HomeWork 7

This homework need to use PEFT(Parameter Efficient Fine-Tuning) to fine-tune a LLM(Large Language Model) and try to use different LoRA configs finally compare the result.

Setup

!pip install transformers
!pip install datasets
!pip install accelerate
!pip install peft

Result

Without LoRA
trainable model parameters: 65783042 all model parameters: 65783042 percentage of trainable model parameters: 100.00%
Using LoRA
trainable model parameters: 813314 all model parameters: 66596356 percentage of trainable model parameters: 1.22%

Config 1

```
r=8,
lora_alpha=32,
lora_dropout=0.05,
target_modules=["q_lin", "k_lin","v_lin"],
bias='none',
task_type=TaskType.SEQ_CLS
```

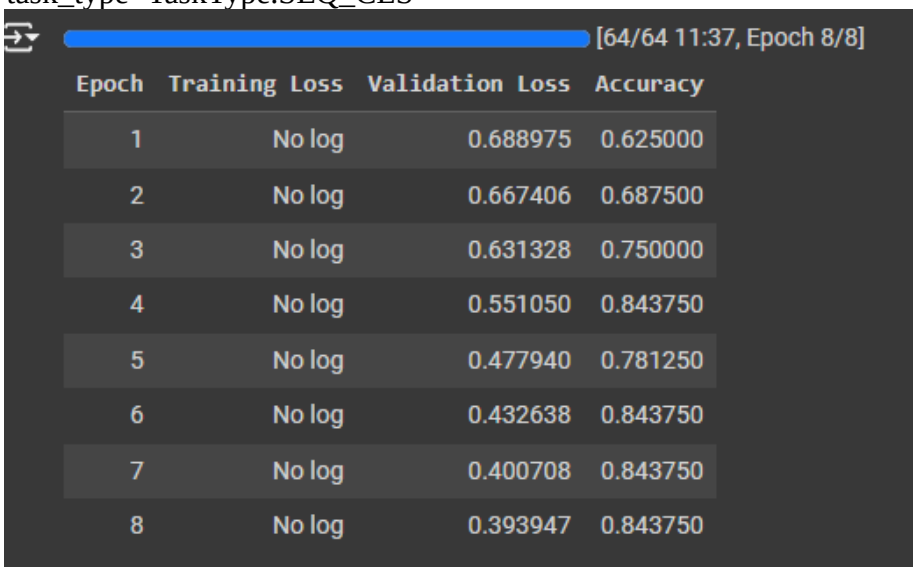
[64/64 09:54, Epoch 8/8]

Epoch	Training Loss	Validation Loss	Accuracy
1	No log	0.695146	0.437500
2	No log	0.683279	0.593750
3	No log	0.674405	0.562500
4	No log	0.650910	0.562500
5	No log	0.652312	0.593750
6	No log	0.585342	0.656250
7	No log	0.544727	0.718750
8	No log	0.537028	0.718750

```
PredictionOutput(predictions=array([[0.20563483, 0.21584545],
       [0.22710314, 0.19645725],
       [0.19117099, 0.14843869],
       [0.21138549, 0.16851144],
       [0.15074639, 0.20138836],
       [0.21285076, 0.16002882],
       [0.20809   , 0.11896151],
       [0.21061125, 0.19299033],
       [0.17564015, 0.23414241],
       [0.17190261, 0.19909424],
       [0.19763005, 0.2163772 ],
       [0.2524781 , 0.10385972],
       [0.18600446, 0.16466182],
       [0.19018903, 0.16652927],
       [0.19784276, 0.16024332],
       [0.17829013, 0.10582904],
       [0.22059232, 0.12387354],
       [0.18845229, 0.17890874],
       [0.21097481, 0.14440343],
       [0.14287387, 0.20949566],
       [0.20877954, 0.14217615],
       [0.22035219, 0.18926692],
       [0.17945167, 0.18837884],
       [0.21406762, 0.18342996],
       [0.22085267, 0.178282  ],
       [0.19710688, 0.18896426],
       [0.1706554 , 0.21593145],
       [0.23764741, 0.14908534],
       [0.17323679, 0.17553255],
       [0.17276055, 0.12632418],
       [0.19190821, 0.19915201],
       [0.17582431, 0.2054169 ]], dtype=float32), label_ids=array([1, 0, 1, 1, 1, 0, 0, 0, 1, 1, 1, 0, 0, 1, 0, 0, 1, 1, 1, 1, 0, 0,
       0, 1, 1, 0, 1, 1, 1, 0, 0, 1]), metrics={'test_loss': 0.6861392855644226, 'test_accuracy': 0.65625, 'test_runtime': 4.6837, 'test_samples_per_second': 6.832, 'test_steps_per_second': 0.427})
```


Config 2

r=8,
lora_alpha=16,
lora_dropout=0.01,
target_modules=["q_lin", "k_lin","v_lin"],
bias='none',
task_type=TaskType.SEQ_CLS



