent classifier vs. CT-CLIP variants and CT-Net [?]. Sorted by our AUROC; best per row in bold.

Finding	Ours	CT-Net	CT-CLIP$_{zs}$	CT-CLIP$_{ft}$
Cardiomegaly	**0.92**	0.79	0.86	**0.92**
Pleural effusion	0.91	0.77	0.90	**0.93**
Arterial wall calcif.	**0.91**	0.63	0.85	0.87
Coronary artery calcif.	**0.91**	0.63	0.85	0.86
Interlobular septal thick.	**0.88**	0.73	0.77	0.80
Pericardial effusion	**0.83**	0.65	0.77	0.78
Mosaic attenuation	**0.81**	0.74	0.77	0.78
Bronchiectasis	**0.78**	0.57	0.65	0.61
Atelectasis	**0.76**	0.61	0.68	0.69
Consolidation	**0.76**	0.66	0.72	0.75
Medical material	**0.76**	0.66	0.72	0.75
Lung opacity	**0.76**	0.60	0.63	0.69
Hiatal hernia	**0.75**	0.55	0.70	0.72
Emphysema	0.73	0.54	0.74	**0.75**
Lymphadenopathy	**0.72**	0.61	0.70	0.70
Peribronchial thick.	**0.71**	0.53	0.69	**0.71**
Pulmonary fibrotic seq.	**0.70**	0.52	0.57	0.65
Lung nodule	**0.67**	0.55	0.57	0.65
Macro (all 18)	**0.793**	0.629	0.731	0.756

C Additional samples and conditioning



Fig. 1. CONFLUX samples. Forty synthetic chest CT volumes drawn at random from the model, each as a coronal (top) and axial (bottom) mid-slice in a lung window, numbered 0–39; per-patient conditioning is given in Table 3. The range of body habitus, anatomy, and abnormality reflects the diversity and realism of generated volumes; matching coronal/axial views show cross-plane 3D coherence.

Table 3: Conditioning metadata for each synthetic volume in Fig. 1.

#	Sex	Age	Kernel	Conditioned abnormalities
0	F	0–20	Br40f	none
1	F	70+	YA	Arterial wall calcification, Cardiomegaly, Coronary artery wall calcification, Lymphadenopathy, Atelectasis, Lung nodule, Lung opacity
2	M	60–70	Bl56f	Arterial wall calcification, Coronary artery wall calcification, Hiatal hernia, Pulmonary fibrotic sequela, Bronchiectasis
3	M	30–40	YA	Lung opacity, Consolidation, Interlobular septal thickening
4	M	30–40	EA	Hiatal hernia, Atelectasis
5	F	20–30	Br40f	none
6	M	30–40	Br40f	Lymphadenopathy, Peribronchial thickening, Consolidation, Bronchiectasis
7	F	20–30	A	Atelectasis, Lung nodule
8	M	60–70	YA	Arterial wall calcification, Lung opacity
9	F	40–50	YA	Arterial wall calcification, Hiatal hernia, Lymphadenopathy, Atelectasis, Lung nodule, Pulmonary fibrotic sequela, Consolidation
10	F	30–40	EA	Lymphadenopathy, Lung nodule
11	M	40–50	YA	Lymphadenopathy, Lung nodule, Lung opacity
12	M	50–60	YB	Lymphadenopathy, Lung nodule
13	F	50–60	L	Coronary artery wall calcification, Lung nodule, Lung opacity, Pulmonary fibrotic sequela
14	F	70+	Bl56f	Arterial wall calcification, Coronary artery wall calcification, Emphysema, Atelectasis, Lung nodule, Pulmonary fibrotic sequela, Mosaic attenuation pattern
15	F	70+	YA	Arterial wall calcification, Coronary artery wall calcification, Atelectasis
16	M	50–60	Bl57d	Lymphadenopathy, Lung opacity
17	M	20–30	Br36d	none
18	M	20–30	EA	none
19	F	40–50	YA	Arterial wall calcification, Lymphadenopathy, Emphysema, Lung nodule, Lung opacity, Pulmonary fibrotic sequela
20	M	50–60	YA	Lung opacity
21	F	40–50	YA	none
22	M	40–50	EA	Lymphadenopathy, Lung nodule
23	F	50–60	Br40f	Cardiomegaly, Lymphadenopathy, Consolidation

