



DEEP  
LEARNING  
INSTITUTE

# DEEP LEARNING DEMYSTIFIED

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DLI Certified Instructor

# DEFINITIONS

## ARTIFICIAL INTELLIGENCE

Early artificial intelligence stirs excitement.



## MACHINE LEARNING

Machine learning begins to flourish.



## DEEP LEARNING

Deep learning breakthroughs drive AI boom.



1950's

1960's

1970's

1980's

1990's

2000's

2010's

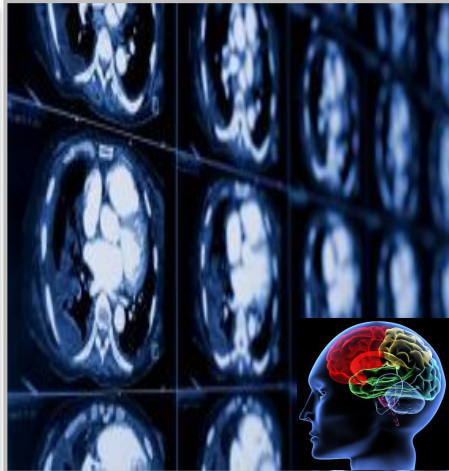
# DEEP LEARNING IS SWEEPING ACROSS INDUSTRIES

## Internet Services



- Image/Video classification
- Speech recognition
- Natural language processing

## Medicine



- Cancer cell detection
- Diabetic grading
- Drug discovery

## Media & Entertainment



- Video captioning
- Content based search
- Real time translation

## Security & Defense



- Face recognition
- Video surveillance
- Cyber security

