

Assignment 2 Report

CS-726: Advanced Machine Learning

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1 Denoising Diffusion Probabilistic Models

For NLL calculation, the temperature is set to 0.1. For EMD calculation, the number of subsamples is set to 250 and the number of iterations is set to 5.

1.1 Varying Timesteps

Here, $\text{lbeta} = 0.0001$ and $\text{ubeta} = 0.02$.

Dataset	Metric	Timesteps					
		10	50	100	150	200	500
Moons	EMD	39.99	28.95	27.40	29.64	30.55	44.90
	NLL	1.02	0.96	0.94	0.93	0.94	0.95
Circles	EMD	34.60	31.48	33.24	34.41	38.62	42.04
	NLL	1.05	0.99	1.00	0.98	1.01	1.03
Blobs	EMD	88.78	43.69	20.08	18.36	17.17	19.83
	NLL	0.34	0.12	0.04	0.03	0.01	0.04
Manycircles	EMD	33.65	26.41	27.77	27.98	30.98	30.34
	NLL	0.66	0.54	0.54	0.54	0.54	0.58
Helix	EMD	56.00	59.33	57.15	56.13	58.87	60.49
	NLL	1.55	1.53	1.52	1.52	1.53	1.51

1.2 Varying Beta Schedule

Here, $\text{timesteps} = 200$.

Dataset	Metric	Beta Schedule ($\text{lbeta} \rightarrow \text{ubeta}$)					
		1e-4 \rightarrow 0.02	1e-3 \rightarrow 0.2	1e-5 \rightarrow 0.002	1e-5 \rightarrow 0.02	1e-4 \rightarrow 0.2	1e-5 \rightarrow 0.2
Moons	EMD	30.55	35.57	34.76	30.48	33.48	33.62
	NLL	0.94	0.93	0.98	0.95	0.95	0.94
Circles	EMD	38.62	38.03	33.03	38.36	36.52	37.45
	NLL	1.01	1.00	1.02	1.00	1.01	1.01
Blobs	EMD	17.17	20.35	62.98	17.17	19.59	19.62
	NLL	0.01	0.02	0.20	0.01	0.01	0.00
Manycircles	EMD	30.98	28.75	26.55	31.82	29.40	29.92
	NLL	0.54	0.52	0.58	0.53	0.53	0.54
Helix	EMD	58.87	56.25	57.31	58.29	57.34	58.72
	NLL	1.53	1.52	1.54	1.53	1.53	1.52

