

```

!pip install "unsloth[colab-new] @ git+https://github.com/unslothai/unsloth.git"
!pip install trl==0.14.0 peft==0.14.0 xformers==0.0.28.post3
!pip install torch==2.5.1 torchvision==0.20.1 --index-url https://download.pytorch.org/whl/cu124

Using cached torch-2.5.1-cp311-cp311-manylinux1_x86_64.whl (906.5 MB)
Using cached triton-3.1.0-cp311-cp311-manylinux_2_17_x86_64.manylinux2014_x86_64.whl (209.5 MB)
Installing collected packages: triton, torch, xformers, trl, peft
  Attempting uninstall: triton
    Found existing installation: triton 3.2.0
    Uninstalling triton-3.2.0:
      Successfully uninstalled triton-3.2.0
  Attempting uninstall: torch
    Found existing installation: torch 2.6.0+cu124
    Uninstalling torch-2.6.0+cu124:
      Successfully uninstalled torch-2.6.0+cu124
  Attempting uninstall: trl
    Found existing installation: trl 0.19.1
    Uninstalling trl-0.19.1:
      Successfully uninstalled trl-0.19.1
  Attempting uninstall: peft
    Found existing installation: peft 0.16.0
    Uninstalling peft-0.16.0:
      Successfully uninstalled peft-0.16.0
ERROR: pip's dependency resolver does not currently take into account all the packages that are installed. This behaviour is the source
torchaudio 2.6.0+cu124 requires torch==2.6.0, but you have torch 2.5.1 which is incompatible.
torchvision 0.21.0+cu124 requires torch==2.6.0, but you have torch 2.5.1 which is incompatible.
Successfully installed peft-0.14.0 torch-2.5.1 triton-3.1.0 trl-0.14.0 xformers-0.0.28.post3
Looking in indexes: https://download.pytorch.org/whl/cu124
Requirement already satisfied: torch==2.5.1 in /usr/local/lib/python3.11/dist-packages (2.5.1)
Collecting torchvision==0.20.1
  Downloading https://download.pytorch.org/whl/cu124/torchvision-0.20.1%2Bcu124-cp311-cp311-linux_x86_64.whl (7.3 MB)
    7.3/7.3 MB 49.5 MB/s eta 0:00:00
Requirement already satisfied: filelock in /usr/local/lib/python3.11/dist-packages (from torch==2.5.1) (3.18.0)
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Requirement already satisfied: nvidia-cudnn-cu12==9.1.0.70 in /usr/local/lib/python3.11/dist-packages (from torch==2.5.1) (9.1.0.70)
Requirement already satisfied: nvidia-cublas-cu12==12.4.5.8 in /usr/local/lib/python3.11/dist-packages (from torch==2.5.1) (12.4.5.8)
Requirement already satisfied: nvidia-cufft-cu12==11.2.1.3 in /usr/local/lib/python3.11/dist-packages (from torch==2.5.1) (11.2.1.3)
Requirement already satisfied: nvidia-curand-cu12==10.3.5.147 in /usr/local/lib/python3.11/dist-packages (from torch==2.5.1) (10.3.5.1
Requirement already satisfied: nvidia-cusolver-cu12==11.6.1.9 in /usr/local/lib/python3.11/dist-packages (from torch==2.5.1) (11.6.1.9
Requirement already satisfied: nvidia-cusparse-cu12==12.3.1.170 in /usr/local/lib/python3.11/dist-packages (from torch==2.5.1) (12.3.1
Requirement already satisfied: nvidia-nccl-cu12==2.21.5 in /usr/local/lib/python3.11/dist-packages (from torch==2.5.1) (2.21.5)
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Requirement already satisfied: triton==3.1.0 in /usr/local/lib/python3.11/dist-packages (from torch==2.5.1) (3.1.0)
Requirement already satisfied: sympy==1.13.1 in /usr/local/lib/python3.11/dist-packages (from torch==2.5.1) (1.13.1)
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Requirement already satisfied: pillow!=8.3.*,>=5.3.0 in /usr/local/lib/python3.11/dist-packages (from torchvision==0.20.1) (11.2.1)
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Requirement already satisfied: MarkupSafe>=2.0 in /usr/local/lib/python3.11/dist-packages (from Jinja2->torch==2.5.1) (3.0.2)
Installing collected packages: torchvision
  Attempting uninstall: torchvision
    Found existing installation: torchvision 0.21.0+cu124
    Uninstalling torchvision-0.21.0+cu124:
      Successfully uninstalled torchvision-0.21.0+cu124
Successfully installed torchvision-0.20.1+cu124

from unsloth import FastLanguageModel
import torch
from trl import SFTTrainer
from unsloth import is_bfloat16_supported
from huggingface_hub import login
from transformers import TrainingArguments
from datasets import load_dataset
import wandb

Unsloth: Will patch your computer to enable 2x faster free finetuning.
Unsloth Zoo will now patch everything to make training faster!

