Prompt, Prefix-Tuning and Adaptors

COMP3361 — Week 9

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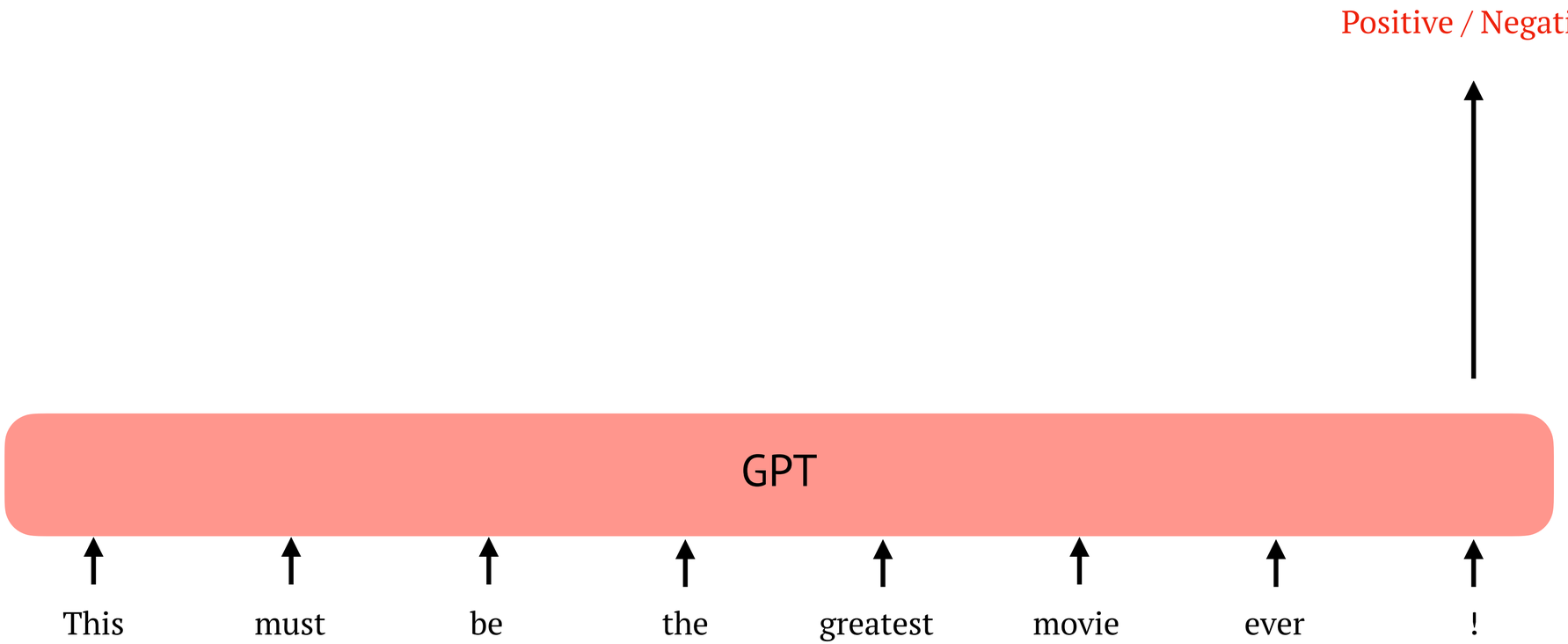
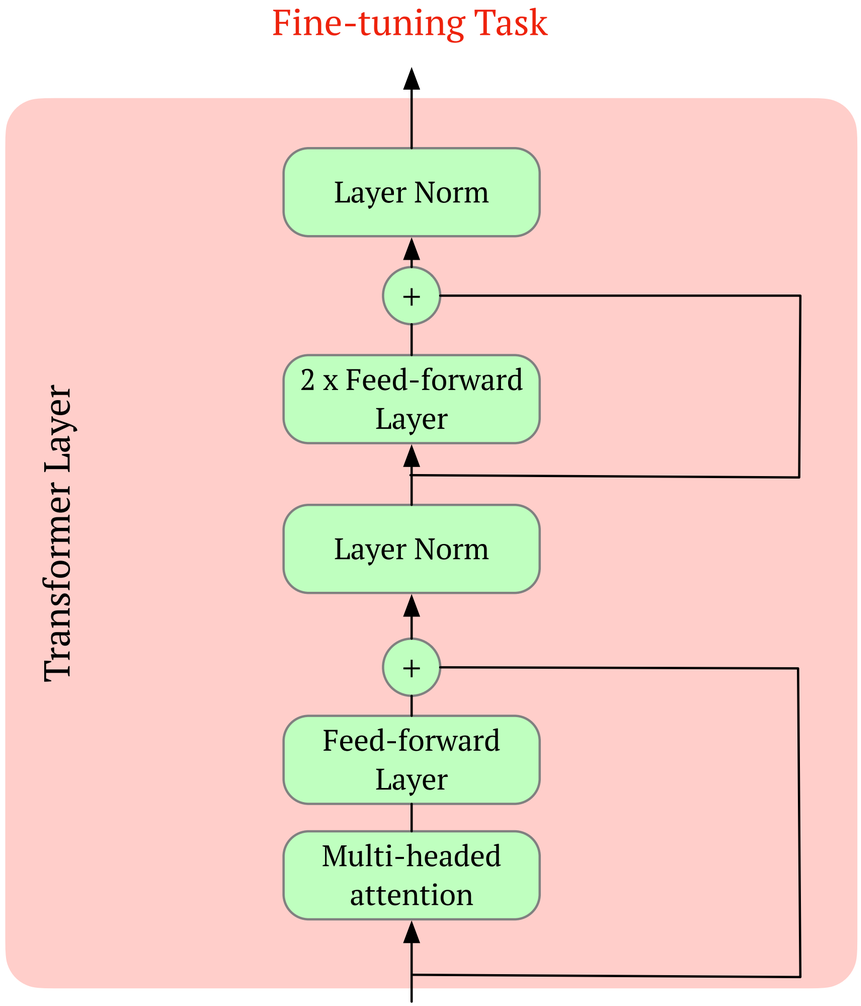
Many materials from Stanford CS224n with special thanks!

