深度學習基本原理

第 6 部分：進階架構

課程大綱

- 第 1 部分：深度學習簡介
- 第 2 部分：神經網路如何訓練
- 第 3 部分：卷積神經網路 (Convolutional Neural Networks)
- 第 4 部分：資料增強與部署
- 第 5 部分：預訓練模型
- 第 6 部分：進階架構

繼續更深入的主題

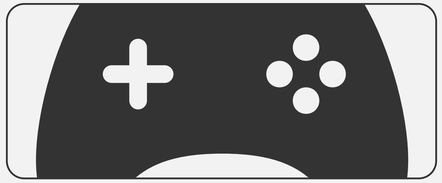
人工智慧的領域

電腦視覺 (Computer Vision)

- 視光學 (Optometry)

自然語言處理 (Natural Language Processing)

- 語言學 (Linguistics)



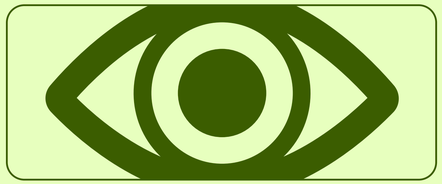
強化學習 (Reinforcement Learning)

- 賽局理論 (Game Theory)
- 心理學 (Psychology)

異常檢測 (Anomaly Detection)

- 安全 (Security)
- 醫學 (Medicine)

人工智慧的領域



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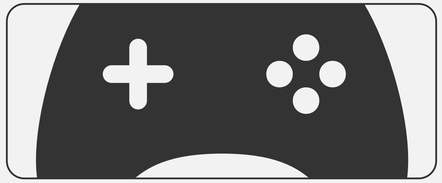

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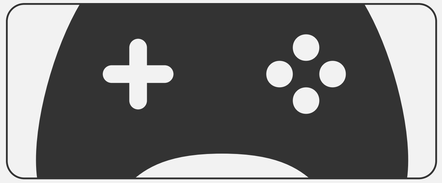

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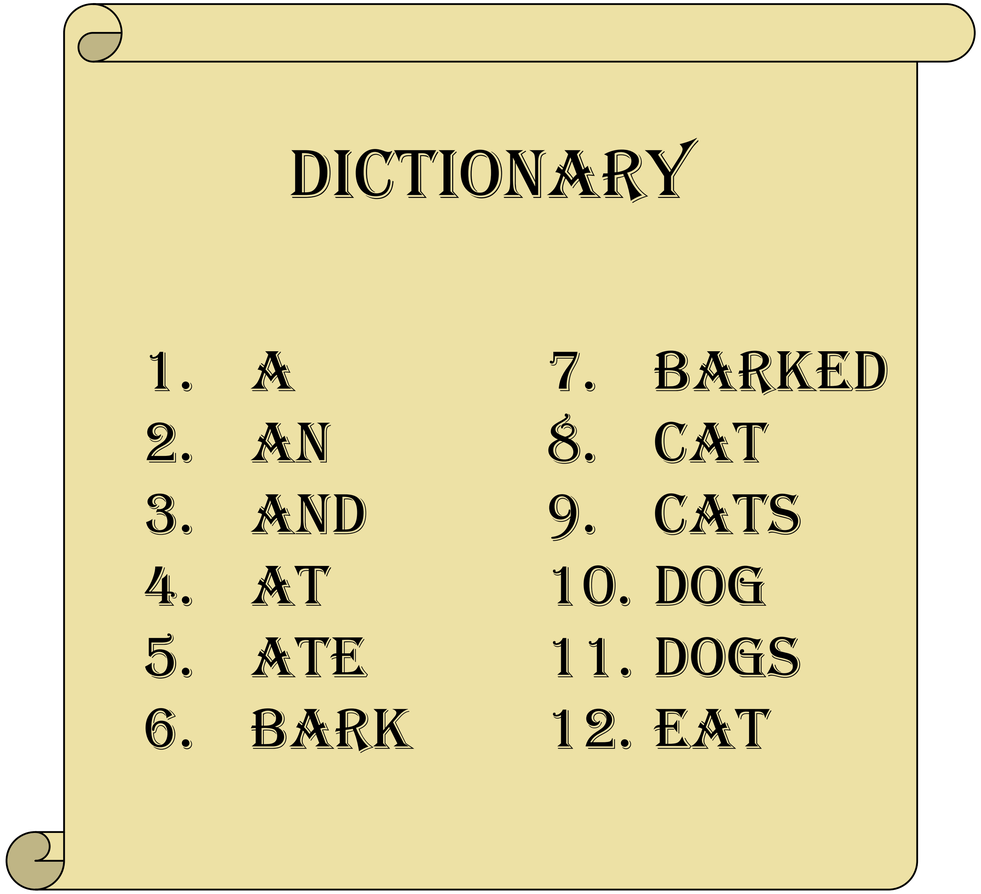
自然語言處理
(Natural Language Processing)

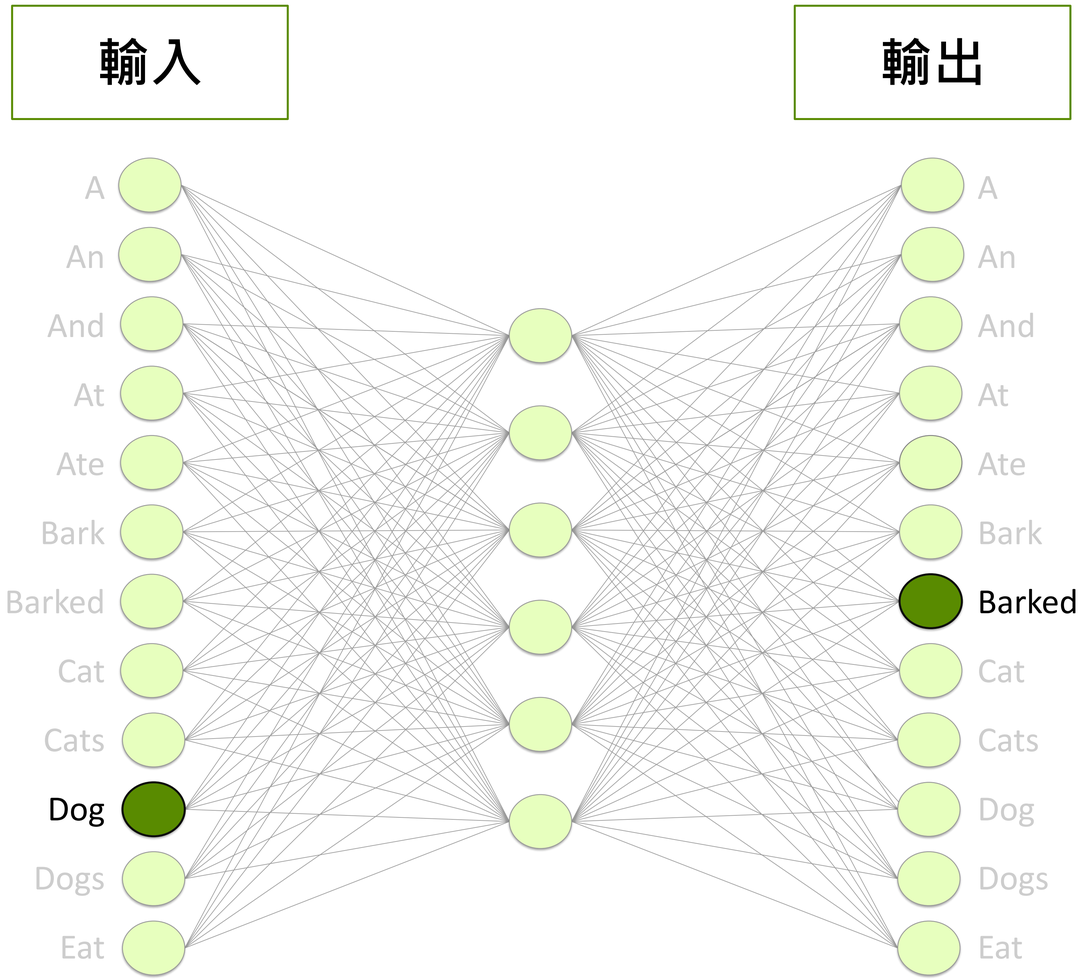
從詞語到數字

“A dog barked at a cat.”
(一隻狗對著一隻貓吠叫)

[1, 10, 7, 4, 1, 8]