```

```
pip install --upgrade --no-cache-dir "unsloth[colab-new] @ git+https://github.com/unslothai/unsloth.git"
```

```

Collecting unsloth@ git+https://github.com/unslothai/unsloth.git (from unsloth[colab-new]@ git+https://github.com/unslothai/unsloth.git)
Cloning https://github.com/unslothai/unsloth.git to /tmp/pip-install-19f83c9v/unsloth_1c915e42173c43ffa08591c1c9517426
Running command git clone --filter=blob:none --quiet https://github.com/unslothai/unsloth.git /tmp/pip-install-19f83c9v/unsloth_1c915e
Resolved https://github.com/unslothai/unsloth.git to commit 0eb61fba728cdc8acd1f2fa1f6f71074f559ac0
Installing build dependencies ... done
Getting requirements to build wheel ... done
Preparing metadata (pyproject.toml) ... done
Collecting unsloth_zoo>=2025.7.4 (from unsloth@ git+https://github.com/unslothai/unsloth.git->unsloth[colab-new]@ git+https://github.com
Downloading unsloth_zoo-2025.7.4-py3-none-any.whl.metadata (8.1 kB)
Requirement already satisfied: packaging in /usr/local/lib/python3.11/dist-packages (from unsloth@ git+https://github.com/unslothai/unslo
Collecting tyro (from unsloth@ git+https://github.com/unslothai/unsloth.git->unsloth[colab-new]@ git+https://github.com/unslothai/unslo
Downloading tyro-0.9.26-py3-none-any.whl.metadata (12 kB)
Requirement already satisfied: transformers!=4.47.0,!4.52.0,!4.52.1,!4.52.2,!4.52.3,!4.53.0,>=4.51.3 in /usr/local/lib/python3.11/d
Collecting datasets<4.0.0,>=3.4.1 (from unsloth@ git+https://github.com/unslothai/unsloth.git->unsloth[colab-new]@ git+https://github.cc
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Requirement already satisfied: sentencepiece==0.2.0 in /usr/local/lib/python3.11/dist-packages (from unsloth@ git+https://github.com/uns
Requirement already satisfied: tqdm in /usr/local/lib/python3.11/dist-packages (from unsloth@ git+https://github.com/unslothai/unsloth.g
Requirement already satisfied: psutil in /usr/local/lib/python3.11/dist-packages (from unsloth@ git+https://github.com/unslothai/unslo
Requirement already satisfied: wheel>=0.42.0 in /usr/local/lib/python3.11/dist-packages (from unsloth@ git+https://github.com/unslothai/
Requirement already satisfied: numpy in /usr/local/lib/python3.11/dist-packages (from unsloth@ git+https://github.com/unslothai/unsloth
Requirement already satisfied: protobuf in /usr/local/lib/python3.11/dist-packages (from unsloth@ git+https://github.com/unslothai/unslo
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Requirement already satisfied: pyarrow>=15.0.0 in /usr/local/lib/python3.11/dist-packages (from datasets<4.0.0,>=3.4.1->unsloth@ git+https://gi
Requirement already satisfied: dill<0.3.9,>=0.3.0 in /usr/local/lib/python3.11/dist-packages (from datasets<4.0.0,>=3.4.1->unsloth@ git+https://gi
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Requirement already satisfied: xxhash in /usr/local/lib/python3.11/dist-packages (from datasets<4.0.0,>=3.4.1->unsloth@ git+https://git
Requirement already satisfied: multiprocessing<0.70.17 in /usr/local/lib/python3.11/dist-packages (from datasets<4.0.0,>=3.4.1->unsloth@ gi
Collecting fsspec<2025.3.0,>=2023.1.0 (from fsspec[http]<2025.3.0,>=2023.1.0->datasets<4.0.0,>=3.4.1->unsloth@ git+https://github.com/
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Requirement already satisfied: pyyaml>=5.1 in /usr/local/lib/python3.11/dist-packages (from datasets<4.0.0,>=3.4.1->unsloth@ git+https://
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Requirement already satisfied: regex!=2019.12.17 in /usr/local/lib/python3.11/dist-packages (from transformers!=4.47.0,!4.52.0,!4.52.1
Requirement already satisfied: tokenizers<0.22,>=0.21 in /usr/local/lib/python3.11/dist-packages (from transformers!=4.47.0,!4.52.0,!4
Requirement already satisfied: safetensors>=0.4.3 in /usr/local/lib/python3.11/dist-packages (from transformers!=4.47.0,!4.52.0,!4.52
Requirement already satisfied: triton>=3.0.0 in /usr/local/lib/python3.11/dist-packages (from unsloth_zoo>=2025.7.4->unsloth@ git+https://
