

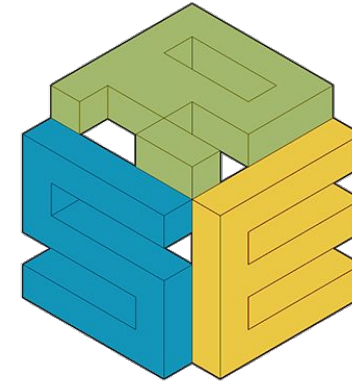


DEEP
LEARNING
INSTITUTE

FUNDAMENTALS OF DEEP LEARNING FOR COMPUTER VISION

Twin Karmakharm
DLI Certified Instructor

This event is organised and run by...



Research
Software
Engineering
Sheffield.

What we do:

- Project work and consultancy
 - Deep Learning, HPC, GPU
 - Accelerating your research software
 - Increasing research impact through software
- Grant support
- Training
 - Deep Learning (with Nvidia DLI), CUDA
- Research Software Support
 - Installation
 - Management
 - Documentation
 - Troubleshooting

Today's Schedule

- 9:00 - Deep Learning Demystified and Applied Deep Learning (lecture)
- 9:45 - Break
- 10:00 - Image Classification with DIGITS (lab)
- 12:00 - Lunch
- 1:00 - Object Detection with DIGITS (lab)
- 3:00 - Break
- 3:15 - Neural Network Deployment with DIGITS and TensorRT (lab)
- 4:45 - Closing Comments & Questions
- 5:00 - End

Contents

Labs (use Google Chrome):

nvlabs.qwiklab.com

Slides:

<http://gpucomputing.shef.ac.uk/education>



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DEEP LEARNING DEMYSTIFIED

Twin Karmakharm
DLI Certified Instructor

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#GTC18

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LEARN

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DISCOVER

Discover the latest breakthroughs in fields such as autonomous vehicles, HPC, smart cities, VR, robotics, and more.



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9-11 October 2018 at the International Congress Centre, Munich.

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

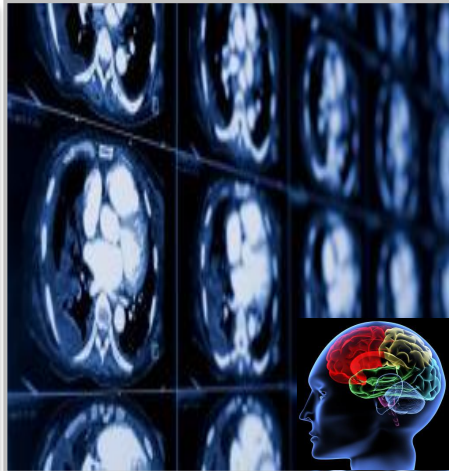
DEEP LEARNING IS SWEEPING ACROSS INDUSTRIES

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



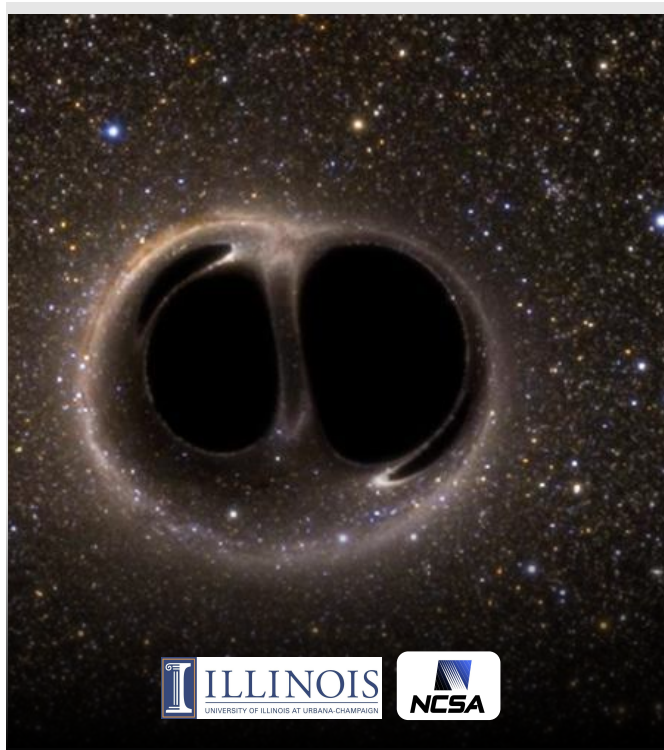
- Face recognition
- Video surveillance
- Cyber security