Epoch	Training Loss	Validation Loss	Accuracy
1	No log	0.688975	0.625000
2	No log	0.667406	0.687500
3	No log	0.631328	0.750000
4	No log	0.551050	0.843750
5	No log	0.477940	0.781250
6	No log	0.432638	0.843750
7	No log	0.400708	0.843750
8	No log	0.393947	0.843750


```
PredictionOutput(predictions=array([[-0.42432398,  0.81219757],
       [ 0.7792884 , -0.2631061 ],
       [-0.25695962,  0.3365784 ],
       [-0.11180465,  0.32808656],
       [-0.95701617,  0.99187636],
       [ 0.60232973, -0.33735508],
       [ 0.7076106 , -0.8032887 ],
       [ 0.91153014, -0.7831641 ],
       [-0.94923955,  0.98396325],
       [-1.1812029 ,  0.92249143],
       [-0.69220376,  0.910442  ],
       [ 1.1302046 , -1.1446705 ],
       [ 0.7094246 , -0.44799092],
       [ 0.09983131,  0.03113251],
       [ 0.8099524 , -0.6487731 ],
       [ 0.9314997 , -1.0685852 ],
       [-0.13552408,  0.06428724],
       [-1.0934927 ,  0.90159667],
       [-0.3074137 ,  0.29185358],
       [-1.1500902 ,  0.9405169 ],
       [ 0.47950438, -0.3754086 ],
       [ 0.22833812, -0.05777533],
       [-0.0194078 ,  0.07729631],
       [-0.72742295,  0.8095778 ],
       [ 0.54920965, -0.3115983 ],
       [-0.62890846,  0.5672336 ],
       [-0.7918495 ,  1.0297548 ],
       [-0.42977846,  0.34765667],
       [ 0.3958242 , -0.3400324 ],
       [ 0.2913689 , -0.2709194 ],
       [ 0.57326937, -0.16788958],
       [-1.1254654 ,  1.0232337 ]], dtype=float32), label_ids=array([1, 0, 1, 1, 1, 0, 0, 0, 1, 1, 1, 0, 0, 1, 0, 0, 1, 1, 1, 1, 0, 0,
       0, 1, 1, 0, 1, 1, 1, 0, 0, 1]), metrics={'test_loss': 0.3939467668533325, 'test_accuracy': 0.84375, 'test_runtime': 12.2886, 'test_samples_per_second': 2.604, 'test_steps_per_second': 0.163})
```

Config 3

r=16,
lora_alpha=8,
lora_dropout=0.002,
target_modules=["q_lin", "k_lin","v_lin"],
bias='none',
task_type=TaskType.SEQ_CLS

[64/64 10:43, Epoch 8/8]

Epoch	Training Loss	Validation Loss	Accuracy
1	No log	0.688975	0.625000
2	No log	0.667406	0.687500
3	No log	0.631328	0.750000
4	No log	0.551050	0.843750
5	No log	0.477940	0.781250
6	No log	0.432638	0.843750
7	No log	0.400708	0.843750
8	No log	0.393947	0.843750


```
PredictionOutput(predictions=array([[-0.42432398,  0.81219757],
       [ 0.7792884 , -0.2631061 ],
       [-0.25695962,  0.3365784 ],
       [-0.11180465,  0.32808656],
       [-0.95701617,  0.99187636],
       [ 0.60232973, -0.33735508],
       [ 0.7076106 , -0.8032887 ],
       [ 0.91153014, -0.7831641 ],
       [-0.94923955,  0.98396325],
       [-1.1812029 ,  0.92249143],
       [-0.69220376,  0.910442  ],
       [ 1.1302046 , -1.1446705 ],
       [ 0.7094246 , -0.44799092],
       [ 0.09983131,  0.03113251],
       [ 0.8099524 , -0.6487731 ],
       [ 0.9314997 , -1.0685852 ],
       [-0.13552408,  0.06428724],
       [-1.0934927 ,  0.90159667],
       [-0.3074137 ,  0.29185358],
       [-1.1500902 ,  0.9405169 ],
       [ 0.47950438, -0.3754086 ],
       [ 0.22833812, -0.05777533],
       [-0.0194078 ,  0.07729631],
       [-0.72742295,  0.8095778 ],
       [ 0.54920965, -0.3115983 ],
       [-0.62890846,  0.5672336 ],
       [-0.7918495 ,  1.0297548 ],
       [-0.42977846,  0.34765667],
       [ 0.3958242 , -0.3400324 ],
       [ 0.2913689 , -0.2709194 ],
       [ 0.57326937, -0.16788958],
       [-1.1254654 ,  1.0232337 ]], dtype=float32), label_ids=array([1, 0, 1, 1, 1, 0, 0, 0, 1, 1, 1, 0, 0, 1, 0, 0, 1, 1, 1, 1, 0, 0,
       0, 1, 1, 0, 1, 1, 1, 0, 0, 1]), metrics={'test_loss': 0.3939467668533325, 'test_accuracy': 0.84375, 'test_runtime': 4.7597, 'test_samples_per_second': 6.723, 'test_steps_per_second': 0.42})
```