



DEEP
LEARNING
INSTITUTE

深度学习基础知识

第 6 部分：高级架构

课程议题

第 1 部分：深度学习简介

第 2 部分：神经网络是如何训练的

第 3 部分：卷积神经网络

第 4 部分：数据增强与模型部署

第 5 部分：预训练的模型

第 6 部分：更高级的模型结构

课程议题 - 第 6 部分

- 继续学习
- 自然语言处理
- 循环神经网络
- 其它网络结构
- 结束语

继续学习

AI 领域



计算机视觉

- 光学



自然语言处理

- 语言学



强化学习

- 博弈论
- 心理学



异常检测

- 安全
- 医学

AI 领域



计算机视觉
• 光学



自然语言处理
• 语言学



强化学习
• 博弈论
• 心理学



异常检测
• 安全
• 医学

AI 领域



计算机视觉
• 光学



自然语言处理
• 语言学



强化学习
• 博弈论
• 心理学



异常检测
• 安全
• 医学

自然语言处理

将单词转换为数字

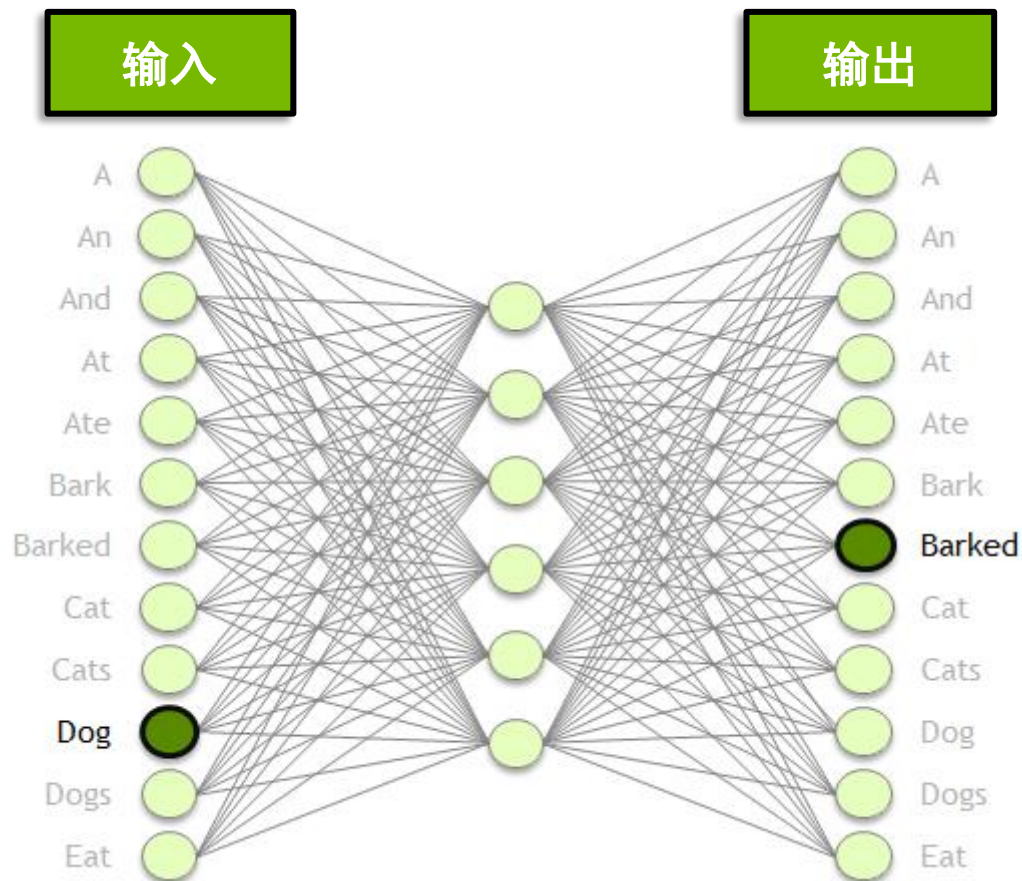
“A dog barked at a cat.”