## Autonomous Machines

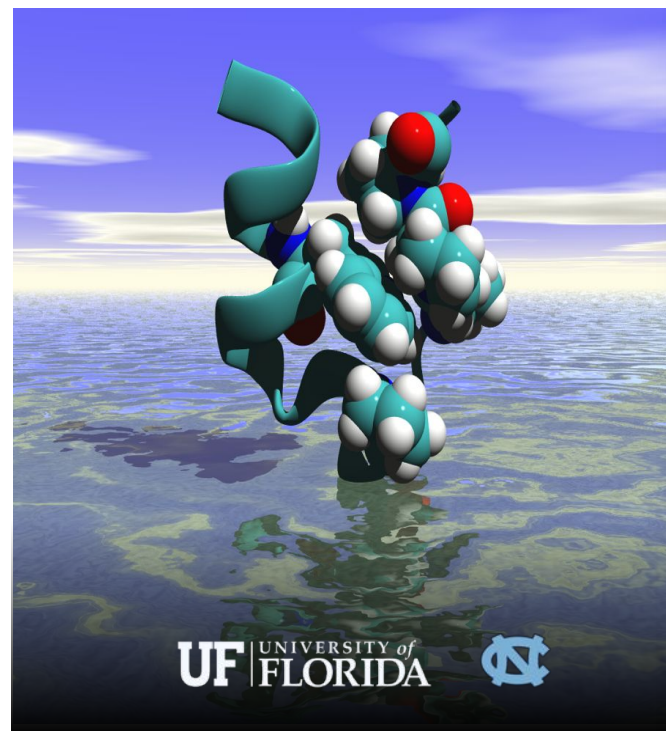


- Pedestrian detection
- Lane tracking
- Recognize traffic signs

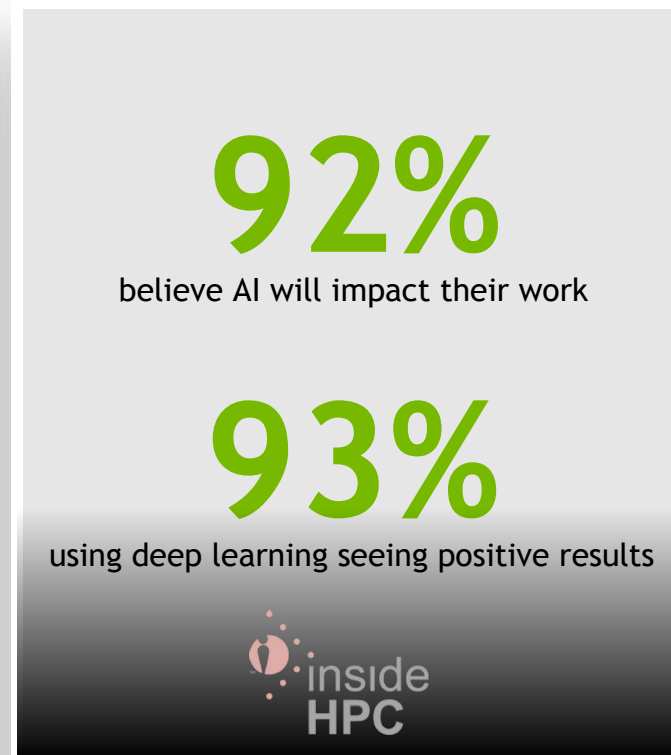
# DEEP LEARNING IS TRANSFORMING HPC



“Seeing” Gravity In Real Time



Accelerating Drug Discovery



92%

believe AI will impact their work

93%

using deep learning seeing positive results



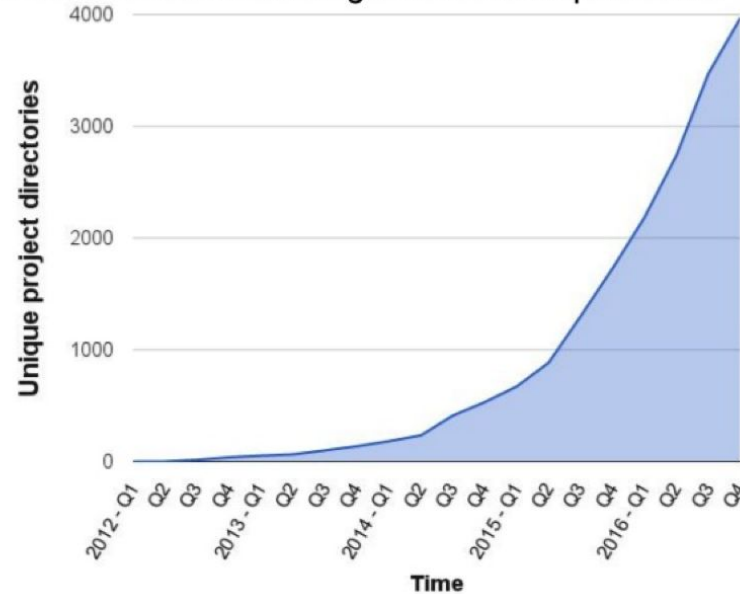
insideHPC.com Survey  
November 2016

# AI IS CRITICAL FOR INTERNET APPLICATIONS

Users Expect Intelligence In Services

## Growing Use of Deep Learning at Google

# of directories containing model description files



Across many products/areas:

- Android
- Apps
- drug discovery
- Gmail
- Image understanding
- Maps
- Natural language understanding
- Photos
- Robotics research
- Speech
- Translation
- YouTube
- ... many others ...



