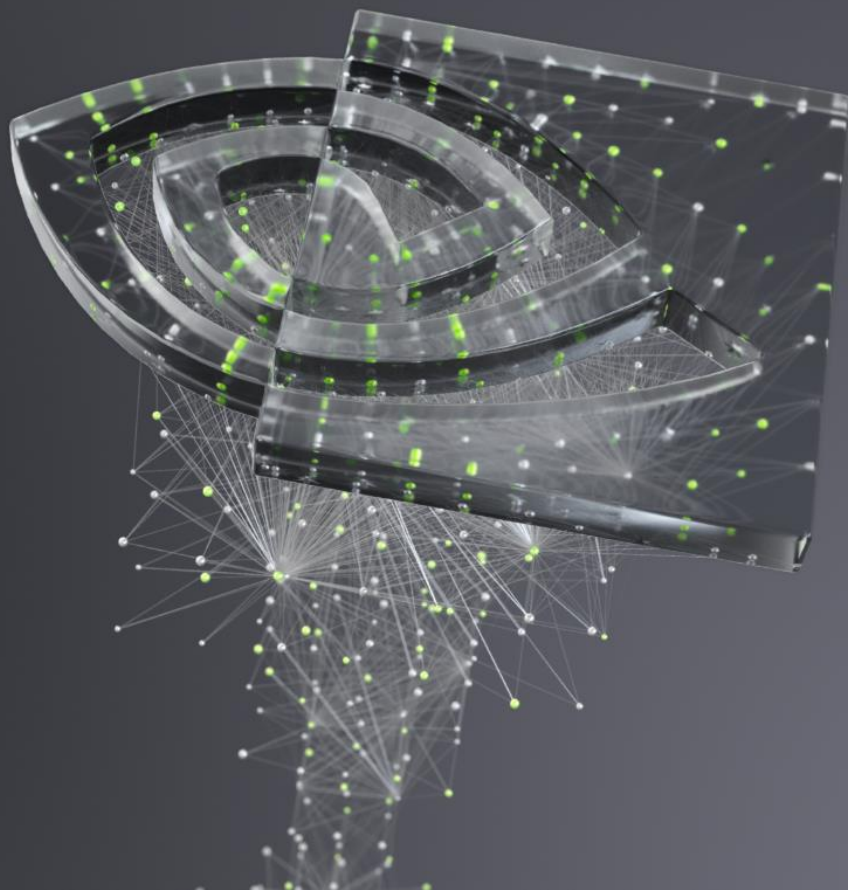




DEEP  
LEARNING  
INSTITUTE

# FUNDAMENTALS OF DEEP LEARNING

Part 6: Advanced Architectures



---

## AGENDA

Part 1: An Introduction to Deep Learning

Part 2: How a Neural Network Trains

Part 3: Convolutional Neural Networks

Part 4: Data Augmentation and Deployment

Part 5: Pre-trained Models

Part 6: Advanced Architectures

# AGENDA – PART 6

- Moving Forward
- Natural Language Processing
- Recurrent Neural Networks
- Other Architectures
- Closing Thoughts



MOVING FORWARD

# FIELDS OF AI



## Computer Vision

- Optometry



## Natural Language Processing

- Linguistics



## Reinforcement Learning

- Game Theory
- Psychology



## Anomaly Detection

- Security
- Medicine

# FIELDS OF AI



## Computer Vision

- Optometry



## Natural Language Processing

- Linguistics



## Reinforcement Learning

- Game Theory
- Psychology



## Anomaly Detection

- Security
- Medicine

# FIELDS OF AI



## Computer Vision

- Optometry



## Natural Language Processing

- Linguistics



## Reinforcement Learning

- Game Theory
- Psychology



## Anomaly Detection

- Security
- Medicine

NATURAL LANGUAGE  
PROCESSING

## FROM WORDS TO NUMBERS

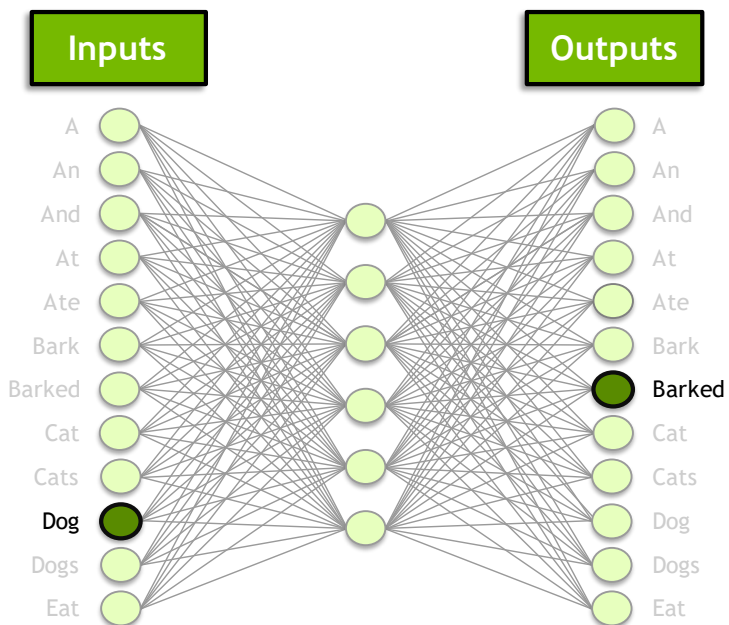
“A dog barked at a cat.”

