Build
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Gemma简介

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内容提要

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02 Gemma简介

03 开始使用Gemma

04 Gemma新进展

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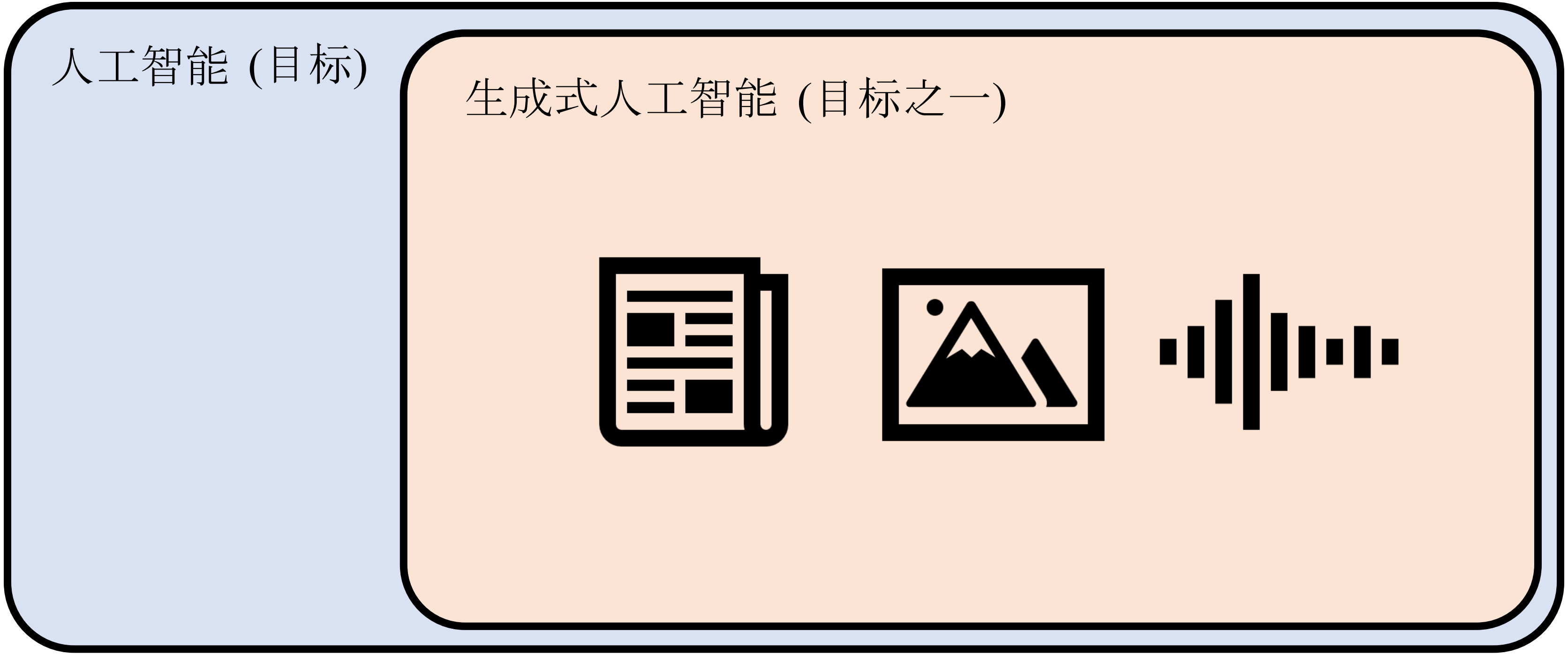
生成式AI简介

生成式人工智能

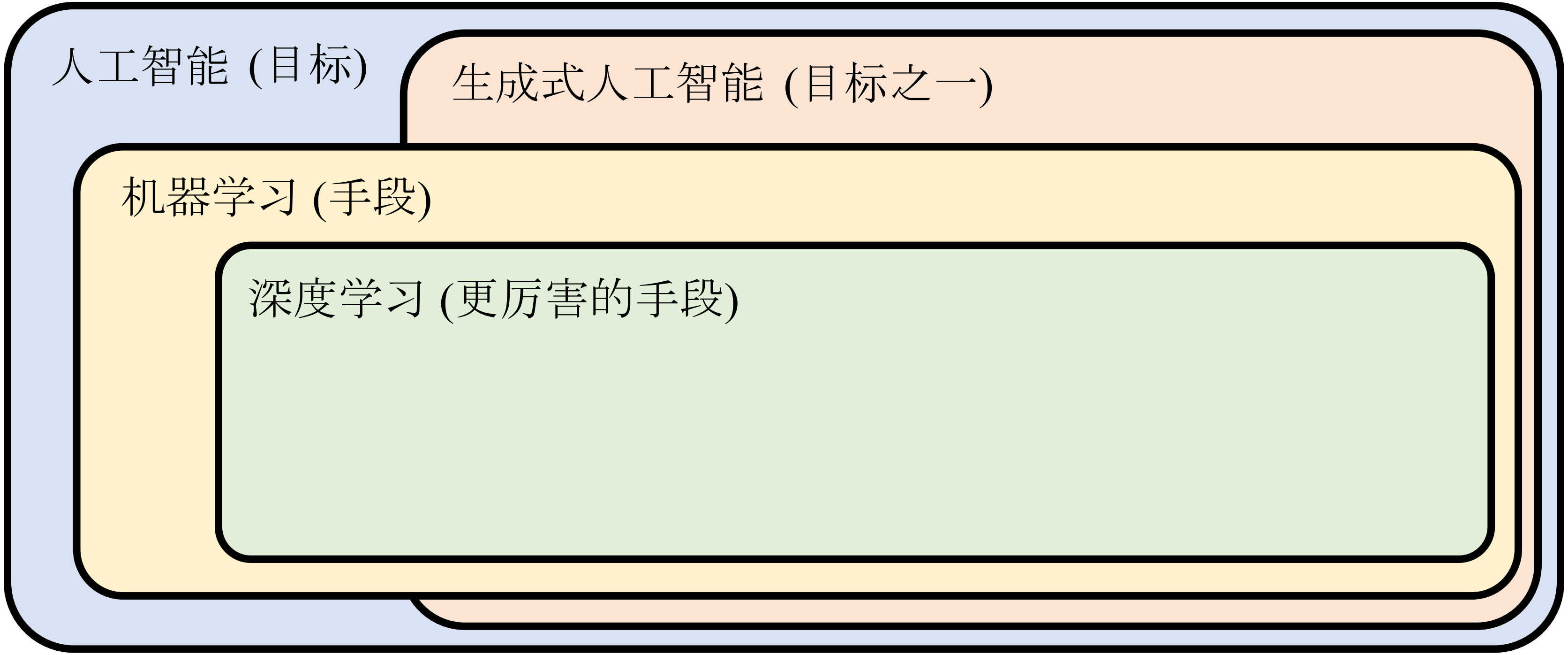


人工智能 (目标)