# THE EXPANDING UNIVERSE OF MODERN AI

## "THE BIG BANG"

Big Data  
GPU  
Algorithms

### RESEARCH



### CORE TECHNOLOGY / FRAMEWORKS



### AI-as-a-PLATFORM



### START-UPS



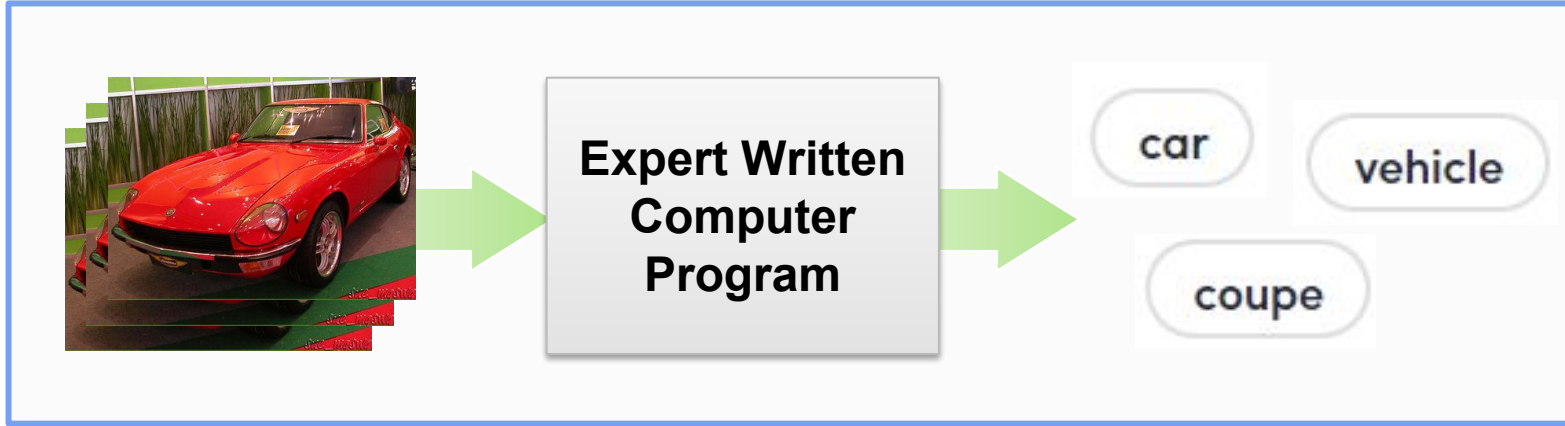
1,000+ AI START-UPS  
**\$5B IN FUNDING**  
 Source: Venture Scanner

### INDUSTRY LEADERS



# A NEW COMPUTING MODEL

Algorithms that Learn from Examples

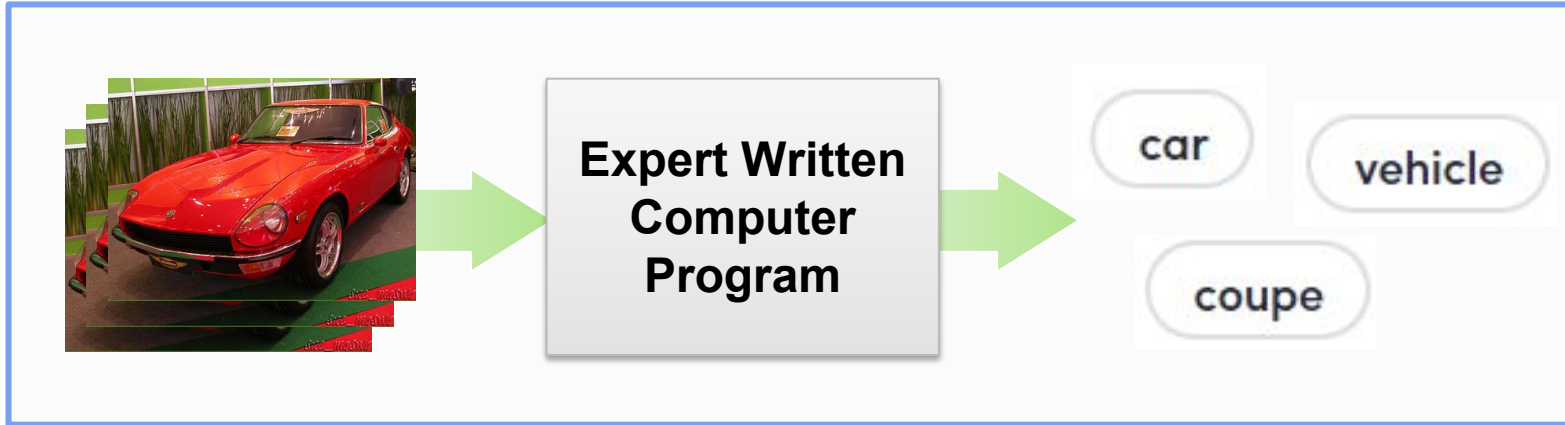


## Traditional Approach

- ▶ Requires domain experts
- ▶ Time consuming
- ▶ Error prone
- ▶ Not scalable to new problems