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

### DICTIONARY

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

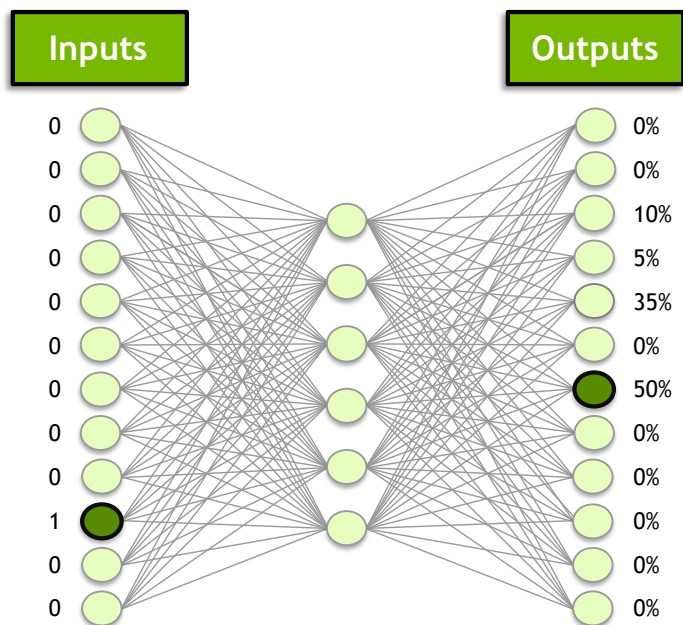
## FROM WORDS TO NUMBERS



### DICTIONARY

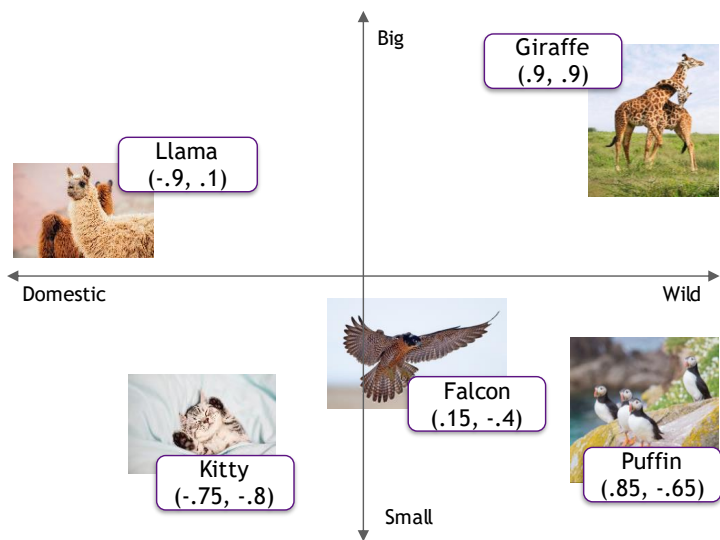
- |           |          |
|-----------|----------|
| 1. A      | 8. CAT   |
| 2. AN     | 9. CATS  |
| 3. AND    | 10. DOG  |
| 4. AT     | 11. DOGS |
| 5. ATE    | 12. EAT  |
| 6. BARK   |          |
| 7. BARKED |          |