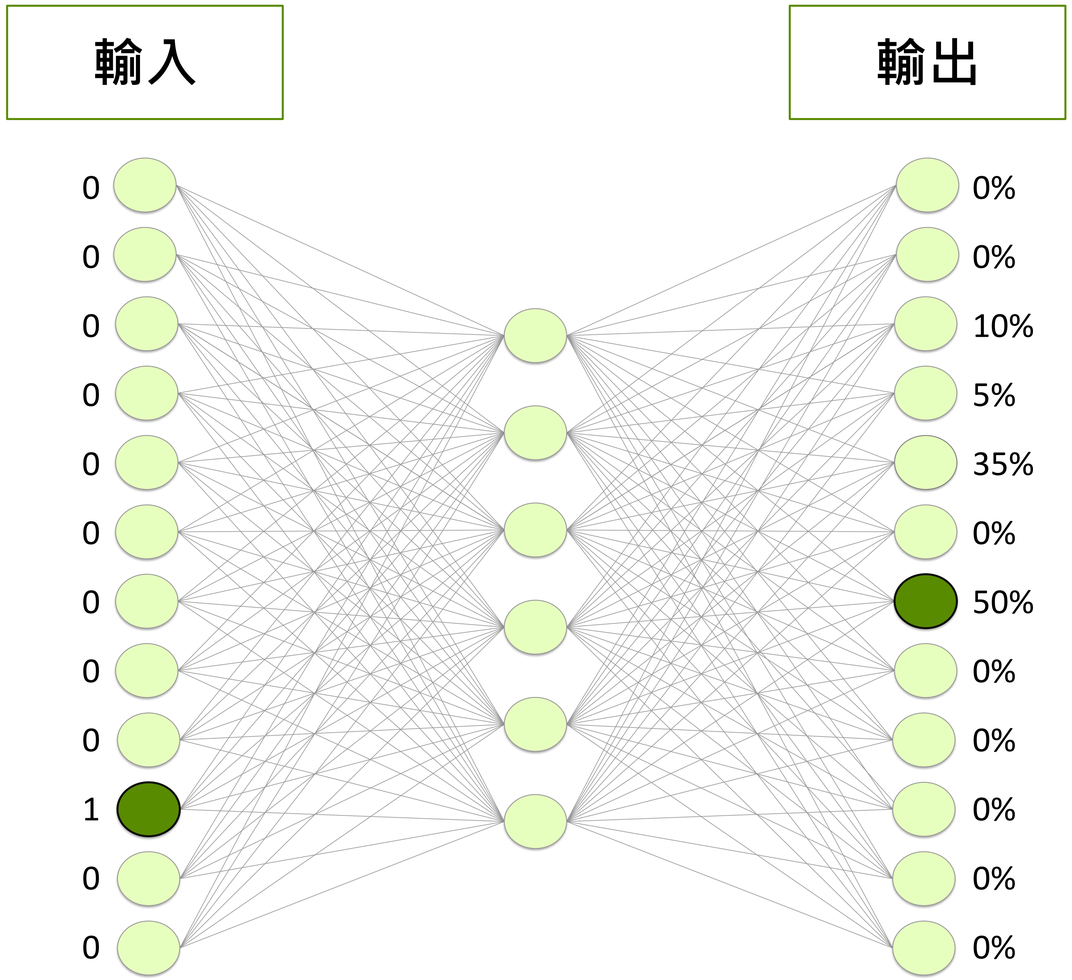
從詞語到數字



DICTIONARY

1. A
2. AN
3. AND
4. AT
5. ATE
6. BARK
7. BARKED
8. CAT
9. CATS
10. DOG
11. DOGS
12. EAT

從詞語到數字


輸入
輸出
0
0
0
0
0
0
0
0
0
1
0
0
0%
0%
10%
5%
35%
0%
50%
0%
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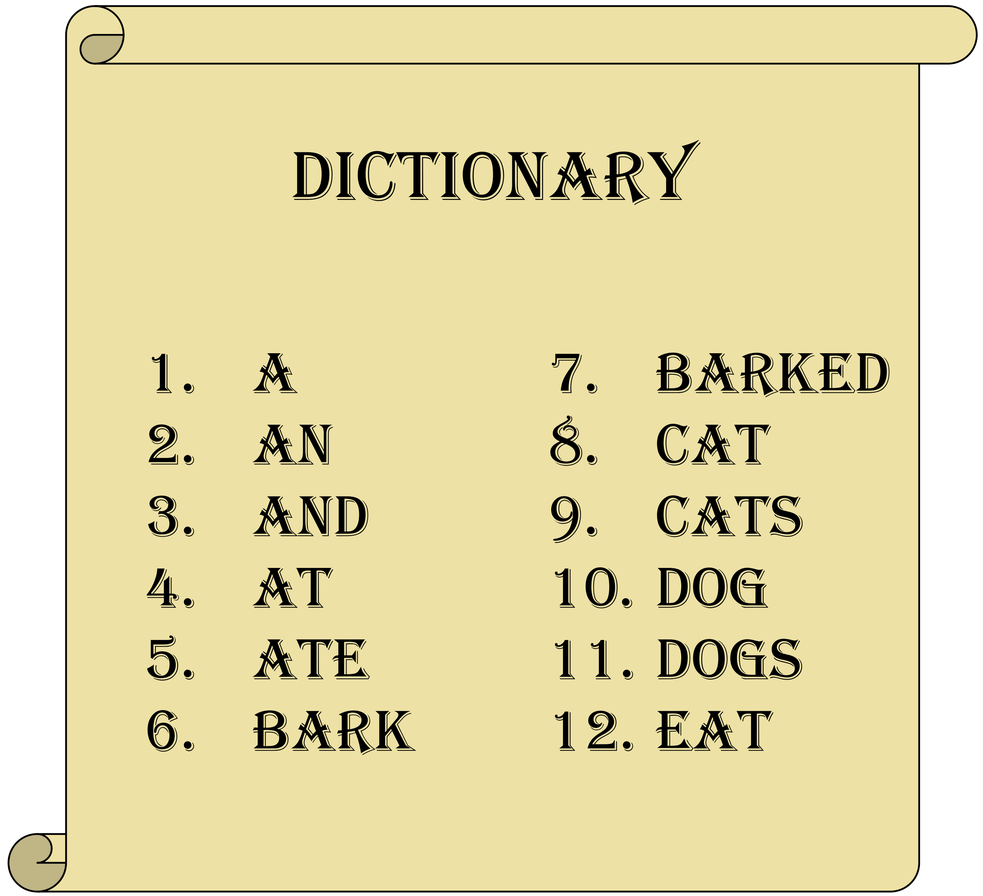
0%


