
DLHLP 2023 Fall

LLM Finetuning

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Background

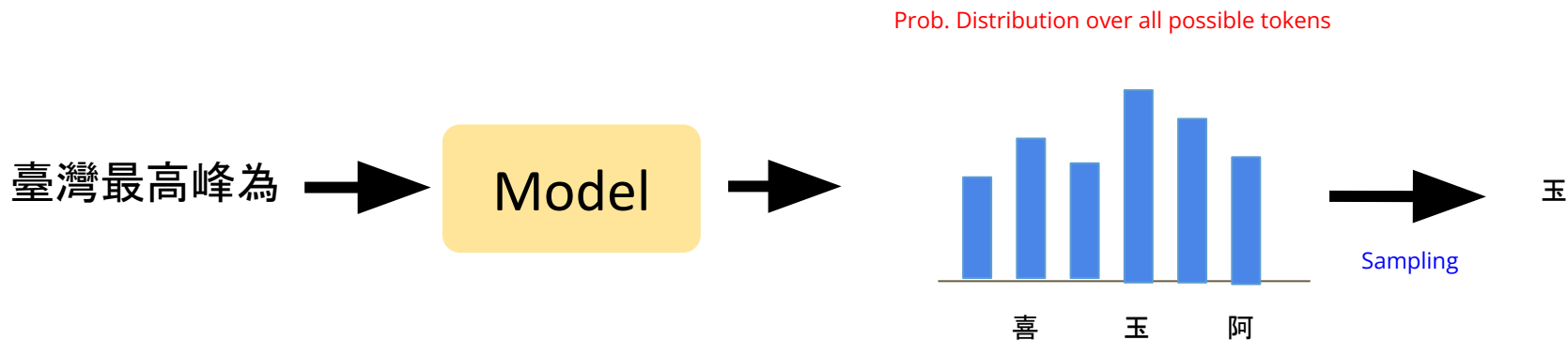
LLM and Finetuning

Recommendation

- Here we will only briefly go through some background knowledge
- Please refer to the following lecture videos for details
 - [ChatGPT \(可能\)是怎麼煉成的 - GPT 社會化的過程](#)
 - [【生成式AI】ChatGPT 原理剖析 \(2/3\) — 預訓練 \(Pre-train\)](#)

Causal Language Modeling (文字接龍)

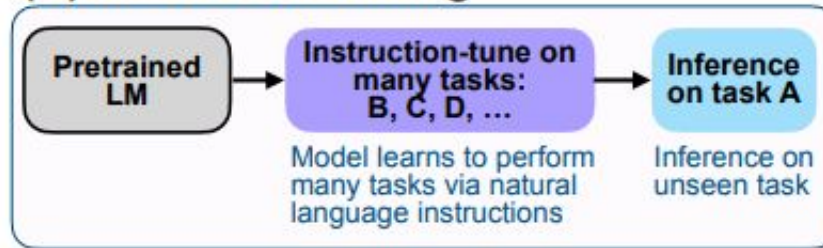
- Predict the next token (conditioned on previous tokens only)
 - vs. masked language modeling (MLM)



Finetuning

- Train the pre-trained model for specific purposes
 - Specific domain, language, writing style...
 - Corresponding dataset is needed
- Instruction tuning: teach the model to understand and follow the instruction

(C) Instruction tuning



[source](#)

Inference Parameters

Inference

- When using LLM for generation, there are typically several parameters:
 - max_length
 - num_beams
 - temperature
 - Top-k
 - Top-p

指令：給我解釋這個硬體技術

回應：

隨機存取是一種技術，其中數據被存儲在一個或多個位元組（位元）上。這些位元被稱為“行”或“列”。這個技術在計算機和其他計算設備中非常常見。它允許快速存儲和檢索數據。在某些情況下！它也被用於創建密碼學和數據加密。隨機存取通常以二進制形式存儲。這意味著它可以用於存儲任何兩個數字。這使得它非常適合存儲大量數據的情況。它也非常有用於在數據庫中存儲數據；這些數據可以是文本、數字、圖像、音頻和視頻數據等等。此技術的一個應用是創建安全的數據存儲解決方案。這可以包括使用隨機位元存儲密碼或使用

max_length

- The max length of the generated token sequence.
- If you found that the generated sentence seems truncated, check max_length!