# FROM WORDS TO NUMBERS



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

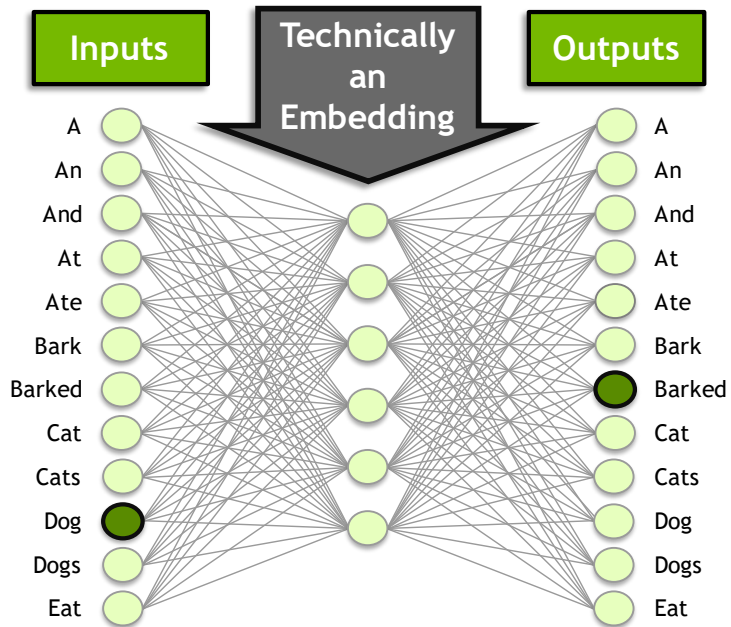
# FROM WORDS TO NUMBERS



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



# FROM WORDS TO NUMBERS



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

RECURRENT NEURAL  
NETWORKS

# RECURRENT NEURAL NETWORKS

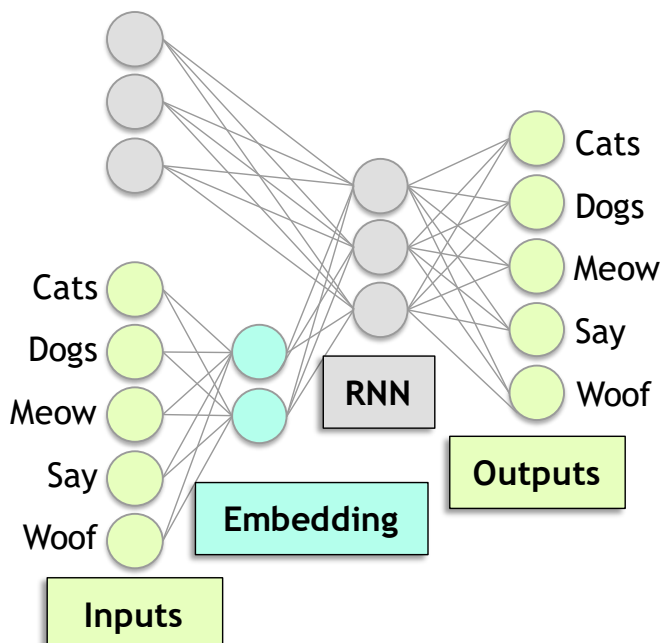
“Cats say \_\_\_\_.”

“Dogs say \_\_\_\_.”

## DICTIONARY

1. CATS
2. DOGS
3. MEOW
4. SAY
5. WOOF

# RECURRENT NEURAL NETWORKS



“Cats say \_\_\_\_.”

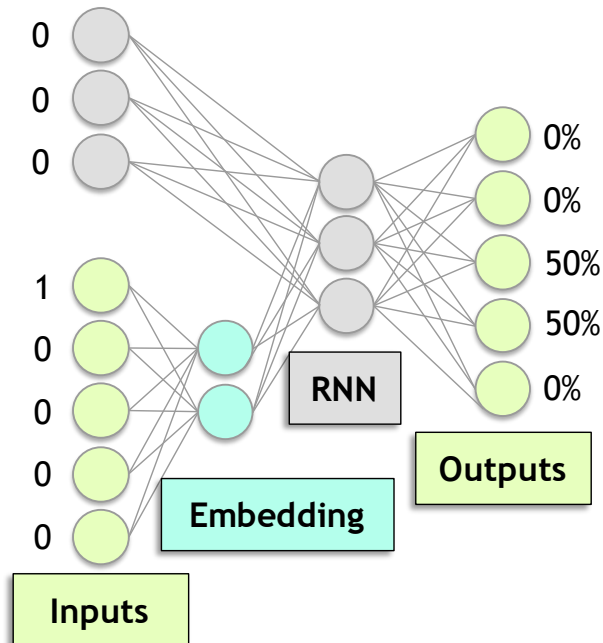
“Dogs say \_\_\_\_.”

## DICTIONARY

1. CATS
2. DOGS
3. MEOW
4. SAY
5. WOOF



# RECURRENT NEURAL NETWORKS



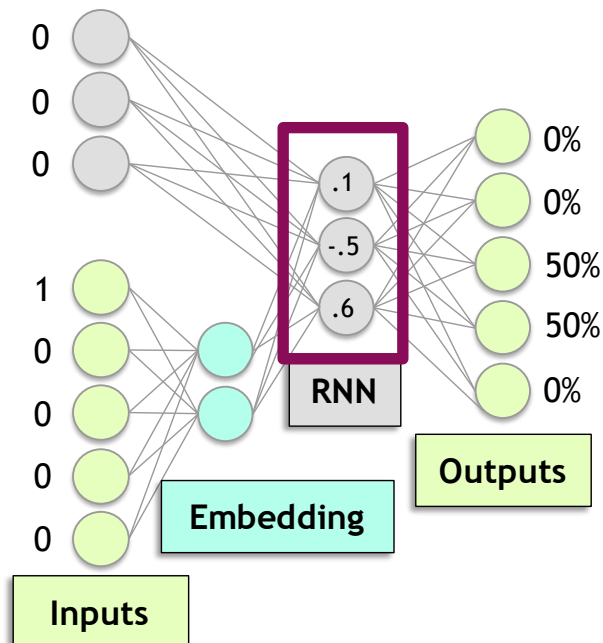
“Cats say \_\_\_\_.”

“Dogs say \_\_\_\_.”

## DICTIONARY

1. CATS
2. DOGS
3. MEOW
4. SAY
5. WOOF

# RECURRENT NEURAL NETWORKS



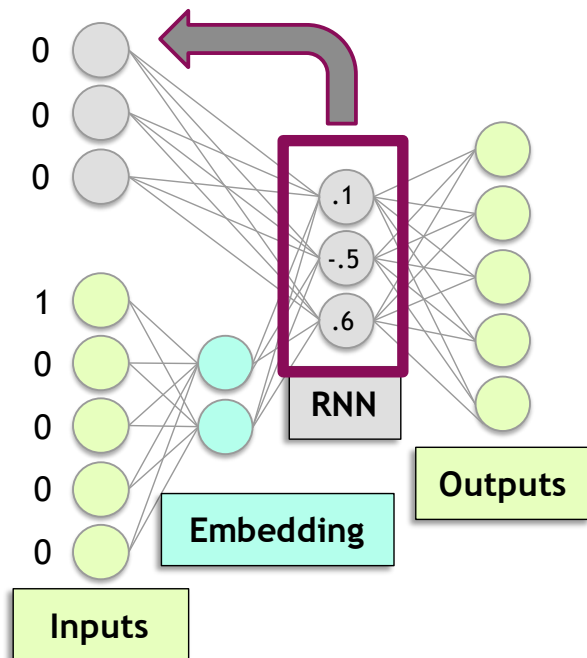
“Cats say \_\_\_\_.”

