

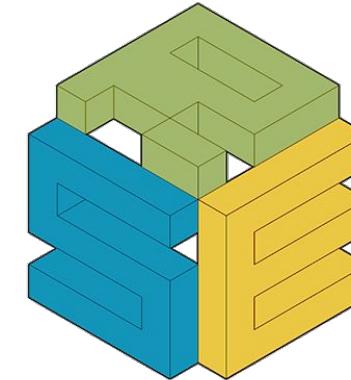


DEEP
LEARNING
INSTITUTE

FUNDAMENTALS OF DEEP LEARNING FOR COMPUTER VISION

Twin Karmakham
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

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#GTC18



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

DEFINITIONS

ARTIFICIAL INTELLIGENCE

Early artificial intelligence stirs excitement.



1950's

1960's

1970's

1980's

1990's

2000's

2010's

MACHINE LEARNING

Machine learning begins to flourish.



DEEP LEARNING

Deep learning breakthroughs drive AI boom.

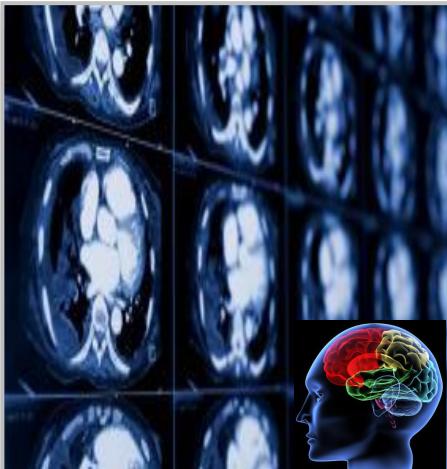


DEEP LEARNING IS SWEEPING ACROSS INDUSTRIES

Internet Services



Medicine



Media & Entertainment



Security & Defense



Autonomous Machines

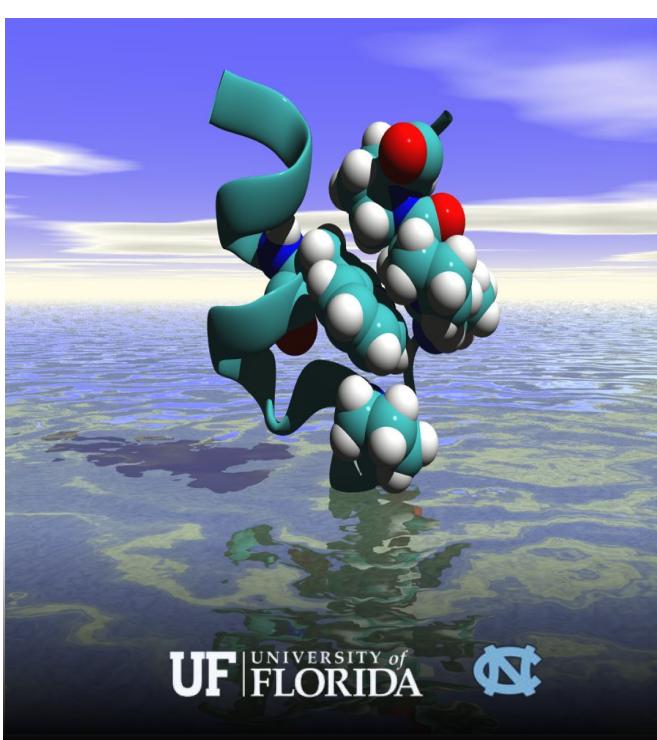


- Image/Video classification
- Cancer cell detection
- Speech recognition
- Diabetic grading
- Natural language processing
- Drug discovery
- Video captioning
- Content based search
- Real time translation
- Face recognition
- Video surveillance
- Cyber security
- Pedestrian detection
- Lane tracking
- Recognize traffic signs