Autonomous Machines

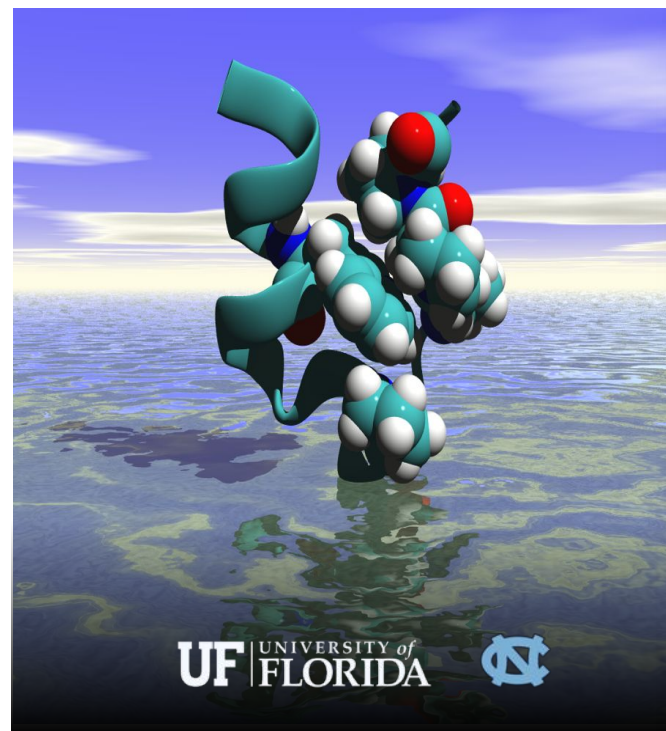


- Pedestrian detection
- Lane tracking
- Recognize traffic signs

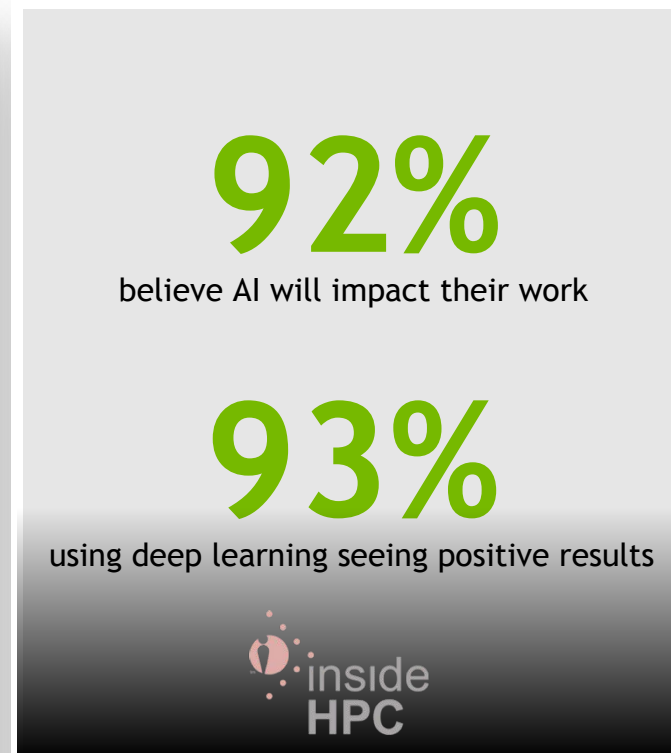
DEEP LEARNING IS TRANSFORMING HPC



“Seeing” Gravity In Real Time



Accelerating Drug Discovery



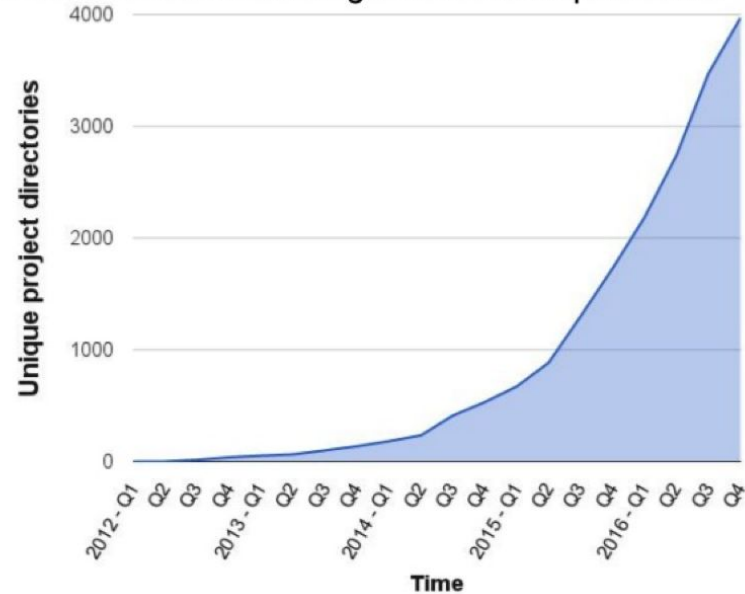
insideHPC.com Survey
November 2016

AI IS CRITICAL FOR INTERNET APPLICATIONS

Users Expect Intelligence In Services

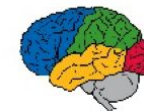
Growing Use of Deep Learning at Google