DICTIONARY
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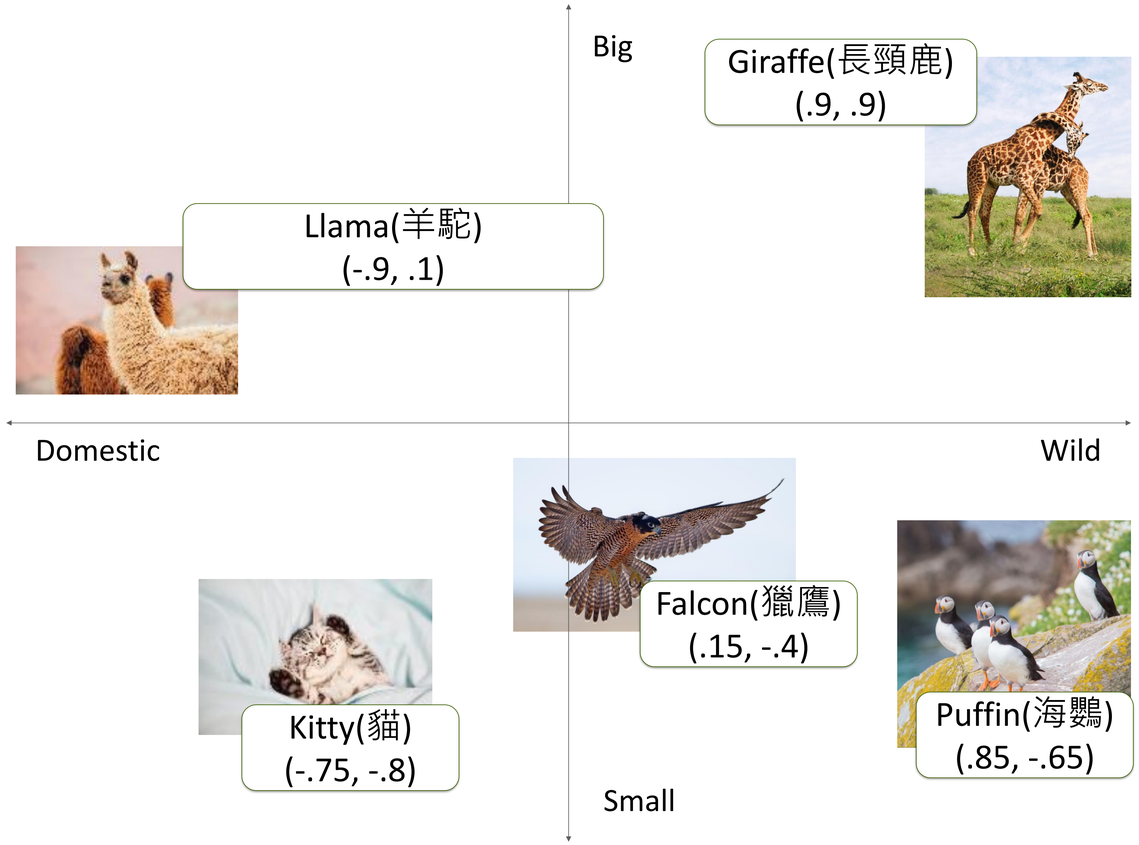
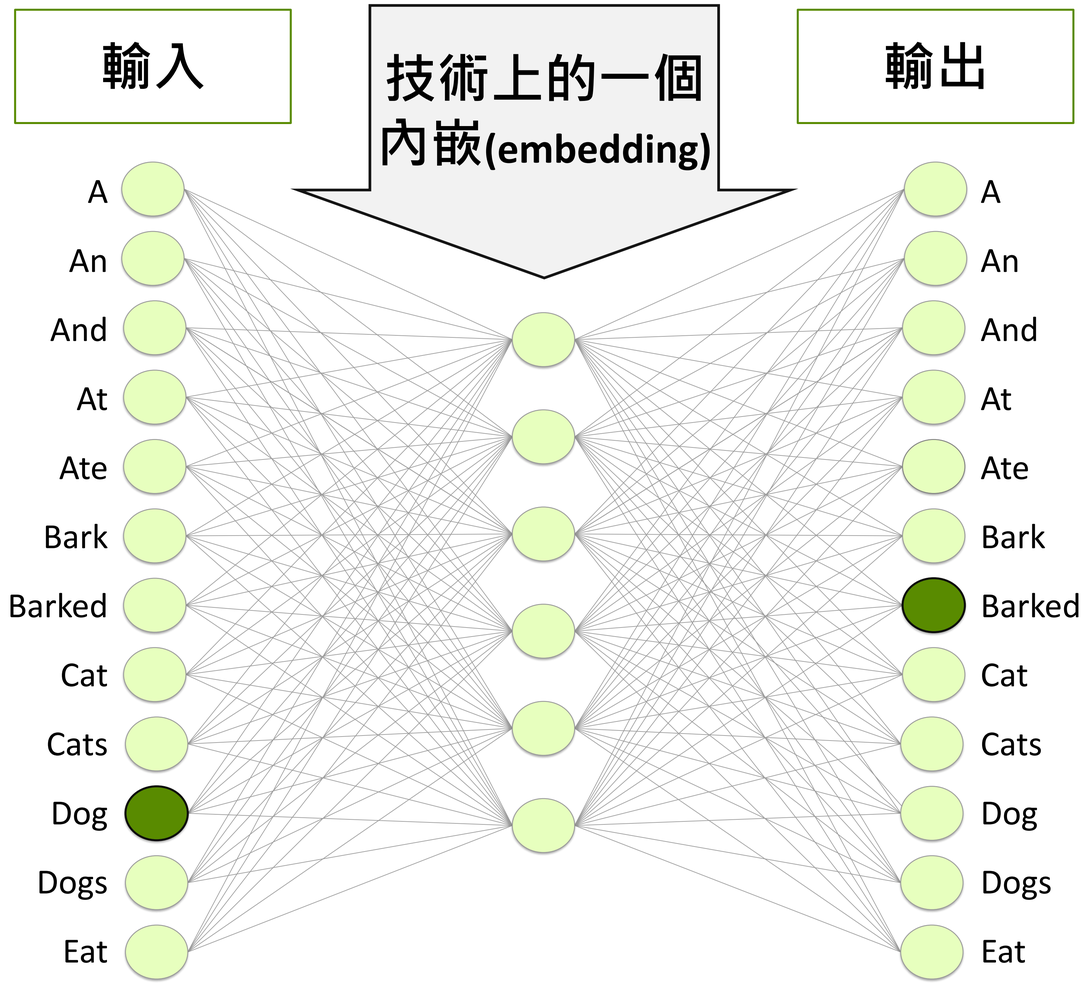
從詞語到數字



BIGGER DICTIONARY

1.	A	33.	BARKED	65.	EATEN
2.	AN	34.	CAT	66.	A
3.	AND	35.	CATS	67.	AN
4.	AT	36.	DOG	68.	AND
5.	ATE	37.	DOGS	69.	AT
6.	BARK	38.	EAT	70.	ATE
7.	BARKED	39.	EATEN	71.	BARK
8.	CAT	40.	A	72.	BARKED
9.	CATS	41.	AN	73.	CAT
10.	DOG	42.	AND	74.	CATS
11.	DOGS	43.	AT	75.	DOG
12.	EAT	44.	ATE	76.	DOGS
13.	EATEN	45.	BARK	77.	EAT
14.	A	46.	BARKED	78.	EATEN
15.	AN	47.	CAT	79.	...
16.	AND	48.	CATS	80.	...
17.	AT	49.	DOG	81.	...
18.	ATE	50.	DOGS	82.	...
19.	BARK	51.	EAT		
20.	BARKED	52.	EATEN		
21.	CAT	53.	A		
22.	CATS	54.	AN		
23.	DOG	55.	AND		
24.	DOGS	56.	AT		
25.	EAT	57.	ATE		
26.	EATEN	58.	BARK		
27.	A	59.	BARKED		
28.	AN	60.	CAT		
29.	AND	61.	CATS		
30.	AT	62.	DOG		
31.	ATE	63.	DOGS		
32.	BARK	64.	EAT		

從詞語到數字



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6.	BARK	38.	EAT	70.	ATE
7.	BARKED	39.	EATEN	71.	BARK
8.	CAT	40.	A	72.	BARKED
9.	CATS	41.	AN	73.	CAT
10.	DOG	42.	AND	74.	CATS
11.	DOGS	43.	AT	75.	DOG
12.	EAT	44.	ATE	76.	DOGS
13.	EATEN	45.	BARK	77.	EAT
14.	A	46.	BARKED	78.	EATEN
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20.	BARKED	52.	EATEN		
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22.	CATS	54.	AN		
23.	DOG	55.	AND		
24.	DOGS	56.	AT		
25.	EAT	57.	ATE		
26.	EATEN	58.	BARK		
27.	A	59.	BARKED		
28.	AN	60.	CAT		
29.	AND	61.	CATS		
30.	AT	62.	DOG		
31.	ATE	63.	DOGS		
32.	BARK	64.	EAT		

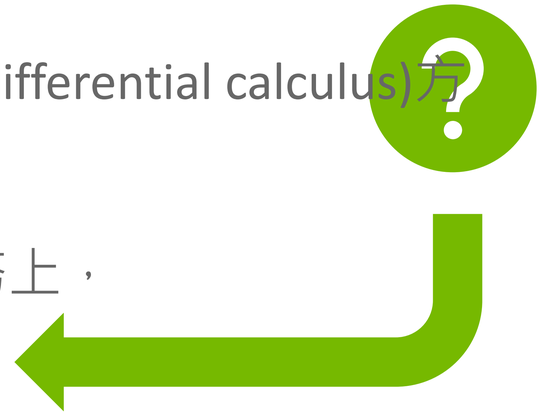
注意力機制(Attention)

句子預測

我是現代少將的完美典範，
我擁有關於植物、動物和礦物的資訊，

....