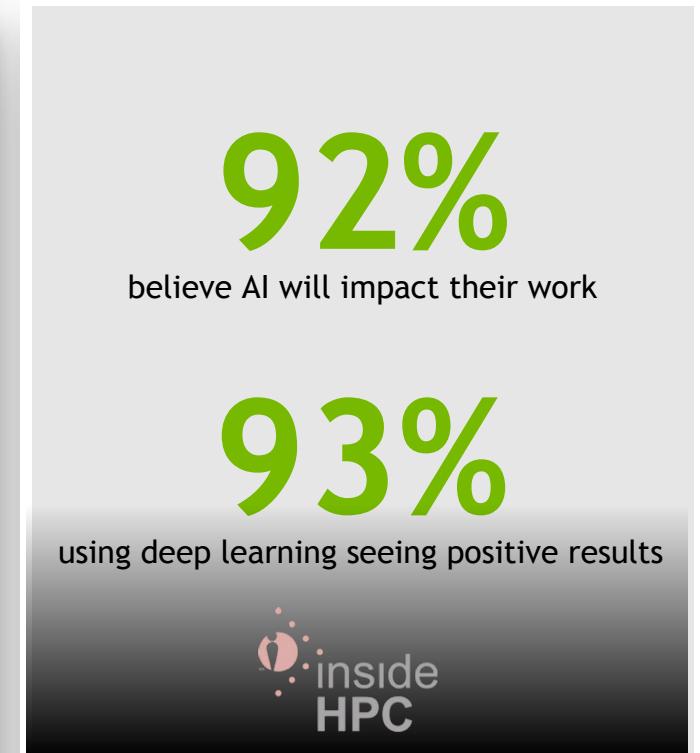
DEEP LEARNING IS TRANSFORMING HPC



“Seeing” Gravity In Real Time



Accelerating Drug Discovery

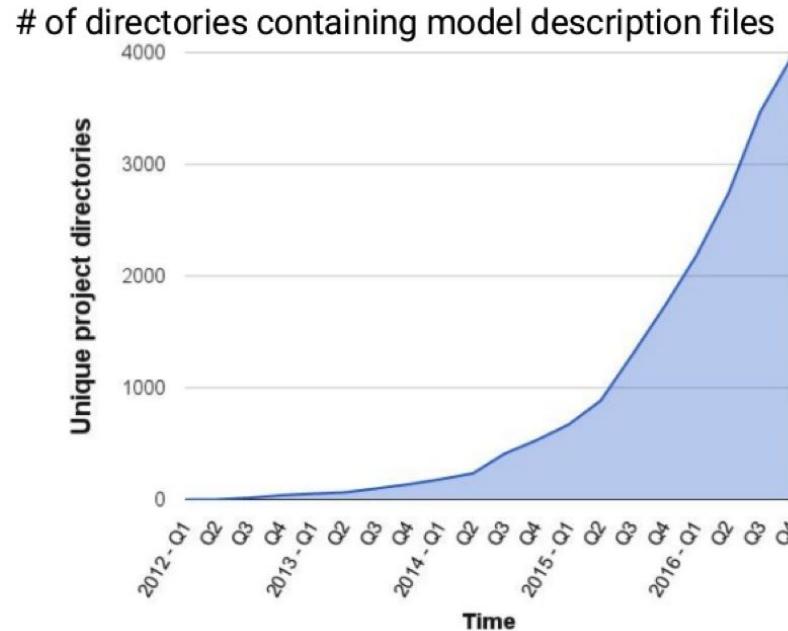


insideHPC.com Survey
November 2016

AI IS CRITICAL FOR INTERNET APPLICATIONS

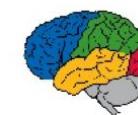
Users Expect Intelligence In Services

Growing Use of Deep Learning at Google



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

