1. 更新apt

```
add-apt-repository ppa:ubuntu-toolchain-r/test
apt update
apt install gcc-7 g++-7
更新系统的默认 gcc 和 g++ 指向:
sudo update-alternatives --install /usr/bin/gcc gcc /usr/bin/gcc-7 60 --slave
/usr/bin/g++ g++ /usr/bin/g++-7
sudo update-alternatives --config gcc
```

2. 创建隔离的 Anaconda 环境

```
conda create -n deepspeed --clone base
```

3. 源码安装transformers

```
pip install git+https://github.com/huggingface/transformers
```
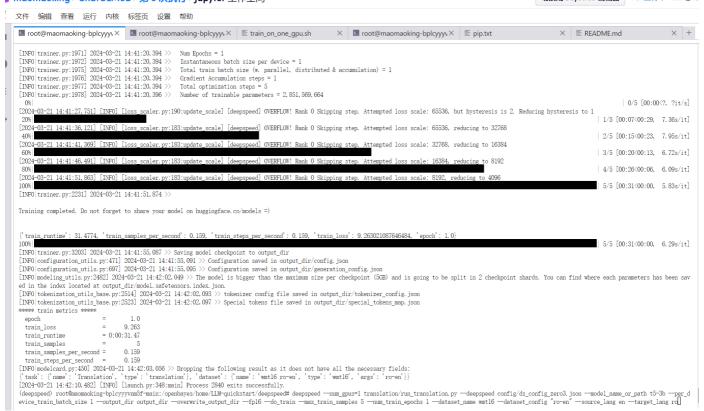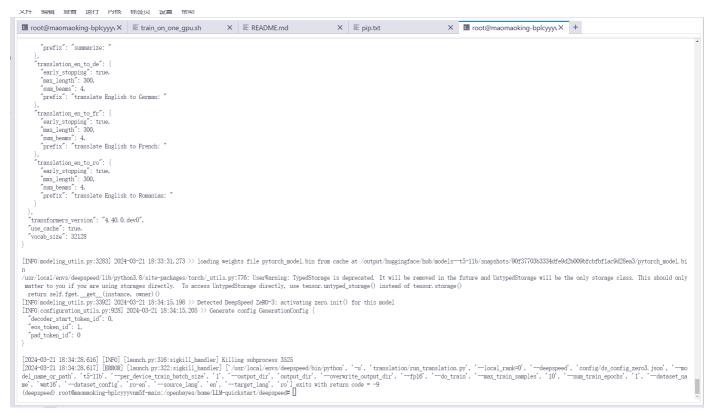
4. 源码安装deepspeed

```
git clone https://github.com/microsoft/DeepSpeed/
cd DeepSpeed
rm -rf build
pip install -e ./
```

5.运行代码前需要安装以下pip包

```
pip install datasets
pip install evaluate
pip install accelerate -U
pip install sacrebleu
```

6. 运行结果如下图

文件 编辑 查看 运行 内核 标签页 设置 帮助

root@maomaoking-bplcyyy\ ✕ | root@maomaoking-bplcyyy\ ✕ | train_on_one_gpu.sh ✕ | root@maomaoking-bplcyyy\ ✕ | pip.txt ✕ | README.md ✕ | +

```
[INFO|trainer.py:1971] 2024-03-21 14:41:20,394 >> Num Epochs = 1
[INFO|trainer.py:1972] 2024-03-21 14:41:20,394 >> Instantaneous batch size per device = 1
[INFO|trainer.py:1975] 2024-03-21 14:41:20,394 >> Total train batch size (w. parallel, distributed & accumulation) = 1
[INFO|trainer.py:1976] 2024-03-21 14:41:20,394 >> Gradient Accumulation steps = 1
[INFO|trainer.py:1977] 2024-03-21 14:41:20,394 >> Total optimization steps = 5
[INFO|trainer.py:1978] 2024-03-21 14:41:20,396 >> Number of trainable parameters = 2,851,569,664
  0%|                                                                          | 0/5 [00:00<?, ?it/s]
[2024-03-21 14:41:27,751] [INFO] [loss_scaler.py:190:update_scale] [deepspeed] OVERFLOW! Rank 0 Skipping step. Attempted loss scale: 65536, but hysteresis is 2. Reducing hysteresis to 1
 20%|█████████████                                                             | 1/5 [00:07<00:29,  7.36s/it]
[2024-03-21 14:41:36,121] [INFO] [loss_scaler.py:183:update_scale] [deepspeed] OVERFLOW! Rank 0 Skipping step. Attempted loss scale: 65536, reducing to 32768
 40%|██████████████████████████                                                | 2/5 [00:15<00:23,  7.95s/it]
[2024-03-21 14:41:41,369] [INFO] [loss_scaler.py:183:update_scale] [deepspeed] OVERFLOW! Rank 0 Skipping step. Attempted loss scale: 32768, reducing to 16384
 60%|███████████████████████████████████████                                   | 3/5 [00:20<00:13,  6.72s/it]
