

Fine-Tuning My Stable Diffusion Model

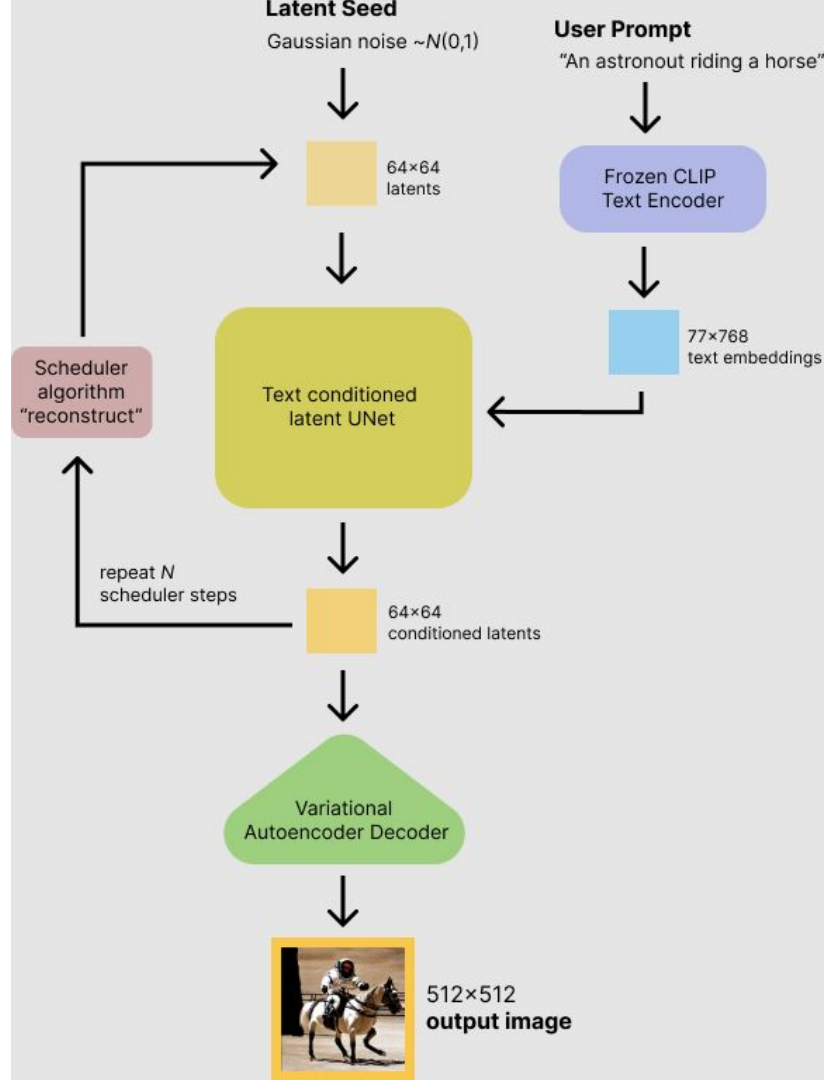
資工碩一 梁廣廷

Outline

1. Create and fine-tune Stable Diffusion models using a Dreambooth template notebook.
2. Use TWCC to accelerate the training of Stable Diffusion models with GPUs.
3. Work with unfamiliar codebases and use new tools, including **Dreambooth** and **Weights & Biases**.

1. Create and fine-tune Stable Diffusion models using a Dreambooth template notebook.

Stable Diffusion



DreamBooth: Fine Tuning Text-to-Image Diffusion Models for Subject-Driven Generation

[Nataniel Ruiz](#) [Yuanzhen Li](#) [Varun Jampani](#) [Yael Pritch](#) [Michael Rubinstein](#) [Kfir Aberman](#)