我在積分和微分演算(integral and differential calculus)方面非常擅長；
我知道微小動物的科學名稱：
總之，在植物、動物和礦物的事務上，
我是[redacted]的完美典範。



~少將 Stanley

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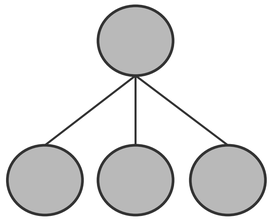
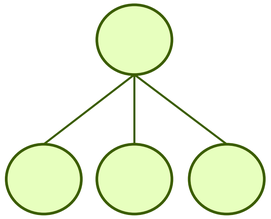
注意力機制(Attention)





I
am
the
very
model

5 x 3

Q

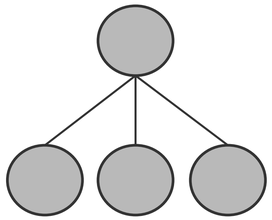
Query

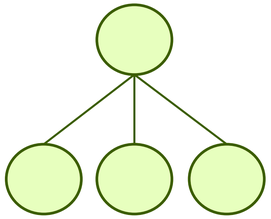
5 x 3

K

Key

注意力機制(Attention)





I						
am						
the						
very						
model						

5 x 3

Q

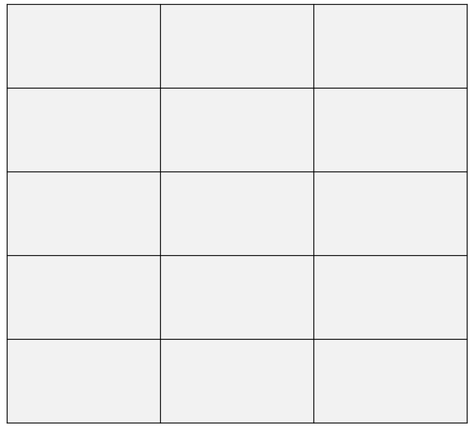
Query

5 x 3

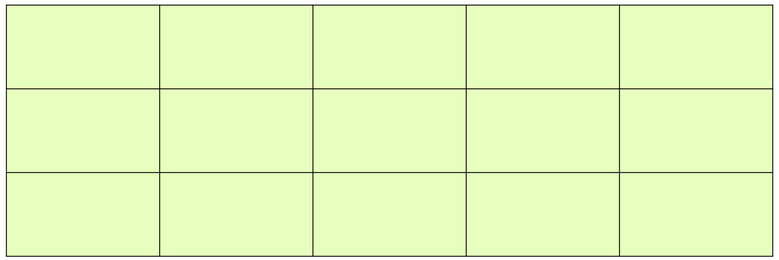
K

Key

注意力機制(Attention)

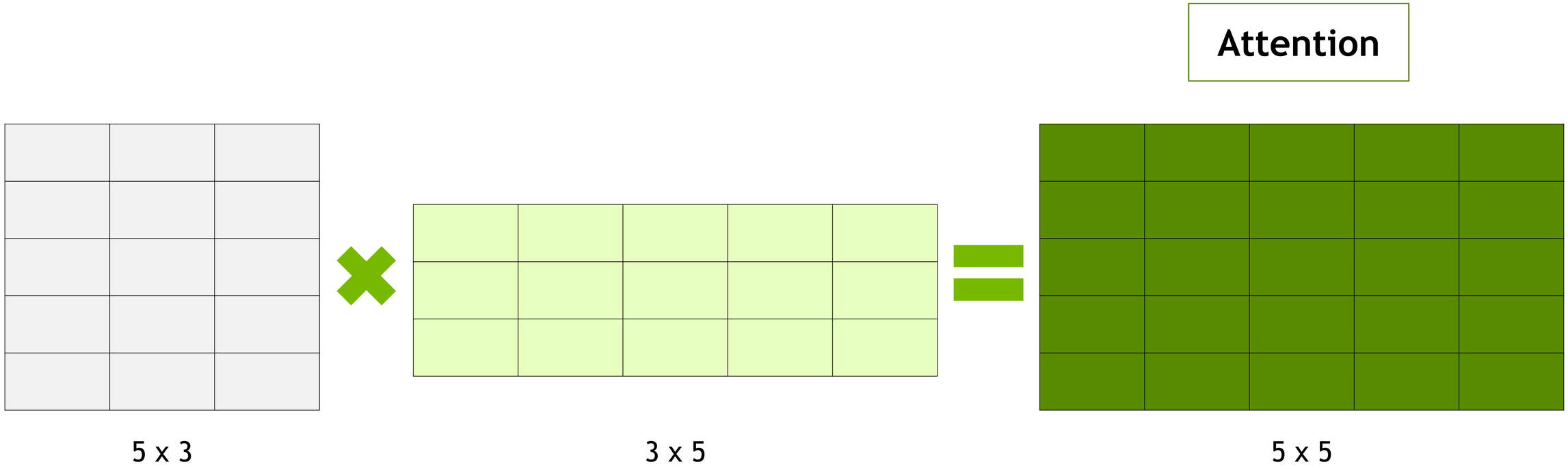


5 x 3

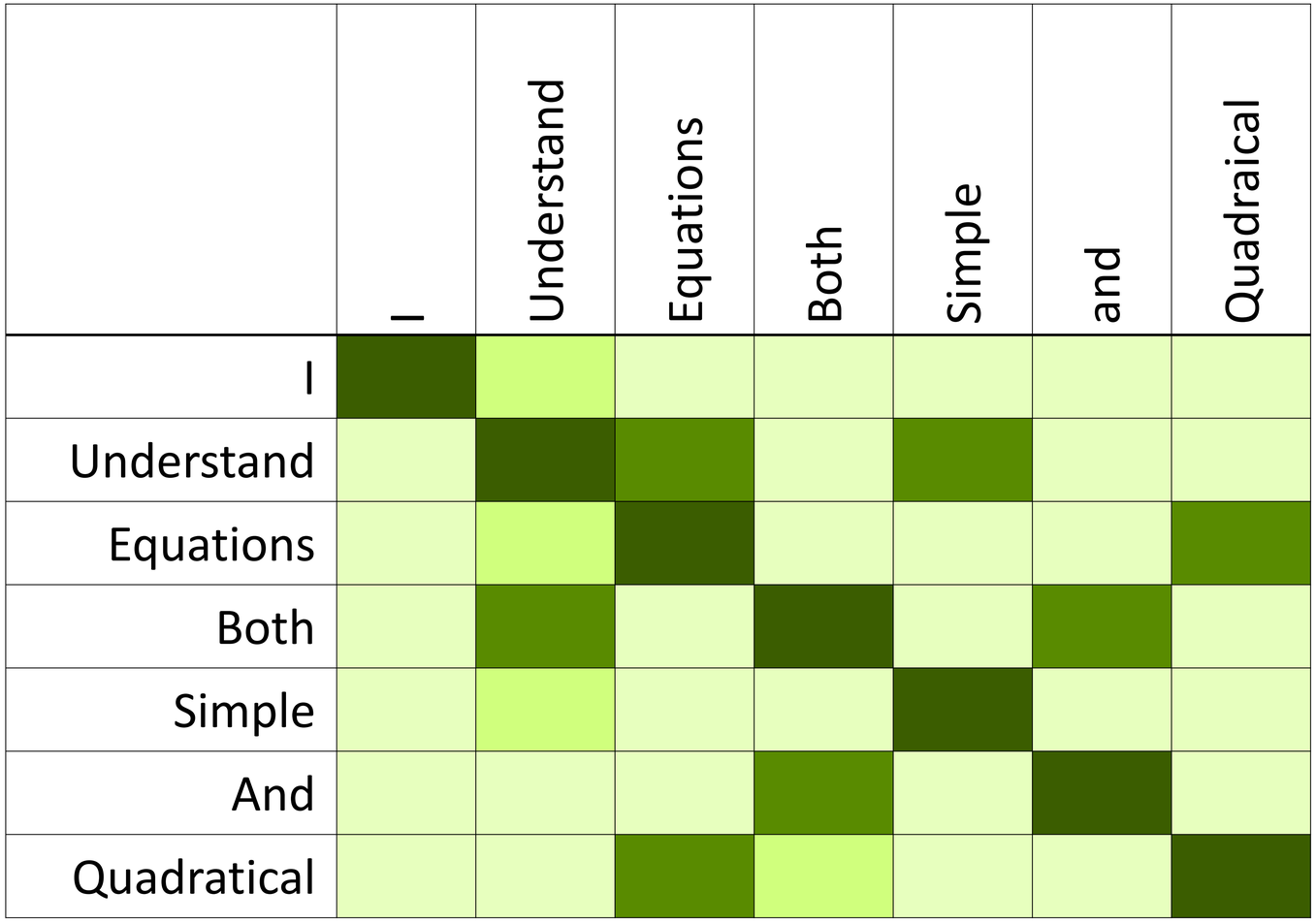


3 x 5

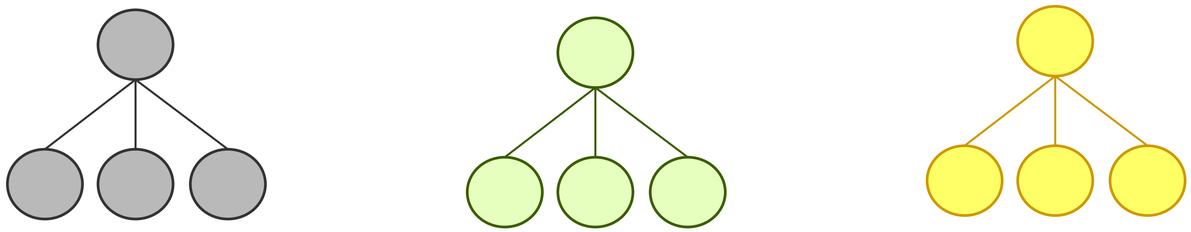
注意力機制(Attention)