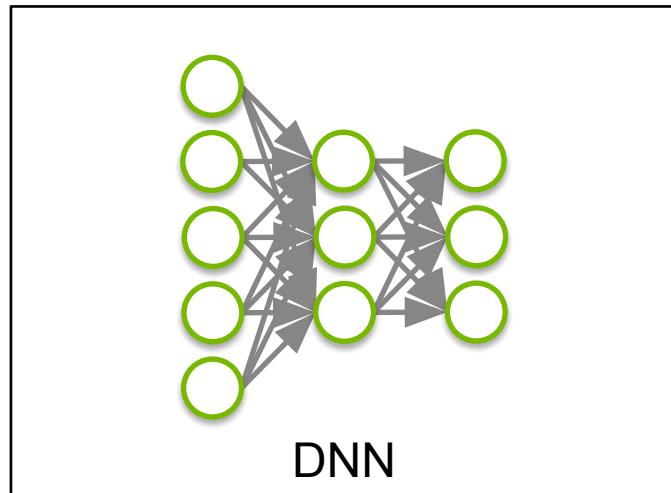
\$5B IN FUNDING

Source: Venture Scanner

INDUSTRY LEADERS



THE BIG BANG IN MACHINE LEARNING

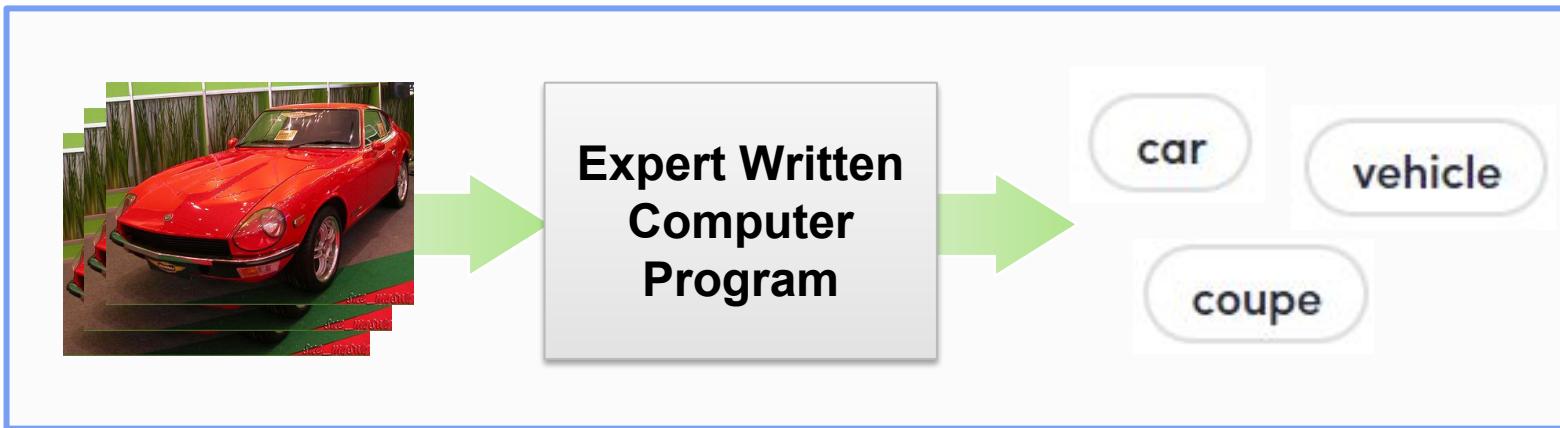


“Google’s AI engine also reflects how the world of computer hardware is changing. (It) depends on machines equipped with GPUs... And it depends on these chips more than the larger tech universe realizes.”