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



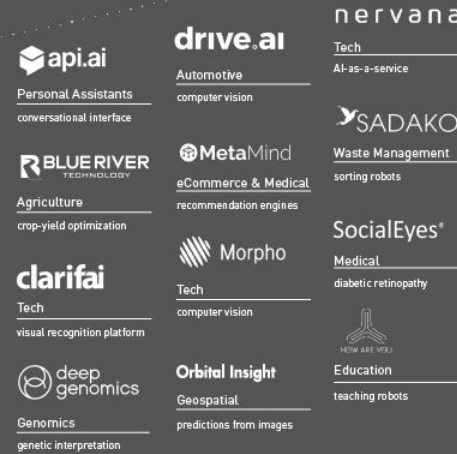
CORE TECHNOLOGY / FRAMEWORKS



AI-as-a-PLATFORM



START-UPS

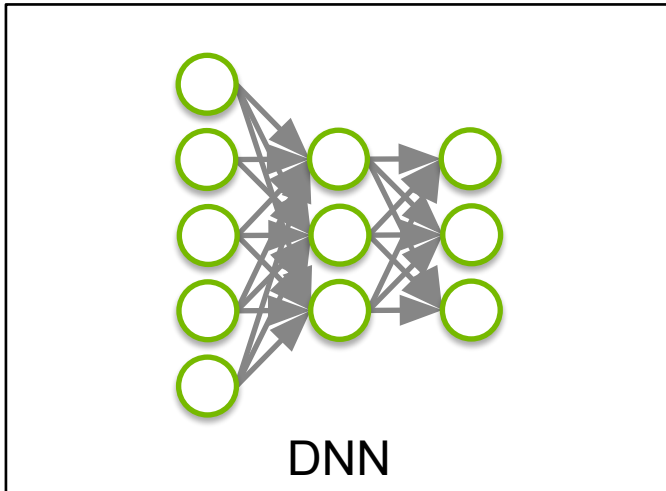


1,000+ AI START-UPS
\$5B IN FUNDING
 Source: Venture Scanner

INDUSTRY LEADERS



THE BIG BANG IN MACHINE LEARNING



“ Google’s AI engine also reflects how the world of computer hardware is changing. (It) depends on machines equipped with GPUs... And it depends on these chips more than the larger tech universe realizes.”