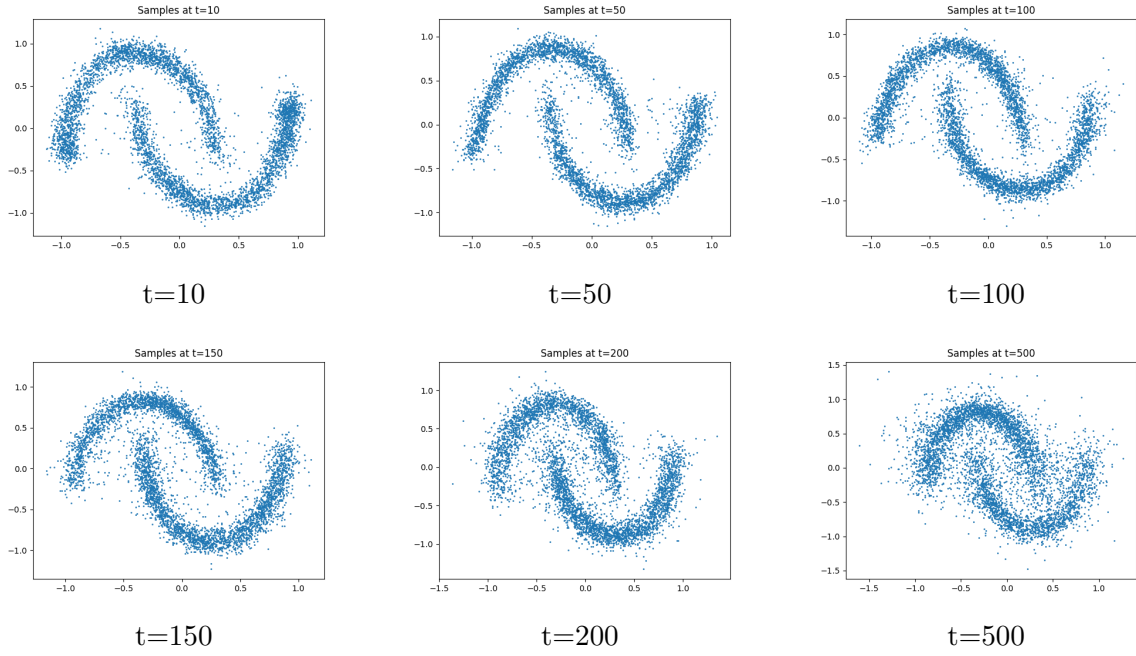


Figure 1: Samples generated by DDPM with **varying timesteps** for the Moons dataset.

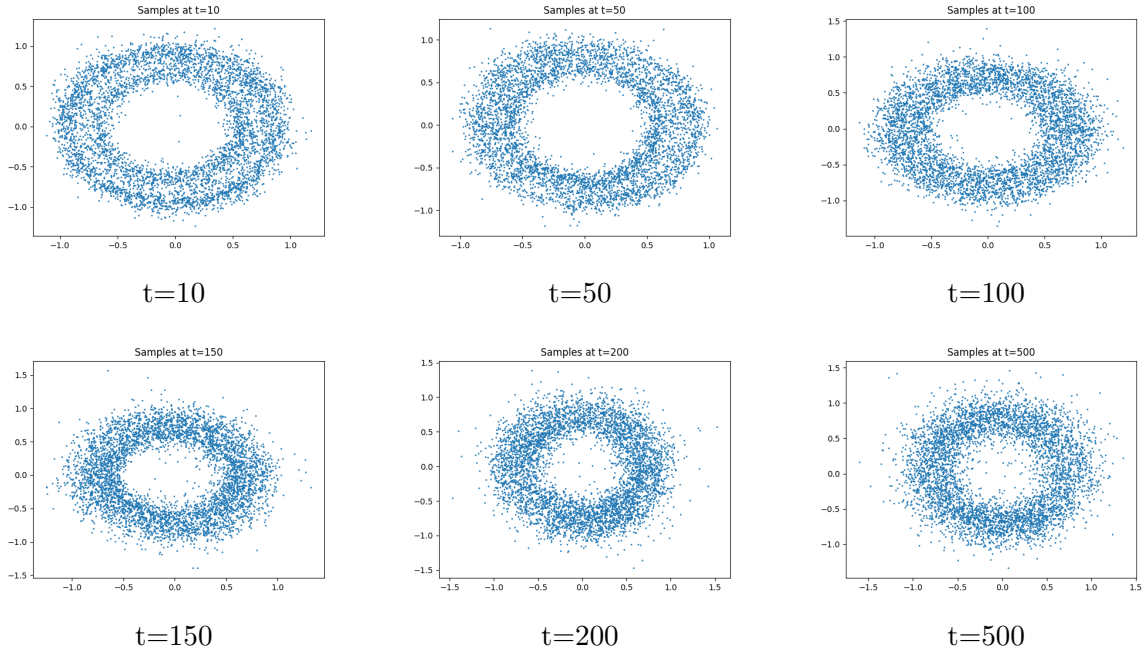


Figure 2: Samples generated by DDPM with **varying timesteps** for the Circles dataset.