“Dogs say \_\_\_\_.”

## DICTIONARY

1. CATS
2. DOGS
3. MEOW
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# RECURRENT NEURAL NETWORKS



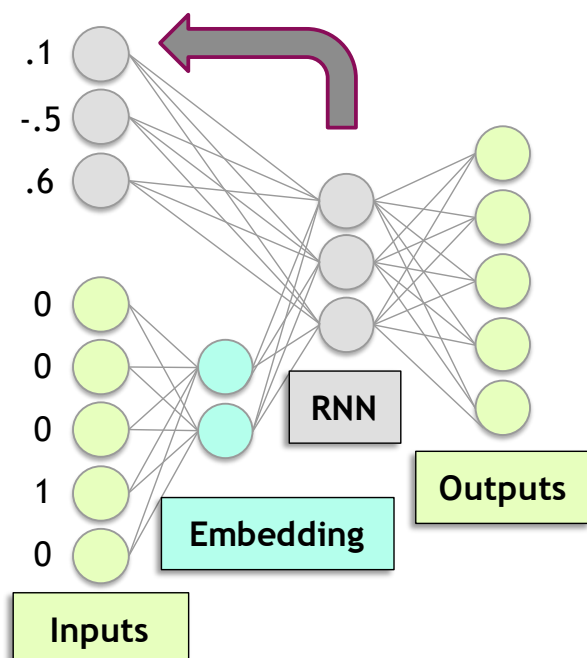
“Cats say \_\_\_\_.”

“Dogs say \_\_\_\_.”

## DICTIONARY

1. CATS
2. DOGS
3. MEOW
4. SAY
5. WOOF

# RECURRENT NEURAL NETWORKS



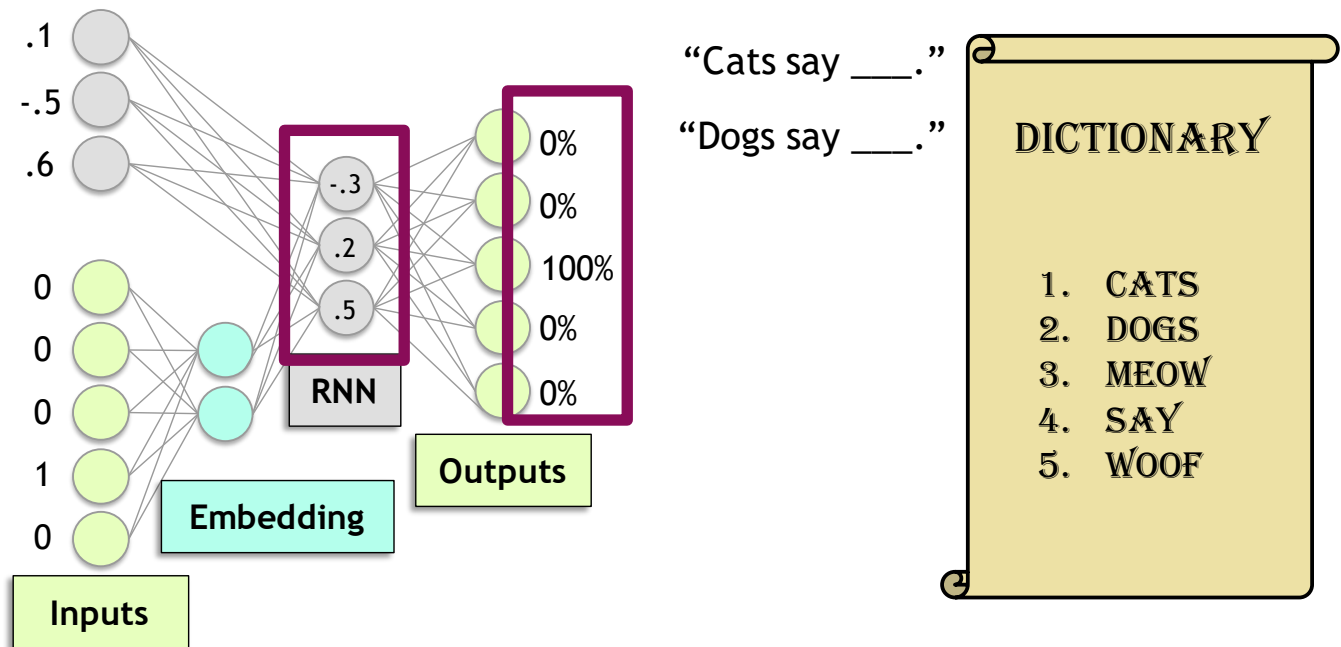
“Cats say \_\_\_\_.”