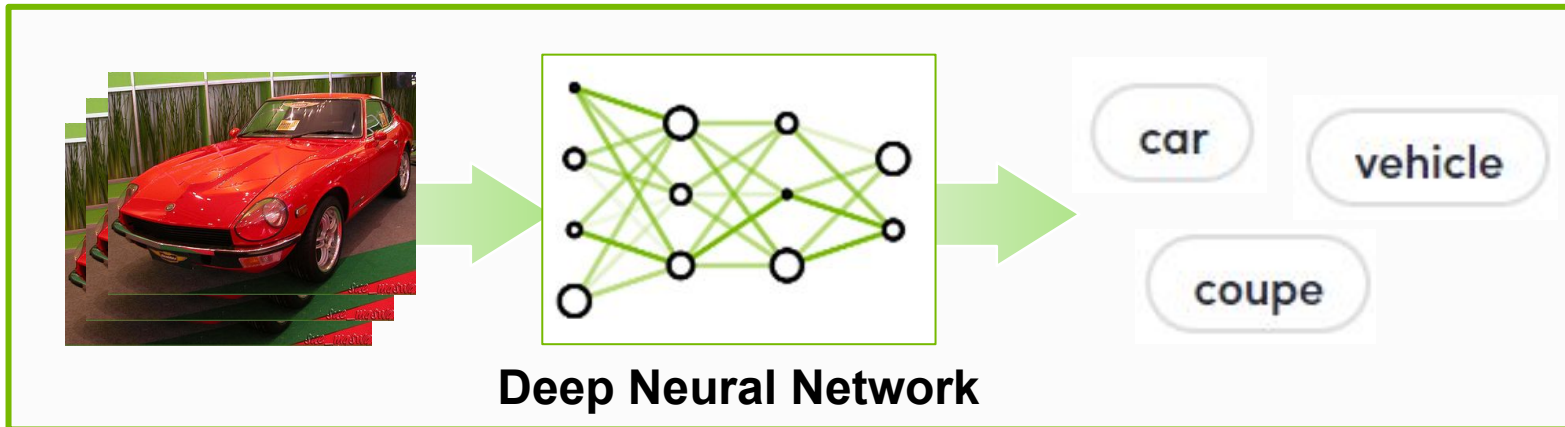
# A NEW COMPUTING MODEL

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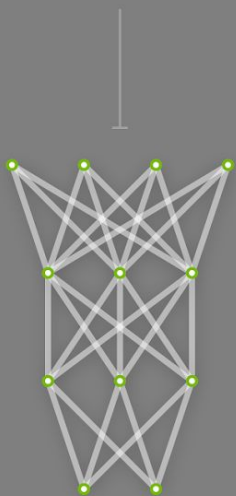
### Deep Learning Approach

- ✓ Learn from data
- ✓ Easily to extend
- ✓ Speedup with GPUs



# DEEP LEARNING

Untrained  
Neural Network  
Model

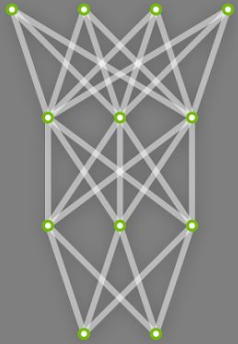


# DEEP LEARNING

## TRAINING

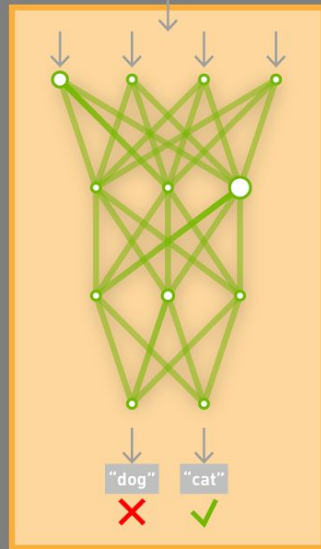
Learning a new capability  
from existing data