Requirement already satisfied: accelerate>=0.34.1 in /usr/local/lib/python3.11/dist-packages (from unsloth_zoo>=2025.7.4->unsloth@ git+https://
Collecting trl!=0.15.0,!0.9.0,!0.9.1,!0.9.2,!0.9.3,>=0.7.9 (from unsloth_zoo>=2025.7.4->unsloth@ git+https://github.com/unslothai/ur
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Requirement already satisfied: peft!=0.11.0,>=0.7.1 in /usr/local/lib/python3.11/dist-packages (from unsloth_zoo>=2025.7.4->unsloth@ git
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Collecting cut_cross_entropy (from unsloth_zoo>=2025.7.4->unsloth@ git+https://github.com/unslothai/unsloth.git->unsloth[colab-new]@ git
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Requirement already satisfied: pillow in /usr/local/lib/python3.11/dist-packages (from unsloth_zoo>=2025.7.4->unsloth@ git+https://github
Collecting msgspec (from unsloth_zoo>=2025.7.4->unsloth@ git+https://github.com/unslothai/unsloth.git->unsloth[colab-new]@ git+https://gi
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Requirement already satisfied: docstring-parser>=0.15 in /usr/local/lib/python3.11/dist-packages (from tyro->unsloth@ git+https://github
Requirement already satisfied: rich>=11.1.0 in /usr/local/lib/python3.11/dist-packages (from tyro->unsloth@ git+https://github.com/unslo
Collecting shtab>=1.5.6 (from tyro->unsloth@ git+https://github.com/unslothai/unsloth.git->unsloth[colab-new]@ git+https://github.com/ur
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Requirement already satisfied: typeguard>=4.0.0 in /usr/local/lib/python3.11/dist-packages (from tyro->unsloth@ git+https://github.com/unslo
Requirement already satisfied: aiohttp!=4.0.0a0,!4.0.0a1 in /usr/local/lib/python3.11/dist-packages (from fsspec[http]<2025.3.0,>=2023
Requirement already satisfied: charset-normalizer<4,>=2 in /usr/local/lib/python3.11/dist-packages (from requests>=2.32.2->datasets<4.0
Requirement already satisfied: idna<4,>=2.5 in /usr/local/lib/python3.11/dist-packages (from requests>=2.32.2->datasets<4.0.0,>=3.4.1->u
Requirement already satisfied: urllib3<3,>=1.21.1 in /usr/local/lib/python3.11/dist-packages (from requests>=2.32.2->datasets<4.0.0,>=3
Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.11/dist-packages (from requests>=2.32.2->datasets<4.0.0,>=3
Requirement already satisfied: markdown-it-py>=2.2.0 in /usr/local/lib/python3.11/dist-packages (from rich>=11.1.0->tyro->unsloth@ git+https://github.com/unslo
Requirement already satisfied: pygments<3.0.0,>=2.13.0 in /usr/local/lib/python3.11/dist-packages (from rich>=11.1.0->tyro->unsloth@ git
Requirement already satisfied: networkx in /usr/local/lib/python3.11/dist-packages (from torch<3,>=2.2->bitsandbytes>=0.45.5->unsloth@ git
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Requirement already satisfied: sympy==1.13.1 in /usr/local/lib/python3.11/dist-packages (from torch<3,>=2.2->bitsandbytes>=0.45.5->unslo
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Requirement already satisfied: python-dateutil>=2.8.2 in /usr/local/lib/python3.11/dist-packages (from pandas->datasets<4.0.0,>=3.4.1->u
Requirement already satisfied: pytz>=2020.1 in /usr/local/lib/python3.11/dist-packages (from pandas->datasets<4.0.0,>=3.4.1->unsloth@ gi
Requirement already satisfied: tzdata>=2022.7 in /usr/local/lib/python3.11/dist-packages (from pandas->datasets<4.0.0,>=3.4.1->unsloth@
Requirement already satisfied: aiohappyeyeballs>=2.3.0 in /usr/local/lib/python3.11/dist-packages (from aiohttp!=4.0.0a0,!<4.0.0a1->fsssp
Requirement already satisfied: aiosignal>=1.1.2 in /usr/local/lib/python3.11/dist-packages (from aiohttp!=4.0.0a0,!<4.0.0a1->fsspec[http<=
Requirement already satisfied: attrs>=17.3.0 in /usr/local/lib/python3.11/dist-packages (from aiohttp!=4.0.0a0,!<4.0.0a1->fsspec[http<=
Requirement already satisfied: frozenlist>=1.1.1 in /usr/local/lib/python3.11/dist-packages (from aiohttp!=4.0.0a0,!<4.0.0a1->fsspec[htt
Requirement already satisfied: multidict<7.0,>=4.5 in /usr/local/lib/python3.11/dist-packages (from aiohttp!=4.0.0a0,!<4.0.0a1->fsspec[h