GPT for Understanding

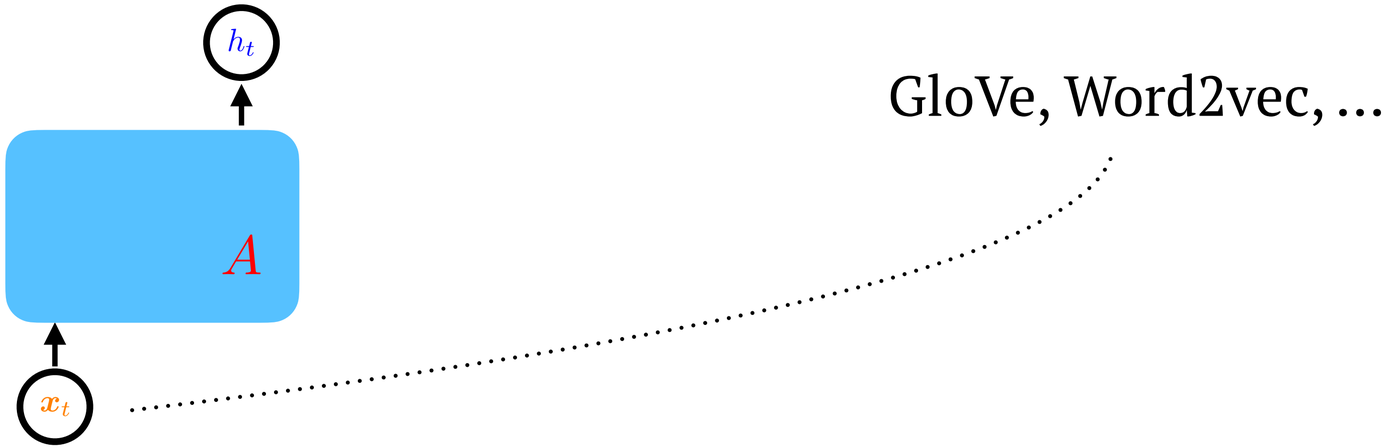


GPT for Understanding



Full Fine-tuning

An idea starts from initialization:



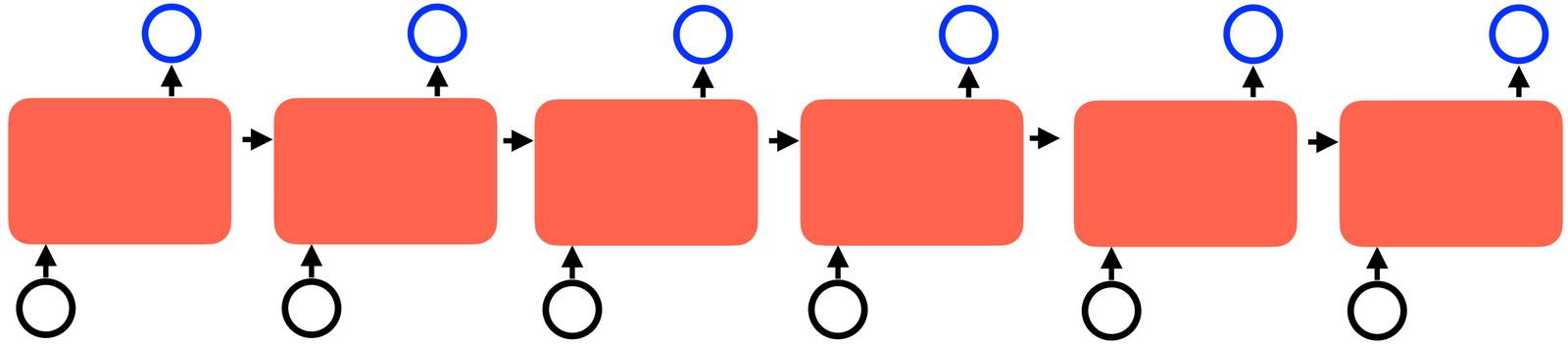
A full-supervised learning task.