Untrained  
Neural Network  
Model



Deep Learning  
Framework

TRAINING  
DATASET

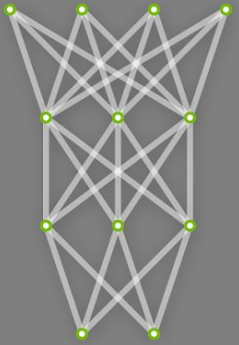


# DEEP LEARNING

## TRAINING

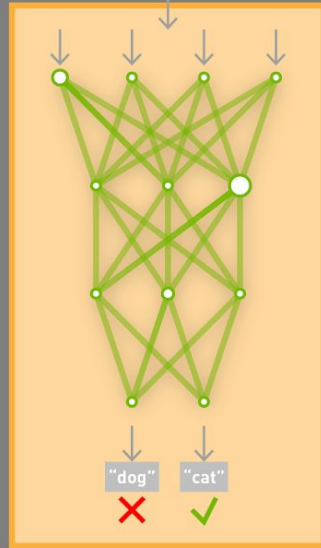
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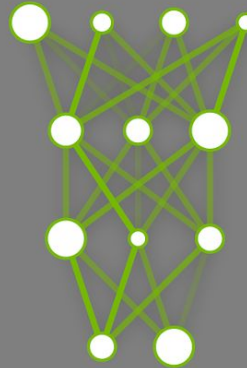


Deep Learning  
Framework

TRAINING  
DATASET



Trained Model  
New Capability

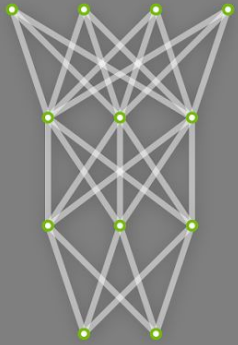


# DEEP LEARNING

## TRAINING

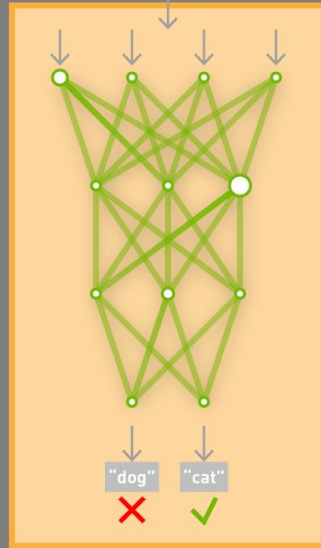
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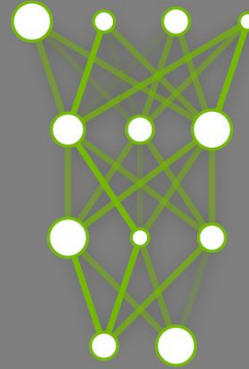


Deep Learning  
Framework

TRAINING  
DATASET



Trained Model  
New Capability



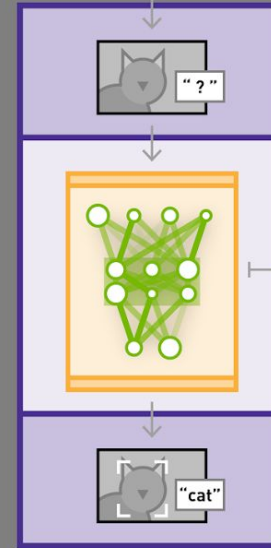
## INFERENCE

Applying this capability  
to new data

NEW  
DATA



App or Service  
Featuring Capability



Trained Model  
Optimized for  
Performance

# CHALLENGES

Deep Learning Needs	Why
Data Scientists	New computing model
Latest Algorithms	Rapidly evolving
Fast Training	Impossible -> Practical
Deployment Platforms	Must be available everywhere

# NVIDIA DEEP LEARNING INSTITUTE

Hands-on Training for Data Scientists and Software Engineers



Helping the world to solve challenging problems using AI and deep learning

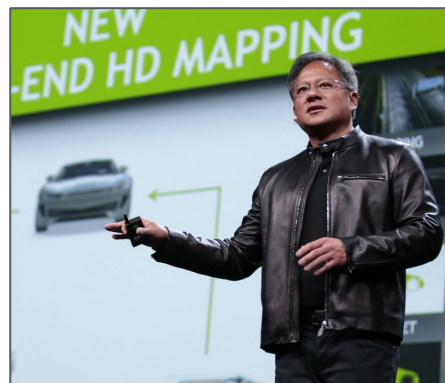
On-site workshops and online courses presented by certified instructors