Requirement already satisfied: propcache>=0.2.0 in /usr/local/lib/python3.11/dist-packages (from aiohttp!=4.0.0a0,!<4.0.0a1->fsspec[http
Requirement already satisfied: yarl<2.0,>=1.17.0 in /usr/local/lib/python3.11/dist-packages (from aiohttp!=4.0.0a0,!<4.0.0a1->fsspec[htt
Requirement already satisfied: mdurl~=0.1 in /usr/local/lib/python3.11/dist-packages (from markdown-it-py>=2.2.0->rich>=11.1.0->tyro->un
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.11/dist-packages (from python-dateutil>=2.8.2->pandas->datasets<4.0.0,
Requirement already satisfied: MarkupSafe>=2.0 in /usr/local/lib/python3.11/dist-packages (from jinja2->torch<3,>=2.2->bitsandbytes>=0.4
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Downloading unsloth_zoo-2025.7.4-py3-none-any.whl (162 kB)
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Downloading protobuf-3.20.3-py2.py3-none-any.whl (162 kB)
162.1/162.1 kB 272.0 MB/s eta 0:00:00
Downloading tyro-0.9.26-py3-none-any.whl (128 kB)
129.0/129.0 kB 254.5 MB/s eta 0:00:00
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193.6/193.6 kB 270.7 MB/s eta 0:00:00
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Downloading nvidia_cuda_nvrtc_cu12-12.4.127-py3-none-manylinux2014_x86_64.whl (24.6 MB)
24.6/24.6 MB 257.5 MB/s eta 0:00:00
Downloading nvidia_cuda_runtime_cu12-12.4.127-py3-none-manylinux2014_x86_64.whl (883 kB)
883.7/883.7 kB 167.1 MB/s eta 0:00:00
Downloading nvidia_cudnn_cu12-9.1.0.70-py3-none-manylinux2014_x86_64.whl (664.8 MB)
664.8/664.8 MB 125.7 MB/s eta 0:00:00
Downloading nvidia_cufft_cu12-11.2.1.3-py3-none-manylinux2014_x86_64.whl (211.5 MB)
211.5/211.5 MB 151.4 MB/s eta 0:00:00
Downloading nvidia_curand_cu12-10.3.5.147-py3-none-manylinux2014_x86_64.whl (56.3 MB)
56.3/56.3 MB 95.7 MB/s eta 0:00:00
Downloading nvidia_cusolver_cu12-11.6.1.9-py3-none-manylinux2014_x86_64.whl (127.9 MB)
127.9/127.9 MB 12.8 MB/s eta 0:00:00
Downloading nvidia_cusparselt_cu12-12.3.1.170-py3-none-manylinux2014_x86_64.whl (207.5 MB)
207.5/207.5 MB 191.9 MB/s eta 0:00:00
Downloading nvidia_nvjitlink_cu12-12.4.127-py3-none-manylinux2014_x86_64.whl (21.1 MB)
21.1/21.1 MB 194.5 MB/s eta 0:00:00
Downloading trl-0.19.1-py3-none-any.whl (376 kB)
376.2/376.2 kB 393.2 MB/s eta 0:00:00
Downloading cut_cross_entropy-25.1.1-py3-none-any.whl (22 kB)
Downloading msgspec-0.19.0-cp311-cp311-manylinux_2_17_x86_64.manylinux2014_x86_64.whl (210 kB)
210.7/210.7 kB 392.9 MB/s eta 0:00:00
Building wheels for collected packages: unsloth
  Building wheel for unsloth (pyproject.toml) ... done
  Created wheel for unsloth: filename=unsloth-2025.7.3-py3-none-any.whl size=298679 sha256=d52deb833eb02b0bfe296b70e823f87859ad0e02fd462
  Stored in directory: /tmp/pip-ephem-wheel-cache-1k7mo58g/wheels/d1/17/05/850ab10c33284a4763b0595cd8ea9d01fce6e221cac24b3c01
Successfully built unsloth
Installing collected packages: unsloth, shtab, protobuf, nvidia-nvjitlink-cu12, nvidia-curand-cu12, nvidia-cufft-cu12, nvidia-cuda-runti
  Attempting uninstall: protobuf
    Found existing installation: protobuf 5.29.5
    Uninstalling protobuf-5.29.5:
      Successfully uninstalled protobuf-5.29.5
  Attempting uninstall: nvidia-nvjitlink-cu12
    Found existing installation: nvidia-nvjitlink-cu12 12.5.82
    Uninstalling nvidia-nvjitlink-cu12-12.5.82:
      Successfully uninstalled nvidia-nvjitlink-cu12-12.5.82
  Attempting uninstall: nvidia-curand-cu12
    Found existing installation: nvidia-curand-cu12 10.3.6.82
    Uninstalling nvidia-curand-cu12-10.3.6.82:
      Successfully uninstalled nvidia-curand-cu12-10.3.6.82
  Attempting uninstall: nvidia-cufft-cu12
    Found existing installation: nvidia-cufft-cu12 11.2.3.61
    Uninstalling nvidia-cufft-cu12-11.2.3.61:
      Successfully uninstalled nvidia-cufft-cu12-11.2.3.61
  Attempting uninstall: nvidia-cuda-runtime-cu12
    Found existing installation: nvidia-cuda-runtime-cu12 12.5.82
    Uninstalling nvidia-cuda-runtime-cu12-12.5.82:
      Successfully uninstalled nvidia-cuda-runtime-cu12-12.5.82