Pretrained General model -> Task Specific Model

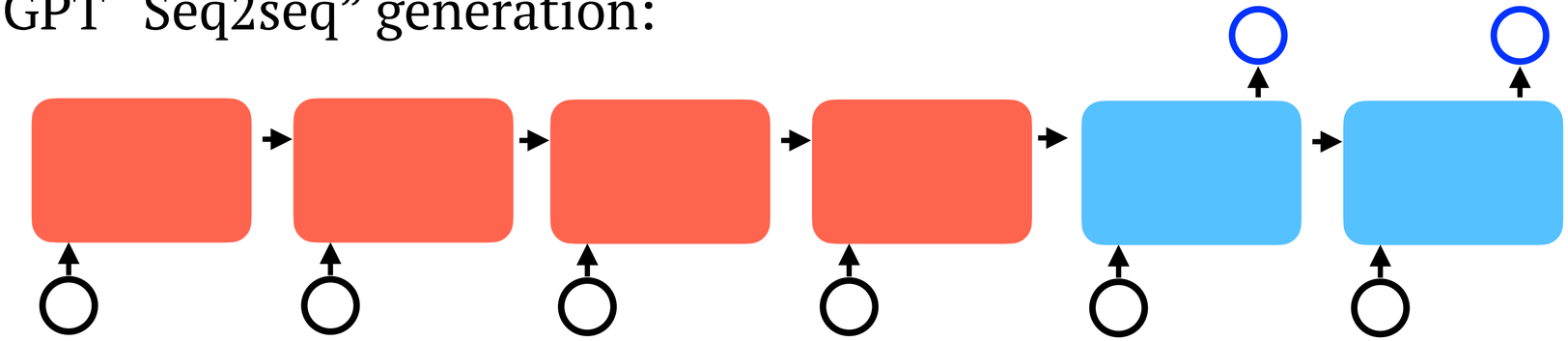
Full Fine-tuning

We fine-tune for generation task as well in the same spirit:

GPT text style transfer:

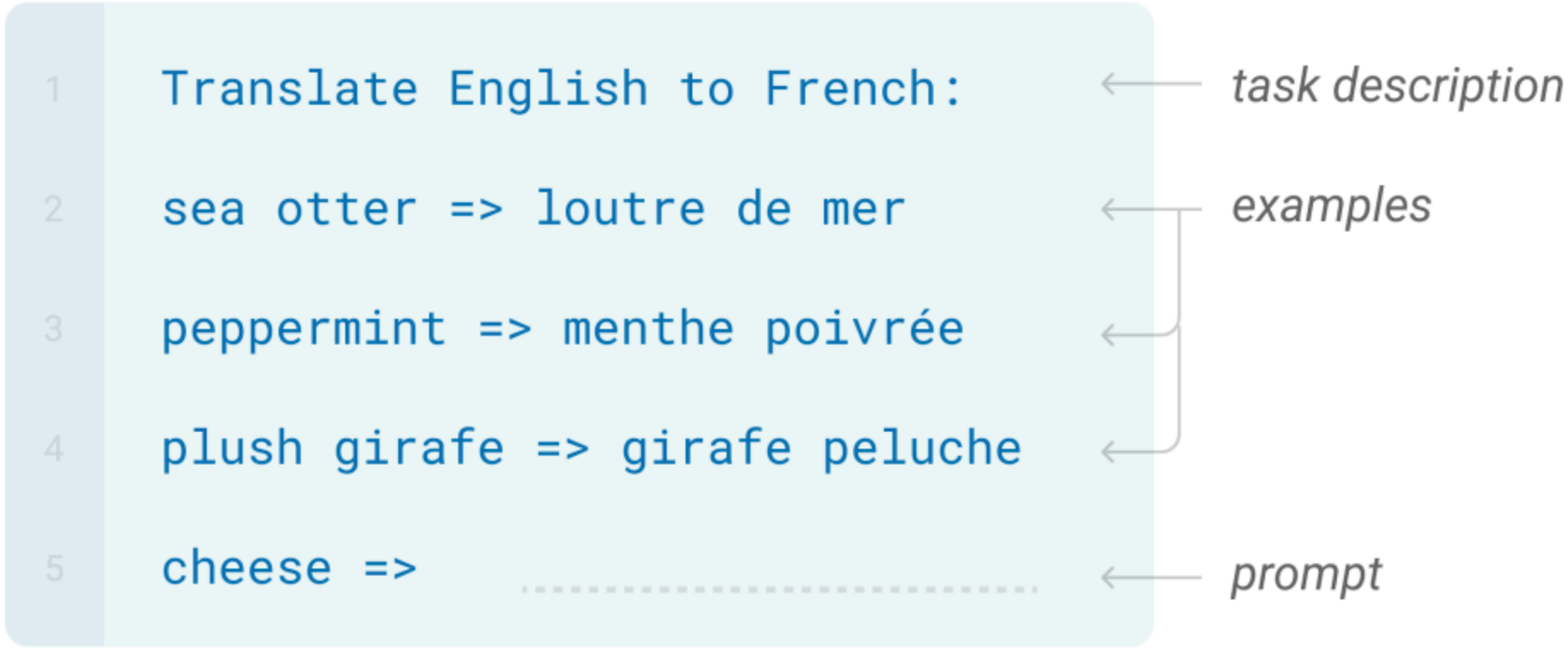


GPT “Seq2seq” generation:



In-Context Learning

Few Shots Learning



In-Context Learning

Few Shots Learning

	SuperGLUE Average	BoolQ Accuracy	CB Accuracy	CB F1	COPA Accuracy	RTE Accuracy
Fine-tuned SOTA	**89.0**	**91.0**	**96.9**	**93.9**	**94.8**	**92.5**
Fine-tuned BERT-Large	69.0	77.4	83.6	75.7	70.6	71.7
GPT-3 Few-Shot	71.8	76.4	75.6	52.0	92.0	69.0

	WiC Accuracy	WSC Accuracy	MultiRC Accuracy	MultiRC F1a	ReCoRD Accuracy	ReCoRD F1
Fine-tuned SOTA	**76.1**	**93.8**	**62.3**	**88.2**	**92.5**	**93.3**
Fine-tuned BERT-Large	69.6	64.6	24.1	70.0	71.3	72.0
GPT-3 Few-Shot	49.4	80.1	30.5	75.4	90.2	91.1