[2024-03-21 14:41:46,491] [INFO] [loss_scaler.py:183:update_scale] [deepspeed] OVERFLOW! Rank 0 Skipping step. Attempted loss scale: 16384, reducing to 8192
 80%|████████████████████████████████████████████████████                      | 4/5 [00:26<00:06,  6.09s/it]
[2024-03-21 14:41:51,863] [INFO] [loss_scaler.py:183:update_scale] [deepspeed] OVERFLOW! Rank 0 Skipping step. Attempted loss scale: 8192, reducing to 4096
100%|██████████████████████████████████████████████████████████████████████████| 5/5 [00:31<00:00,  5.83s/it]
[INFO|trainer.py:2231] 2024-03-21 14:41:51,874 >>

Training completed. Do not forget to share your model on huggingface.co/models =)


{'train_runtime': 31.4774, 'train_samples_per_second': 0.159, 'train_steps_per_second': 0.159, 'train_loss': 9.263021087646484, 'epoch': 1.0}
100%|██████████████████████████████████████████████████████████████████████████| 5/5 [00:31<00:00,  6.29s/it]
[INFO|trainer.py:3203] 2024-03-21 14:41:55,087 >> Saving model checkpoint to output_dir
[INFO|configuration_utils.py:471] 2024-03-21 14:41:55,091 >> Configuration saved in output_dir/config.json
[INFO|configuration_utils.py:697] 2024-03-21 14:41:55,095 >> Configuration saved in output_dir/generation_config.json
[INFO|modeling_utils.py:2482] 2024-03-21 14:42:02,049 >> The model is bigger than the maximum size per checkpoint (5GB) and is going to be split in 2 checkpoint shards. You can find where each parameters has been saved in the index located at output_dir/model.safetensors.index.json.
[INFO|tokenization_utils_base.py:2514] 2024-03-21 14:42:02,093 >> tokenizer config file saved in output_dir/tokenizer_config.json
[INFO|tokenization_utils_base.py:2523] 2024-03-21 14:42:02,097 >> Special tokens file saved in output_dir/special_tokens_map.json
***** train metrics *****
  epoch                    =        1.0
  train_loss               =     9.263
  train_runtime            = 0:00:31.47
  train_samples            =          5
  train_samples_per_second =      0.159
  train_steps_per_second   =      0.159
[INFO|modelcard.py:450] 2024-03-21 14:42:03,056 >> Dropping the following result as it does not have all the necessary fields:
{'task': {'name': 'Translation', 'type': 'translation'}, 'dataset': {'name': 'wmt16 ro-en', 'type': 'wmt16', 'args': 'ro-en'}}
[2024-03-21 14:42:10,482] [INFO] [launch.py:348:main] Process 2840 exits successfully.