注意力機制(Attention)



注意力機制(Attention)



I									
am									
the									
very									
model									

5 x 3

Q

Query

5 x 3

K

Key

5 x 3

V

Value

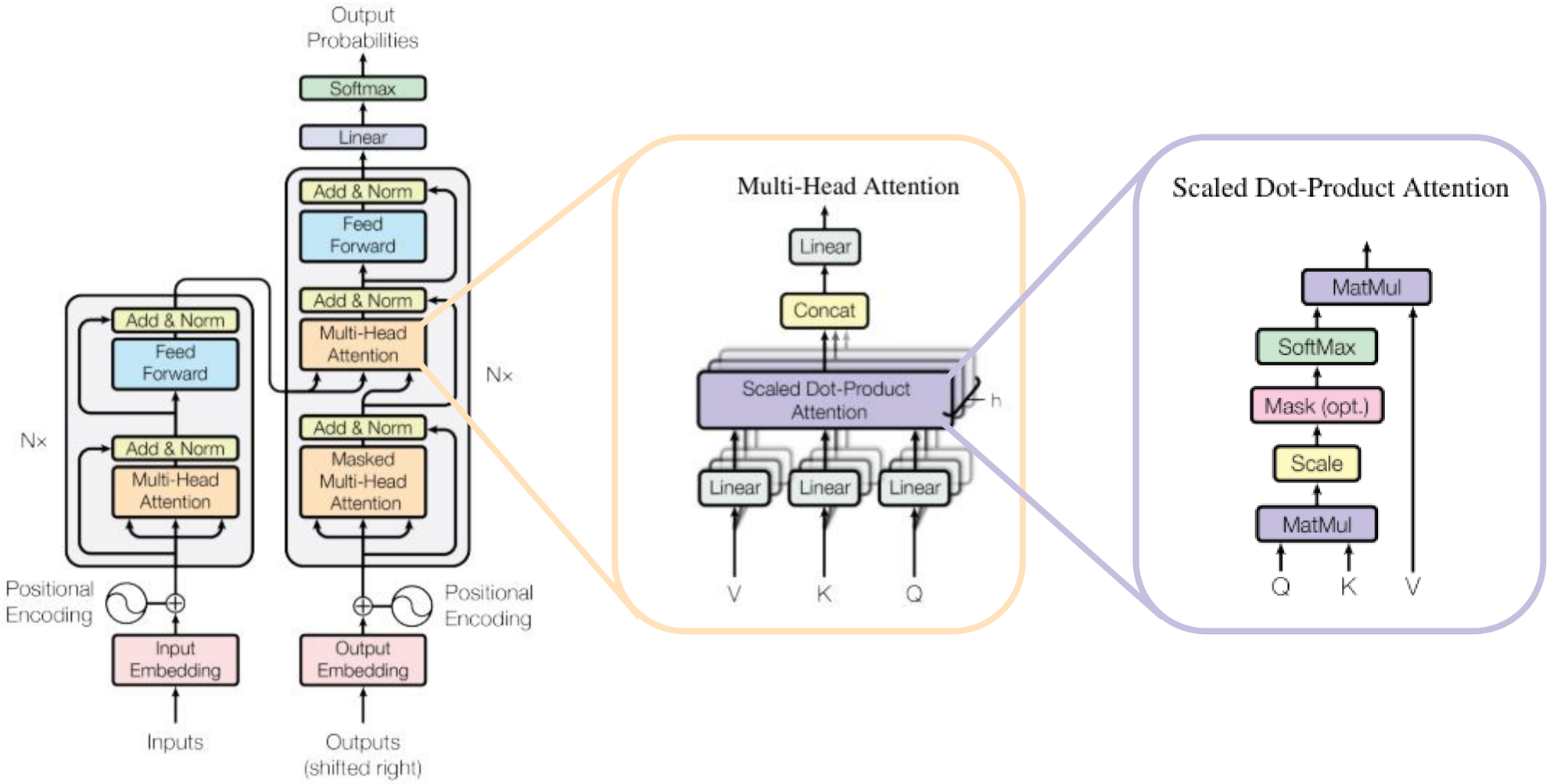
注意力機制(Attention)

$$Z = softmax\left(\frac{Q \times K^T}{\sqrt{d_k}}\right)V$$

I												
am												
the												
very												
model												

5 x 3	5 x 3	5 x 3	5 x 3
Q	K	V	Z
Query	Key	Value	Attention Score

Transformers



BERT

BERT: Pre-training of Deep Bidirectional Transformers for Language Understanding

Jacob Devlin **Ming-Wei Chang** **Kenton Lee** **Kristina Toutanova**
Google AI Language
{jacobdevlin,mingweichang,kentonl,kristout}@google.com

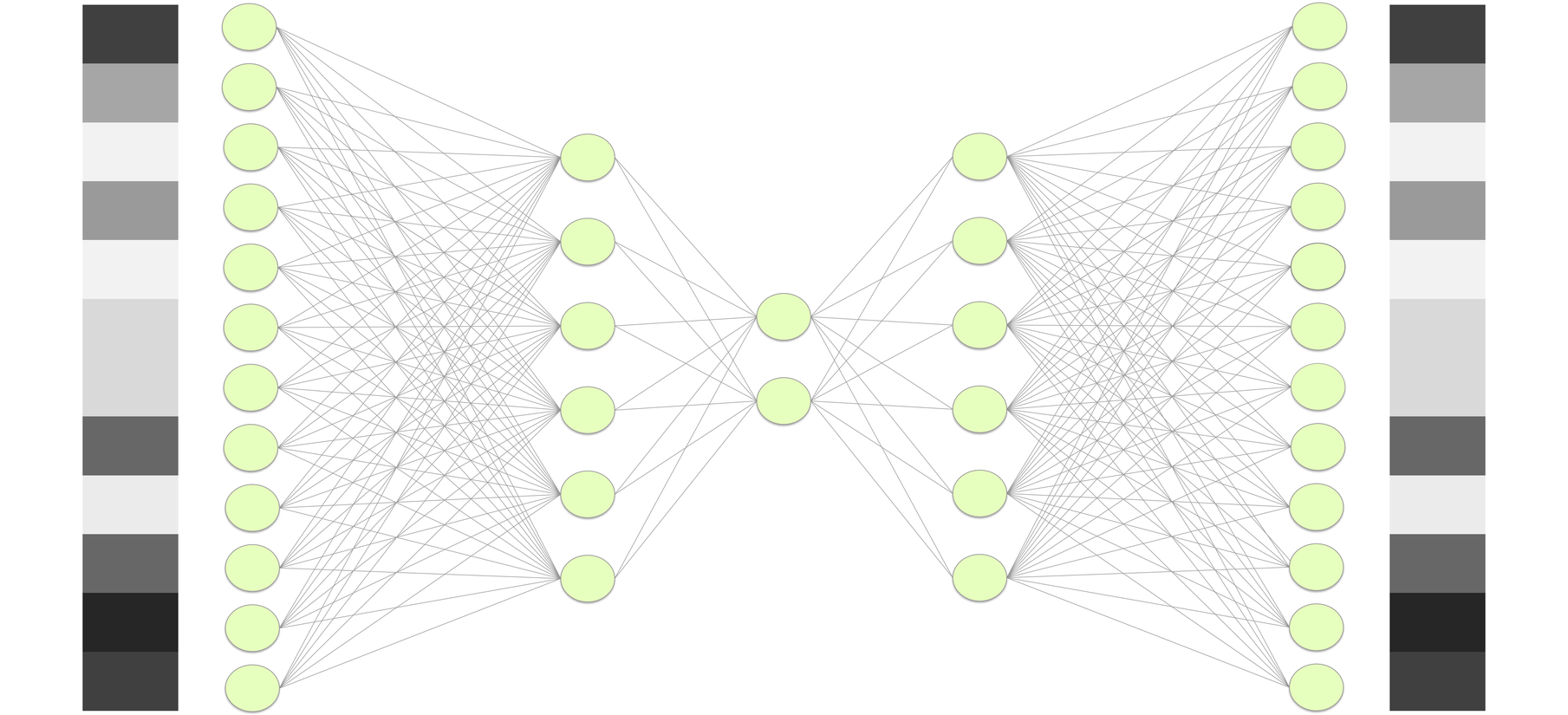
Abstract

We introduce a new language representation model called **BERT**, which stands for **B**idirectional **E**ncoder **R**epresentations from

There are two existing strategies for applying pre-trained language representations to downstream tasks: *feature-based* and *fine-tuning*. The feature-based approach, such as ELMo (Peters