32 examples with the context and performs no gradient updates

In-Context Learning

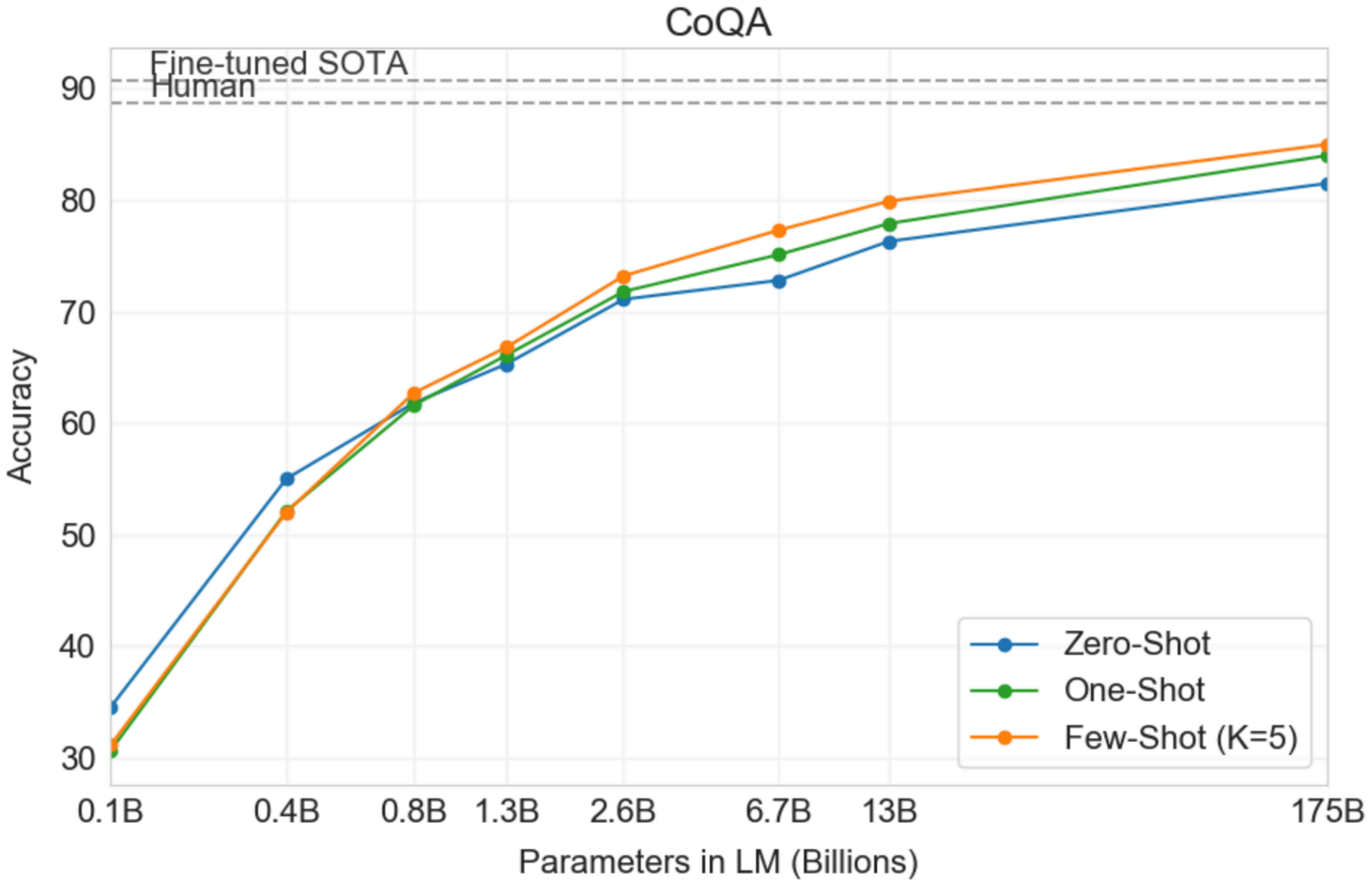
One-shot:

```
1  Translate English to French:        ← task description
2  sea otter => loutre de mer          ← example
3  cheese =>                           ← prompt
```