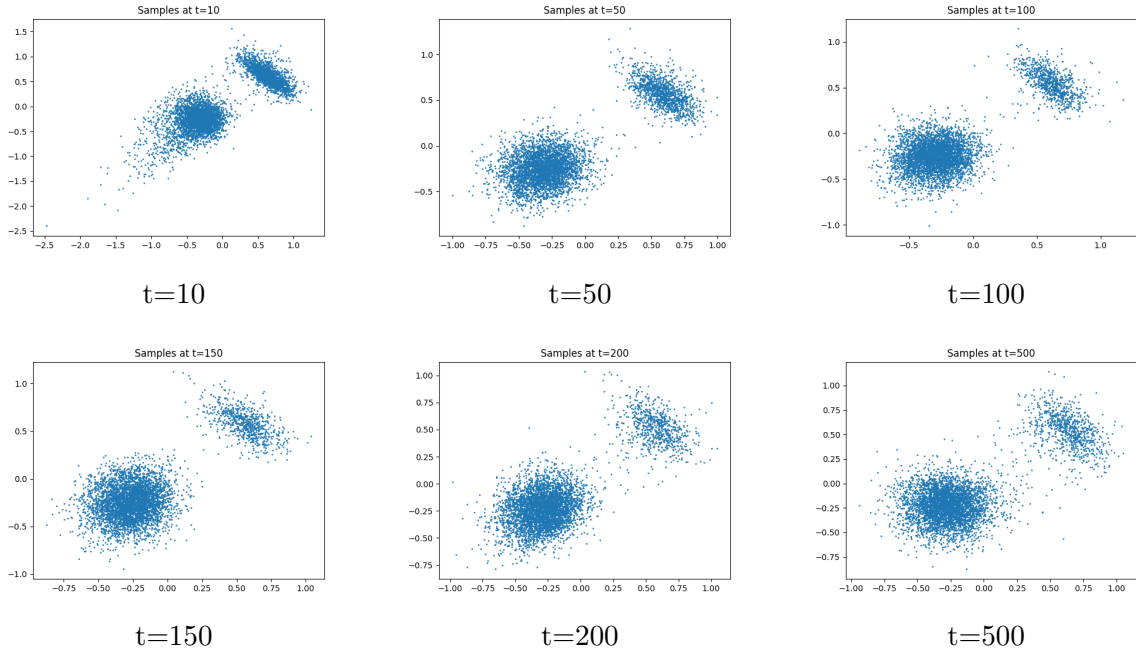


Figure 3: Samples generated by DDPM with **varying timesteps** for the Blobs dataset.