WIRED

A NEW COMPUTING MODEL

Algorithms that Learn from Examples

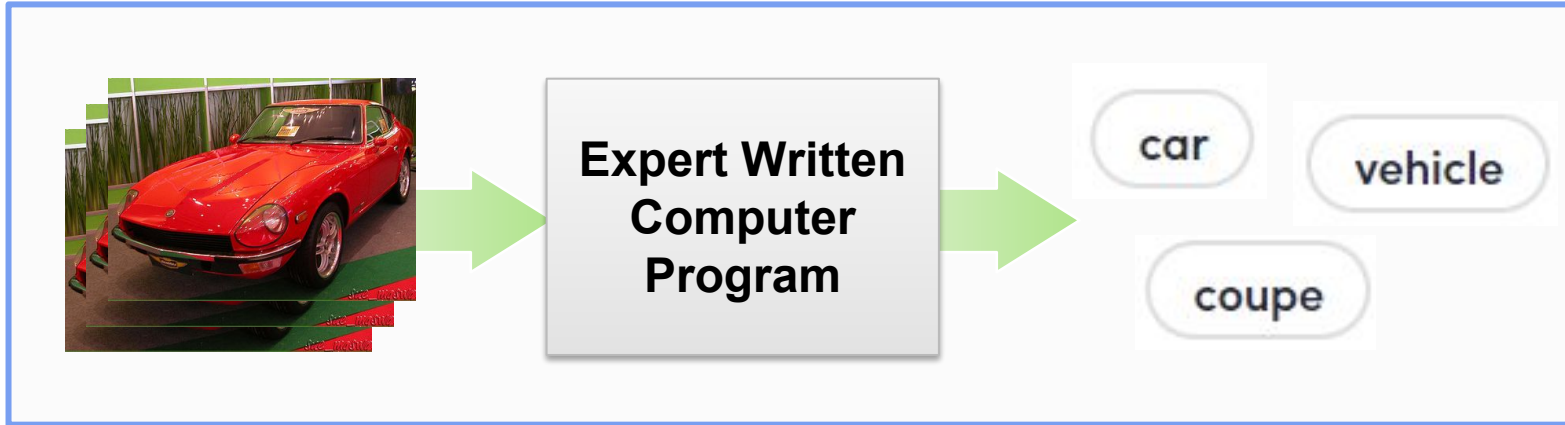


Traditional Approach

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

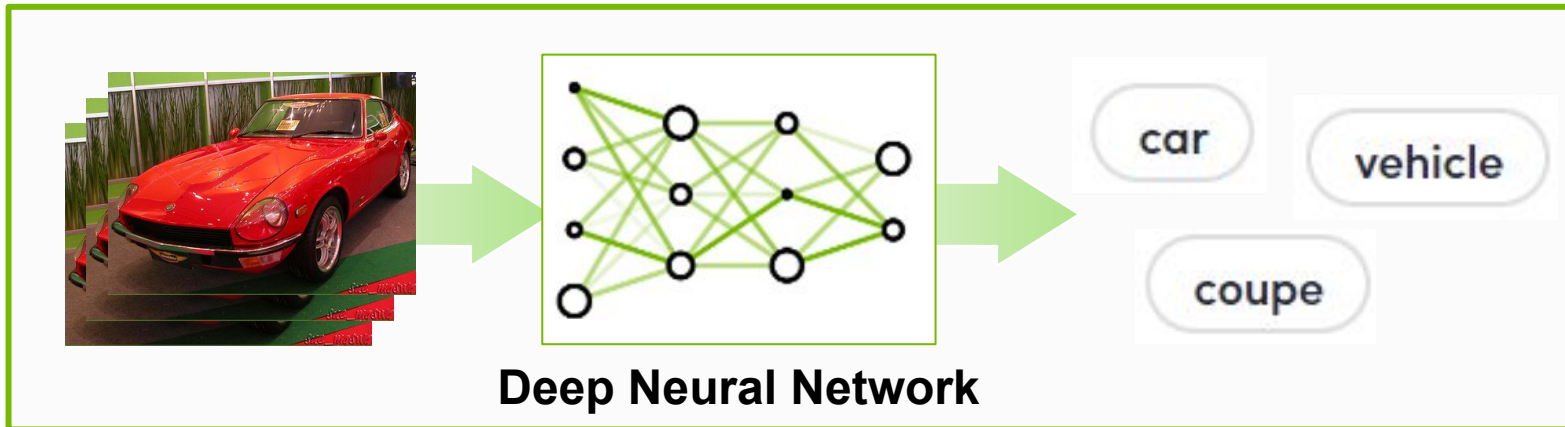
A NEW COMPUTING MODEL

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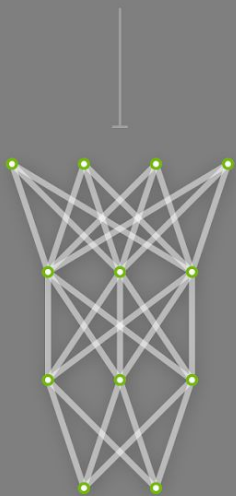


Deep Learning Approach

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

DEEP LEARNING

Untrained
Neural Network
Model

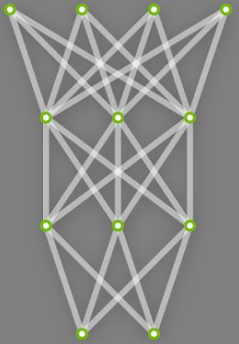


DEEP LEARNING

TRAINING

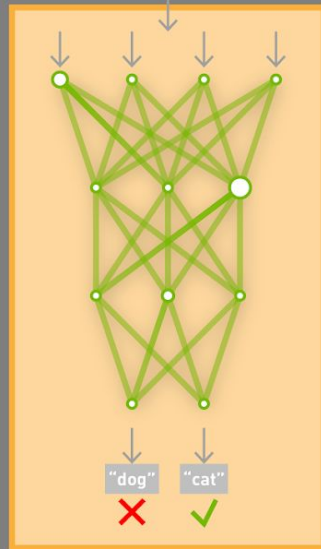
Learning a new capability
from existing data