Covering complete workflows for proven application use cases

Self-Driving Cars, Healthcare, Intelligent Video Analytics, IoT/Robotics, Finance and more

[www.nvidia.com/dli](http://www.nvidia.com/dli)

# GPU TECHNOLOGY CONFERENCE



## ADVANCE YOUR DEEP LEARNING TRAINING AT GTC

Don't miss the world's most important event for GPU developers

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Silicon Valley, May 8-11  
Beijing, September 26-27  
Munich, October 10-11

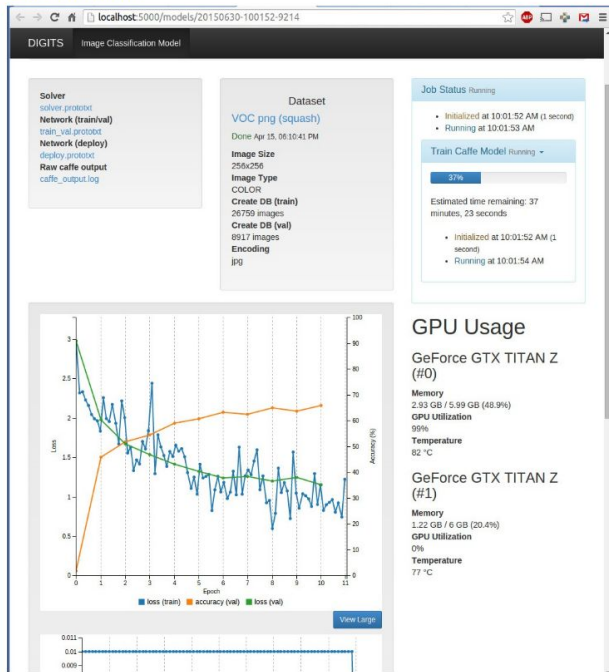
Israel, October 18  
Washington DC, November 1-2  
Tokyo, December 12-13

# DEEP LEARNING SOFTWARE

## NVIDIA DIGITS™

Interactively manage data and train deep learning models for image classification without the need to write code.

[Learn more](#)



## Deep Learning Frameworks

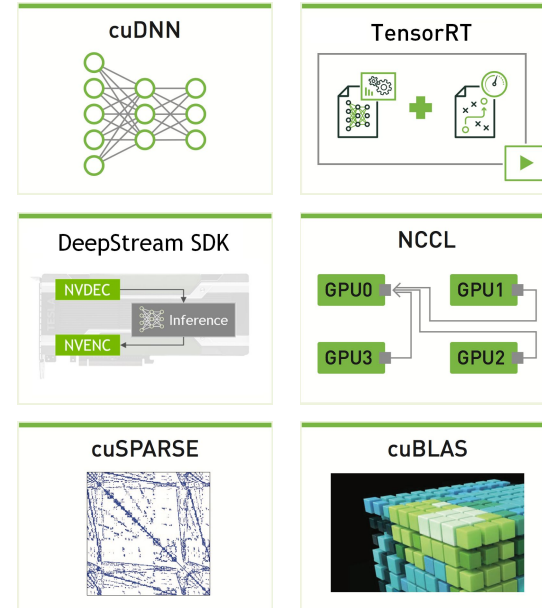
Design and train deep learning models using a high-level interface. Choose a deep learning framework that best suits your needs based on your choice of programming language, platform, and target application.

[Learn more](#)



## NVIDIA Deep Learning SDK

This SDK delivers high-performance multi-GPU acceleration and industry-vetted deep learning algorithms, and is designed for easy drop-in acceleration for deep learning frameworks.