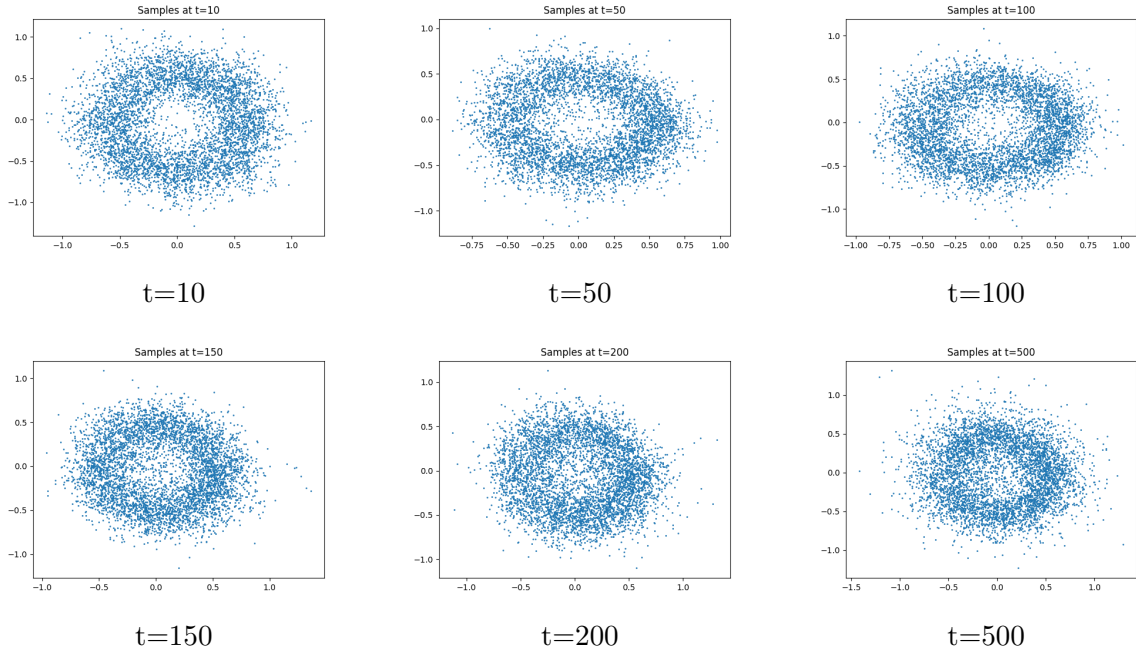


Figure 4: Samples generated by DDPM with **varying timesteps** for the Manycircles dataset.

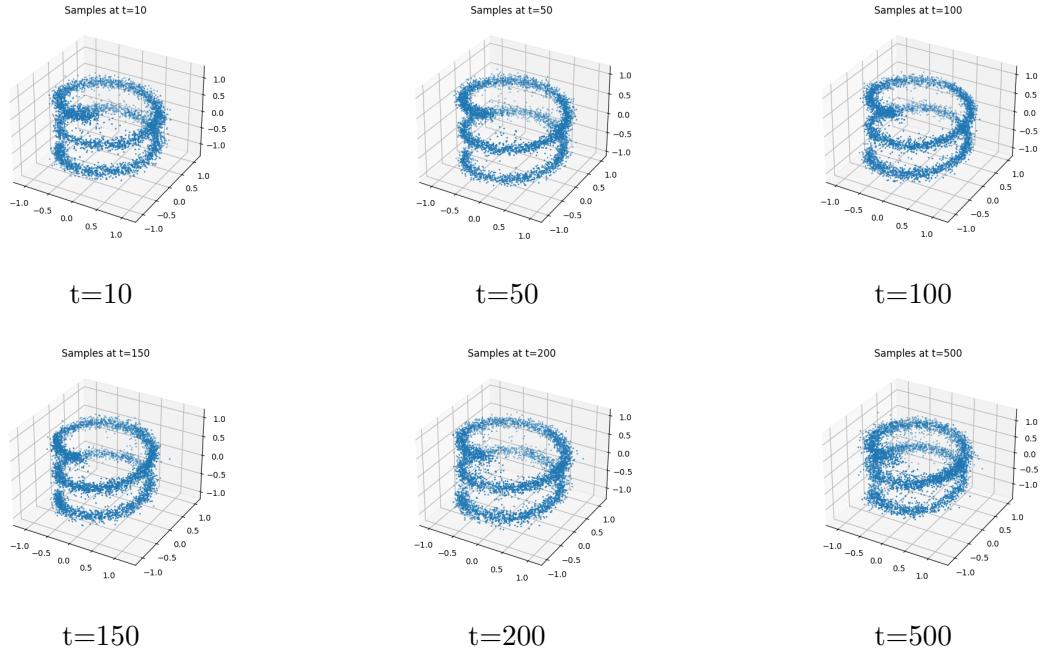


Figure 5: Samples generated by DDPM with **varying timesteps** for the Helix dataset.