生成式人工智能 (目标之一)

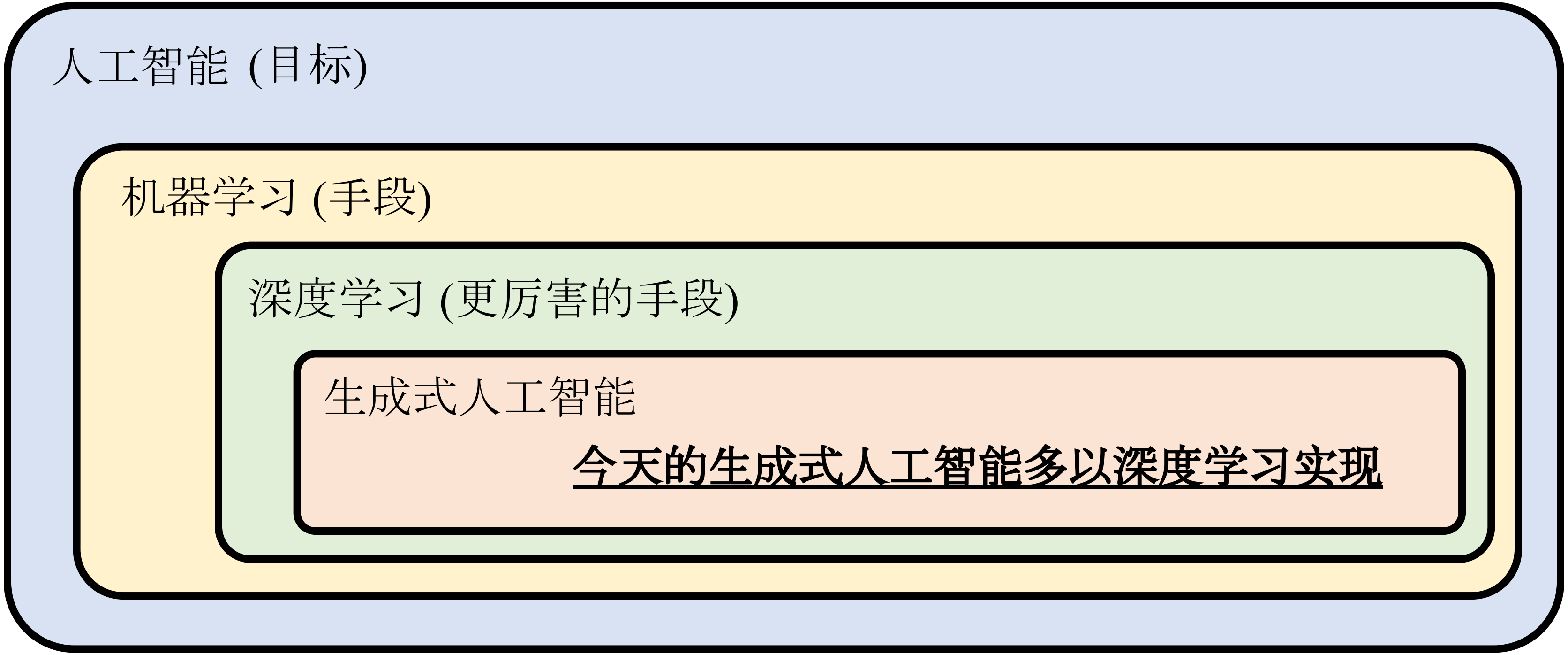
本页Slide来自李宏毅 (Hung-yi Lee)教授2024年《生成式人工智慧导论》第1讲“生成式AI是什么”幻灯片

生成式人工智能



本页Slide来自李宏毅 (Hung-yi Lee)教授2024年《生成式人工智慧导论》第1讲“生成式AI是什么”幻灯片

生成式人工智慧



人工智能 (目标)

机器学习 (手段)

深度学习 (更厉害的手段)