Untrained
Neural Network
Model



Deep Learning
Framework

TRAINING
DATASET

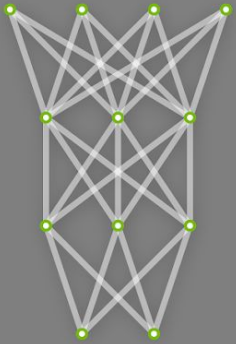


DEEP LEARNING

TRAINING

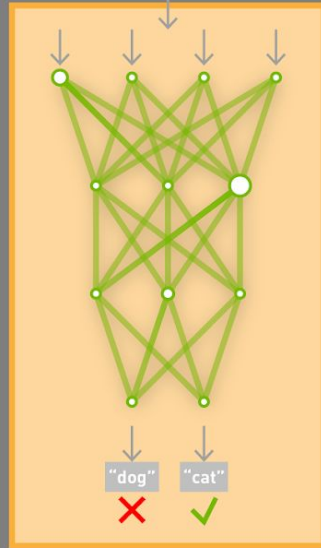
Learning a new capability
from existing data

Untrained
Neural Network
Model

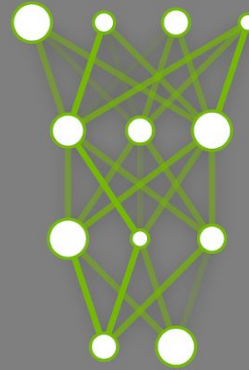


Deep Learning
Framework

TRAINING
DATASET



Trained Model
New Capability

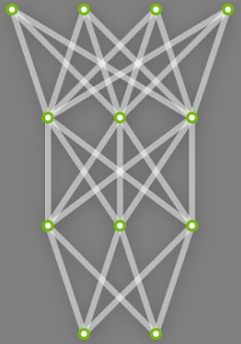


DEEP LEARNING

TRAINING

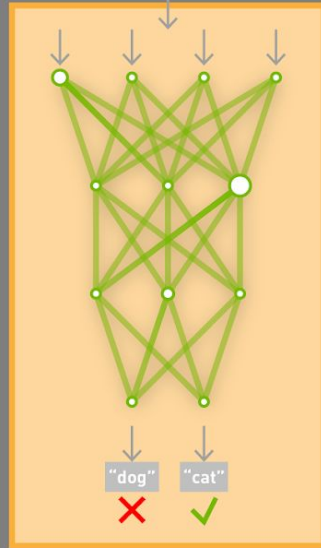
Learning a new capability
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Untrained
Neural Network
Model