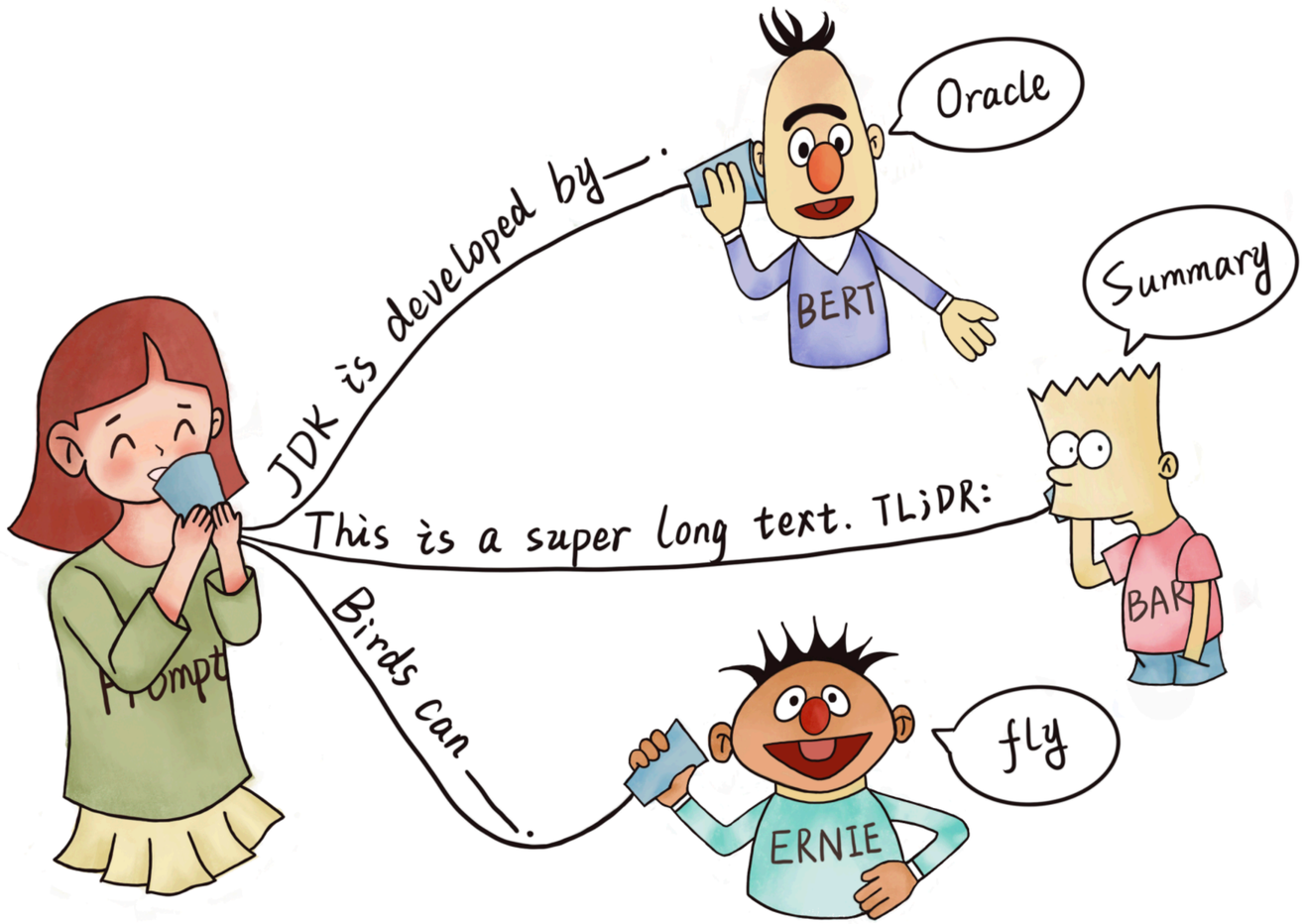
Zero-shot:

```
1  Translate English to French:        ← task description
2  cheese =>                           ← prompt
```