指令：有機電致發光材料及裝置

回覆：

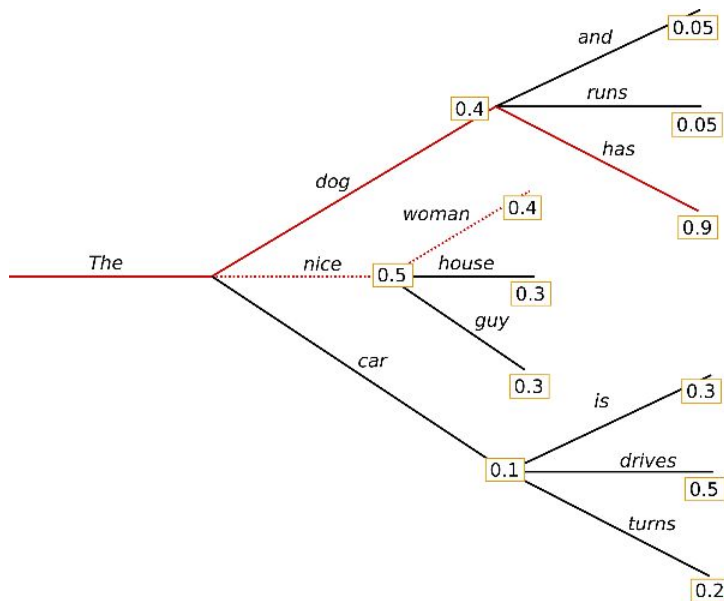
本研究所提供的有機發光二極體及其相關裝置，是一種使用有機材料（通常為硅）進行光電效應的光電元件及其應用。該裝置具有以下特點：

1. 光電導性；
2. 具有高光電容率與低光電阻率；
3. 能夠產生高頻率的光，並且具有較低的光損失率。
4. 可以應用於各種應用領域、如顯示器、顯示屏、通訊裝置、照明裝置等。
5. 對環境的影響較小。
6. 適用於低光環境下的應用^{www}如夜間環境、低光照明環境等。

研究結果顯示：使用這種裝置可以有效地提高光學顯示技術的效能（如電視、電

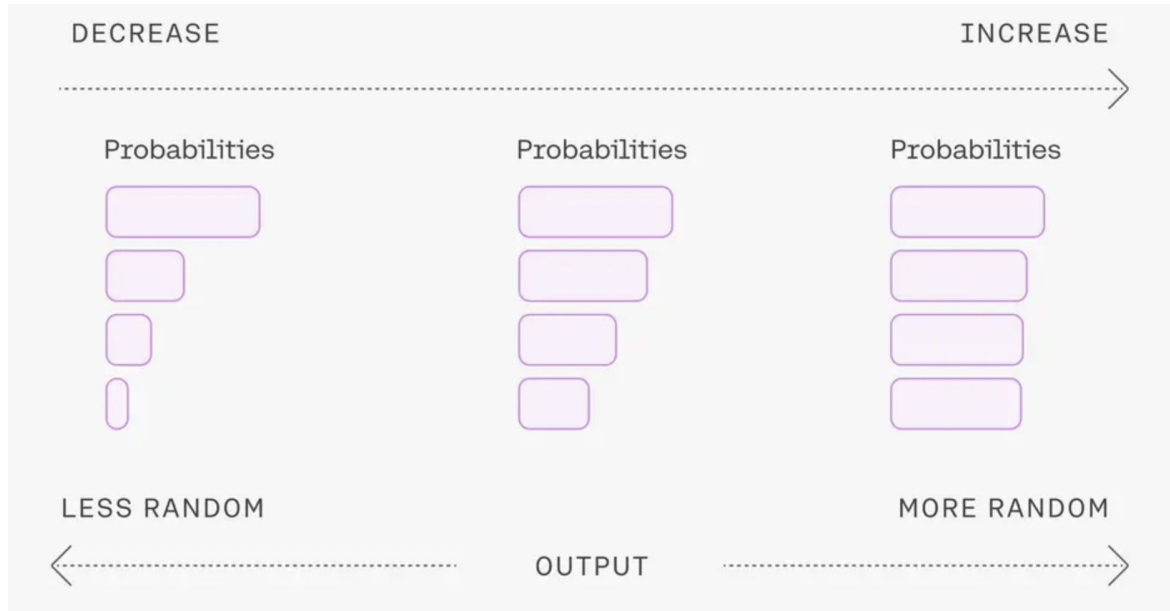
num_beams

- Number of beams for beam search during generation
 - Higher num_beams can take more possible beams into consideration, but it will also increase the computation.