#	Sex	Age	Kernel	Conditioned abnormalities
24	F	60–70	YA	Arterial wall calcification, Lymphadenopathy, Lung nodule, Pulmonary fibrotic sequela, Mosaic attenuation pattern
25	F	70+	YA	Coronary artery wall calcification
26	M	50–60	L	Lung opacity, Consolidation
27	M	70+	Bl56f	Arterial wall calcification, Coronary artery wall calcification, Atelectasis, Lung opacity, Pulmonary fibrotic sequela
28	F	20–30	YA	none
29	M	30–40	EA	Lung nodule, Pulmonary fibrotic sequela
30	F	50–60	Br40f	Arterial wall calcification, Coronary artery wall calcification, Hiatal hernia, Lung nodule
31	F	20–30	B	none
32	F	50–60	YA	Lymphadenopathy, Atelectasis, Lung opacity, Pulmonary fibrotic sequela
33	F	60–70	Br36d	Lung opacity, Pulmonary fibrotic sequela, Peribronchial thickening, Consolidation, Bronchiectasis, Interlobular septal thickening
34	M	20–30	EA	none
35	M	30–40	B	Lung nodule
36	F	70+	YA	Arterial wall calcification, Coronary artery wall calcification, Emphysema, Consolidation
37	F	40–50	Br40f	none
38	M	20–30	Br40f	none
39	F	30–40	YA	none



Fig. 2. CONFLUX samples (continued). A further 40 synthetic chest CT volumes drawn at random, each a coronal (top) and axial (bottom) mid-slice in a lung window, numbered 0–39; per-patient conditioning is given in Table 4.

Table 4: Conditioning metadata for each synthetic volume in Fig. 2.

#	Sex	Age	Kernel	Conditioned abnormalities
0	M	40–50	B	Medical material, Atelectasis, Lung nodule, Lung opacity
1	F	20–30	YB	Lung nodule
2	M	50–60	L	Arterial wall calcification, Atelectasis
3	M	20–30	YA	Lung opacity, Interlobular septal thickening
4	M	50–60	EA	Hiatal hernia, Atelectasis, Lung nodule, Pulmonary fibrotic sequela
5	M	50–60	EA	Arterial wall calcification, Lung opacity
6	F	20–30	Bl56f	Arterial wall calcification, Cardiomegaly, Pericardial effusion, Coronary artery wall calcification, Hiatal hernia, Lymphadenopathy, Lung nodule
7	M	30–40	Bl57d	Emphysema, Atelectasis
8	F	50–60	Br40f	none
9	F	30–40	Br40f	none
10	M	40–50	Bl56f	Hiatal hernia, Lymphadenopathy, Atelectasis, Lung nodule, Bronchiectasis
11	F	30–40	Bl57d	none
12	M	50–60	L	Lymphadenopathy, Lung opacity
13	M	50–60	EA	Lung nodule
14	F	30–40	Br60f	Medical material, Emphysema, Pulmonary fibrotic sequela
15	F	30–40	Br40f	none
16	M	40–50	B	Emphysema, Lung opacity, Consolidation
17	F	70+	YA	Emphysema, Atelectasis, Lung nodule, Peribronchial thickening
18	F	60–70	YA	Arterial wall calcification, Hiatal hernia, Atelectasis, Lung opacity
19	F	40–50	YA	Emphysema
20	F	70+	Br40f	Arterial wall calcification, Coronary artery wall calcification, Lymphadenopathy, Lung nodule, Pulmonary fibrotic sequela
21	M	20–30	YA	Lung opacity, Peribronchial thickening, Bronchiectasis
22	F	40–50	Br40f	Coronary artery wall calcification, Lung nodule
23	M	50–60	EA	Medical material, Coronary artery wall calcification, Lymphadenopathy
24	F	50–60	YA	Arterial wall calcification, Lymphadenopathy, Emphysema, Atelectasis
25	M	20–30	Br40f	Lymphadenopathy, Lung nodule, Lung opacity

#	Sex	Age	Kernel	Conditioned abnormalities
26	M	60–70	B	Arterial wall calcification, Cardiomegaly, Pericardial effusion, Lymphadenopathy, Emphysema, Atelectasis, Lung opacity, Pulmonary fibrotic sequela, Pleural effusion, Peribronchial thickening, Bronchiectasis
27	F	30–40	Br40f	none
28	M	60–70	B	Arterial wall calcification, Coronary artery wall calcification, Hiatal hernia, Lung opacity
29	M	30–40	Bl56f	Lymphadenopathy, Lung opacity, Bronchiectasis
30	M	40–50	Br40f	Medical material, Emphysema, Lung nodule, Pulmonary fibrotic sequela
31	M	20–30	YB	none
32	M	20–30	YA	Lung nodule
33	M	50–60	YA	Hiatal hernia, Lung nodule, Pulmonary fibrotic sequela, Mosaic attenuation pattern, Peribronchial thickening
34	M	30–40	A	Lung opacity, Interlobular septal thickening
35	M	40–50	YA	Hiatal hernia, Lung opacity
36	M	30–40	Br60f	Bronchiectasis
37	F	30–40	Br40f	Medical material, Pericardial effusion, Atelectasis, Lung nodule, Pulmonary fibrotic sequela
38	M	30–40	Bl56f	none
39	M	50–60	B	Lung opacity



Fig. 3. CONFLUX samples (continued). A further 40 synthetic chest CT volumes drawn at random, each a coronal (top) and axial (bottom) mid-slice in a lung window, numbered 0–39; per-patient conditioning is given in Table 5.