(deepspeed) root@maomaoking-bplcyyyvnm5f-main:/openbayes/home/LLM-quickstart/deepspeed# deepspeed --num_gpus=1 translation/run_translation.py --deepspeed config/ds_config_zero3.json --model_name_or_path t5-3b --per_device_train_batch_size 1 --output_dir output_dir --overwrite_output_dir --fp16 --do_train --max_train_samples 5 --num_train_epochs 1 --dataset_name wmt16 --dataset_config "ro-en" --source_lang en --target_lang ro
```

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root@maomaoking-bplcyyy\ ✕ | train_on_one_gpu.sh ✕ | README.md ✕ | pip.txt ✕ | root@maomaoking-bplcyyy\ | +

```
      "prefix": "summarize: "
    },
    "translation_en_to_de": {
      "early_stopping": true,
      "max_length": 300,
      "num_beams": 4,
      "prefix": "translate English to German: "
    },
    "translation_en_to_fr": {
      "early_stopping": true,
      "max_length": 300,
      "num_beams": 4,
      "prefix": "translate English to French: "
    },
    "translation_en_to_ro": {
      "early_stopping": true,
      "max_length": 300,
      "num_beams": 4,
      "prefix": "translate English to Romanian: "
    }
  },
  "transformers_version": "4.40.0.dev0",
  "use_cache": true,
  "vocab_size": 32128
}

[INFO|modeling_utils.py:3283] 2024-03-21 18:33:31,273 >> loading weights file pytorch_model.bin from cache at /output/huggingface/hub/models--t5-11b/snapshots/90f37703b3334dfe9d2b009bfcbfbf1ac9d28ea3/pytorch_model.bin
/usr/local/envs/deepspeed/lib/python3.8/site-packages/torch/_utils.py:776: UserWarning: TypedStorage is deprecated. It will be removed in the future and UntypedStorage will be the only storage class. This should only matter to you if you are using storages directly.  To access UntypedStorage directly, use tensor.untyped_storage() instead of tensor.storage()
  return self.fget.__get__(instance, owner)()
[INFO|modeling_utils.py:3392] 2024-03-21 18:34:15,198 >> Detected DeepSpeed ZeRO-3: activating zero.init() for this model
[INFO|configuration_utils.py:928] 2024-03-21 18:34:15,205 >> Generate config GenerationConfig {
  "decoder_start_token_id": 0,
  "eos_token_id": 1,
  "pad_token_id": 0
}


[2024-03-21 18:34:28,616] [INFO] [launch.py:316:sigkill_handler] Killing subprocess 3525
[2024-03-21 18:34:28,617] [ERROR] [launch.py:322:sigkill_handler] ['/usr/local/envs/deepspeed/bin/python', '-u', 'translation/run_translation.py', '--local_rank=0', '--deepspeed', 'config/ds_config_zero3.json', '--model_name_or_path', 't5-11b', '--per_device_train_batch_size', '1', '--output_dir', 'output_dir', '--overwrite_output_dir', '--fp16', '--do_train', '--max_train_samples', '10', '--num_train_epochs', '1', '--dataset_name', 'wmt16', '--dataset_config', 'ro-en', '--source_lang', 'en', '--target_lang', 'ro'] exits with return code = -9
(deepspeed) root@maomaoking-bplcyyyvnm5f-main:/openbayes/home/LLM-quickstart/deepspeed# []
```

```
      "prefix": "summarize: "
    },
    "translation_en_to_de": {
      "early_stopping": true,
      "max_length": 300,
      "num_beams": 4,
      "prefix": "translate English to German: "
    },
    "translation_en_to_fr": {
      "early_stopping": true,
      "max_length": 300,
      "num_beams": 4,
      "prefix": "translate English to French: "
    },
    "translation_en_to_ro": {
      "early_stopping": true,
      "max_length": 300,
      "num_beams": 4,
      "prefix": "translate English to Romanian: "
    }
  },
  "transformers_version": "4.40.0.dev0",
  "use_cache": true,
  "vocab_size": 32128
}

[INFO|modeling_utils.py:3283] 2024-03-21 18:35:59,560 >> loading weights file pytorch_model.bin from cache at /output/huggingface/hub/models--t5-11b/snapshots/90f37703b3334dfe9d2b009bfcbfbf1ac9d28ea3/pytorch_model.bi
n
/usr/local/envs/deepspeed/lib/python3.8/site-packages/torch/_utils.py:776: UserWarning: TypedStorage is deprecated. It will be removed in the future and UntypedStorage will be the only storage class. This should only
 matter to you if you are using storages directly.  To access UntypedStorage directly, use tensor.untyped_storage() instead of tensor.storage()
  return self.fget.__get__(instance, owner)()
[INFO|modeling_utils.py:3392] 2024-03-21 18:36:45,348 >> Detected DeepSpeed ZeRO-3: activating zero.init() for this model