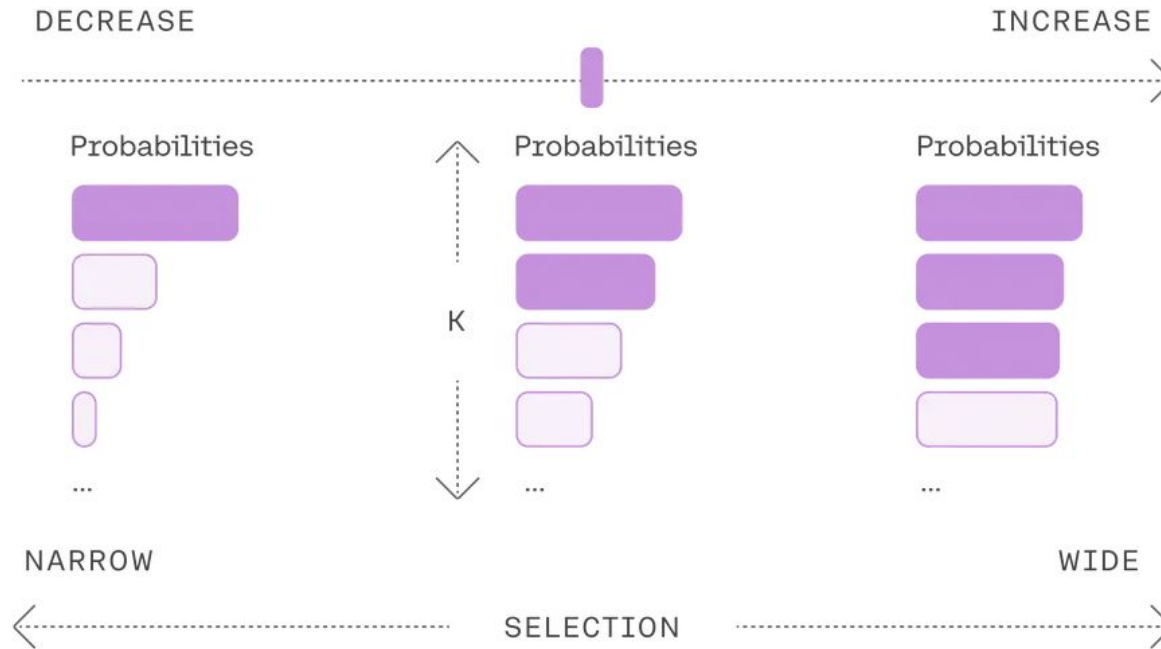


temperature

- Related to the diversity of the output
- Higher temperature for better diversity



Top-K



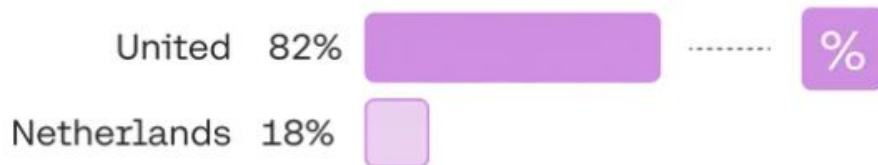
Top-P

1. Consider only the top tokens whose likelihoods add up to 15%. Ignore all others.

United + Netherlands \approx 15%



2. Sample from them based on their likelihood scores.



Homework (TODOs)

[Sample code link](#)

Dataset Collection/Construction

TODO: Task Design and Dataset Collection/Construction

- Decide the task you want the model to learn
 - Translation, question answering...
- Collect/Construct the corresponding dataset
 - Existing corpora for some languages: [Common Crawl](#), [nlp chinese corpus](#), ...
 - Existing instruction tuning datasets: [Stanford Alpaca](#), [BELLE](#), ...
 - Other resources (for reference): [LLMDataHub](#), [awesome-instruction-dataset](#)
 - Construct your own dataset (maybe through web crawling?)