“Dogs say \_\_\_\_.”

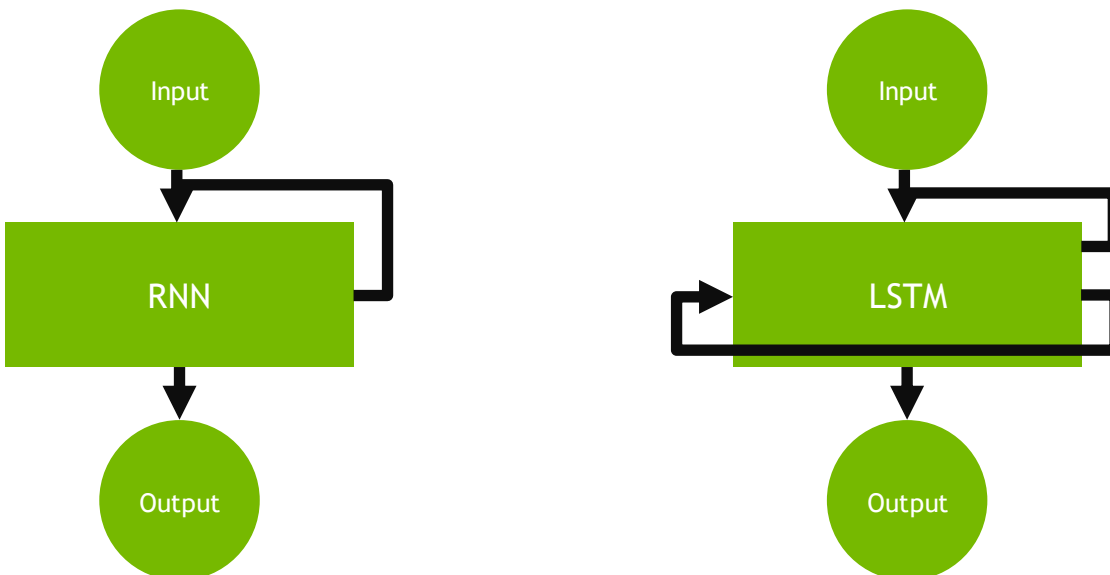
## DICTIONARY

1. CATS
2. DOGS
3. MEOW
4. SAY
5. WOOF

# RECURRENT NEURAL NETWORKS



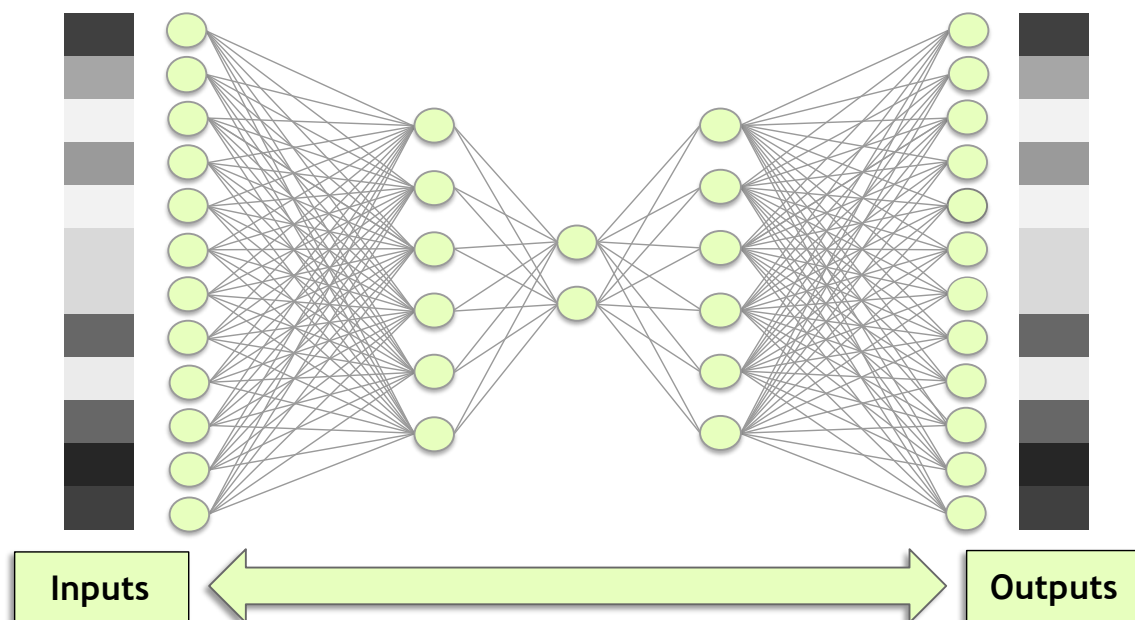
# RECURRENT NEURAL NETWORKS



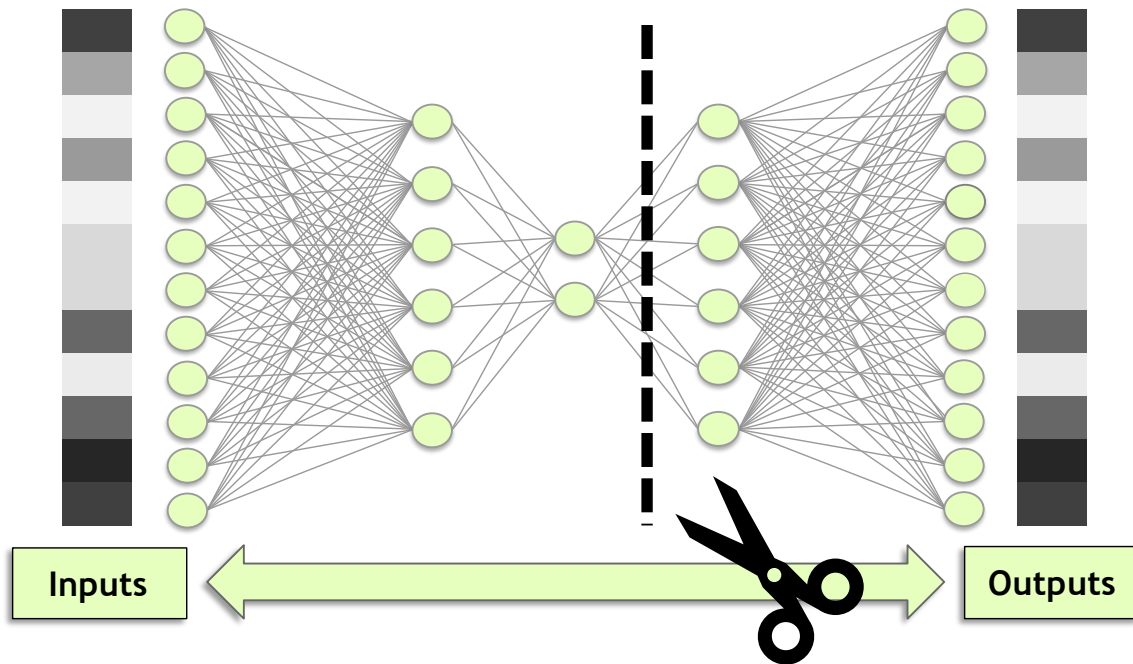


# OTHER ARCHITECTURES

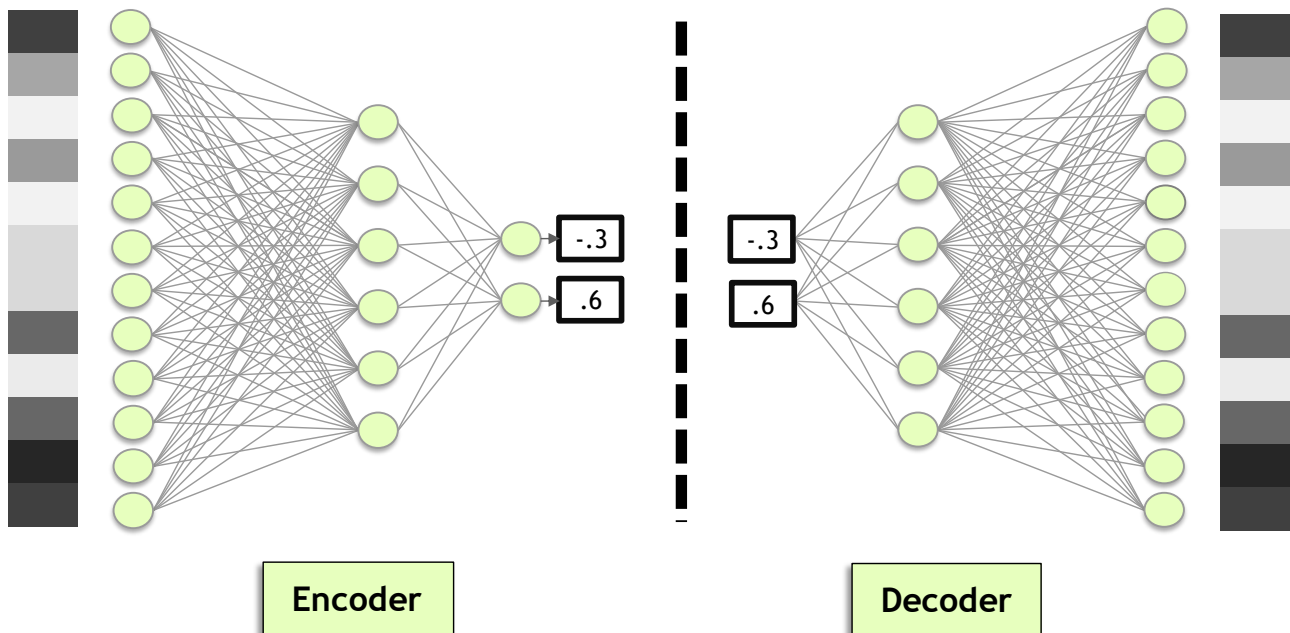