[INFO|configuration_utils.py:928] 2024-03-21 18:36:45,357 >> Generate config GenerationConfig {
  "decoder_start_token_id": 0,
  "eos_token_id": 1,
  "pad_token_id": 0
}

[2024-03-21 18:36:59,961] [INFO] [launch.py:316:sigkill_handler] Killing subprocess 3705
[2024-03-21 18:36:59,963] [ERROR] [launch.py:322:sigkill_handler] ['/usr/local/envs/deepspeed/bin/python', '-u', 'translation/run_translation.py', '--local_rank=0', '--deepspeed', 'config/ds_config_zero3.json', '--mo
del_name_or_path', 't5-11b', '--per_device_train_batch_size', '1', '--output_dir', 'output_dir', '--overwrite_output_dir', '--fp16', '--do_train', '--max_train_samples', '10', '--num_train_epochs', '1', '--dataset_na
me', 'wmt16', '--dataset_config', 'ro-en', '--source_lang', 'en', '--target_lang', 'ro'] exits with return code = -9
(deepspeed) root@maomaoking-bplcyyyvnm5f-main:/openbayes/home/LLM-quickstart/deepspeed#
```

```
[2024-03-21 14:31:11,946] [INFO] [loss_scaler.py:183:update_scale] [deepspeed] OVERFLOW! Rank 0 Skipping step. Attempted loss scale: 8, reducing to 4
  5%|████                                                                                                                              | 26/500 [03:26<57:29,  7.28s/it]
[2024-03-21 14:31:17,433] [INFO] [loss_scaler.py:183:update_scale] [deepspeed] OVERFLOW! Rank 0 Skipping step. Attempted loss scale: 4, reducing to 2
  6%|████                                                                                                                              | 28/500 [03:40<56:40,  7.20s/it]
[2024-03-21 14:31:30,692] [INFO] [loss_scaler.py:183:update_scale] [deepspeed] OVERFLOW! Rank 0 Skipping step. Attempted loss scale: 2, reducing to 1
  6%|████                                                                                                                              | 29/500 [03:45<51:18,  6.54s/it]
Traceback (most recent call last):
  File "translation/run_translation.py", line 699, in <module>
    main()
  File "translation/run_translation.py", line 614, in main
    train_result = trainer.train(resume_from_checkpoint=checkpoint)
  File "/output/LLM-quickstart/deepspeed/transformers/src/transformers/trainer.py", line 1780, in train
    return inner_training_loop(
  File "/output/LLM-quickstart/deepspeed/transformers/src/transformers/trainer.py", line 2118, in _inner_training_loop
    tr_loss_step = self.training_step(model, inputs)
  File "/output/LLM-quickstart/deepspeed/transformers/src/transformers/trainer.py", line 3045, in training_step
    self.accelerator.backward(loss)
  File "/usr/local/envs/deepspeed/lib/python3.8/site-packages/accelerate/accelerator.py", line 1995, in backward
    self.deepspeed_engine_wrapped.backward(loss, **kwargs)
  File "/usr/local/envs/deepspeed/lib/python3.8/site-packages/accelerate/utils/deepspeed.py", line 175, in backward
    self.engine.step()
  File "/output/LLM-quickstart/deepspeed/DeepSpeed/deepspeed/runtime/engine.py", line 2169, in step
    self._take_model_step(lr_kwargs)
  File "/output/LLM-quickstart/deepspeed/DeepSpeed/deepspeed/runtime/engine.py", line 2075, in _take_model_step
    self.optimizer.step()
  File "/output/LLM-quickstart/deepspeed/DeepSpeed/deepspeed/utils/nvtx.py", line 15, in wrapped_fn
    ret_val = func(*args, **kwargs)
  File "/output/LLM-quickstart/deepspeed/DeepSpeed/deepspeed/runtime/zero/stage3.py", line 2024, in step
    if self._overflow_check_and_loss_scale_update():
  File "/output/LLM-quickstart/deepspeed/DeepSpeed/deepspeed/utils/nvtx.py", line 15, in wrapped_fn
    ret_val = func(*args, **kwargs)
  File "/output/LLM-quickstart/deepspeed/DeepSpeed/deepspeed/runtime/zero/stage3.py", line 1972, in _overflow_check_and_loss_scale_update
    self._update_scale(self.overflow)
  File "/output/LLM-quickstart/deepspeed/DeepSpeed/deepspeed/runtime/zero/stage3.py", line 2359, in _update_scale
    self.loss_scaler.update_scale(has_overflow)
  File "/output/LLM-quickstart/deepspeed/DeepSpeed/deepspeed/runtime/fp16/loss_scaler.py", line 175, in update_scale
    raise Exception(
Exception: Current loss scale already at minimum - cannot decrease scale anymore. Exiting run.