```

```
Attempting uninstall: nvidia-cuda-nvrtc-cu12
Found existing installation: nvidia-cuda-nvrtc-cu12 12.5.82
Uninstalling nvidia-cuda-nvrtc-cu12-12.5.82:
  Successfully uninstalled nvidia-cuda-nvrtc-cu12-12.5.82
Attempting uninstall: nvidia-cuda-cupti-cu12
Found existing installation: nvidia-cuda-cupti-cu12 12.5.82
Uninstalling nvidia-cuda-cupti-cu12-12.5.82:
  Successfully uninstalled nvidia-cuda-cupti-cu12-12.5.82
Attempting uninstall: nvidia-cublas-cu12
Found existing installation: nvidia-cublas-cu12 12.5.3.2
Uninstalling nvidia-cublas-cu12-12.5.3.2:
  Successfully uninstalled nvidia-cublas-cu12-12.5.3.2
Attempting uninstall: fsspec
Found existing installation: fsspec 2025.3.2
Uninstalling fsspec-2025.3.2:
  Successfully uninstalled fsspec-2025.3.2
Attempting uninstall: nvidia-cuspars-cu12
Found existing installation: nvidia-cuspars-cu12 12.5.1.3
Uninstalling nvidia-cuspars-cu12-12.5.1.3:
  Successfully uninstalled nvidia-cuspars-cu12-12.5.1.3
Attempting uninstall: nvidia-cudnn-cu12
Found existing installation: nvidia-cudnn-cu12 9.3.0.75
Uninstalling nvidia-cudnn-cu12-9.3.0.75:
  Successfully uninstalled nvidia-cudnn-cu12-9.3.0.75
Attempting uninstall: nvidia-cusolver-cu12
Found existing installation: nvidia-cusolver-cu12 11.6.3.83
Uninstalling nvidia-cusolver-cu12-11.6.3.83:
  Successfully uninstalled nvidia-cusolver-cu12-11.6.3.83
Attempting uninstall: datasets
Found existing installation: datasets 2.14.4
Uninstalling datasets-2.14.4:
  Successfully uninstalled datasets-2.14.4
ERROR: pip's dependency resolver does not currently take into account all the packages that are installed. This behaviour is the source
grpcio-status 1.71.2 requires protobuf<6.0dev,>=5.26.1, but you have protobuf 3.20.3 which is incompatible.
gcsfs 2025.3.2 requires fsspec==2025.3.2, but you have fsspec 2025.3.0 which is incompatible.
ydf 0.12.0 requires protobuf<6.0.0,>=5.29.1, but you have protobuf 3.20.3 which is incompatible.
tensorflow-metadata 1.17.2 requires protobuf>=4.25.2; python_version >= "3.11", but you have protobuf 3.20.3 which is incompatible.
Successfully installed bitsandbytes-0.46.1 cut_cross_entropy-25.1.1 datasets-3.6.0 fsspec-2025.3.0 msgspec-0.19.0 nvidia-cublas-cu12-12.
WARNING: The following packages were previously imported in this runtime:
[google]
You must restart the runtime in order to use newly installed versions.
```