WIRED

A NEW COMPUTING MODEL

Algorithms that Learn from Examples

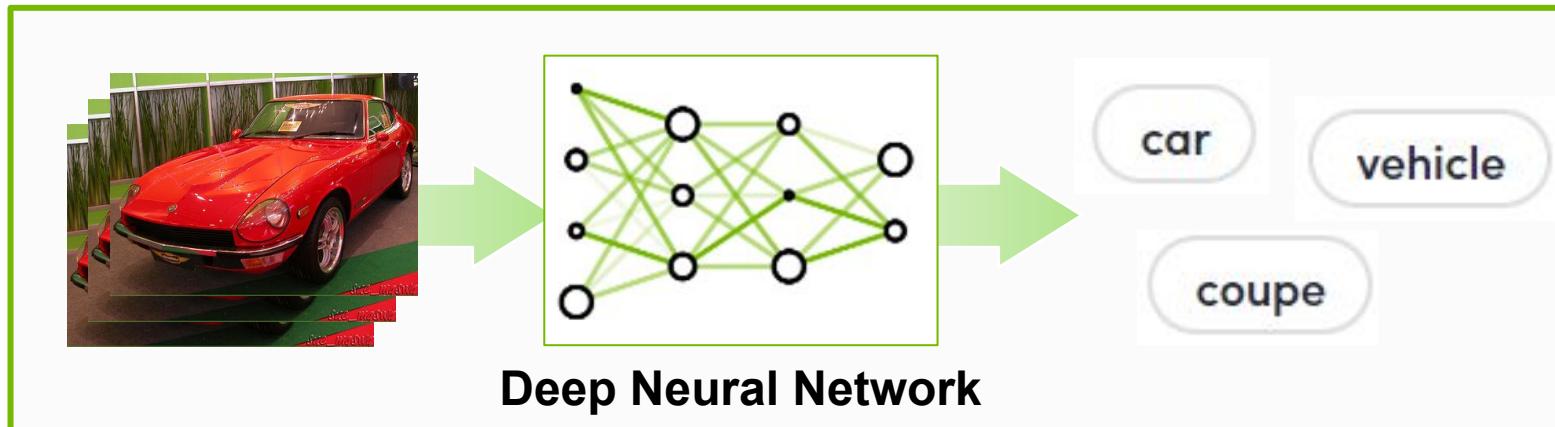
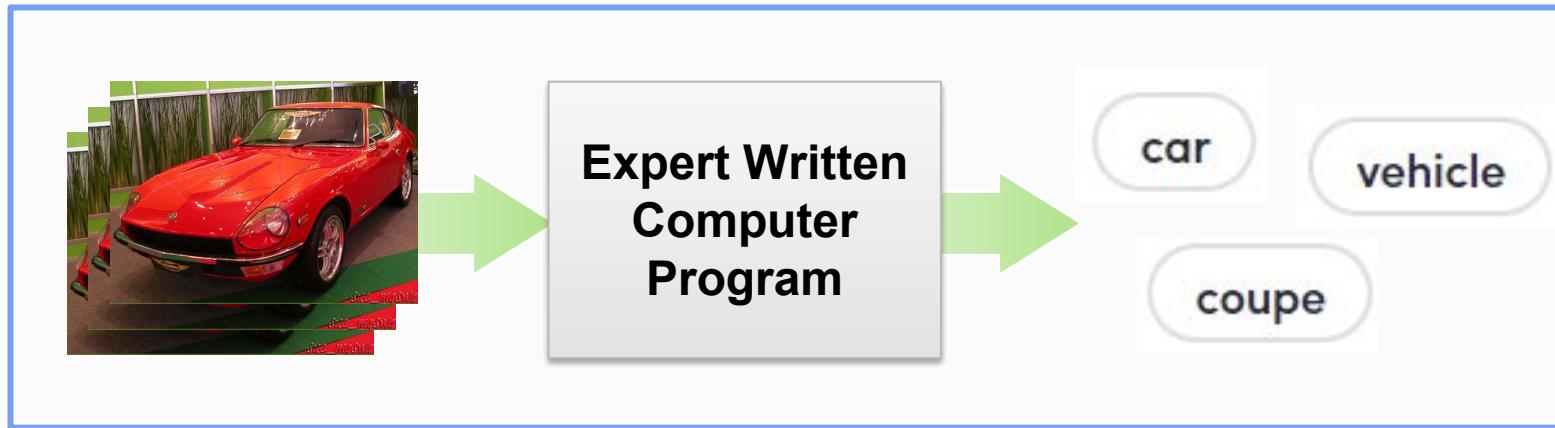