Table 5: Conditioning metadata for each synthetic volume in Fig. 3.

#	Sex	Age	Kernel	Conditioned abnormalities
0	M	30–40	YA	Lung opacity
1	F	70+	YA	Arterial wall calcification, Coronary artery wall calcification, Atelectasis, Lung nodule, Pulmonary fibrotic sequela
2	M	60–70	YA	Arterial wall calcification, Coronary artery wall calcification, Emphysema, Pulmonary fibrotic sequela
3	F	50–60	YA	Lung nodule, Lung opacity, Pulmonary fibrotic sequela
4	F	40–50	YA	Medical material, Lung nodule
5	F	20–30	YA	Pericardial effusion, Pleural effusion, Peribronchial thickening, Consolidation
6	F	70+	Bl56f	Arterial wall calcification, Coronary artery wall calcification, Hiatal hernia, Lymphadenopathy, Lung nodule, Lung opacity, Pulmonary fibrotic sequela
7	M	50–60	YA	Arterial wall calcification, Coronary artery wall calcification, Lymphadenopathy, Lung nodule, Lung opacity
8	M	40–50	EA	Lung nodule, Pulmonary fibrotic sequela
9	M	30–40	EA	Emphysema, Lung nodule, Pulmonary fibrotic sequela
10	M	40–50	Br40f	Hiatal hernia, Atelectasis
11	F	60–70	YA	Lymphadenopathy
12	M	60–70	YA	Medical material, Arterial wall calcification, Cardiomegaly, Coronary artery wall calcification, Lymphadenopathy, Emphysema, Lung nodule, Pleural effusion, Mosaic attenuation pattern
13	M	70+	Br40f	Arterial wall calcification, Cardiomegaly, Coronary artery wall calcification, Lymphadenopathy, Emphysema, Lung opacity, Pleural effusion, Peribronchial thickening, Consolidation
14	F	60–70	Br60f	Cardiomegaly, Lymphadenopathy, Atelectasis
15	M	30–40	EA	Lung nodule
16	F	40–50	YA	Medical material, Atelectasis, Lung opacity, Consolidation
17	M	40–50	B	Coronary artery wall calcification, Pulmonary fibrotic sequela
18	F	60–70	Bl56f	Atelectasis, Lung opacity
19	M	30–40	Br40f	Lymphadenopathy, Emphysema

#	Sex	Age	Kernel	Conditioned abnormalities
20	M	20–30	other	none
21	F	70+	Br60f	Arterial wall calcification, Coronary artery wall calcification, Hiatal hernia, Lymphadenopathy, Emphysema, Lung nodule, Lung opacity, Consolidation
22	F	50–60	Bl56f	Lung nodule
23	F	70+	YA	Coronary artery wall calcification, Hiatal hernia, Atelectasis, Pleural effusion
24	F	70+	Br60f	Medical material, Arterial wall calcification, Coronary artery wall calcification, Lung nodule, Lung opacity
25	M	40–50	Bl56f	Lung nodule, Lung opacity
26	M	50–60	B	Arterial wall calcification, Coronary artery wall calcification, Lymphadenopathy, Emphysema, Lung nodule, Pulmonary fibrotic sequela
27	F	30–40	Bl56f	Lymphadenopathy, Lung nodule, Pulmonary fibrotic sequela
28	M	70+	YA	Arterial wall calcification, Coronary artery wall calcification, Hiatal hernia, Lymphadenopathy, Lung nodule, Lung opacity, Pulmonary fibrotic sequela
29	M	50–60	Bl56f	Medical material, Arterial wall calcification, Coronary artery wall calcification, Hiatal hernia, Emphysema, Lung nodule, Pulmonary fibrotic sequela, Bronchiectasis
30	M	50–60	B	Medical material, Consolidation, Bronchiectasis
31	F	40–50	YA	Lung nodule, Lung opacity
32	M	20–30	Br40f	Lung opacity, Consolidation
33	M	30–40	B	Lymphadenopathy, Consolidation
34	M	50–60	EA	Lung nodule
35	M	30–40	Bl56f	Lymphadenopathy, Emphysema, Atelectasis, Lung nodule
36	M	60–70	B	Arterial wall calcification, Coronary artery wall calcification, Atelectasis, Lung nodule, Mosaic attenuation pattern
37	M	30–40	Br40f	none
38	M	60–70	B	Lung nodule, Pulmonary fibrotic sequela
39	F	40–50	YA	Emphysema, Lung nodule, Lung opacity, Pulmonary fibrotic sequela