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

字典

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

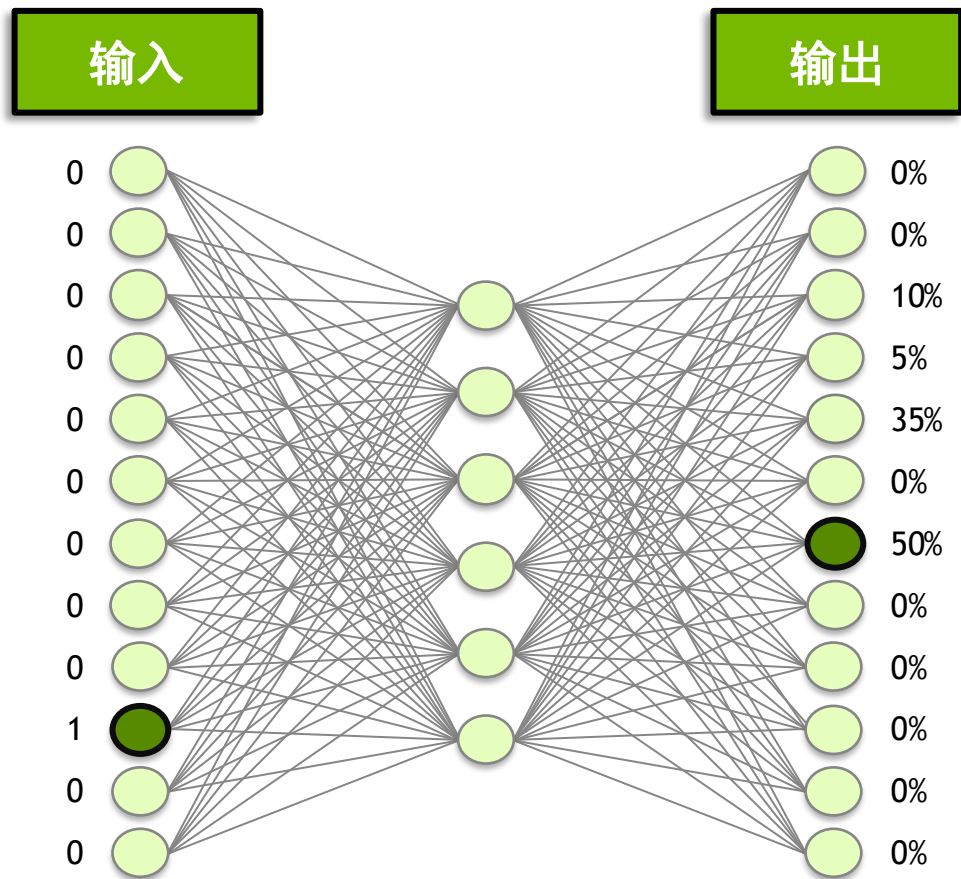
将单词转换为数字



字典

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

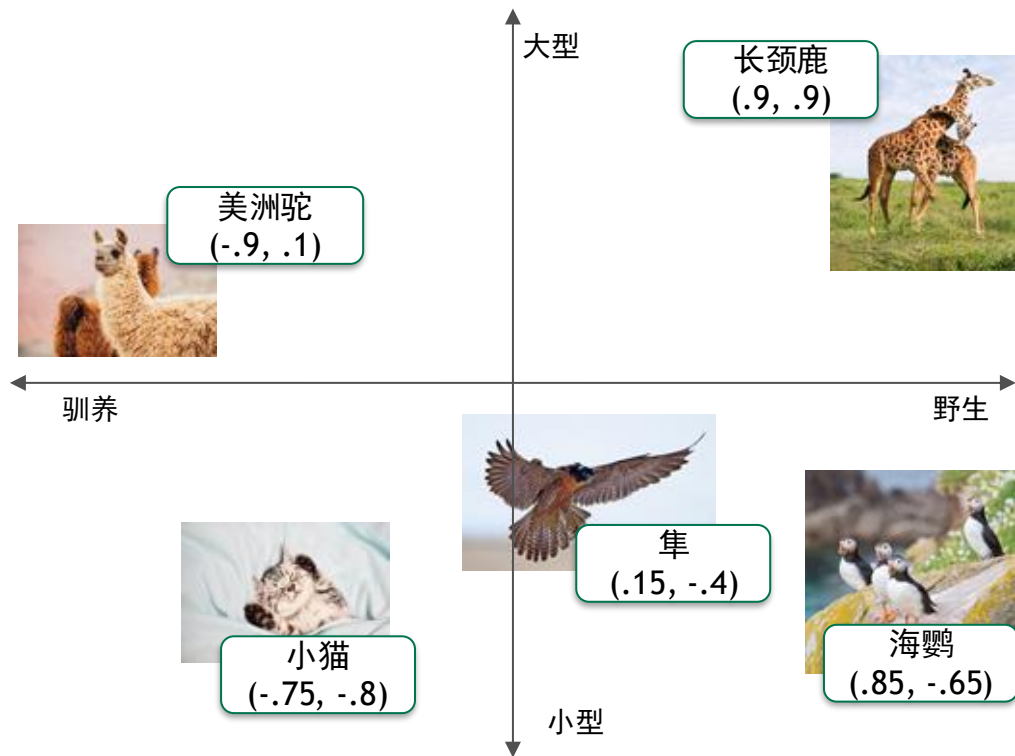
将单词转换为数字



字典

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

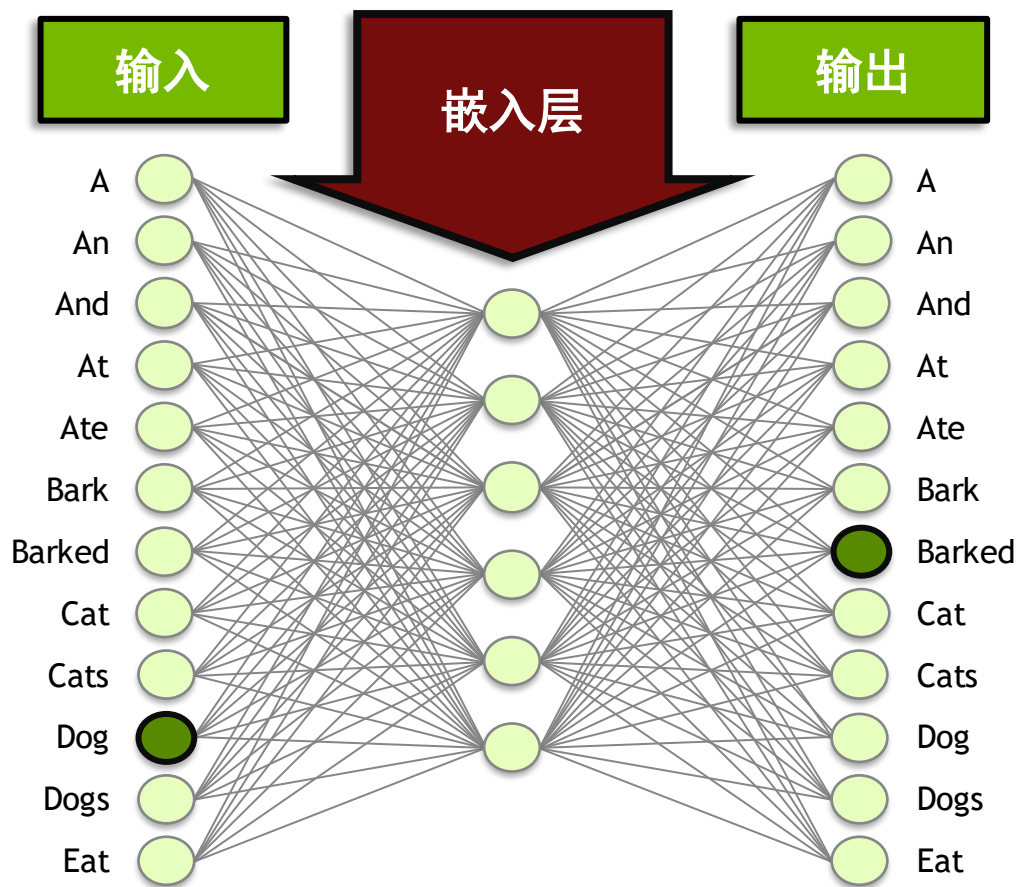
将单词转换为数字



更大的字典

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		

将单词转换为数字



更大的字典


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		

注意力机制

句子预测

I am the very model of a modern Major-General,
I've information vegetable, animal, and mineral,

...

I'm very good at integral and differential calculus;
I know the scientific names of beings animalculous:
In short, in matters vegetable, animal, and mineral,
I am the very model of 



~ Major-General Stanley

句子预测

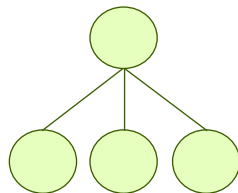
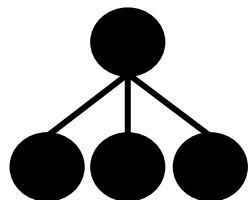
I am the very model of a modern Major-General,
I've information vegetable, animal, and mineral,

...

I'm very good at integral and differential calculus;
I know the scientific names of beings animalculous:
In short, in matters vegetable, animal, and mineral,
I am the very model of a modern Major-General.

~ Major-General Stanley

注意力机制



I
am
the
very
model

5 x 3

Q

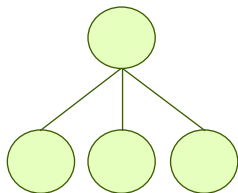
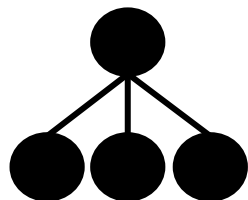
Query