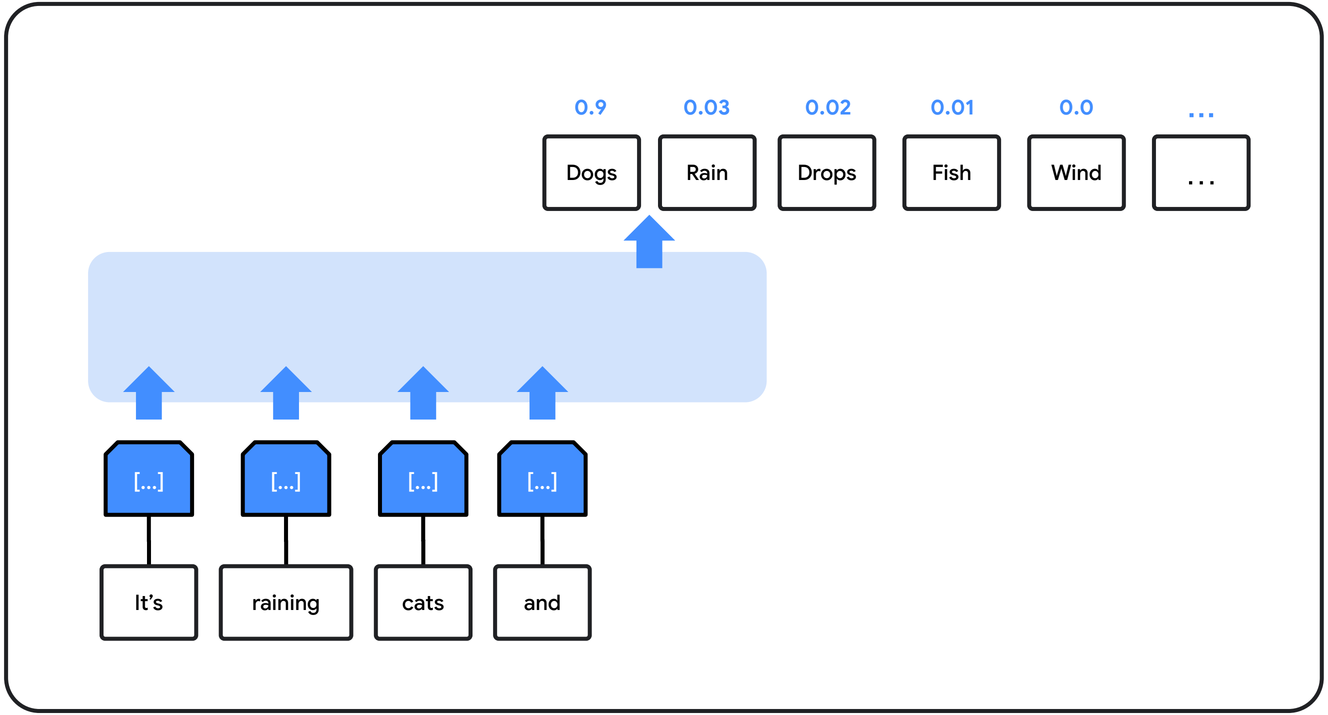
生成式人工智能

今天的生成式人工智能多以深度学习实现

本页Slide来自李宏毅 (Hung-yi Lee)教授2024年《生成式人工智慧导论》第1讲“生成式AI是什么”幻灯片

LLMs Explained

What is an LLM?



Roses are red,

LLMs Explained

Roses are red,
Violets are blue,
Sugar is sweet,

```
for(var i = 0
for(var i = 0; i < 10; i++) {
```

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Gemma简介

模型结构

- **多查询注意力（Multi-Query Attention）**

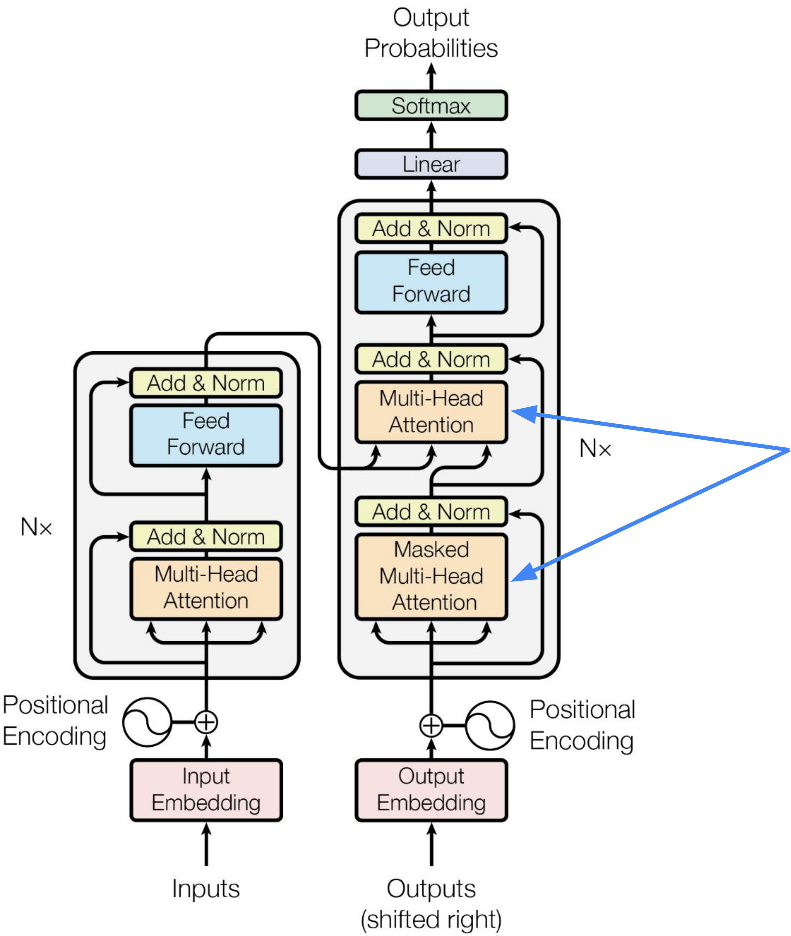
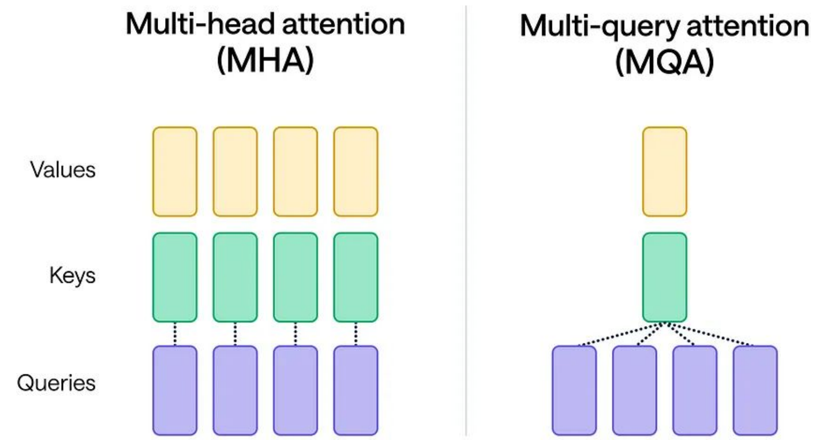


Figure 1: The Transformer - model architecture.