In-Context Learning

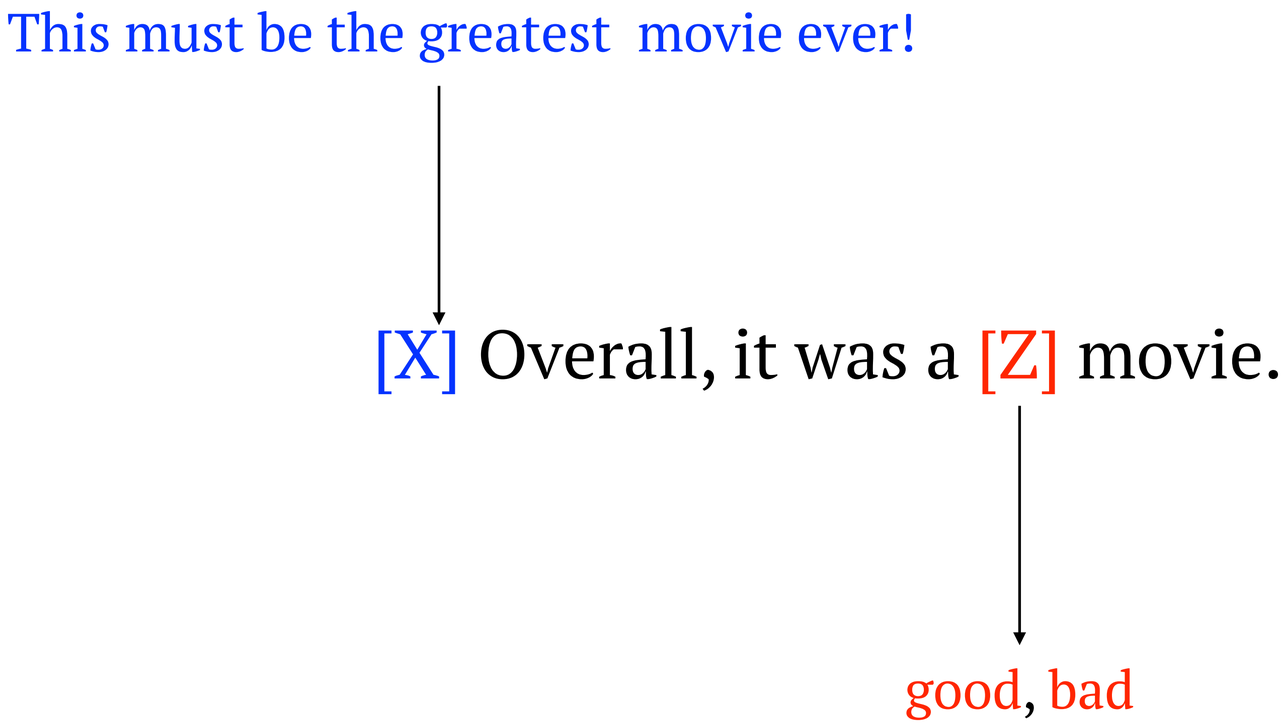


Prompt-Based Learning



Survey of Prompting Methods: Liu et al., 2021

Prompt-Based Learning



Prompt-Based Learning

Type	Task	Input (`[X]`)	Template	Answer (`[Z]`)
Text CLS	Sentiment	I love this movie.	`[X]` The movie is `[Z]`.	great fantastic ...
	Topics	He prompted the LM.	`[X]` The text is about `[Z]`.	sports science ...
	Intention	What is taxi fare to Denver?	`[X]` The question is about `[Z]`.	quantity city ...
Text-span CLS	Aspect Sentiment	Poor service but good food.	`[X]` What about service? `[Z]`.	Bad Terrible ...
Text-pair CLS	NLI	`[X1]`: An old man with ... `[X2]`: A man walks ...	`[X1]`? `[Z]`, `[X2]`	Yes No ...
Tagging	NER	`[X1]`: Mike went to Paris. `[X2]`: Paris	`[X1][X2]` is a `[Z]` entity.	organization location ...
Text Generation	Summarization	Las Vegas police ...	`[X]` TL;DR: `[Z]`	The victim ... A woman ... ...
	Translation	Je vous aime.	French: `[X]` English: `[Z]`	I love you. I fancy you. ...

Survey of Prompting Methods: Liu et al., 2021

Prompt-Based Learning

Natural language processing (**NLP**) is a subfield of linguistics, computer science, and artificial intelligence concerned with the interactions between computers and human language, in particular how to program computers to process and analyze large amounts of natural language data. The goal is a computer capable of "understanding" the contents of documents, including the contextual nuances of the language within them. The technology can then accurately extract information and insights contained in the documents as well as categorize and organize the documents themselves.

Challenges in natural language processing frequently involve speech recognition, natural language understanding, and natural language generation.

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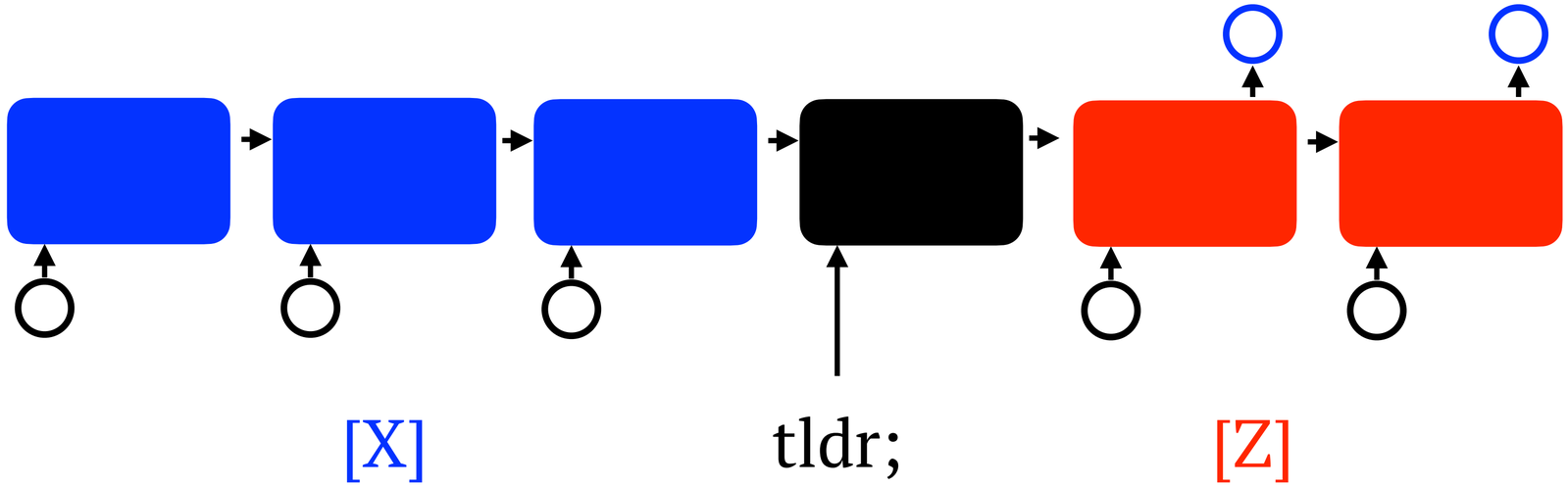
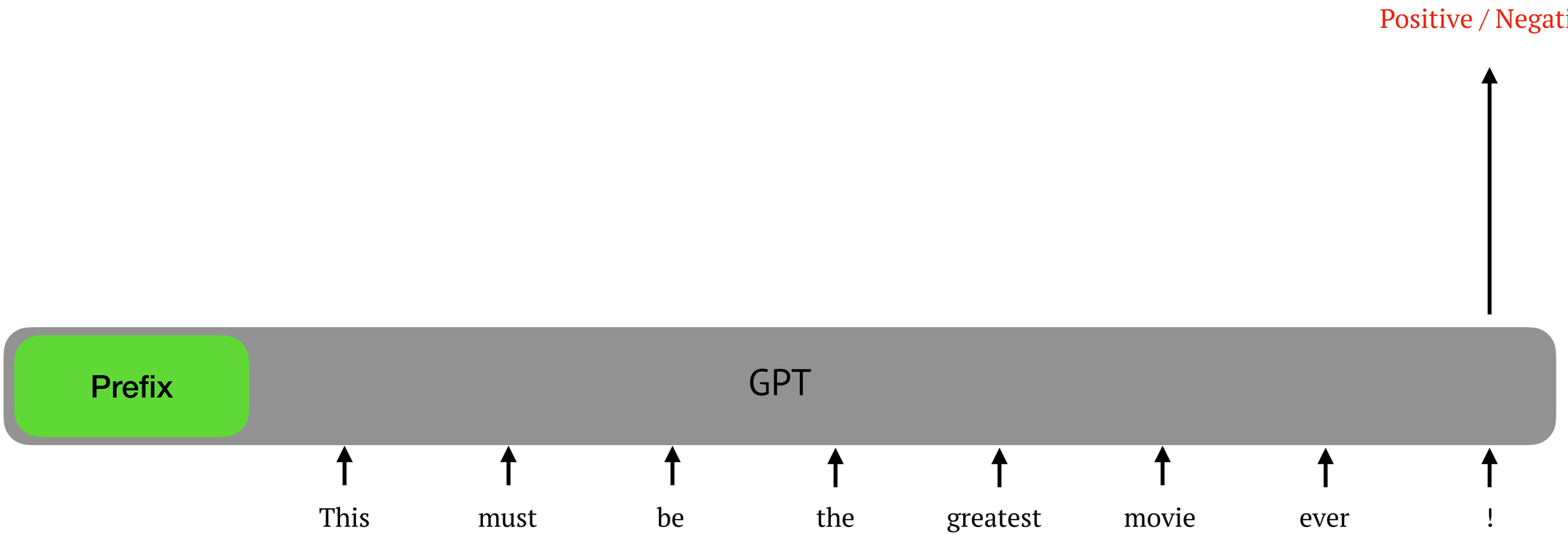
Prompt-Based Learning