其他架構

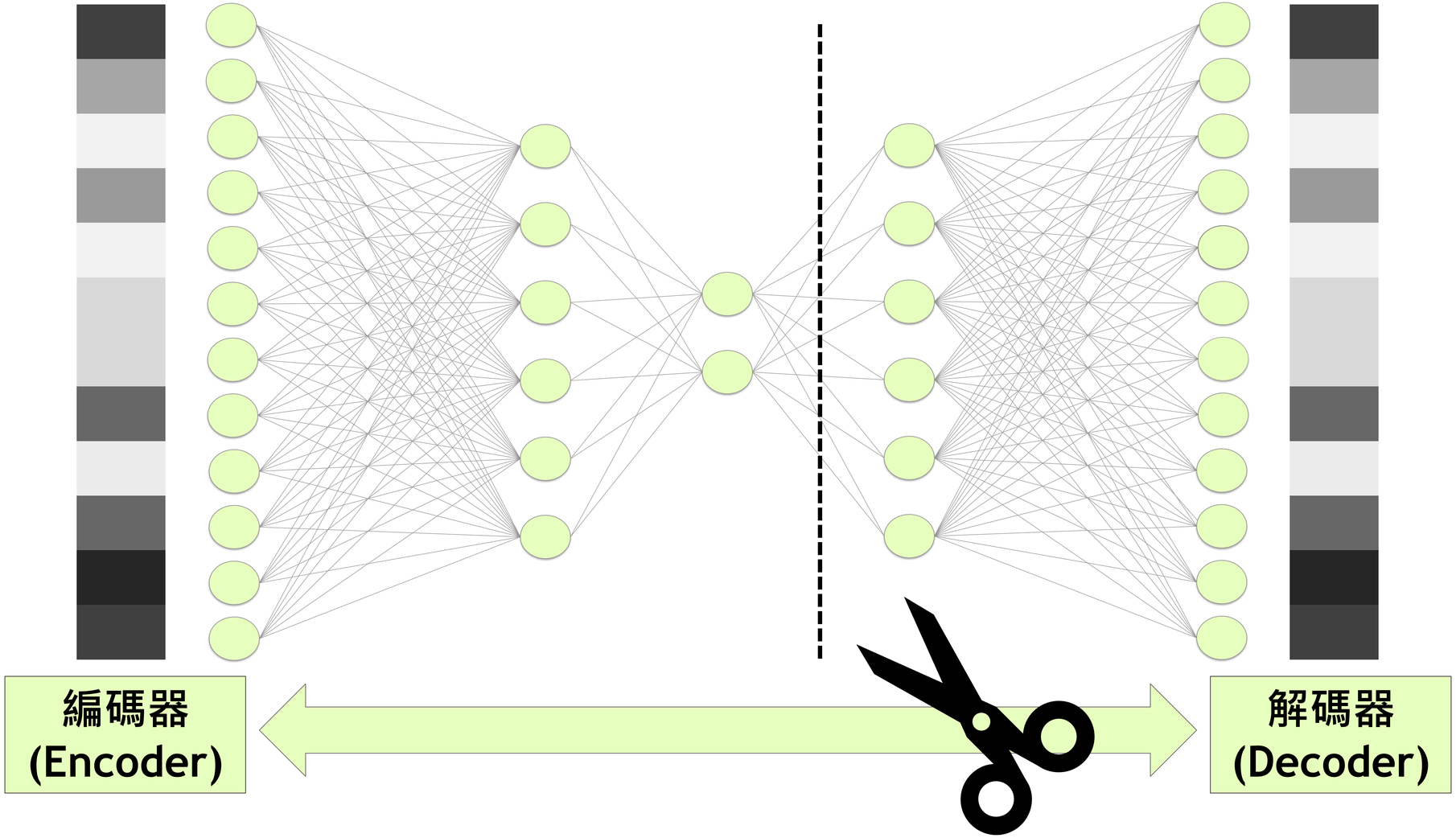
自編碼器(Autoencoder)



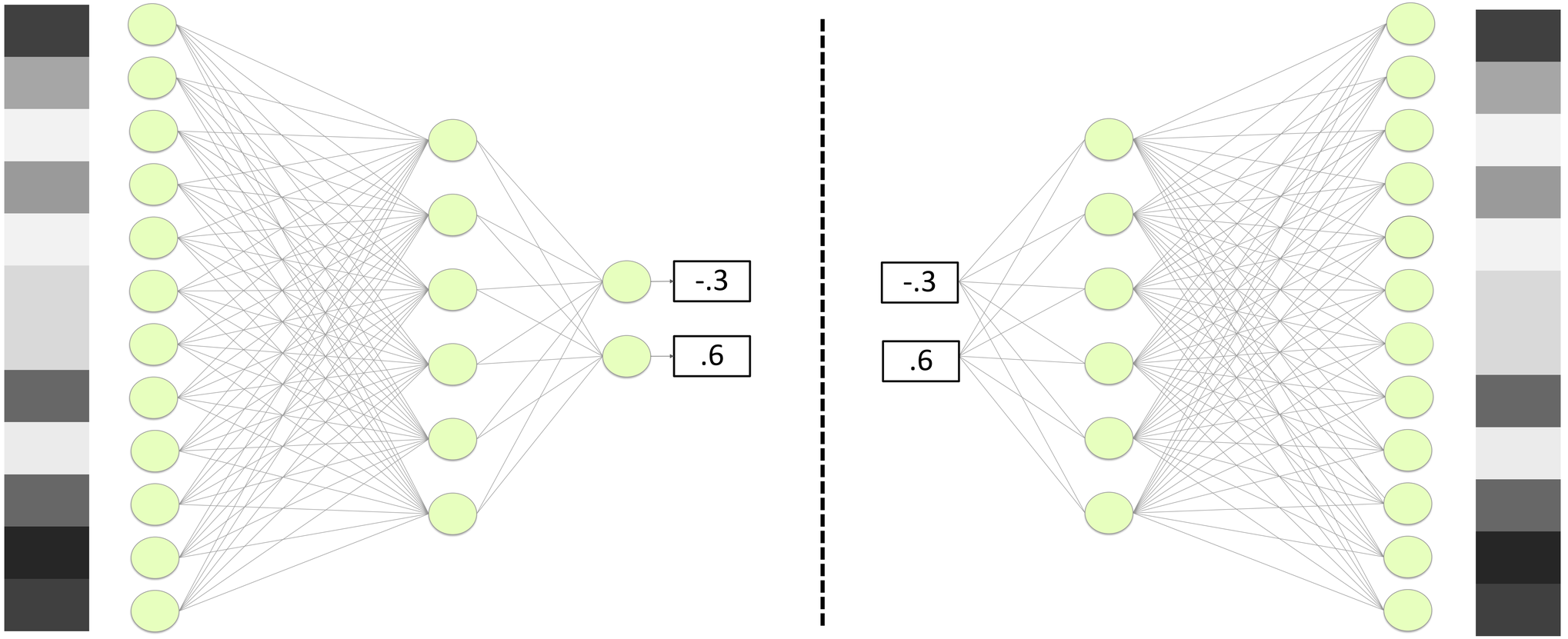
編碼器
(Encoder)

解碼器
(Decoder)

自編碼器(Autoencoder)