左图来源：[Attention Is All You Need]

右图来源：[Grouped Query Attention (GQA) vs. Multi Head Attention (MHA): Optimizing LLM Inference Serving]

模型结构

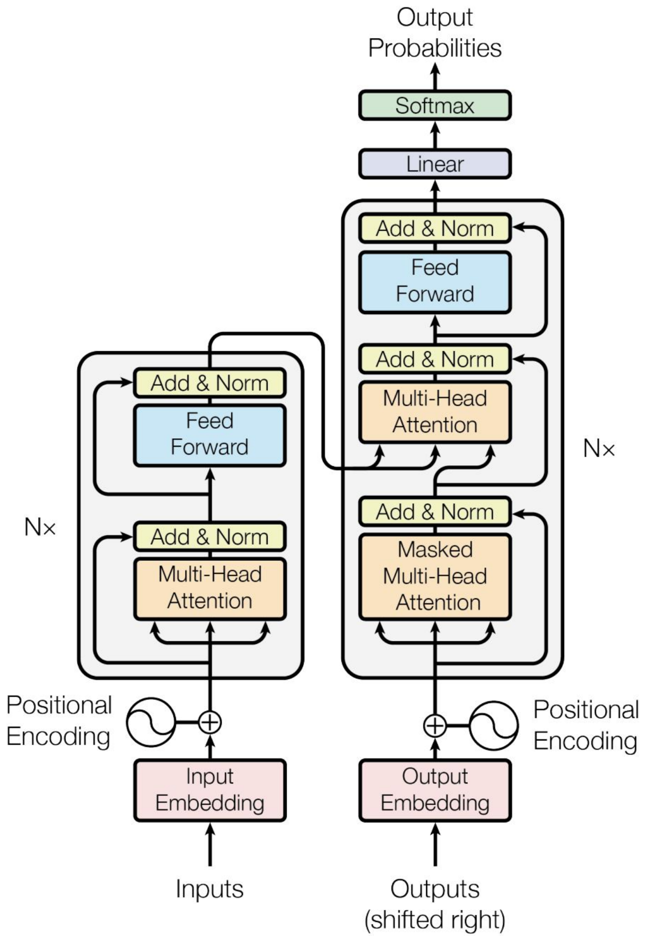


Figure 1: The Transformer - model architecture.

- **RoPE嵌入（Rotary Position Embedding）**

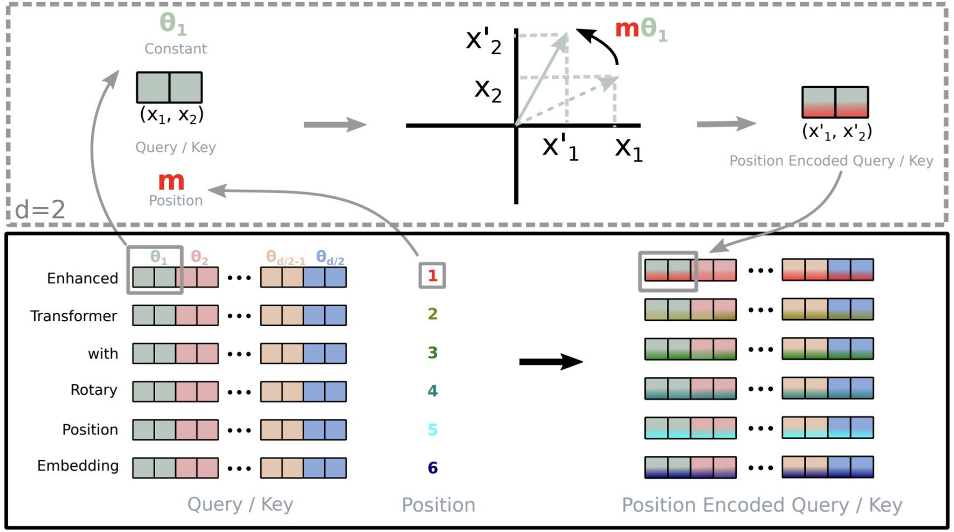


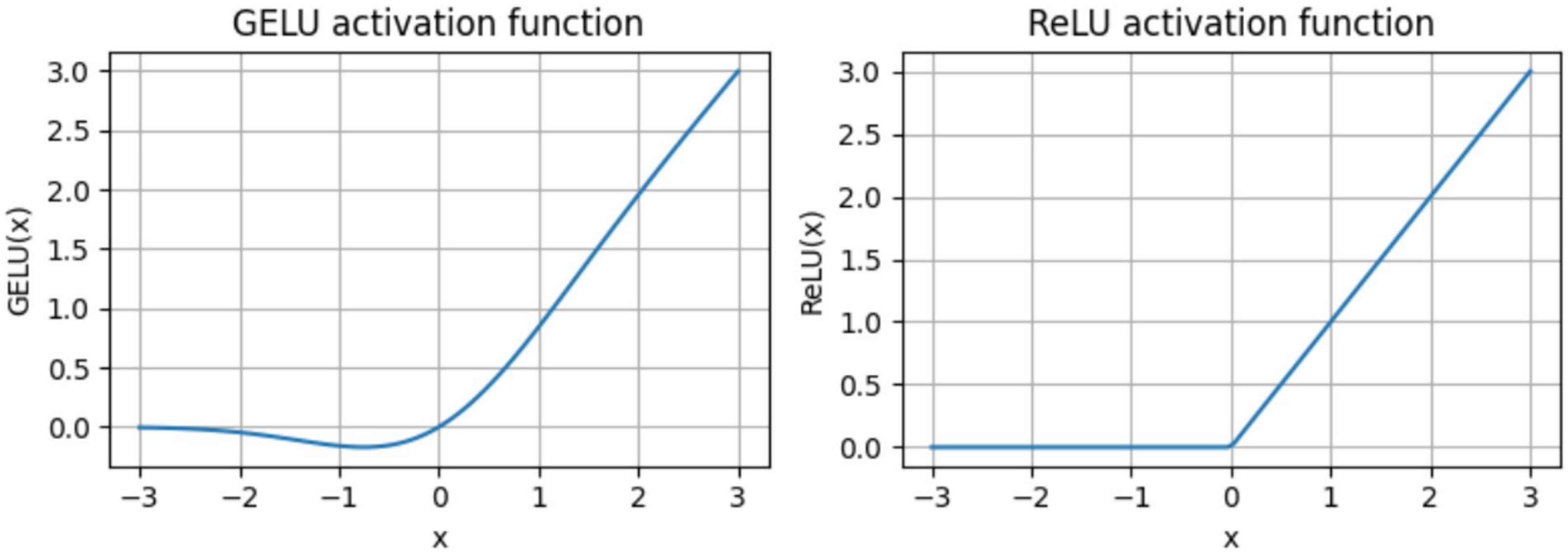
Figure 1: Implementation of Rotary Position Embedding(RoPE).