Traditional Approach

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

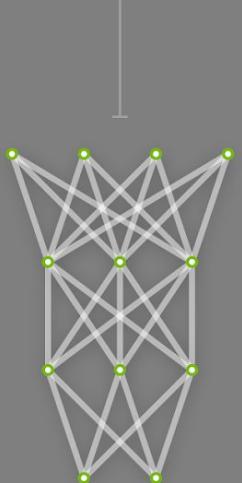
A NEW COMPUTING MODEL

Algorithms that Learn from Examples



DEEP LEARNING

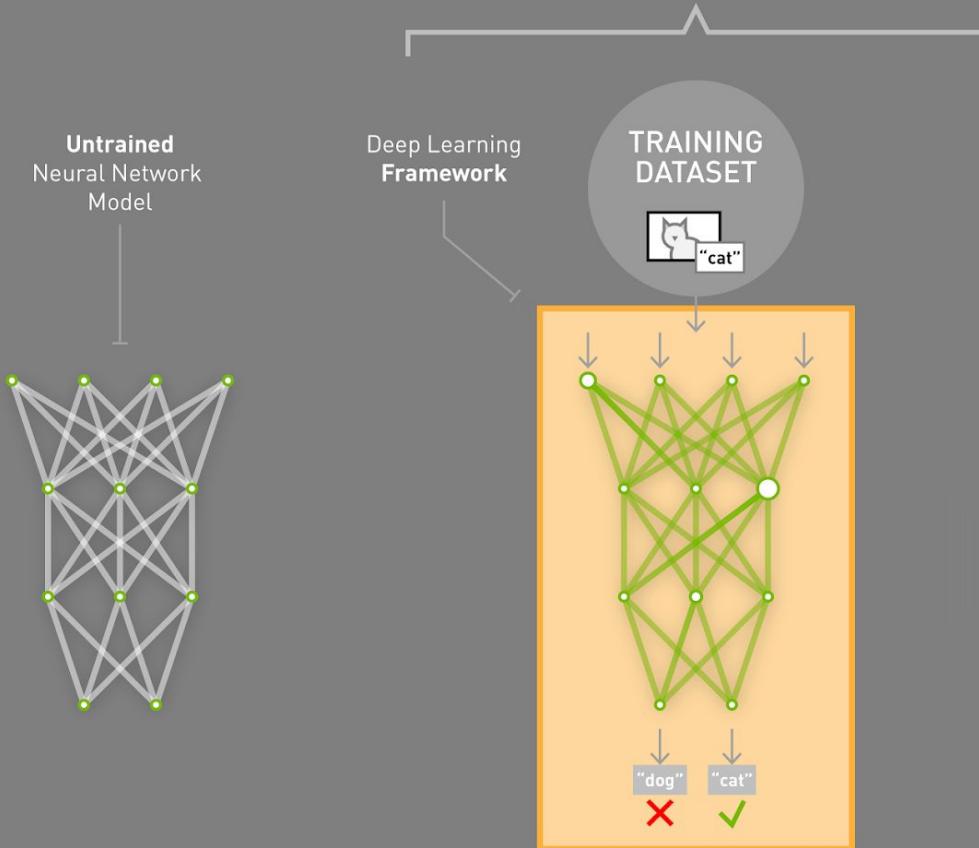
Untrained
Neural Network
Model



DEEP LEARNING

TRAINING

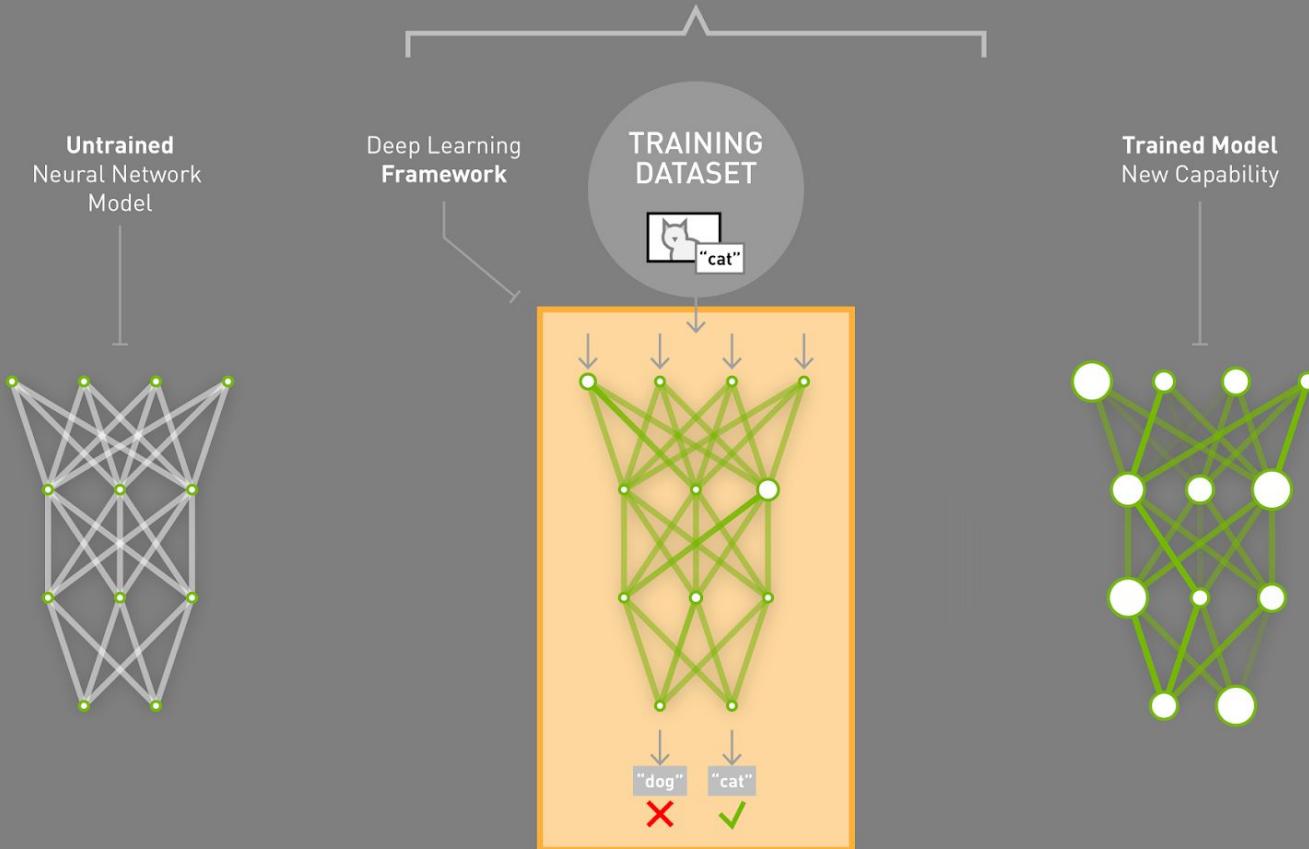
Learning a new capability
from existing data