[RESTART SESSION](#)

```
#Step4: Check HF token
from google.colab import userdata
hf_token=userdata.get('AI_Token')
login(hf_token)
```

```
#optional: Check GPU availability
# Test if CUDA is available
import torch
print("CUDA available:", torch.cuda.is_available())
print("GPU device", torch.cuda.get_device_name(0) if torch.cuda.is_available() else "No GPU")
```

```
→ CUDA available: True
GPU device Tesla T4
```

```
#Step 5: Setup pretrained DeepSeek-R1
```

```
model_name="deepseek-ai/DeepSeek-R1-Distill-Llama-8B"
max_sequence_length = 2048
dtype = None
load_in_4bit = True
```

```
model,tokenizer=FastLanguageModel.from_pretrained (
    model_name = model_name,
    max_seq_length = max_sequence_length,
    dtype = dtype,
    load_in_4bit=load_in_4bit,
    token = hf_token
)
```

```
→ ==((====))== Unsloth 2025.7.3: Fast Llama patching. Transformers: 4.53.2.
  \ \ / | Tesla T4. Num GPUs = 1. Max memory: 14.741 GB. Platform: Linux.
0^0/ \_/ \ Torch: 2.6.0+cu124. CUDA: 7.5. CUDA Toolkit: 12.4. Triton: 3.2.0
 \ \ / / Bfloat16 = FALSE. FA [Xformers = None. FA2 = False]
"-__-" Free license: http://github.com/unslothai/unsloth
Unsloth: Fast downloading is enabled - ignore downloading bars which are red colored!
```

```
# Step6: Setup system prompt
```

```
prompt_style = ""
```

```
Below is a task description along with additional context provided in the input section. Your goal is to provide a well-reasoned response th
```

```
Before crafting your answer, take a moment to carefully analyze the question. Develop a clear, step-by-step thought process to ensure your r
```

```
### Task:
```

```
You are a medical expert specializing in clinical reasoning, diagnostics, and treatment planning. Answer the medical question below using yc
```

```
### Query:
```

```
{}
```

```
### Answer:
```

```
{}
```

```
"""
```

```
#Step7 : Run Inference on the model
```

```
# Define a test Question
```

```
question = """A 61-year-old woman with a long history of involuntary urine loss during activities like coughing or
sneezing but no leakage at night undergoes a gynecological exam and Q-tip test. Based on these findings,
what would cystometry most likely reveal about her residual volume and detrusor contractions?"""
```

```
FastLanguageModel.for_inference(model)
```

```
#Tokenize the input
```

```
inputs = tokenizer([prompt_style.format(question,"")], return_tensors="pt").to("cuda")
```

```
# Generate a response
```

```
outputs = model.generate (
    input_ids=inputs.input_ids,
    attention_mask=inputs.attention_mask,
    max_new_tokens=1024,
    use_cache =True,
)
```

```
# Decode the response tokens back to text
```



```

response = tokenizer.batch_decode(outputs)

print(response)

↳ ["<|begin_of_sentence|>\nBelow is a task description along with additional context provided in the input section. Your goal is to prov

print(response[0].split("### Answer:")[1])

↳

After the gynecological exam and Q-tip test, the findings are likely to indicate that the patient has an overactive bladder. This is bec

When performing cystometry, which is a more detailed diagnostic tool, it would most likely show that her residual volume is within norma

Furthermore, the detrusor contractions during the filling phase of the bladder are likely to be found abnormal. The detrusor muscle is r

Therefore, the most likely findings from the cystometry would be that the residual volume is normal, but there are abnormal detrusor con

</think>

**Answer:**

After the gynecological exam and Q-tip test, the findings suggest the patient has an overactive bladder. The Q-tip test likely revealed

Cystometry would most likely show that her residual volume is within normal limits. This is because her lack of nighttime leakage sugges

However, the test would also likely detect abnormal detrusor contractions during the filling phase. The detrusor muscle's overactivity l

#step8: SetUp fine Tunning

# Load Dataset
medical_dataset = load_dataset("FreedomIntelligence/medical-o1-reasoning-SFT", "en", split="train[:500]", trust_remote_code = True)

medical_dataset[1]

↳ {'Question': 'A 33-year-old woman is brought to the emergency department 15 minutes after being stabbed in the chest with a
screwdriver. Given her vital signs of pulse 110/min, respirations 22/min, and blood pressure 90/65 mm Hg, along with the presence of a
5-cm deep stab wound at the upper border of the 8th rib in the left midaxillary line, which anatomical structure in her chest is most
likely to be injured?',
'Complex_CoT': "Okay, let's figure out what's going on here. A woman comes in with a stab wound from a screwdriver. It's in her chest,
upper border of the 8th rib, left side, kind of around the midaxillary line. First thought, that's pretty close to where the lung sits,
right?\n\nLet's talk about location first. This spot is along the left side of her body. Above the 8th rib, like that, is where a lot
of important stuff lives, like the bottom part of the left lung, possibly the diaphragm too, especially considering how deep the
screwdriver went.\n\nThe wound is 5 cm deep. That sounds pretty deep. I mean, it could definitely reach down to the lung tissue or
maybe the diaphragm. Given that it's midaxillary, we're in the territory where the lower lobe of the left lung hangs out. It's also
possible there's some intersection with where the diaphragm begins, but the lung feels more probable somehow.\n\nNow, her vitals are
concerning: elevated heart rate and low blood pressure. This is serious. My gut says that this kind of vital sign picture could mean
something like pneumothorax or maybe hemothorax. Both can happen if the lung gets punctured, and they can make the blood pressure drop
and the heart rate skyrocket since she's obviously distressed.\n\nSo, putting it all together, the most obvious culprit is the lower
lobe of the left lung. The wound's depth and her condition point that way. And, yeah, this adds up with pneumothorax or maybe blood
collecting in the chest—the kind of stuff that can really mess with breathing and circulation.\n\nAlright, with this in mind, it sure
seems like the lung is the most likely thing that got hurt here. Makes sense given the situation, where the wound is, considering her
symptoms, and the whole setup.",
'Response': 'In this scenario, the most likely anatomical structure to be injured is the lower lobe of the left lung. The location of
the stab wound—at the upper border of the 8th rib in the left midaxillary line—indicates proximity to the lower lobe of the lung. The
depth of the wound (5 cm) suggests it is sufficient to reach lung tissue. Her vital signs of elevated heart rate and low blood pressure
could signal complications like a pneumothorax or hemothorax, common consequences of lung trauma that would result from a penetrating
injury in this area. Given these considerations, the lower lobe of the left lung is the most probable structure injured.'}

EOS_TOKEN = tokenizer.eos_token # Define EOS_TOKEN which tells the model when to stop generating text during training
EOS_TOKEN

↳ '<|end_of_sentence|>'

### Finetuning
# Updated training prompt style to add tag
train_prompt_style = """"Below is an instruction that describes a task, paired with an input that provides further context.
Write a response that appropriately completes the request.
Before answering, think carefully about the question and create a step-by-step chain of thoughts to ensure a logical and accurate response.

### Instruction:
You are a medical expert with advanced knowledge in clinical reasoning, diagnostics, and treatment planning.
Please answer the following medical question.

### Question:
{}