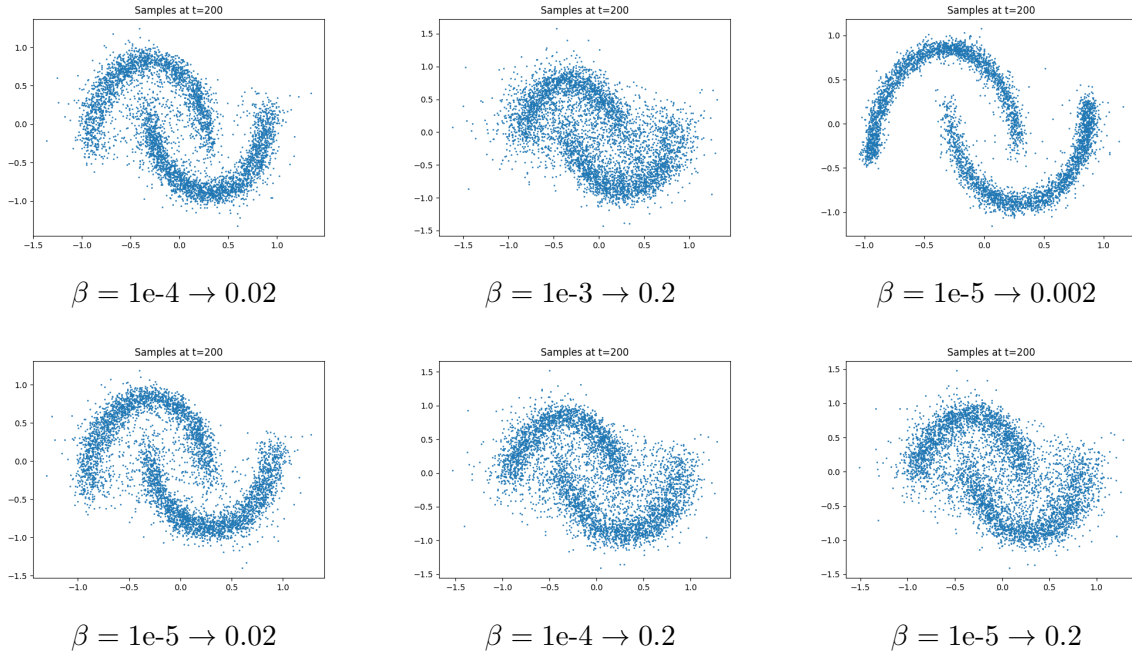


Figure 6: Samples generated by DDPM with **varying beta schedules** for the Moons dataset.

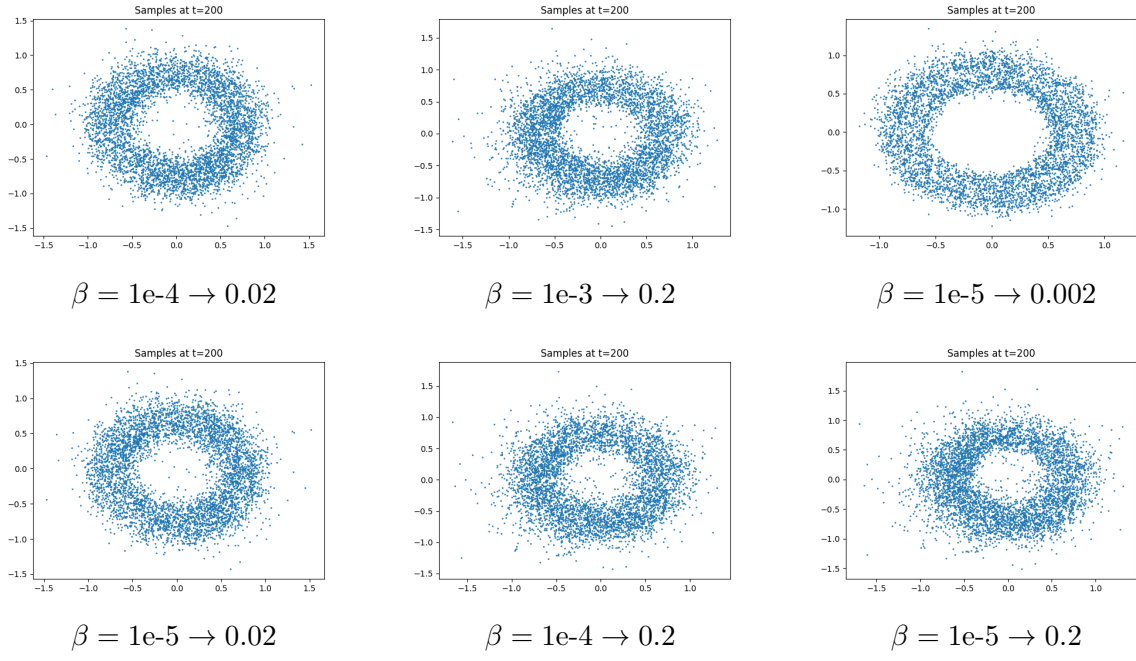


Figure 7: Samples generated by DDPM with **varying beta schedules** for the Circles dataset.