5 x 3

K

Key

注意力机制



I						
am						
the						
very						
model						

5 x 3

5 x 3

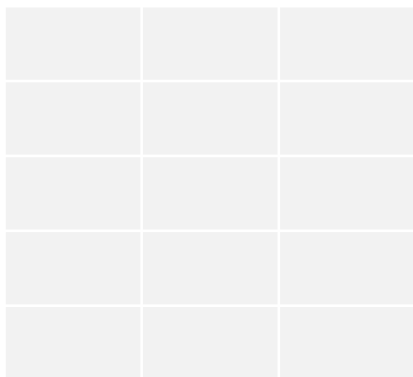
Q

K

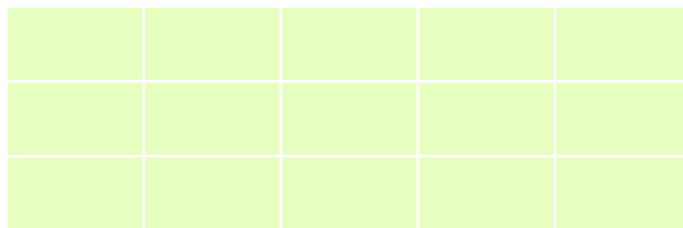
Query

Key

注意力机制

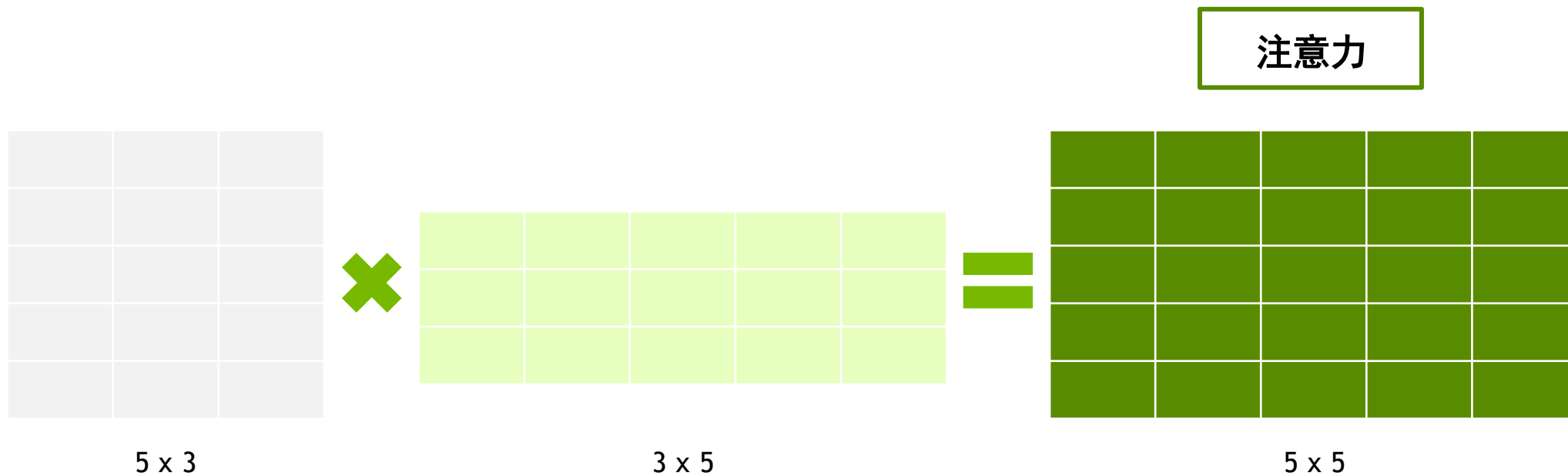


5 x 3



3 x 5

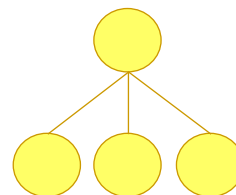
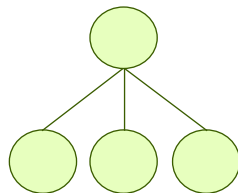
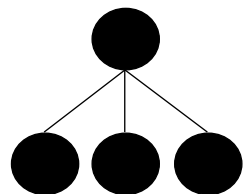
注意力机制



注意力机制

	I	Understand	Equations	Both	Simple	and	Quadratic
I							
Understand							
Equations							
Both							
Simple							
And							
Quadratic							