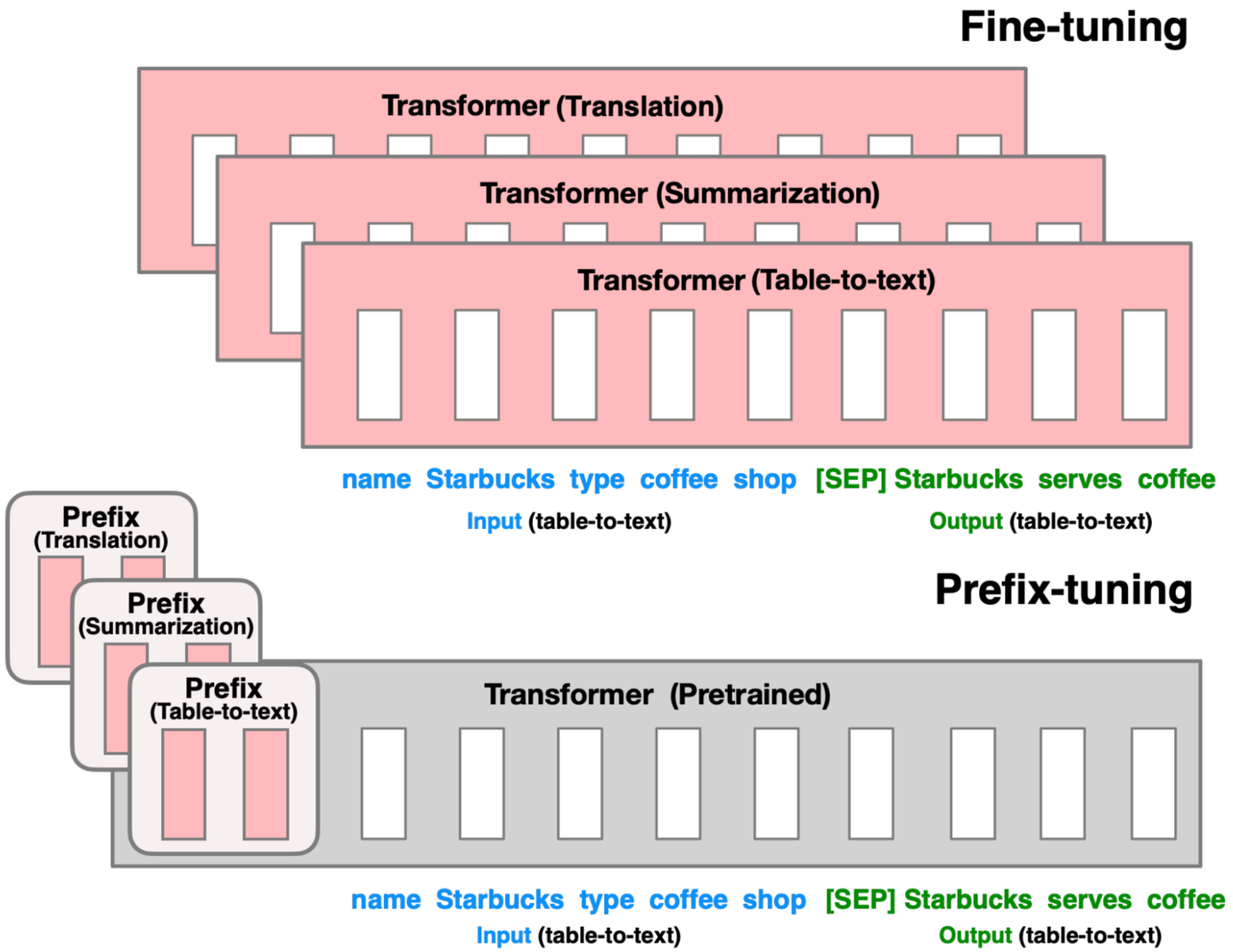
Learning is also possible?