[developer.nvidia.com/deep-learning](https://developer.nvidia.com/deep-learning)



# END-TO-END PRODUCT FAMILY

TRAINING

INFERENCE

## FULLY INTEGRATED DL SUPERCOMPUTER



DGX-1 & DGX Station



## DESKTOP



Titan X Pascal

## DATA CENTER



Tesla P100  
Tesla V100

## DATA CENTER

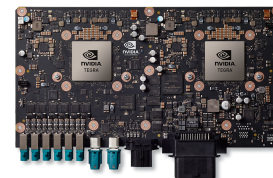
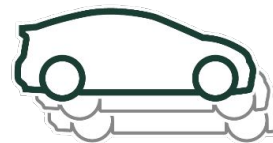


Tesla P100/V100



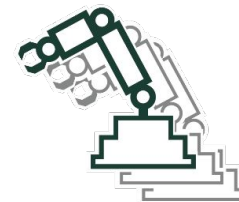
Tesla P4

## AUTOMOTIVE



Drive PX2

## EMBEDDED



Jetson TX1

# CHALLENGES

Deep Learning Needs	Why
Data Scientists	New computing model
Latest Algorithms	Rapidly evolving
Fast Training	Impossible -> Practical
Deployment Platforms	Must be available everywhere

# CHALLENGES

Deep Learning Needs	NVIDIA Delivers
Data Scientists	Deep Learning Institute, GTC, DIGITS
Latest Algorithms	DL SDK, GPU-Accelerated Frameworks
Fast Training	DGX, V100, P100, TITAN X
Deployment Platforms	TensorRT, P100, P4, Drive PX, Jetson





# READY TO GET STARTED?

## Project Checklist

1. What problem are you solving, what are the DL tasks?
2. What data do you have/need, and how is it labeled?
3. Which deep learning framework & tools will you use?
4. On what platform(s) will you train and deploy?

# WHAT PROBLEM ARE YOU SOLVING?

## Defining the AI/DL Tasks

INPUTS	QUESTION	AI/DL TASK	EXAMPLE OUTPUTS
 Text Data  Images   Video  Audio	Is “it” <u>present</u> or not?	Detection	Cancer Detection
	What <u>type</u> of thing is “it”?	Classification	Tumor Identification
	To what <u>extent</u> is “it” present?	Segmentation	Tumor Size/Shape Analysis
	What is the likely <u>outcome</u> ?	Prediction	Survivability Prediction
	What will likely <u>satisfy the objective</u> ?	Recommendation	Therapy Recommendation

# SELECTING A DEEP LEARNING FRAMEWORK

## Considerations

1. Type of problem
2. Training & deployment platforms
3. DNN models available, layer types supported
4. Latest algos & GPU acceleration: cuDNN, NCCL, etc.
5. Usage model/interfaces: GUI, command line, programming language, etc.
6. Easy to install and get started: containers, docs, code samples, tutorials, ...
7. Enterprise integration, vendors, ecosystem

# START SIMPLE, LEARN FAST



How One NVIDIAIAN Uses Deep Learning to Keep Cats from Pooping on His Lawn

# WHAT'S NEXT?

## Learn More

Listen to the [NVIDIA AI Podcast](#)  
Review [examples of AI in action](#)

## Take a Self-Paced Lab

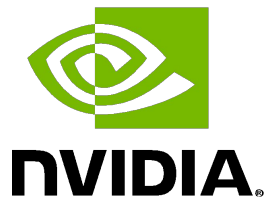
[www.nvidia.com/dlilabs](http://www.nvidia.com/dlilabs)

## REGISTER FOR A DLI WORKSHOP

July 6 <sup>th</sup>	Image Classification with DIGITS	<a href="http://nv/InternDL1">http://nv/InternDL1</a>
July 20 <sup>th</sup>	Object Detection with DIGITS	<a href="http://nv/InternDL2">http://nv/InternDL2</a>
Aug 8 <sup>th</sup>	Neural Network Deployment with DIGITS and TensorRT	<a href="http://nv/InternDL3">http://nv/InternDL3</a>

Contact us at [nvdli@nvidia.com](mailto:nvdli@nvidia.com)





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[www.nvidia.com/dli](http://www.nvidia.com/dli)