  6%|████                                                                                                                              | 29/500 [03:50<1:02:31,  7.96s/it]
[2024-03-21 14:31:45,097] [INFO] [launch.py:316:sigkill_handler] Killing subprocess 2145
[2024-03-21 14:31:45,098] [ERROR] [launch.py:322:sigkill_handler] ['/usr/local/envs/deepspeed/bin/python', '-u', 'translation/run_translation.py', '--local_rank=0', '--deepspeed', 'config/ds_config_zero3.json', '--mo
del_name_or_path', 't5-3b', '--per_device_train_batch_size', '1', '--output_dir', 'output_dir', '--overwrite_output_dir', '--fp16', '--do_train', '--max_train_samples', '500', '--num_train_epochs', '1', '--dataset_na
me', 'wmt16', '--dataset_config', 'ro-en', '--source_lang', 'en', '--target_lang', 'ro'] exits with return code = 1
```

```
[INFO|trainer.py:1971] 2024-03-21 14:34:52,384 >>   Num Epochs = 1
[INFO|trainer.py:1972] 2024-03-21 14:34:52,384 >>   Instantaneous batch size per device = 1
[INFO|trainer.py:1975] 2024-03-21 14:34:52,384 >>   Total train batch size (w. parallel, distributed & accumulation) = 1
[INFO|trainer.py:1976] 2024-03-21 14:34:52,384 >>   Gradient Accumulation steps = 1
[INFO|trainer.py:1977] 2024-03-21 14:34:52,384 >>   Total optimization steps = 5
[INFO|trainer.py:1978] 2024-03-21 14:34:52,386 >>   Number of trainable parameters = 2,851,569,664
  0%|                                                                                          | 0/5 [00:00<?, ?it/s]
[2024-03-21 14:34:58,853] [INFO] [loss_scaler.py:190:update_scale] [deepspeed] OVERFLOW! Rank 0 Skipping step. Attempted loss scale: 65536, but hysteresis is 2. Reducing hysteresis to 1
 20%|███████████████                                                                           | 1/5 [00:06<00:25,  6.45s/it]
[2024-03-21 14:35:07,253] [INFO] [loss_scaler.py:183:update_scale] [deepspeed] OVERFLOW! Rank 0 Skipping step. Attempted loss scale: 65536, reducing to 32768
 40%|██████████████████████████████                                                            | 2/5 [00:14<00:22,  7.60s/it]
[2024-03-21 14:35:12,533] [INFO] [loss_scaler.py:183:update_scale] [deepspeed] OVERFLOW! Rank 0 Skipping step. Attempted loss scale: 32768, reducing to 16384
 60%|█████████████████████████████████████████████                                             | 3/5 [00:20<00:13,  6.54s/it]
[2024-03-21 14:35:17,884] [INFO] [loss_scaler.py:183:update_scale] [deepspeed] OVERFLOW! Rank 0 Skipping step. Attempted loss scale: 16384, reducing to 8192
 80%|████████████████████████████████████████████████████████████                            | 4/5 [00:25<00:06,  6.07s/it]
[2024-03-21 14:35:23,484] [INFO] [loss_scaler.py:183:update_scale] [deepspeed] OVERFLOW! Rank 0 Skipping step. Attempted loss scale: 8192, reducing to 4096
100%|███████████████████████████████████████████████████████████████████████████             | 5/5 [00:31<00:00,  5.90s/it]
[INFO|trainer.py:2231] 2024-03-21 14:35:23,498 >>

Training completed. Do not forget to share your model on huggingface.co/models =)


{'train_runtime': 31.112, 'train_samples_per_second': 0.161, 'train_steps_per_second': 0.161, 'train_loss': 9.263021087646484, 'epoch': 1.0}
100%|███████████████████████████████████████████████████████████████████████████             | 5/5 [00:31<00:00,  6.22s/it]
[INFO|trainer.py:3203] 2024-03-21 14:35:26,689 >> Saving model checkpoint to output_dir
[INFO|configuration_utils.py:471] 2024-03-21 14:35:26,917 >> Configuration saved in output_dir/config.json
[INFO|configuration_utils.py:697] 2024-03-21 14:35:27,156 >> Configuration saved in output_dir/generation_config.json
[]
```