Prefix-Tuning



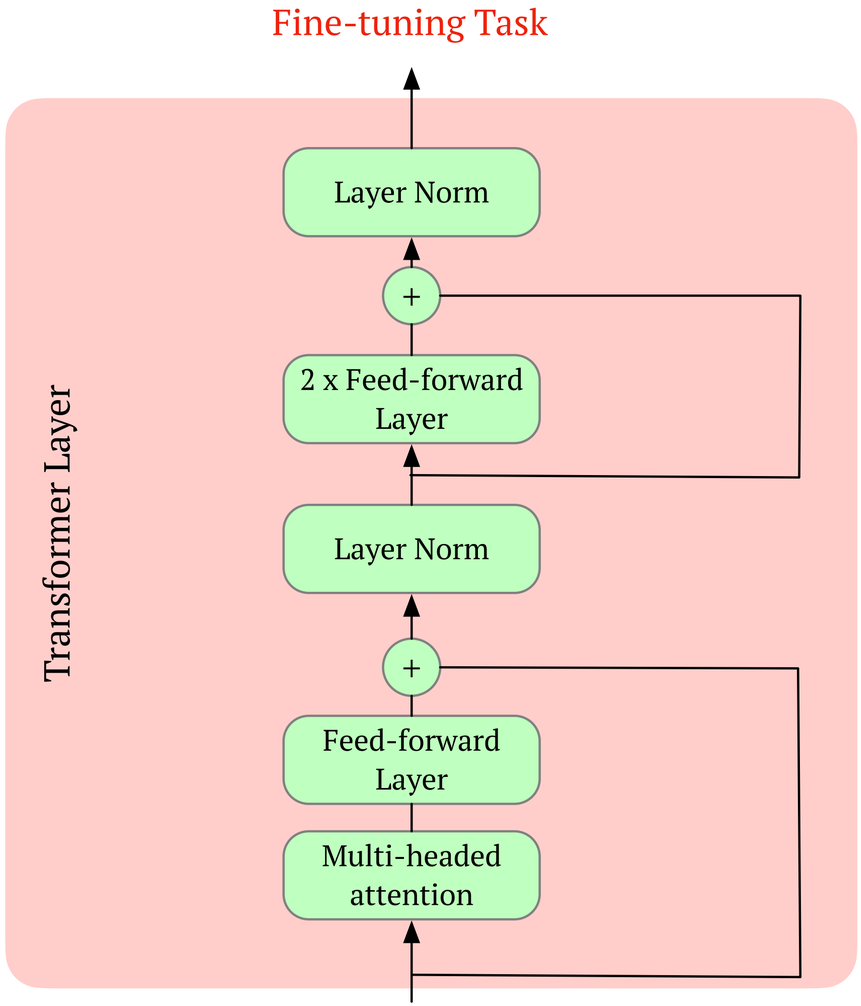
Li and Liang, 2021

Prefix-Tuning



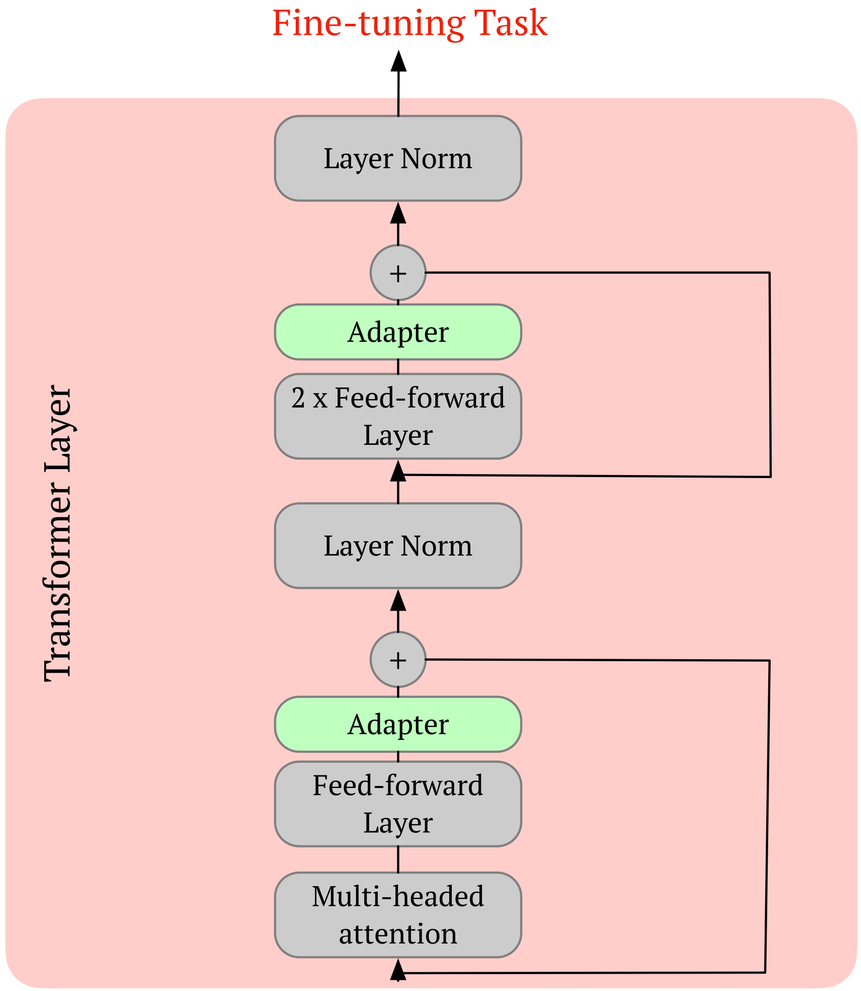
Li and Liang, 2021

Adaptors



Houlsby et al., 2021

Adaptors



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