Google Research



Input images



in the Acropolis



swimming



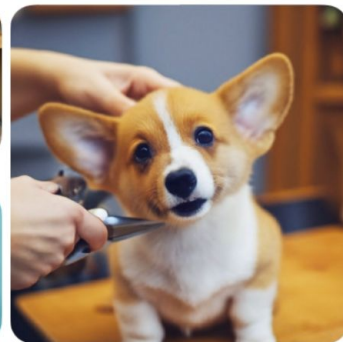
sleeping



in a doghouse



in a bucket

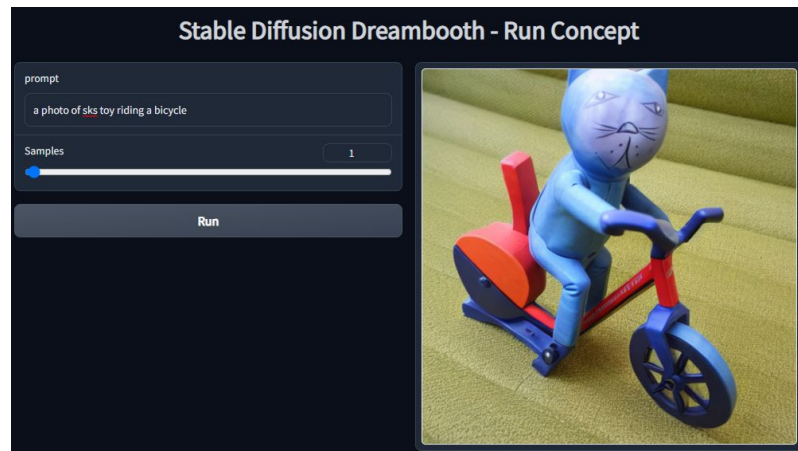


getting a haircut

It's like a photo booth, but once the subject is captured, it can be synthesized wherever your dreams take you...

[\[Paper\]](#) (new!) [\[Dataset\]](#) [\[BibTeX\]](#)

Dreambooth and Stable Diffusion Example



The model usually uses one concept, and the model will modify that specific concept. In total, training takes about 20 minutes.

Runtime - Colab Free Tier

Name (3 selected)	Created	Runtime ▾	End Time	Hostname	ID	Notes	GPU Type	State	Updated	Tags	class_prom	instance_pr	prior_loss_1
<input checked="" type="checkbox"/> winter-firebrand...	3h ago	29m 56s	Jun 06 '23	b7a8f945c	bl5ryiwf	Add notes	Tesla T4	Finished	Jun 06 '23	T4 ×	a photo of	a photo of	1
<input checked="" type="checkbox"/> floral-forest-22	43m ago	24m 46s	Jun 07 '23	1f3c9bcfc	59sq2lfc	Add notes	Tesla T4	Finished	Jun 07 '23	T4 ×	a photo of	big bird	1
<input checked="" type="checkbox"/> royal-leaf-14	5h ago	18m 4s	Jun 06 '23	74afd55bf	e0m2tl1p	Add notes	Tesla T4	Finished	Jun 06 '23	T4 ×	a photo of	a photo of	0.5

prompt

big bird on the road

Samples

1

Run



2. Use TWCC to accelerate the training of Stable Diffusion models with GPUs.

```
In [22]: #@title Run training
import accelerate

accelerate.notebook_launcher(training_function, args=(text_encoder, vae, unet), num_processes=1)
for param in itertools.chain(unet.parameters(), text_encoder.parameters()):
    if param.grad is not None:
        del param.grad # free some memory
torch.cuda.empty_cache()
```

/home/thomas1024/.local/lib/python3.8/site-packages/diffusers/configuration_utils.py:219: FutureWarning: It is deprecated to pass a pretrained model name or path to `from_config`. If you were trying to load a scheduler, please use <class 'diffusers.schedulers.scheduling_ddpm.DDPMSScheduler'>.from_pretrained(...) instead. Otherwise, please make sure to pass a configuration dictionary instead. This functionality will be removed in v1.0.0.
deprecate("config-passed-as-path", "1.0.0", deprecation_message, standard_warn=False)

Launching training on one GPU.

Steps: 100%  300/300 [09:58<00:00, 1.78s/it, loss=0.136]