DEEP LEARNING

TRAINING

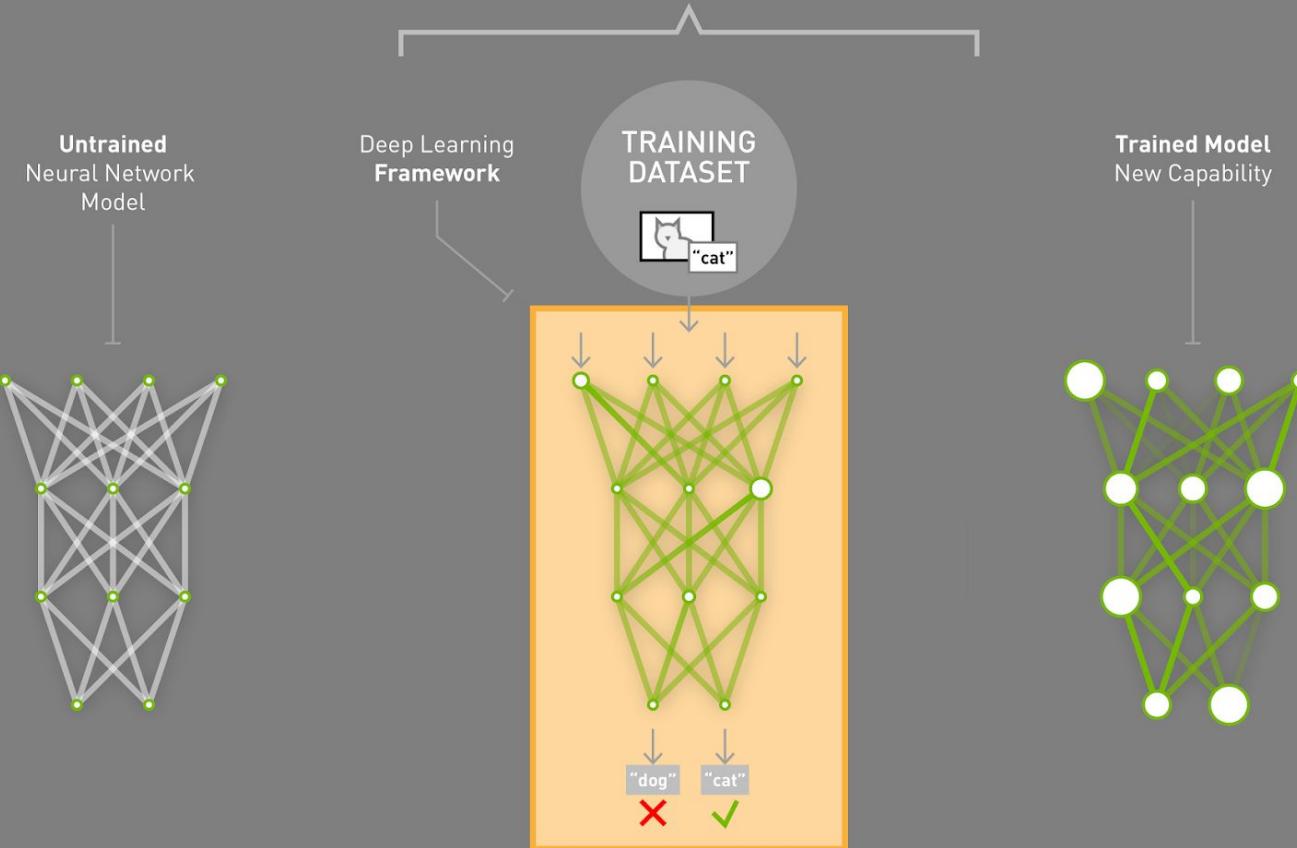
Learning a new capability
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DEEP LEARNING