```

```
### Response:
```

```
{}
```

```
{}
```

```
# Prepare the data for fine-tuning
```

```
def preprocess_input_data(examples):
    inputs = examples['Question']
    cots = examples['Complex_CoT']
    outputs = examples['Response']

    texts=[]

    for input,cot, output in zip(inputs,cots,outputs):
        text= train_prompt_style.format(input,cot,output) + EOS_TOKEN
        texts.append(text)

    return {
        "texts" : texts,
    }
```

```
finetune_dataset = medical_dataset.map(preprocess_input_data, batched = True)
```



Map: 100%

500/500 [00:00<00:00, 12985.14 examples/s]

```
finetune_dataset["texts"][0]
```



'Below is an instruction that describes a task, paired with an input that provides further context.\nWrite a response that appropriately completes the request.\nBefore answering, think carefully about the question and create a step-by-step chain of thoughts to ensure a logical and accurate response.\n\n### Instruction:\nYou are a medical expert with advanced knowledge in clinical reasoning, diagnostics, and treatment planning.\nPlease answer the following medical question.\n\n### Question:\nGiven the symptoms of sudden weakness in the left arm and leg, recent long-distance travel, and the presence of swollen and tender right lower leg, what specific cardiac abnormality is most likely to be found upon further evaluation that could explain these findings?\n\n### Response:\n\nOkay, let's see what's going on here. We've got sudden weakness in the person's left arm and leg - and that screams something neuro-related, maybe a stroke?\n\n

```
# Step9: Setup/Apply LoRA finetuning to the model
```

```
model_lora = FastLanguageModel.get_peft_model(
    model = model,
    r = 16,
    target_modules = [
        "q_proj",
        "k_proj",
        "v_proj",
        "o_proj",
        "gate_proj",
        "up_proj",
        "down_proj"
    ],
    lora_alpha = 16,
    lora_dropout = 0,
    bias = "none",
    use_gradient_checkpointing = "unsloth",
    random_state = 3047,
    use_rslora = False,
    loftq_config = None
)
```

```
def formatting_func(examples):
    texts = []
    for input, cot, output in zip(examples["Question"], examples["Complex_CoT"], examples["Response"]):
        text = train_prompt_style.format(input, cot, output) + EOS_TOKEN
        texts.append(text)
    return {"text": texts} # Key must be "text" for Unsloth
```

```
# 3. Apply to dataset
```

```
finetune_dataset = medical_dataset.map(formatting_func, batched=True)
```

 Map: 100%


500/500 [00:00<00:00, 14106.18 examples/s]

```

trainer = SFTTrainer(
    model = model_lora,
    formatting_func=preprocess_input_data,
    train_dataset = finetune_dataset,
    tokenizer = tokenizer,
    dataset_text_field = "texts",
    max_seq_length = max_sequence_length,
    dataset_num_proc=1,

    #Define training args
    args=TrainingArguments(
        per_device_train_batch_size=2,
        gradient_accumulation_steps=4,
        warmup_steps=5,
        num_train_epochs=1,
        max_steps=60,
        learning_rate=2e-4,
        fp16=not is_bfloat16_supported(),
        logging_steps=10,
        optim="adamw_8bit",
        weight_decay=0.01,
        lr_scheduler_type="linear",
        seed=3407,
        output_dir="outputs",
    )
)

```


 Unslotted: Tokenizing ["text"]: 100%

500/500 [00:00<00:00, 620.06 examples/s]

```

# Setup WANDB
from google.colab import userdata
wnb_token = userdata.get("WANDB_API_TOKEN")
# Login to WnB
wandb.login(key=wnb_token) # import wandb
run = wandb.init(
    project='Fine-tune-DeepSeek-R1-on-Medical-CoT-Dataset',
    job_type="training",
    anonymous="allow"
)

```

 **wandb:** **WARNING** If you're specifying your api key in code, ensure this code is not shared publicly.

wandb: **WARNING** Consider setting the WANDB_API_KEY environment variable, or running `wandb login` from the command line.

wandb: No netrc file found, creating one.

wandb: Appending key for api.wandb.ai to your netrc file: /root/.netrc

wandb: Currently logged in as: **tejeswinid01** (**tejeswinid01-aivariant**) to <https://api.wandb.ai>. Use `wandb login --relogin` to force relog