左图来源：Attention Is All You Need

右图来源：ROFORMER: ENHANCED TRANSFORMER WITH ROTARY POSITION EMBEDDING

模型结构

- **GeGLU激活函数**



图片来源：Understanding, Using, and Finetuning Gemma

模型结构

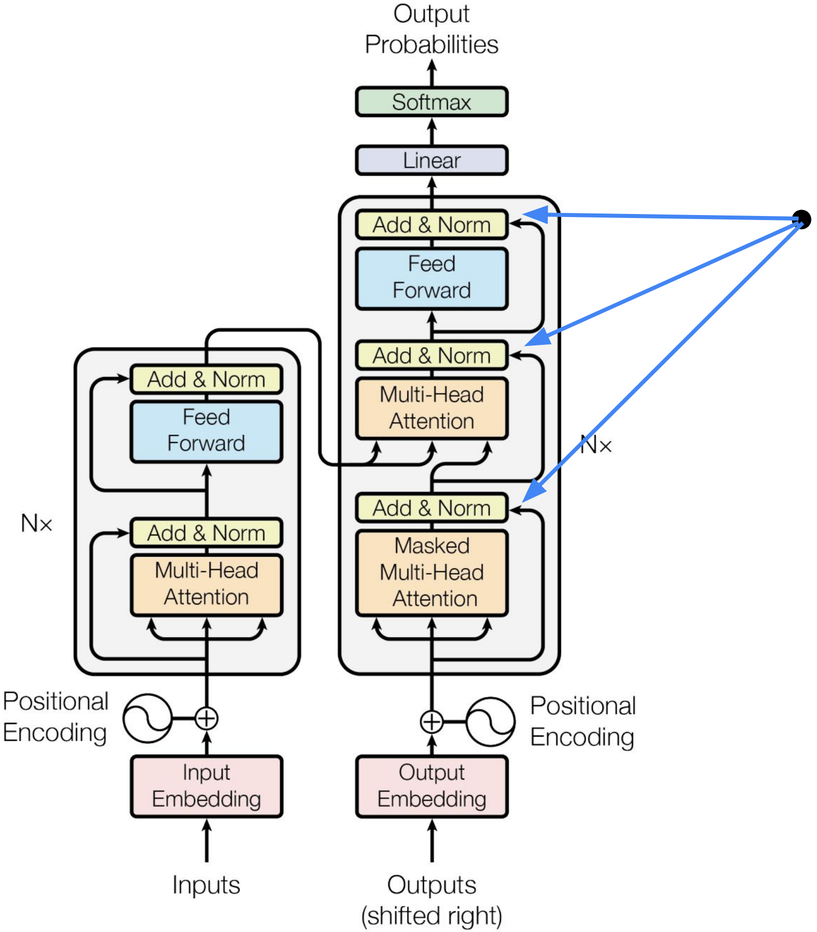
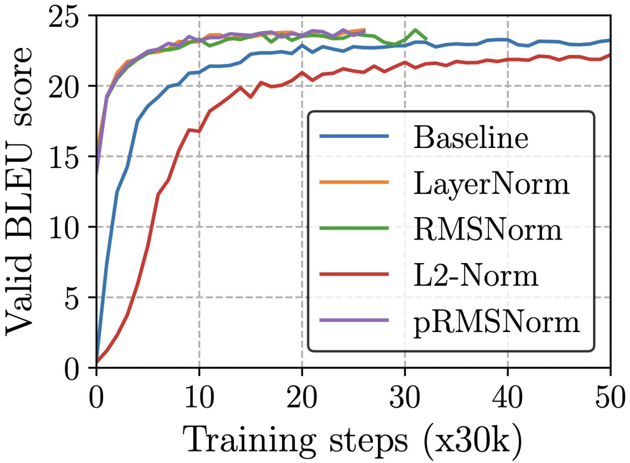


Figure 1: The Transformer - model architecture.

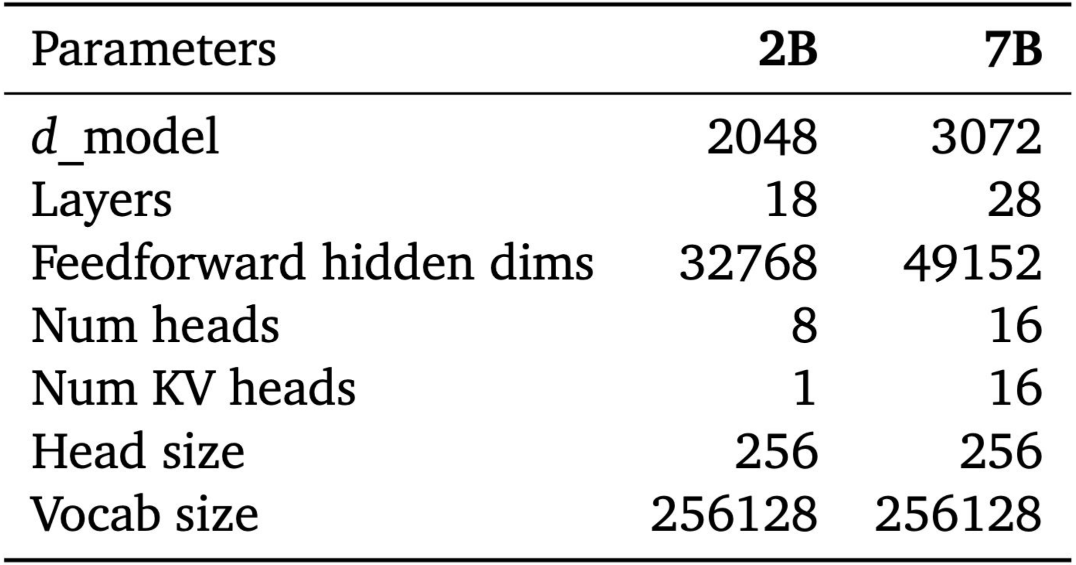
RMSNorm

$$\mathrm{RMSNorm}(x_i) = \frac{x_i}{\sqrt{\frac{1}{N}\sum_{i=1}^{N} x_i^2 + \epsilon}}$$



左图来源: Attention Is All You Need 右图来源: Root Mean Square Layer Normalization

模型结构



Parameters	**2B**	**7B**
*d*_model	2048	3072
Layers	18	28
Feedforward hidden dims	32768	49152
Num heads	8	16
Num KV heads	1	16
Head size	256	256
Vocab size	256128	256128

Table 1 | Key model parameters.