TODO: Data Preprocessing

- Preprocessing may be needed.
- For example: the data may need to be transformed into instruction format for instruction tuning

```
{  
  "instruction": "this is a description of patent, give a title of it",  
  "input": "實施形態提供一種能夠使動作穩定之記憶裝置。本發明之一實施形態之記憶裝置包含第1導電部、第2導電部、第1電阻變化部、第1區域及絕緣部。自第1",  
  "output": "記憶裝置"  
},  
{  
  "instruction": "this is a description of patent, give a title of it",  
  "input": "與密碼更新技術相關聯的實例被描述。一種實例方法包括在一基本輸入/輸出系統(BIOS)中接收欲修改一管理員密碼的一請求。該管理員密碼可被更新。",  
  "output": "密碼更新技術"  
},
```

Model Selection

TODO: Select the Model

- Pick the model for finetuning
 - There are lots of model on [Hugging Face](#)
 - Or you may use this model: [Provided Model](#) (教育部人工智慧競賽辦公室委託國科會開發的模型)
 - Warning: The model will be available only after TAs receive **all** the NDA from you.
 - **Hand it in ASAP if you haven't**
- Parameter-efficient finetuning?
 - It could be better to finetune the entire model in this homework.
 - If it's not affordable for some of you, parameter-efficient finetuning is okay as well.

Finetuning

TODO: Finetune the Selected Model

- Finetune the model with the collected dataset
- Here's a [tutorial](#) that may be helpful.
 - Sample code also provides an example of finetuning for your reference.
 - Feel free to modify the sample code if needed.

Paper Reading

TODO: Paper Reading

- Select 1~2 paper(s) you are interested in.
 - See next page for paper list
 - Register [here](#)! DON'T CHOOSE PAPER(S) THAT HAVE BEEN CHOSEN BY OTHERS
- Summarize and present the chosen papers in your presentation.

TODO: Paper Reading

1. [Unlocking Context Constraints of LLMs: Enhancing Context Efficiency of LLMs with Self-Information-Based Content Filtering](#)
2. [Can Language Models Understand Physical Concepts?](#)
3. [Label Words are Anchors: An Information Flow Perspective for Understanding In-Context Learning](#)
4. [Can We Edit Factual Knowledge by In-Context Learning?](#)
5. [Beyond Labels: Empowering Human Annotators with Natural Language Explanations through a Novel Active-Learning Architecture](#)
6. [Large Language Model Is Not a Good Few-shot Information Extractor, but a Good Reranker for Hard Samples!](#)
7. [LLM-Adapters: An Adapter Family for Parameter-Efficient Fine-Tuning of Large Language Models](#)
8. [Learn to Explain: Multimodal Reasoning via Thought Chains for Science Question Answering](#)
9. [Language Models Are Greedy Reasoners: A Systematic Formal Analysis of Chain-of-Thought](#)
10. [LeanDojo: Theorem Proving with Retrieval-Augmented Language Models](#)

TODO: Paper Reading

11. [Let's Synthesize Step by Step: Iterative Dataset Synthesis with Large Language Models by Extrapolating Errors from Small Models](#)
12. [Efficient Long-Range Transformers: You Need to Attend More, but Not Necessarily at Every Layer](#)
13. [Knowledge Rumination for Pre-trained Language Models](#)

Presentation

TODO: Present Your Work

- Prepare a presentation on what you have done.
- Possible directions
 - What task did you want the model to learn?
 - What dataset did you use? How did you process the dataset?
 - What model did you choose?
 - Was the finetuning useful? How was the improvement?
 - Effect of different generation strategies (inference parameters)
 - The paper(s) you read
 - Other point(s) you want to share with us

Report Dates

- 11/20: group 1, 2, 3 and 4
- 11/27: group 5, 6, 7 and 8

Q & A

- If you have any problem, you can...
 - Check whether this problem has been asked and solved in the FB post
 - If not:
 - Comment on the FB post of this homework
 - Contact TAs (via Email or DM)

Other Ref.

<https://github.com/ntunlp/ntunlp-lab/traditional-chinese-alpaca>

<https://twpat.tipo.gov.tw/>

<https://arxiv.org/abs/2106.09685>

<https://www.nstc.gov.tw/folksonomy/detail/f094b57a-204e-4114-99d3-a9412ae42d7a?l=ch>