## AUTOENCODERS



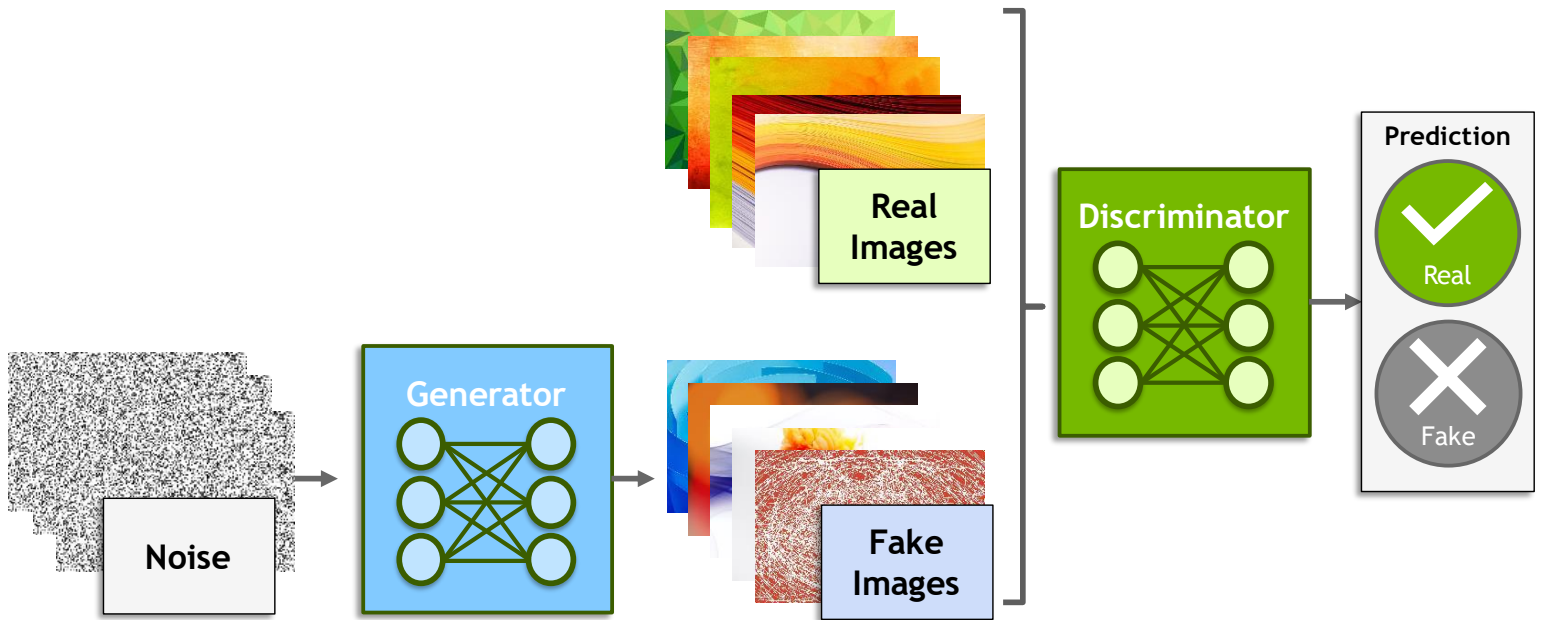
# AUTOENCODERS



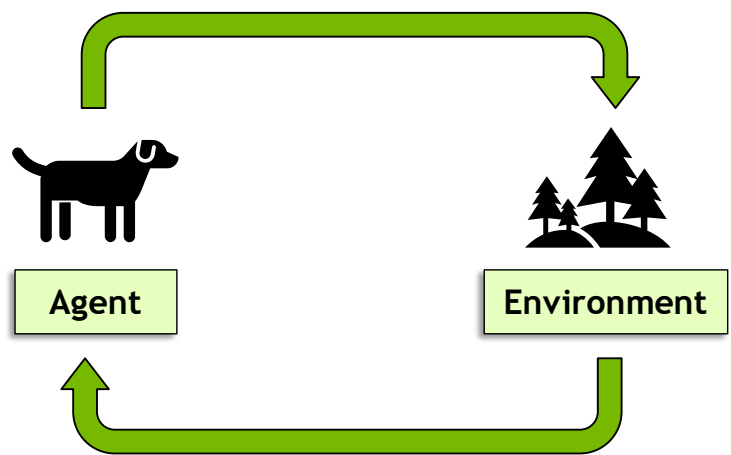
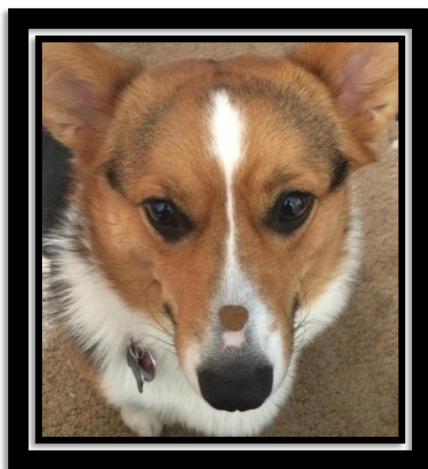
# AUTOENCODERS



# GENERATIVE ADVERSARIAL NETWORKS (GANS)



# REINFORCEMENT LEARNING





# NEXT STEPS

## ENABLING PORTABILITY WITH NGC CONTAINERS

### Extensive

- Diverse range of workloads and industry specific use cases

### Optimized

- DL containers updated monthly
- Packed with latest features and superior performance

### Secure & Reliable

- Scanned for vulnerabilities and crypto
- Tested on workstations, servers, & cloud instances