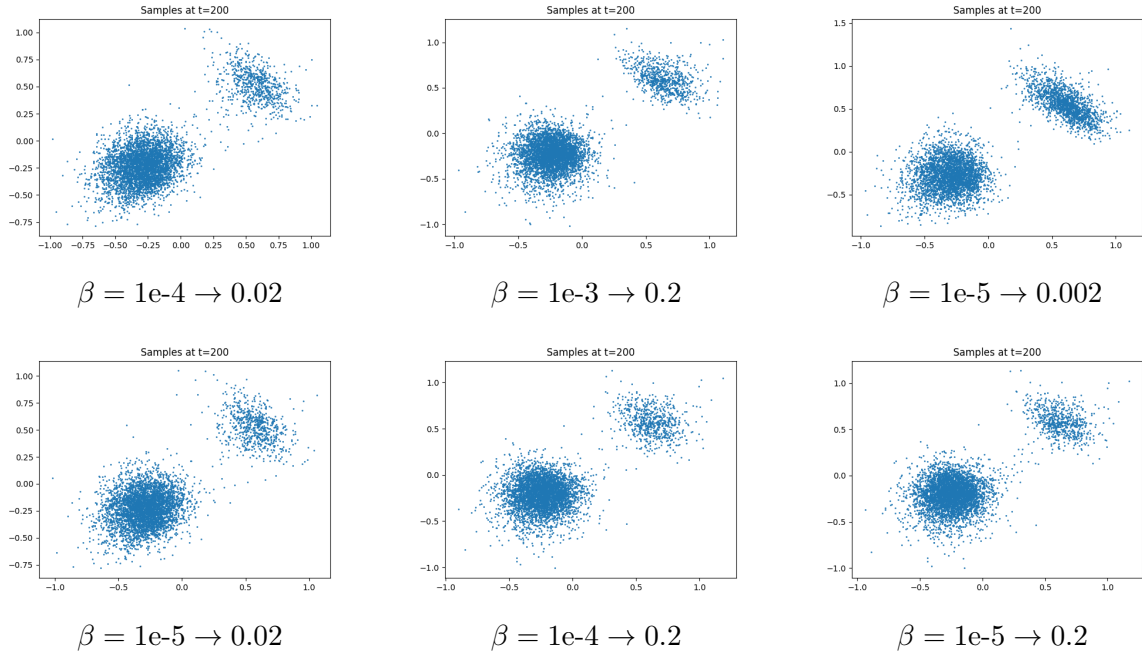


Figure 8: Samples generated by DDPM with **varying beta schedules** for the Blobs dataset.