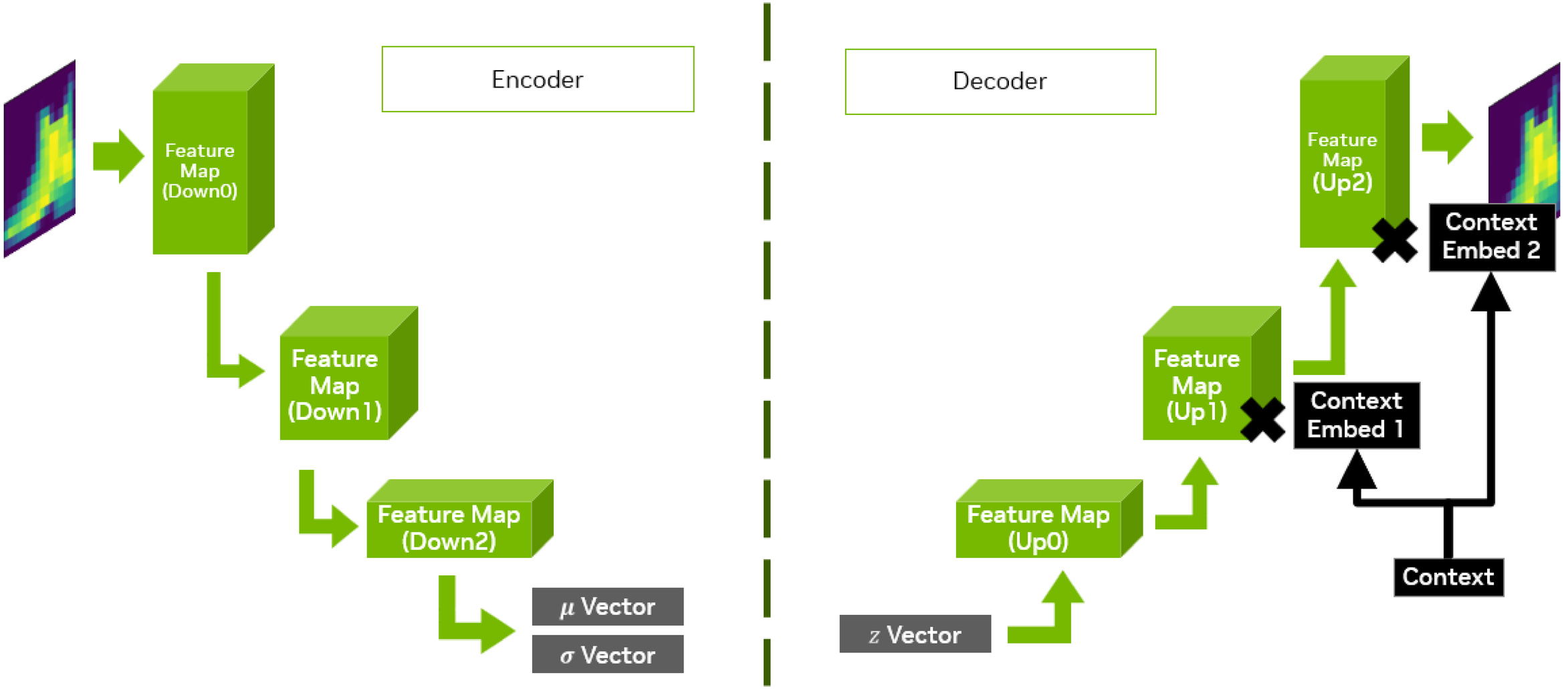
自編碼器(Autoencoder)



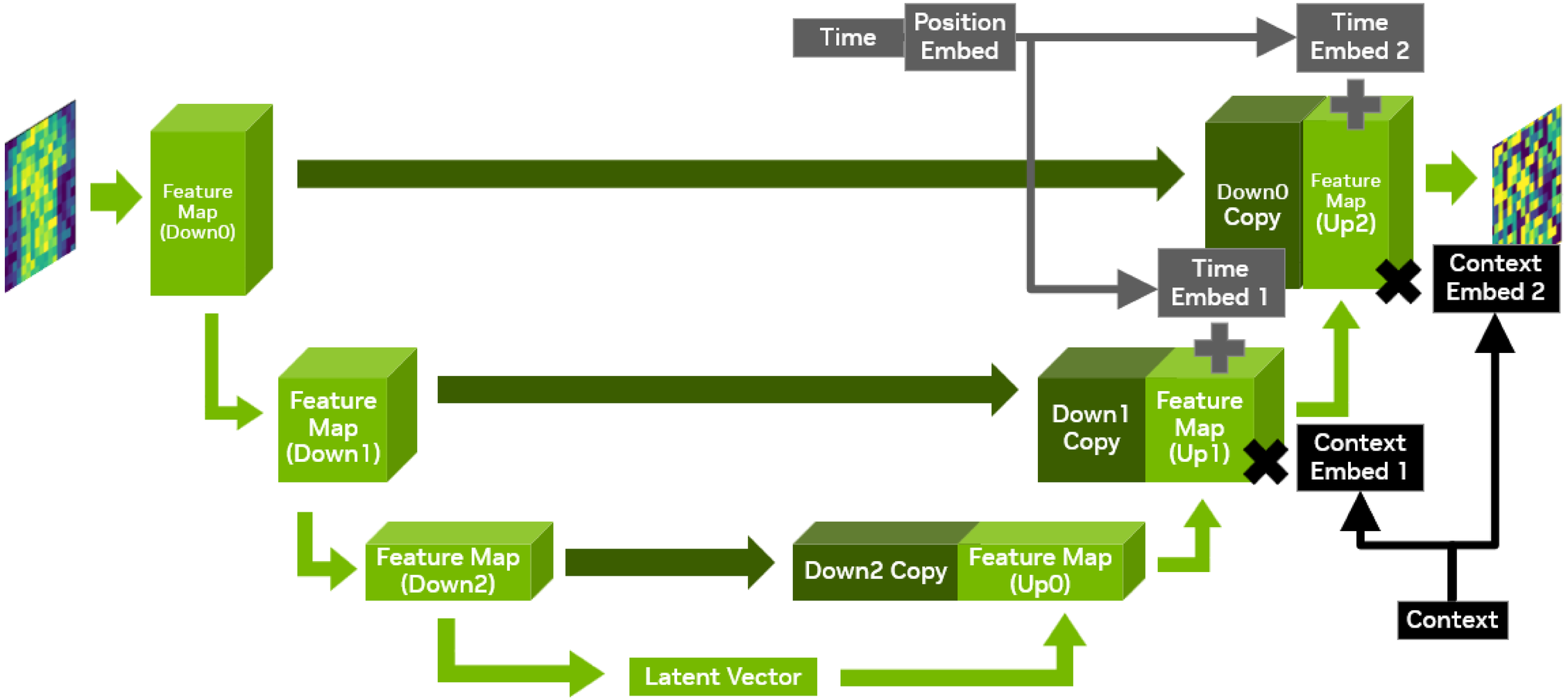
編碼器
(Encoder)

解碼器
(Decoder)

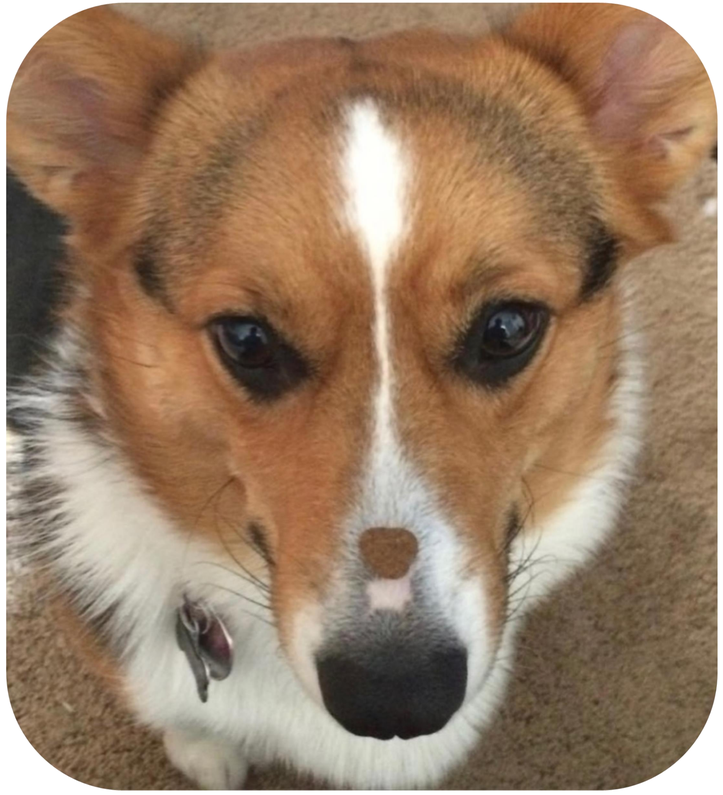
變分自編碼器(Variational Autoencoder)