Tracking run with wandb version 0.21.0

Run data is saved locally in /content/wandb/run-20250717_074251-e65v6yzg

Syncing run **fallen-haze-1** to [Weights & Biases \(docs\)](#)

View project at <https://wandb.ai/tejeswinid01-aivariant/Fine-tune-DeepSeek-R1-on-Medical-CoT-Dataset?apiKey=ca7023e753f08e2774337e2926a961c4a8f471a2>

View run at <https://wandb.ai/tejeswinid01-aivariant/Fine-tune-DeepSeek-R1-on-Medical-CoT-Dataset/runs/e65v6yzg?apiKey=ca7023e753f08e2774337e2926a961c4a8f471a2>

```

# Start the fine-tuning process
trainer_stats = trainer.train()

```



```
==((====))== Unsloth - 2x faster free finetuning | Num GPUs used = 1
\\  /| Num examples = 500 | Num Epochs = 1 | Total steps = 60
0^0/ \_/ \ Batch size per device = 2 | Gradient accumulation steps = 4
\  / Data Parallel GPUs = 1 | Total batch size (2 x 4 x 1) = 8
"-_____" Trainable parameters = 41,943,040 of 8,072,204,288 (0.52% trained)
wandb: WARNING The `run_name` is currently set to the same value as `TrainingArguments.output_dir`. If this was not intended, please spe
Unsloth: Will smartly offload gradients to save VRAM!
```

[60/60 21:19, Epoch 0/1]

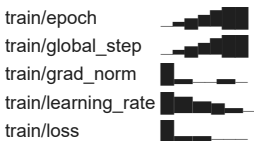
Step	Training Loss
10	1.944200
20	1.444700
30	1.421200
40	1.376400
50	1.401400
60	1.380400

wandb: WARNING The get_url method is deprecated and will be removed in a future release. Please use `run.url` instead.

```
wandb.finish()
```



Run history:



Run summary:

total_flos	1.6602988216516608e+16
train/epoch	0.96
train/global_step	60
train/grad_norm	0.25871
train/learning_rate	0.0
train/loss	1.3804
train_loss	1.49471
train_runtime	1326.2838
train_samples_per_second	0.362
train_steps_per_second	0.045

View run **fallen-haze-1** at: <https://wandb.ai/tejeswinid01-aivariant/Fine-tune-DeepSeek-R1-on-Medical-CoT-Dataset/runs/e65v6yzg?apiKey=ca7023e753f08e2774337e2926a961c4a8f471a2>
View project at: <https://wandb.ai/tejeswinid01-aivariant/Fine-tune-DeepSeek-R1-on-Medical-CoT-Dataset?apiKey=ca7023e753f08e2774337e2926a961c4a8f471a2>
Synced 5 W&B file(s), 0 media file(s), 0 artifact file(s) and 0 other file(s)

```
# Step10: Testing after fine-tuning
question = ""A 61-year-old woman with a long history of involuntary urine loss during activities like coughing or sneezin
but no leakage at night undergoes a gynecological exam and Q-tip test. Based on these findings,
what would cystometry most likely reveal about her residual volume and detrusor contractions?""

FastLanguageModel.for_inference(model_lora)

# Tokenize the input
inputs = tokenizer([prompt_style.format(question, "")], return_tensors="pt").to("cuda")

# Generate a response
outputs = model_lora.generate (
    input_ids = inputs.input_ids,
    attention_mask = inputs.attention_mask,
    max_new_tokens = 1200,
    use_cache = True
)

# Decode the response tokens back to text
```

```
response = tokenizer.batch_decode(outputs)
```

```
↳ ["<|begin_of_sentence|>\nBelow is a task description along with additional context provided in the input section. Your goal is to prov
```

```
print(response[0].split("### Answer:")[1])
```

```
↳
```

Alright, let's think about this. This woman is 61 and has been dealing with involuntary urine loss for a long time, especially when she
Now, she's done a Q-tip test, which is often used to check for urethral obstruction. If the Q-tip test is positive, it suggests that the
That makes me think about the bladder itself. Given her history, it's likely that the bladder is overactive, causing her to lose urine i
In cystometry, if there's an overactive bladder, we might see some contractions happening even before the bladder is full. These contrac
So, if we put it all together, the cystometry results are likely to show that the bladder isn't holding its volume well. It might show t
This makes me confident that when we do the cystometry, we'll see that the residual volume is lower than it should be, and there are the
In summary, based on her history and the Q-tip test results, it's reasonable to expect that cystometry will show her bladder's detrusor

```
question = """A 59-year-old man presents with a fever, chills, night sweats, and generalized fatigue,  
and is found to have a 12 mm vegetation on the aortic valve. Blood cultures indicate gram-positive, catalase-negative,  
gamma-hemolytic cocci in chains that do not grow in a 6.5% NaCl medium.  
What is the most likely predisposing factor for this patient's condition?"""
```

```
FastLanguageModel.for_inference(model_lora)
```