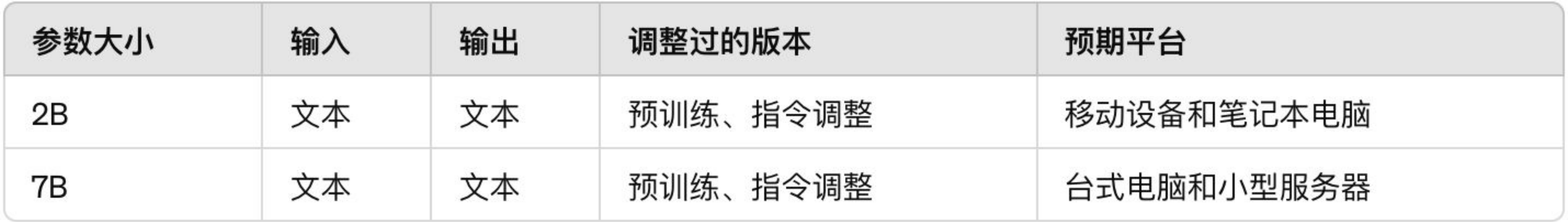
表格来源：[Gemma: Open Models Based on Gemini Research and Technology]()

训练数据

- Gemma 2B和7B分别在3万亿和6万亿的主要以英语为主的数据上进行了训练
- 数据来自网络文档、数学和编程内容
- Gemma模型不是多模态的，也没有针对多语言任务的最新表现进行训练
- 词汇表的大小为256,000个token

信息来源：Gemma: Open Models Based on Gemini Research and Technology

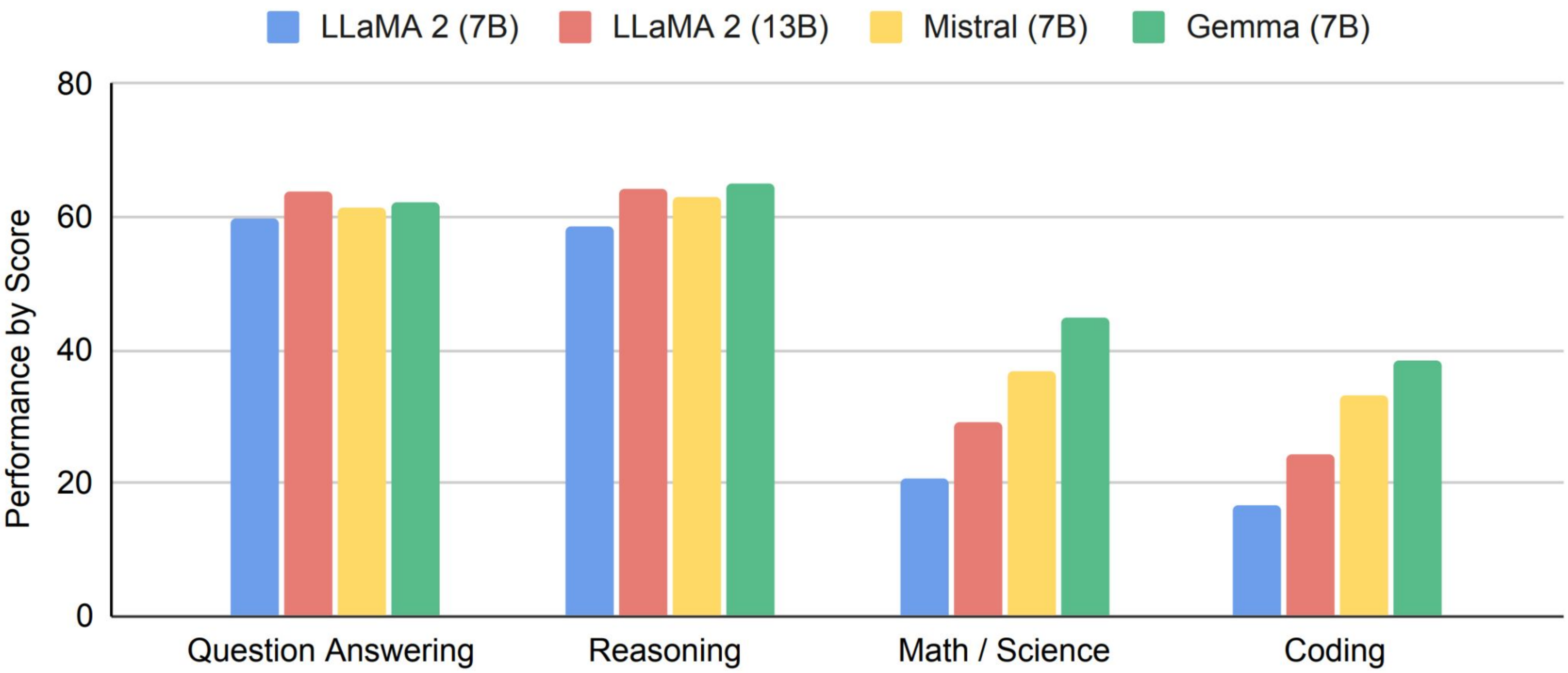
模型尺寸与性能



参数大小	输入	输出	调整过的版本	预期平台
2B	文本	文本	预训练、指令调整	移动设备和笔记本电脑
7B	文本	文本	预训练、指令调整	台式电脑和小型服务器

表格来源：Gemma: Open Models Based on Gemini Research and Technology

模型性能



图片来源：Gemma: Open Models Based on Gemini Research and Technology

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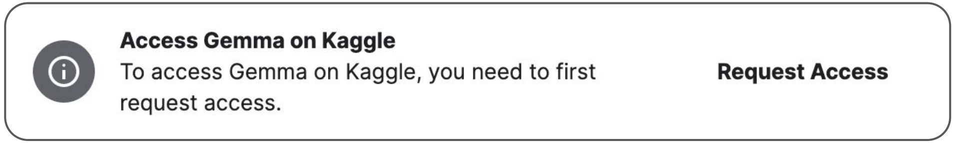
开始使用Gemma

获取Gemma模型

kaggle



Access Gemma on Kaggle
To access Gemma on Kaggle, you need to first request access.