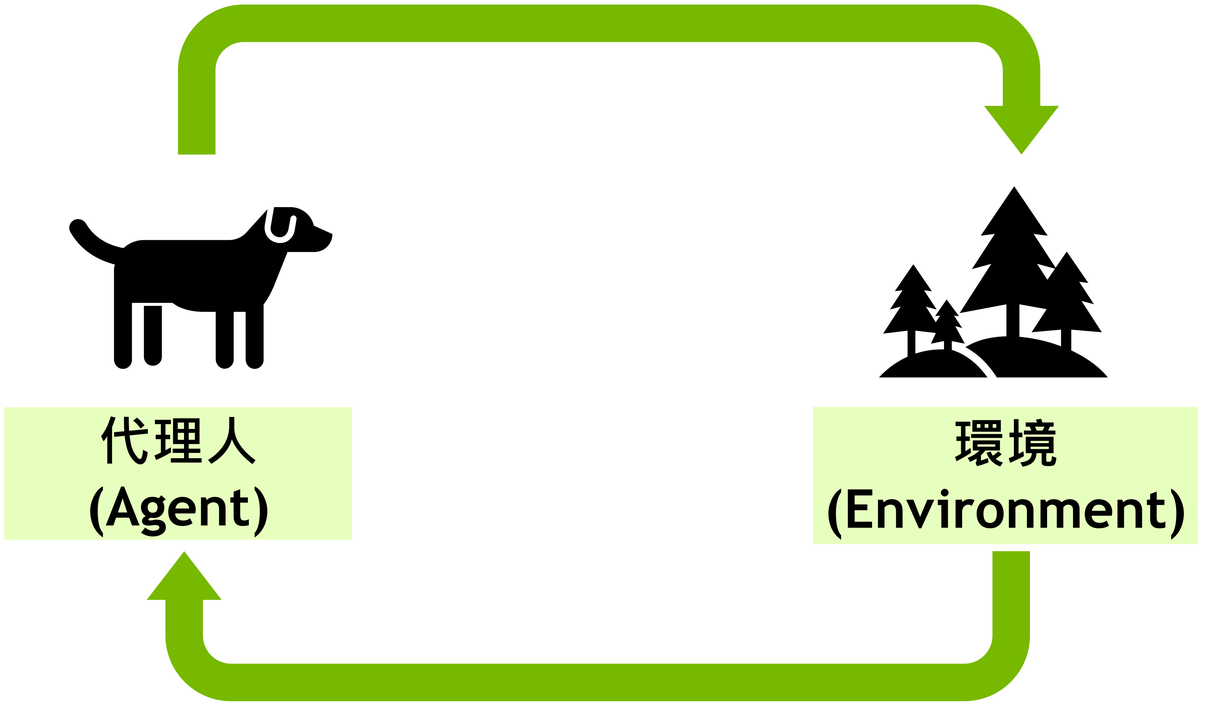


擴散模型(Diffusion Models)



強化學習(Reinforcement Learning)





下一步

使用NGC容器(Containers)實現可攜性(PORTABILITY)

廣泛性

- 支援多樣化的工作負載和特定行業使用案例

優化的

- 深度學習(DL)容器每月更新
- 包含最新功能和卓越效能

安全可靠

- 掃描漏洞和加密
- 在工作站、伺服器和雲端實例上測試

可擴展

- 支援多GPU和多節點(multi-node)系統

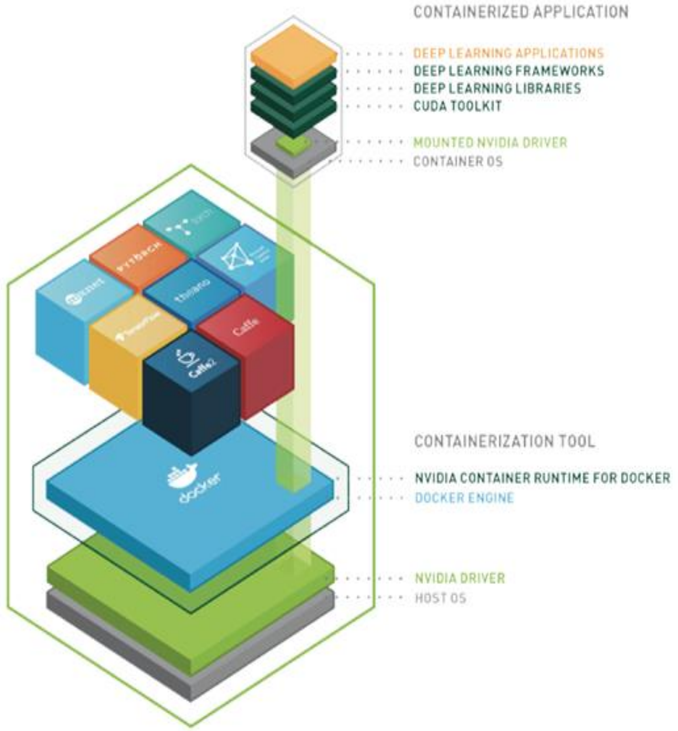
為企業和高效能運算(HPC)設計

- 支援Docker、Singularity和其他執行環境

隨處運行

- 裸機、虛擬機、Kubernetes
- x86, ARM, POWER
- 各種雲端環境、本地(on-prem)、混合(hybrid)、邊緣運算(edge)

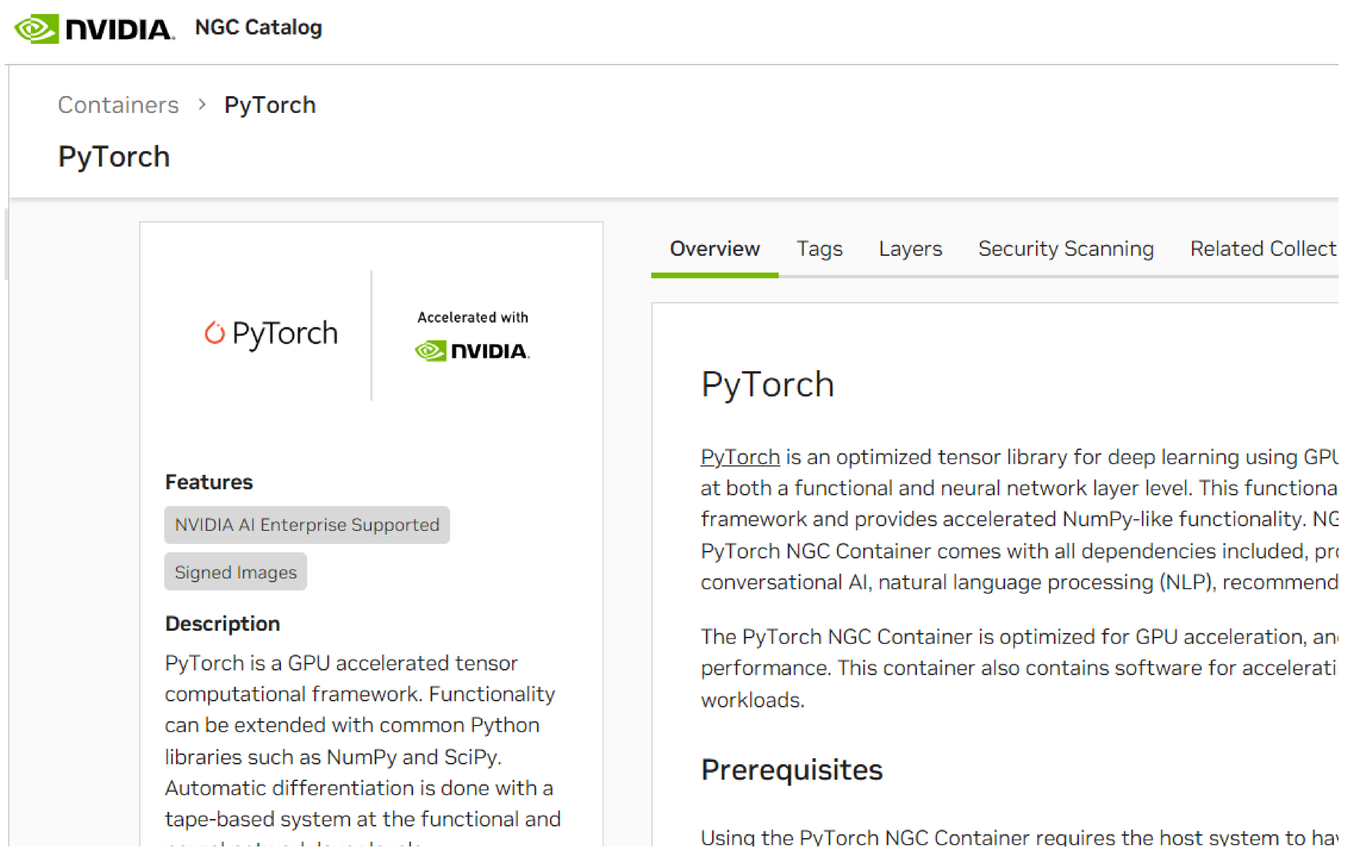
NGC Deep Learning Containers



CONVERSATIONAL AI Riva | HEALTHCARE CLARA | SMART CITIES DEEPSTREAM & SMART PARKING | TELECOM AERIAL | AUTONOMOUS DRIVING DRIVE | ROBOTICS ISAAC | HPC HPC SDK

Learn more about NGC Containers

本課程的後續步驟



Step 1 註冊NGC帳號

https://docs.nvidia.com/dgx/ngc-registry-for-dgx-user-guide/index.html

Step 2 使用 NGC Catalog

https://catalog.ngc.nvidia.com/orgs/nvidia/containers/pytorch

Step 3 下載及運行容器(container)

Visit localhost:8888 to check out a JupyterLab environment

課程感想

複製火箭科學

讓我們開始吧！