`text_config_dict` is provided which will be used to initialize `CLIPTextConfig`. The value `text_config["id2label"]` will be overridden.
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```
In [23]: !nvidia-smi
```

Wed Jun 7 09:33:49 2023

NVIDIA-SMI 470.161.03 Driver Version: 470.161.03 CUDA Version: 12.0									
GPU	Name	Persistence-M	Bus-Id	Disp.A	Volatile Uncorr. ECC				
Fan	Temp	Perf	Pwr:Usage/Cap	Memory-Usage	GPU-Util	Compute M.			
MIG M.									
0	Tesla V100-SXM2...	On	00000000:1B:00.0	Off		0			
N/A	30C	P0	69W / 300W	5071MiB / 32510MiB	100%	Default			
						N/A			

Processes:						
GPU	GI	CI	PID	Type	Process name	GPU Memory Usage
ID	ID	ID				

Report: [link](#)



Runtime - Cloud GPU




Runs (13)








🔍 Filter Group Sort Tag Move Create Sweep

<input type="checkbox"/> Name (13 visualized)	Created	Runtime	End Time	Hostname	ID	Notes	GPU Type	State	Updated	Tags	class_prom	instance_pr	prior_loss_v
flowing-shadow-2	5d ago	6m 58s	Jun 01 '23	10384ab3:	uz2o5a7z	Add notes	NVIDIA A100-SXM4-40GB	Finished	Jun 05 '23		a photo of	<cat-toy>	1
revived-haze-6	5d ago	7m 9s	Jun 02 '23	10384ab3:	s4uqrvos	Add notes	NVIDIA A100-SXM4-40GB	Finished	Jun 05 '23		a photo of	<cat-toy>	1
eager-wave-23	2h ago	8m 8s	Jun 07 '23	f1c0cb931	t97rhj34	Add notes	NVIDIA A100-SXM4-40GB	Finished	Jun 07 '23		a photo of	a photo of	0.5
bright-silence-24	1h ago	8m 11s	Jun 07 '23	9a1c9869:	nzsay28v	Add notes	NVIDIA A100-SXM4-40GB	Finished	Jun 07 '23		a photo of	a photo of	1
leafy-tree-25	1h ago	8m 13s	Jun 07 '23	9a1c9869:	5ms4rsue	Add notes	NVIDIA A100-SXM4-40GB	Finished	Jun 07 '23		a photo of	a photo of	1
driven-deluge-9	2d ago	11m 51s	Jun 05 '23	7220ee6f5	0mytnitg	Add notes	Tesla V100-SXM2-16GB	Finished	Jun 05 '23		a photo of	<cat-toy>	1
comfy-sea-15	13h ago	11m 54s	Jun 06 '23	225588f0c	lytku2j0	Add notes	Tesla V100-SXM2-16GB	Finished	Jun 06 '23		a photo of	a photo of	1
woven-vortex-21	10h ago	13m 17s	Jun 07 '23	a4ff581b6	uq8cwycj	Add notes	Tesla V100-SXM2-16GB	Finished	Jun 07 '23		a photo of	big bird	1
unique-smoke-26	29m ago	13m 32s	Jun 07 '23	049b4864:	qyz0z7z1	Add notes	Tesla V100-SXM2-16GB	Finished	Jun 07 '23		a photo of	a photo of	1
royal-leaf-14	14h ago	18m 4s	Jun 06 '23	74afd55bf	e0m2tl1p	Add notes	Tesla T4	Finished	Jun 06 '23		a photo of	a photo of	0.5
robust-sun-20	11h ago	23m 2s	Jun 07 '23	e5b52e5fa	xjz43c8d	Add notes	Tesla V100-SXM2-16GB	Finished	Jun 07 '23		a photo of	big bird	1
floral-forest-22	9h ago	24m 46s	Jun 07 '23	1f3c9bcfc:	59sq2lfc	Add notes	Tesla T4	Finished	Jun 07 '23		a photo of	big bird	1
winter-firebrand...	12h ago	29m 56s	Jun 06 '23	b7a8f945c	bl5ryiwf	Add notes	Tesla T4	Finished	Jun 06 '23		a photo of	a photo of	1




Compare T4 V.S. V100










Runs (12)

Q  1 Filter  Group  Sort

<input type="checkbox"/>  Name (3 visualized)	Runtime ▲	GPU Type
  royal-leaf-14	18m 4s	Tesla T4
  floral-forest-22	24m 46s	Tesla T4
  winter-firebrand...	29m 56s	Tesla T4




Runs (12)








Q  1 Filter  Group  Sort

<input type="checkbox"/>  Name (4 visualized)	Runtime ▲	GPU Type
  driven-deluge-9	11m 51s	Tesla V100-SXM2-16GB
  comfy-sea-15	11m 54s	Tesla V100-SXM2-16GB
  woven-vortex-21	13m 17s	Tesla V100-SXM2-16GB
  unique-smoke-26	13m 32s	Tesla V100-SXM2-16GB




Compare T4 V.S. A100












Runs (12)

Q  1 Filter  Group  Sort

<input type="checkbox"/>  Name (3 visualized)	Runtime ▲	GPU Type
·   royal-leaf-14	18m 4s	Tesla T4
·   floral-forest-22	24m 46s	Tesla T4
·   winter-firebrand...	29m 56s	Tesla T4

Runs (12)

Q  1 Filter  Group  Sort


<input type="checkbox"/>  Name (5 visualized)	Runtime ▲	GPU Type
·   flowing-shadow-2	6m 58s	NVIDIA A100-SXM4-40GB
·   revived-haze-6	7m 9s	NVIDIA A100-SXM4-40GB
·   eager-wave-23	8m 8s	NVIDIA A100-SXM4-40GB
·   bright-silence-24	8m 11s	NVIDIA A100-SXM4-40GB
·   leafy-tree-25	8m 13s	NVIDIA A100-SXM4-40GB

Conclusion :

Improve execution
performance from the free
version to the cloud GPU
version from 200% to 400%

Thanks for your attention.

Reference

1. **Stable Diffusion with  Diffusers : [link](#)**
2. **Training Stable Diffusion with Dreambooth : [link](#)**
3. **Accelerate_sd_dreambooth_training : [link](#)**
4. **sd-dreambooth-library/big-bird : [link](#)**
5. **Hugging Face Accelerate Super Charged With Weights & Biases : [link](#)**
6. **Fall 2022: Lecture 16 & 17 – “Make your dreams come tuned”
Fine-Tuning Your Stable Diffusion Model : [link](#)**