### Scalable

- Supports multi-GPU & multi-node systems

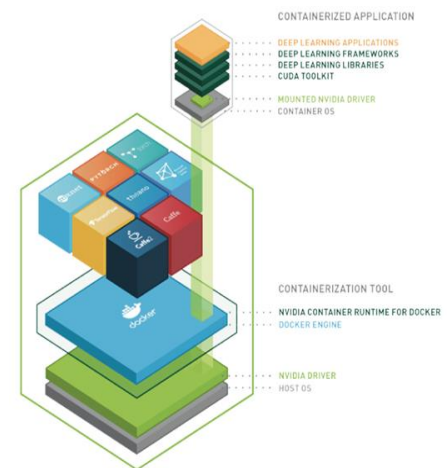
### Designed for Enterprise & HPC

- Supports Docker, Singularity & other runtimes

### Run Anywhere

- Bare metal, VMs, Kubernetes
- x86, ARM, POWER
- Multi-cloud, on-prem, hybrid, 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](#)

# NEXT STEPS FOR THIS CLASS

Catalog: Containers / Containers: nvidia: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**  
No

**Multi-Arch Support**  
No

**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 Setup Docker

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

## Step 2 Visit NGC Catalog

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

## Step 3 Pull and Run Container

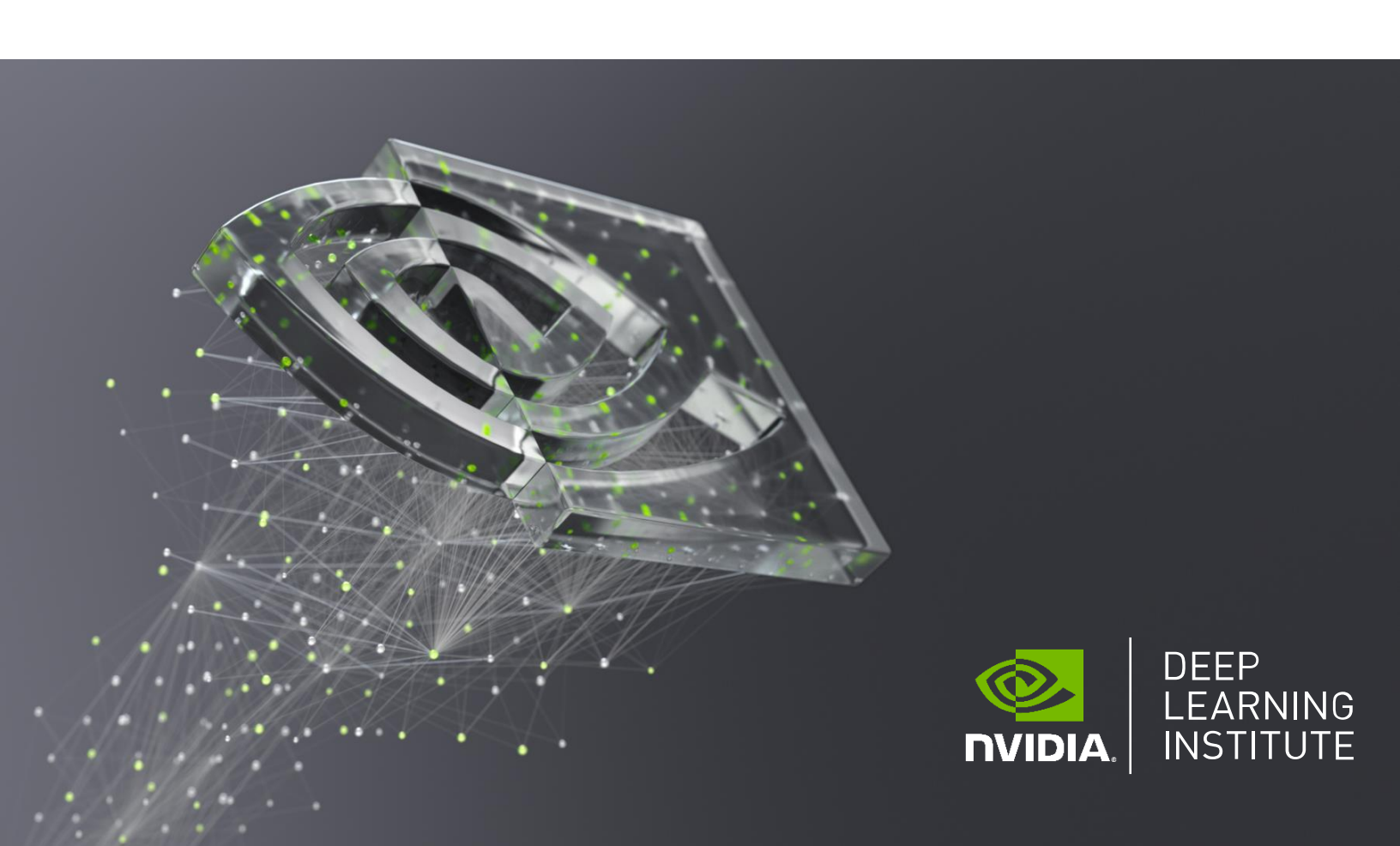
Visit [localhost:8888](http://localhost:8888) to check out a JupyterLab environment with a Next Steps Project

# CLOSING THOUGHTS

# COPYING ROCKET SCIENCE



LET'S GET STARTED!



DEEP  
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