Request Access

准备工作

首先，将Keras 3和KerasNLP安装到您的环境中，然后导入keras_nlp模块。

```
!pip install --upgrade keras-nlp
!pip install --upgrade keras

import keras_nlp
```

接着，从预设配置中加载Gemma模型！

```
# https://keras.io/api/keras_nlp/models/gemma/gemma_causal_lm/
g_lm = keras_nlp.models.GemmaCausalLM.from_preset("gemma_2b_en")
```

预设配置可用于Gemma的2B和7B参数版本。

使用Gemma

只需将提示词传递给**generate()**函数，并可选地指定响应的最大长度。

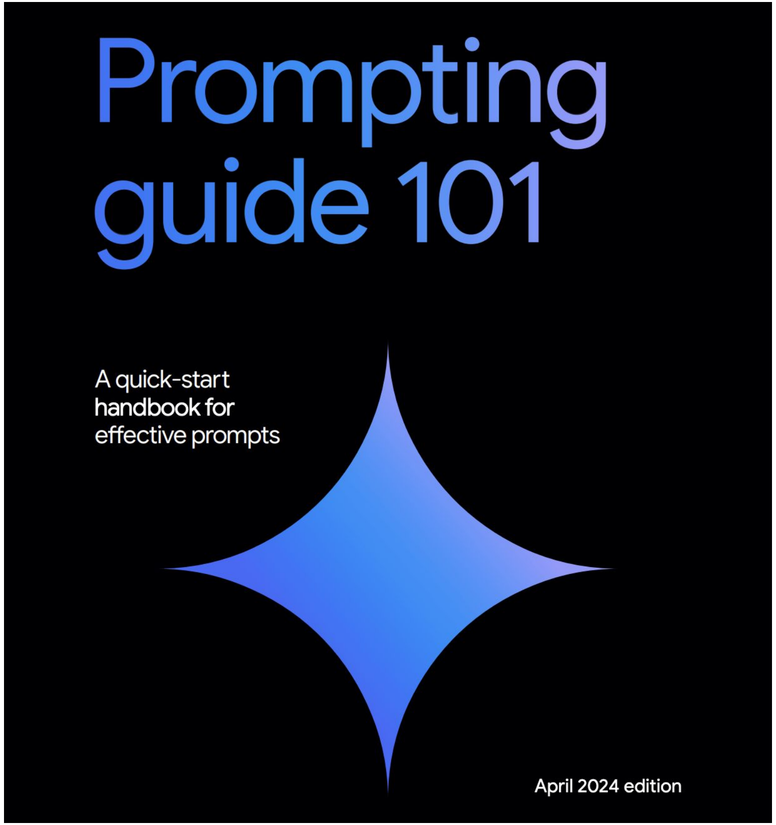
例如，如果问Gemma“it was a dark and stormy night.”

```
txt = g_lm.generate("It was a dark and stormy night.", max_length=64)
print(txt)
```

It was a dark and stormy night.
The rain was pouring down, and the wind was howling.
But that didn’t stop a group of friends from going out for a night of fun.
They were all dressed up in their best clothes, and they were ready to have a good time.