Deep Learning
Framework

TRAINING
DATASET



Trained Model
New Capability



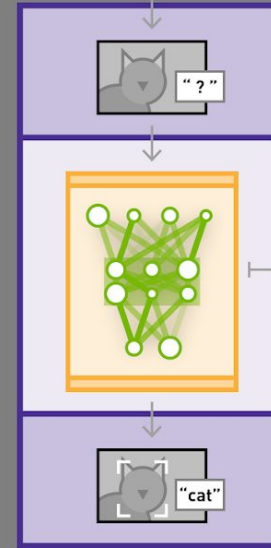
INFERENCE

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

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

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

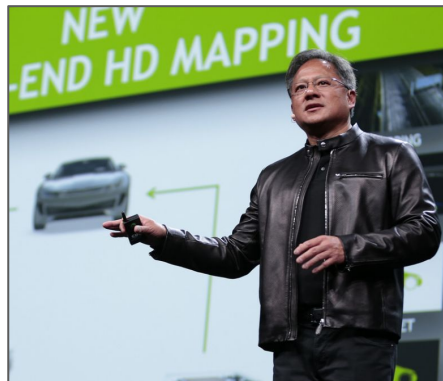
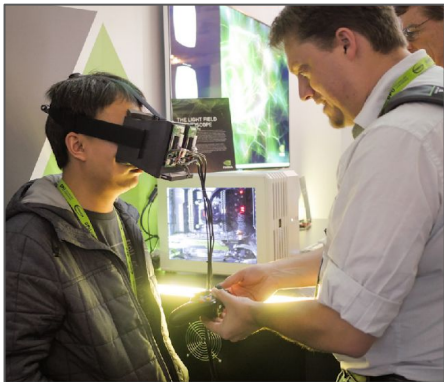
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Washington DC, November 1-2
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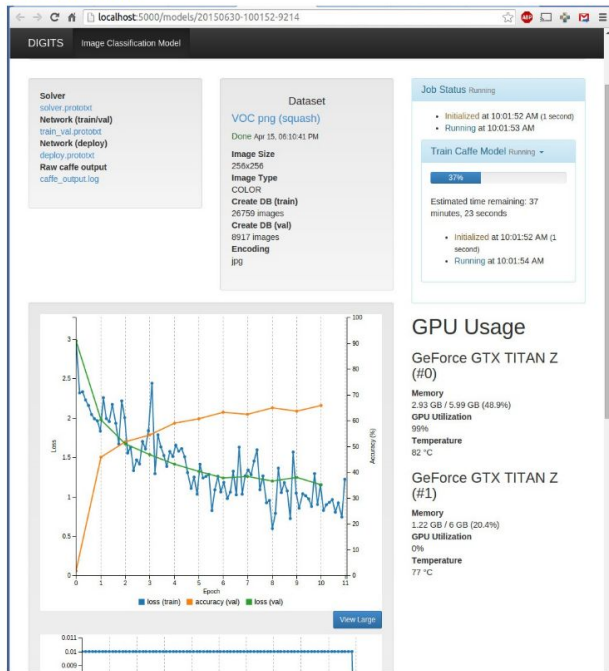
9-11 October 2018 at the International Congress Centre, Munich.

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

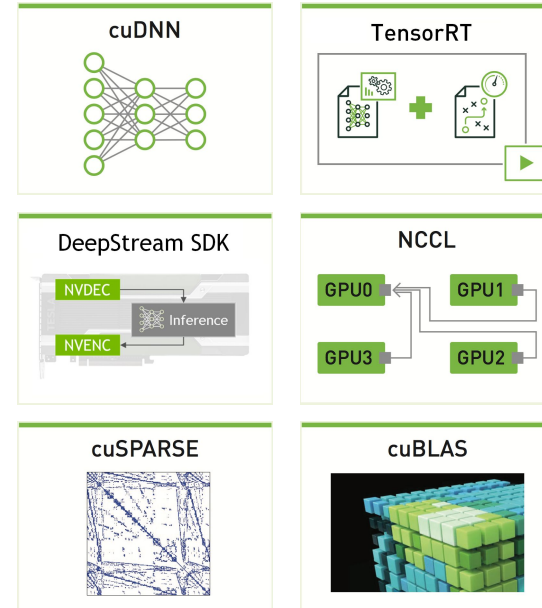
Design and train deep learning models using a high-level interface. Choose a deep learning framework that best suits your needs based on your choice of programming language, platform, and target application.

[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

END-TO-END PRODUCT FAMILY

TRAINING

INFERENCE

FULLY INTEGRATED DL SUPERCOMPUTER



DGX-1 & DGX Station

DATA CENTER

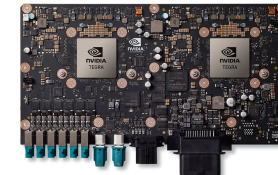
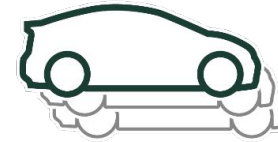


Tesla P100/V100



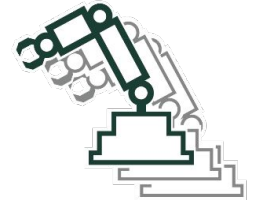
Tesla P4

AUTOMOTIVE



Drive PX2

EMBEDDED



Jetson TX1

DESKTOP



Titan X Pascal

DATA CENTER



Tesla P100
Tesla V100





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](#)

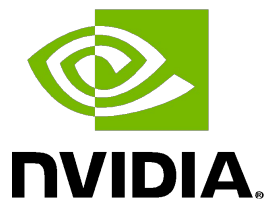
Take a Self-Paced Lab

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REGISTER FOR A DLI WORKSHOP

July 6 th	Image Classification with DIGITS	http://nv/InternDL1
July 20 th	Object Detection with DIGITS	http://nv/InternDL2
Aug 8 th	Neural Network Deployment with DIGITS and TensorRT	http://nv/InternDL3

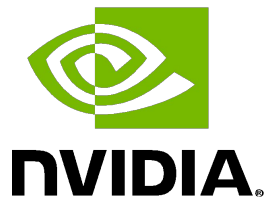
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