注意力机制



I									
am									
the									
very									
model									

5 x 3

Q

Query

5 x 3

K

Key

5 x 3

V

Value

注意力机制

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

I												
am												
the												
very												
model												

5 x 3

5 x 3

5 x 3

5 x 3

Q

K

V

Z

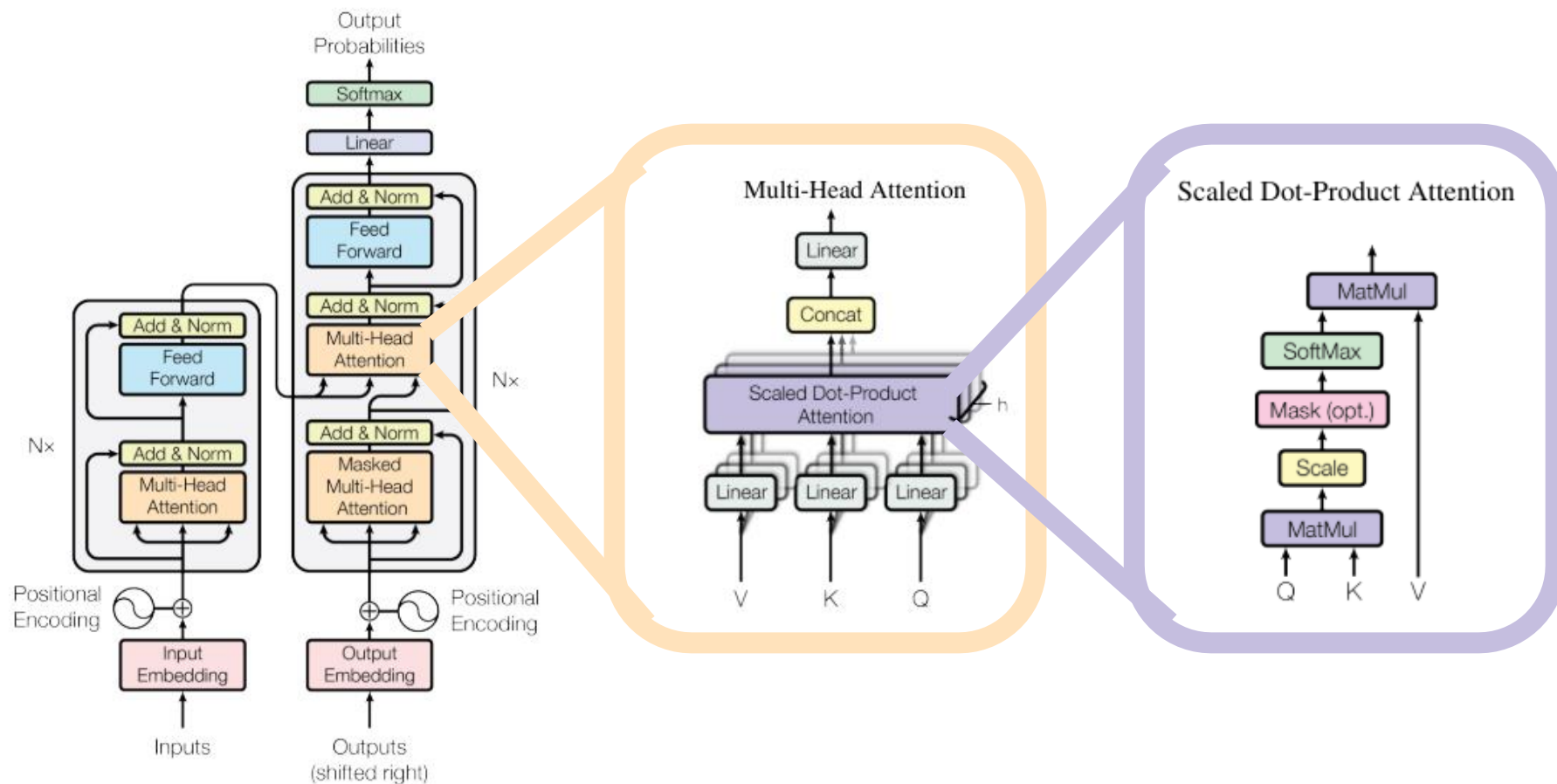
Query