提示词编写指导

Prompting Guide 101



Prompting guide 101

A quick-start handbook for effective prompts

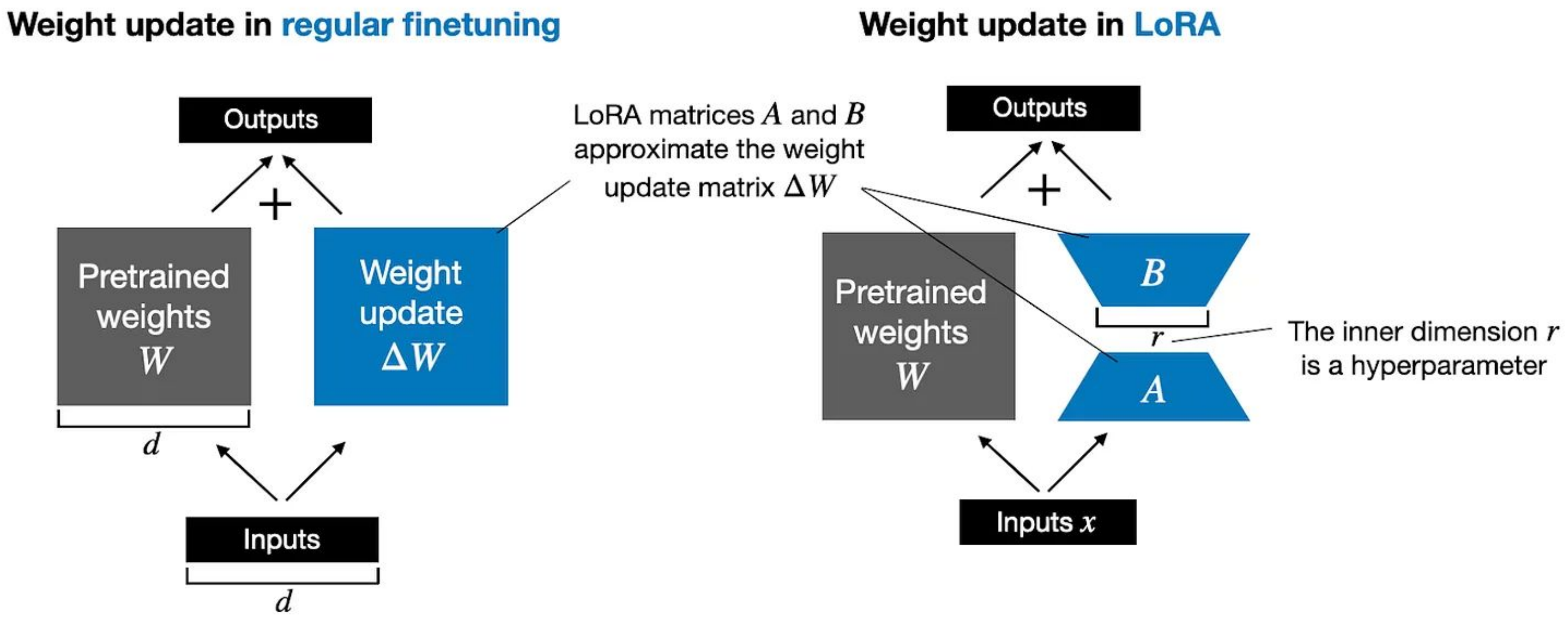
April 2024 edition

微调Gemma

- 使用Keras进行微调
- 支持使用LoRA进行微调

K Keras

LoRA


Weight update in regular finetuning
Outputs
+
Pretrained weights W
Weight update ΔW
d
Inputs
d
LoRA matrices A and B approximate the weight update matrix ΔW
Weight update in LoRA
Outputs
+
Pretrained weights W
B
r
A
The inner dimension r is a hyperparameter
Inputs x

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图片来源 : Practical Tips for Finetuning LLMs Using LoRA (Low-Rank Adaptation)

微调Gemma

- 使用Keras进行微调
- 支持使用LoRA进行微调

Keras

```
gemma.backbone.enable_lora(rank=8)
# fine-tune ...
gemma.fit(...)
gemma.backbone.save_lora_weights("lora.h5")
```

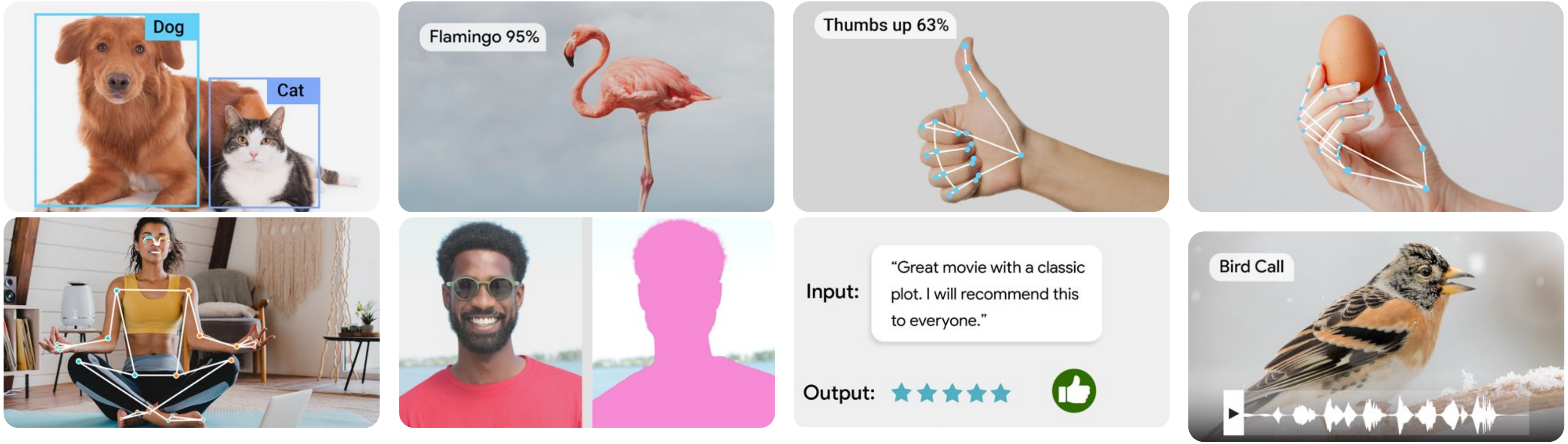
分布式微调Gemma

```
devices=keras.distribution.list_devices()
device_mesh = keras.distribution.DeviceMesh((1, 8),["batch", "model"], devices))
layout_map = keras.distribution.LayoutMap(device_mesh)

# Partitioning for embeddings (regex)
layout_map["token_embedding/embeddings"] = (None, "model")
# Partitioning (regex) for attention layer weights
layout_map["decoder_block.*attention.*(query|key|value).*kernel"] = (None, "model", None)
layout_map["decoder_block.*attention_output.*kernel"] = (None, None, "model")
layout_map["decoder_block.*ffw_gating.*kernel"] = ("model", None)
layout_map["decoder_block.*ffw_linear.*kernel"] = (None, "model")

keras.distribution.set_distribution(keras.distribution.ModelParallel(device_mesh,
                                                                     layout_map,
                                                                     batch_dim_name="batch"))

# - load the model here
```

微调Gemma

- 使用Keras进行微调
- 支持使用LoRA进行微调
- 支持JAX进行微调

使用MediaPipe在设备上的集成Gemma


Dog
Cat
Flamingo 95%
Thumbs up 63%
Input:
"Great movie with a classic plot. I will recommend this to everyone."
Output: ★★★★★
Bird Call

- Studio: https://mediapipe-studio.webapps.google.com/demo/llm_inference
- Documentation: https://developers.google.com/mediapipe/solutions/genai/llm_inference

代码示例

- Android:
  - https://github.com/googlesamples/mediapipe/tree/main/examples/llm_inference/android
  - https://github.com/NSTiwari/Gemma-on-Android
- Web: https://github.com/googlesamples/mediapipe/tree/main/examples/llm_inference/js
- iOS: https://github.com/googlesamples/mediapipe/tree/main/examples/llm_inference/ios

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Gemma新进展

Gemma家族

- CodeGemma
- PaliGemma（中文介绍）
- RecurrentGemma

参考资料

1.Gemma的官方网站：https://ai.google.dev/gemma/docs

2.Gemma技术报告
：https://storage.googleapis.com/deepmind-media/gemma/gemma-report.pdf

3.Gemma: Introducing new state-of-the-art open model by Google, https://medium.com/@shravankoninti/gemma-introducing-new-state-of-the-art-open-model-by-google-caae9fe29972

4.Understanding, Using, and Finetuning Gemma, https://lightning.ai/lightning-ai/studios/understanding-using-and-finetuning-gemma

5.What is Low-Rank Adaptation (LoRA) | explained by the inventor, https://www.youtube.com/watch?v=DhRoTONcyZE

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码出未来，现在开始！