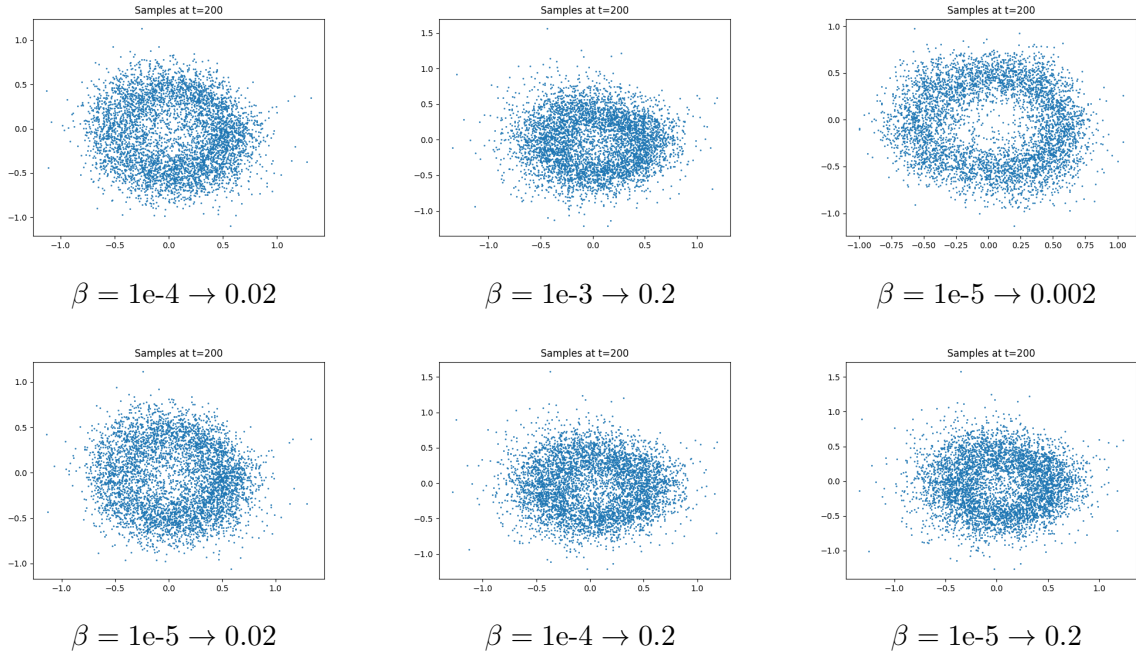


Figure 9: Samples generated by DDPM with **varying beta schedules** for the Manycircles dataset.

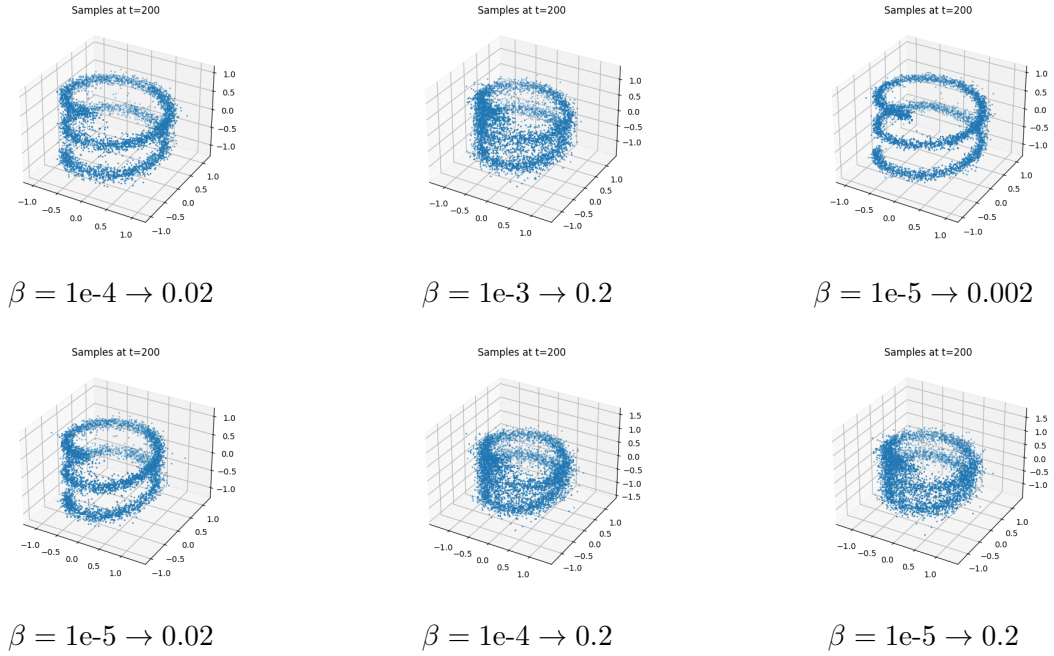


Figure 10: Samples generated by DDPM with **varying beta schedules** for the Helix dataset.