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

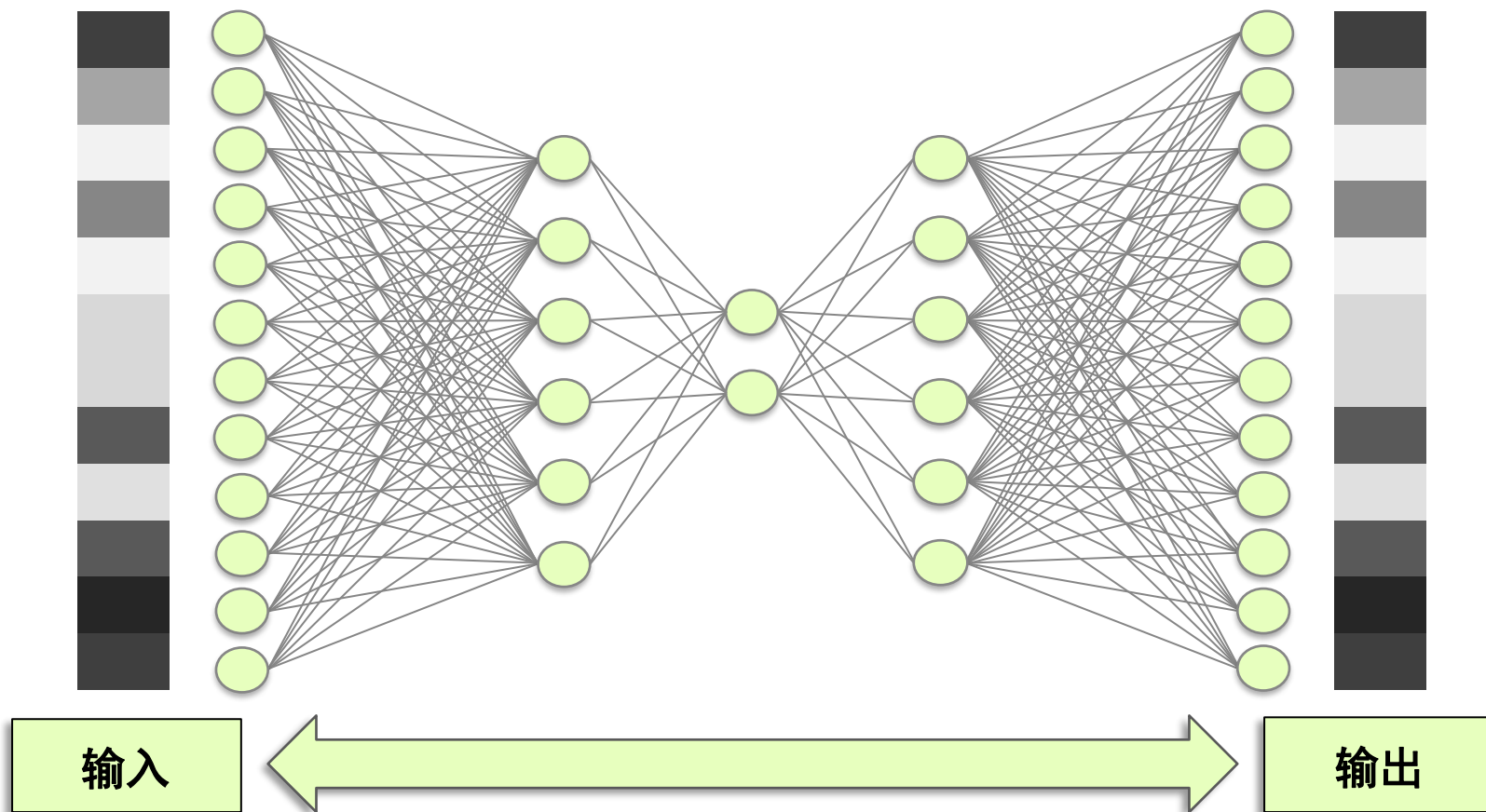
Abstract

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

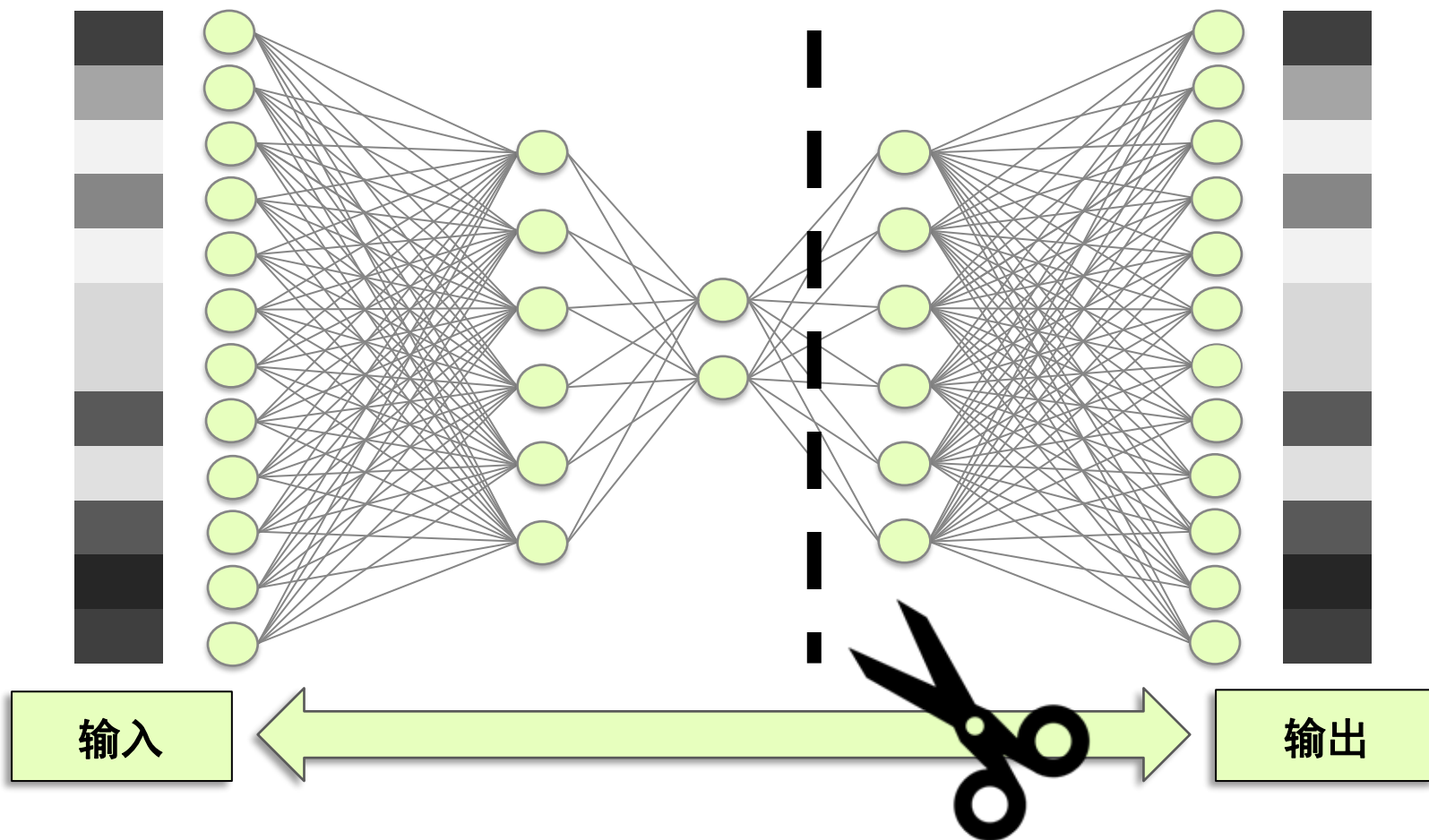
There are two existing strategies for applying pre-trained language representations to downstream tasks: *feature-based* and *fine-tuning*. The feature-based approach, such as ELMo (Peters

其它架构

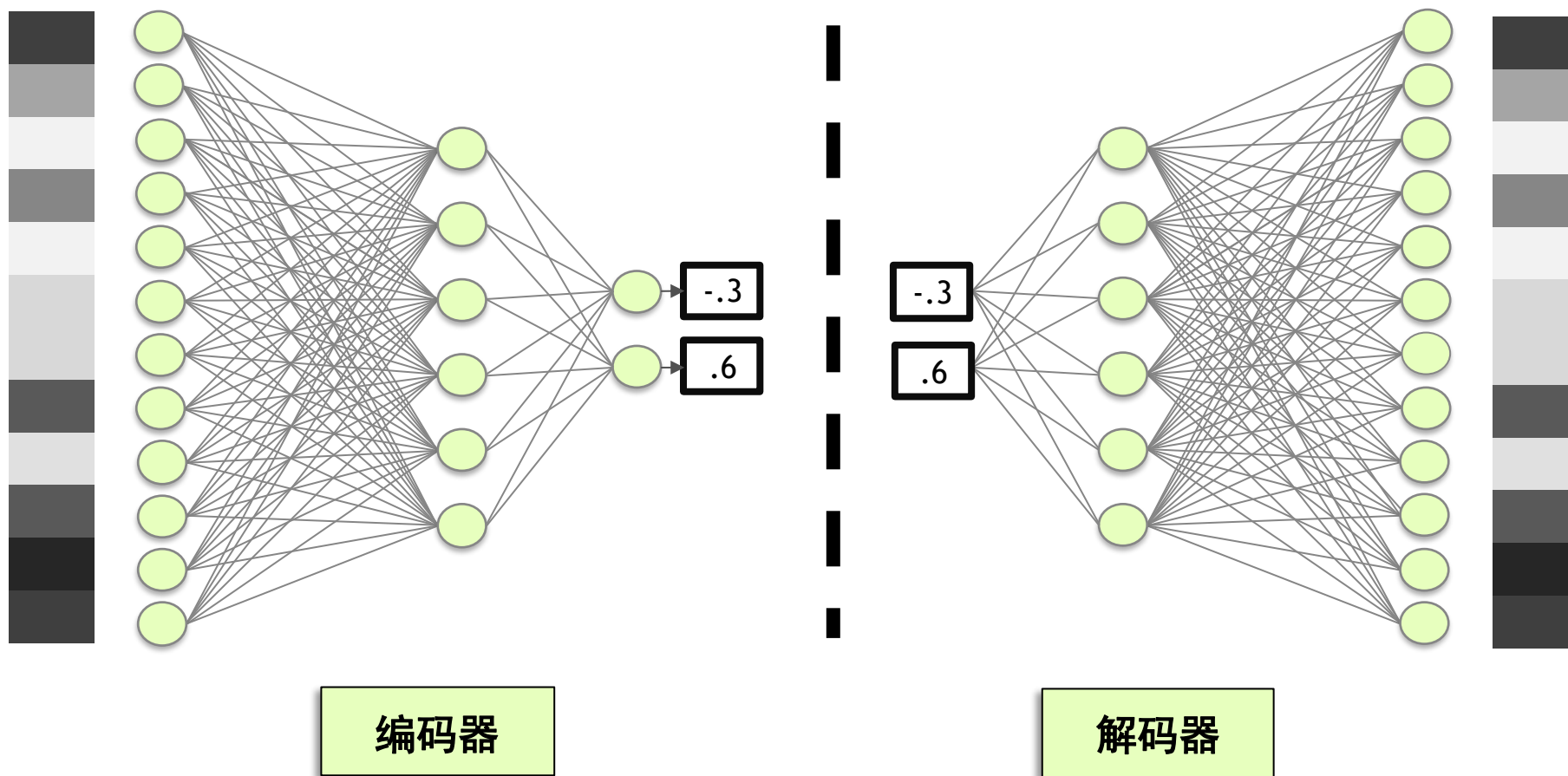
自编码器



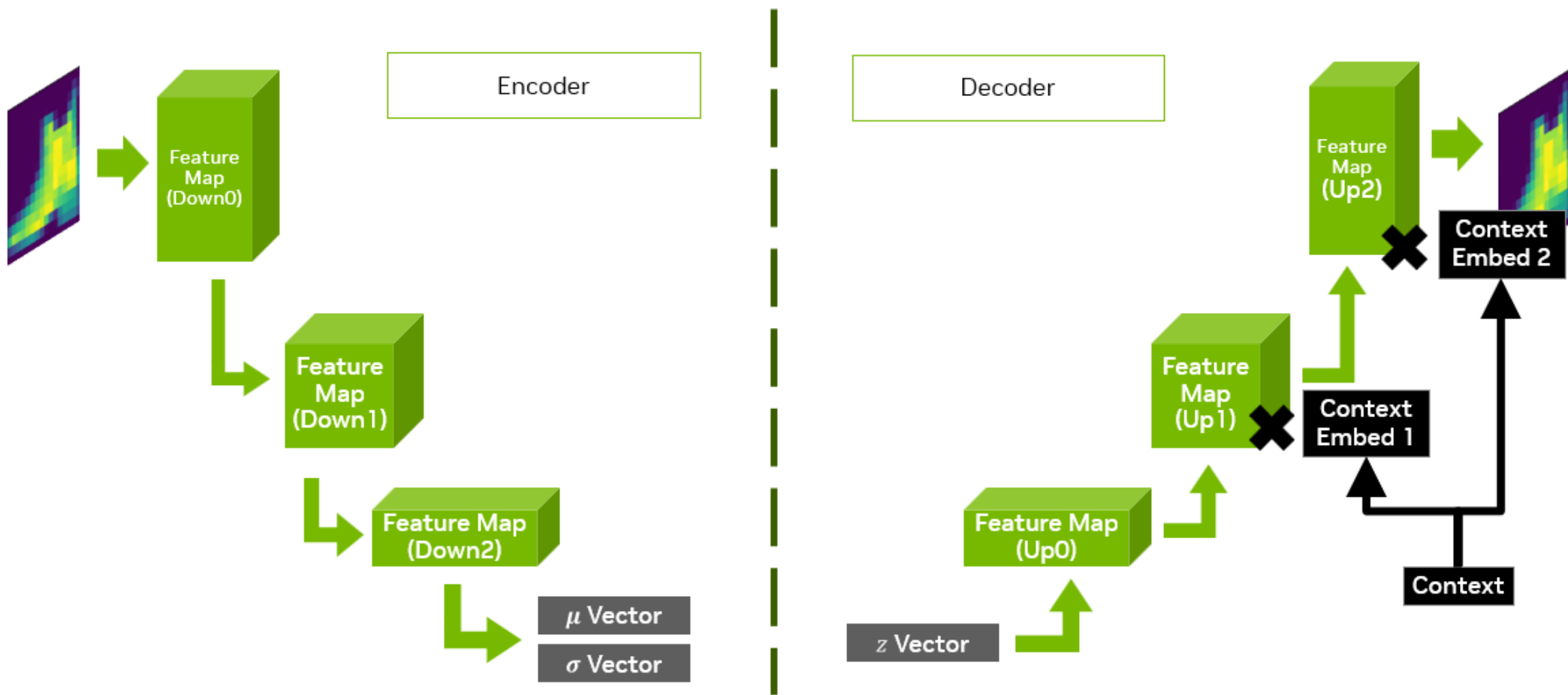
自编码器



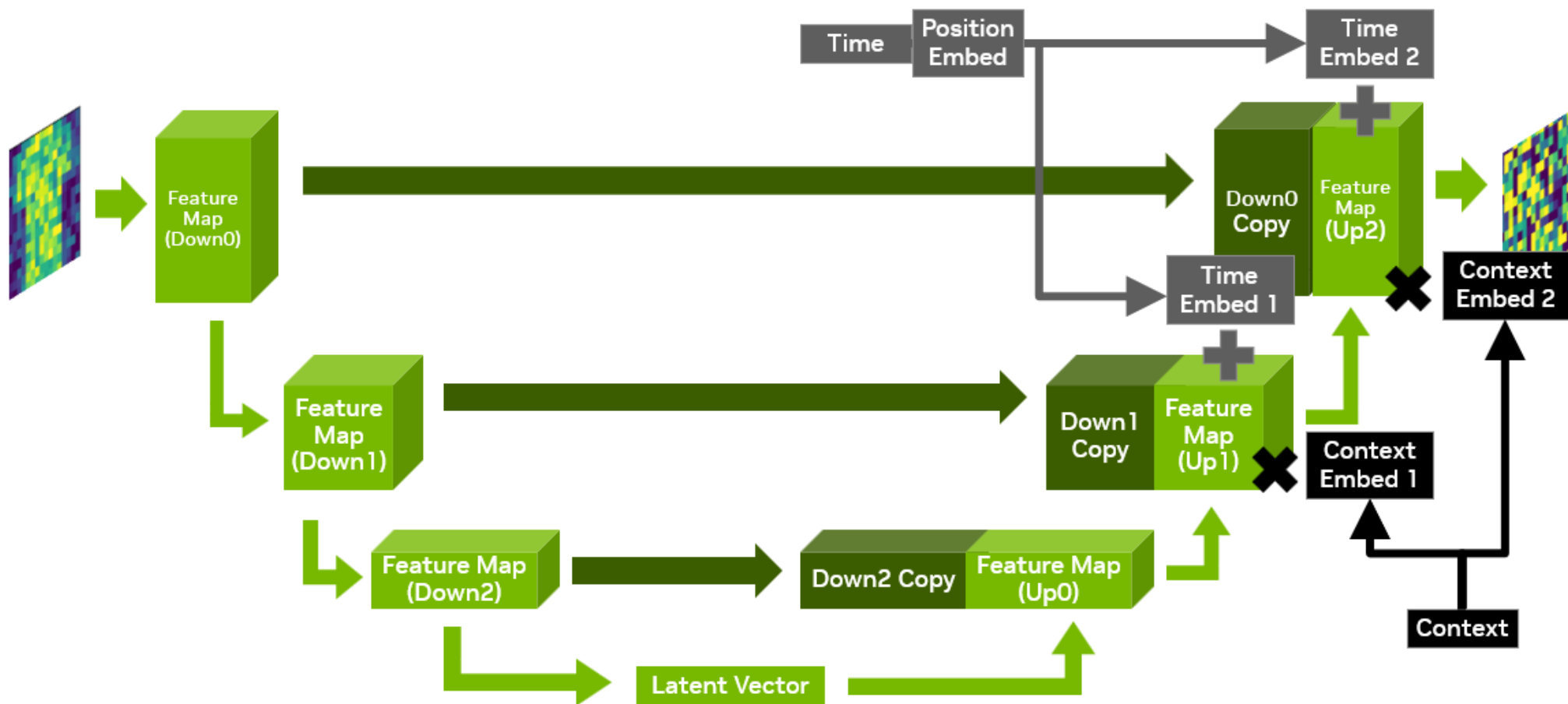
自编码器



变分自编码器



扩散模型（Diffusion Model）



强化学习



下一步

利用NGC容器实现可移植

范围广

- 多种类型的工作负载和针对不同行业的应用

优化

- DL容器每月更新一次
- 具备最新功能和卓越性能

安全可靠

- 漏洞扫描和加密
- 在工作站，服务器和云实例上进行了测试

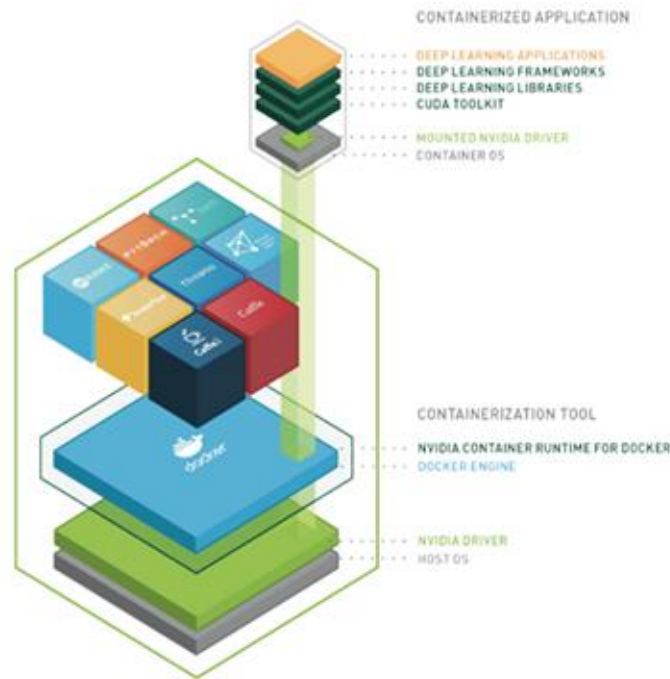
可扩展

- 支持多GPU和多节点系统
- 专为企业和HPC设计
- 支持Docker, Singularity和其他运行库

在任何地方运行

- 裸机，虚拟机，Kubernetes
- x86, ARM, Power系统
- 多云，本地，混合，边缘

NGC 深度学习容器



[了解更多有关 NGC Containers 的信息](#)

下一步

Catalog: Containers / Containers: nvidia:dli-dl-fundamentals

DLI Deep Learning Fundamentals Course -...

Publisher	Built By	Latest Tag	Modified	Size
NVIDIA	NVIDIA	v0.0.1	October 27, 2020	4.19 GB

Multinode Support	Multi-Arch Support
No	<input checked="" type="radio"/>

Description

Base environment used in the NVIDIA Deep Learning Institute (DLI) Course Fundamentals of Deep Learning, along with Next Steps project.

Labels

Computer Vision DLI Jupyter Machine Learning Machine Learning & AI

Pull Command

```
docker pull nvcr.io/nvidia/dli-dl-fundamentals:v0.0.1
```

Step 1 设置 Docker

<https://www.docker.com/>

Step 2 访问 NGC 目录

<https://ngc.nvidia.com/catalog/containers/nvidia:dli-dl-fundamentals>

Step 3 调取并运行 Container

访问在 `localhost:8888` 的本地 JupyterLab 环境，这里提供了与“下一步”有关的项目。

思维实验和结束语

模仿火箭科学



现在开始做最后一个练习！



DEEP
LEARNING
INSTITUTE

学习更多 DLI 课程，请访问 nvidia.cn/DLI