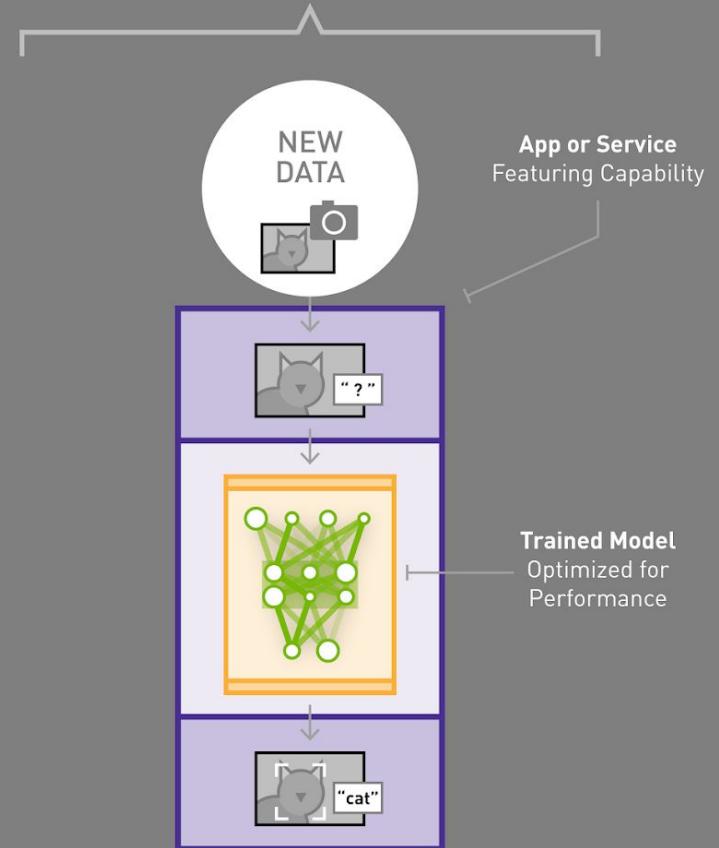
TRAINING

Learning a new capability
from existing data



INFERENCE

Applying this capability
to new data



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

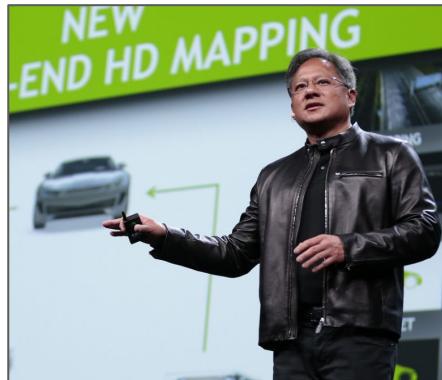
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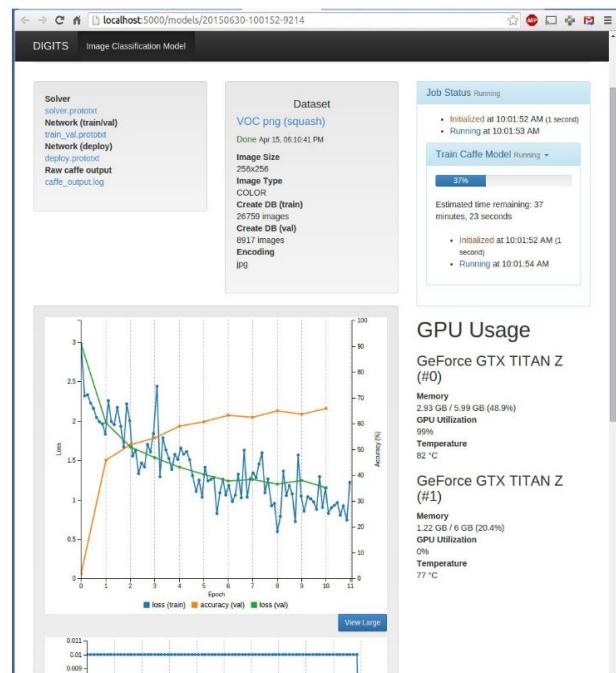
9-11 October 2018 at the International Congress Centre, Munich.

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](#)



Caffe2
MINERVA



KERAS
TensorFlow



theano

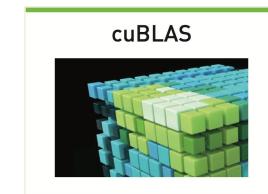
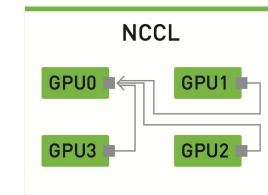
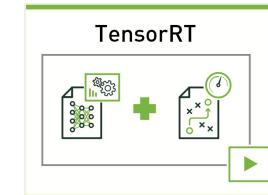
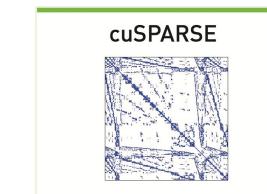
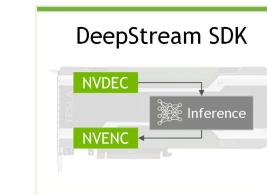
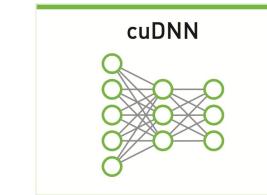


MatConvNet



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

FULLY INTEGRATED DL SUPERCOMPUTER



DGX-1 & DGX Station



DESKTOP



Titan X Pascal

DATA CENTER



Tesla P100
Tesla V100

DATA CENTER

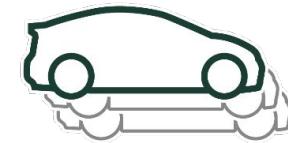


Tesla P100/V100



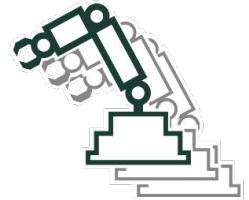
Tesla P4

AUTOMOTIVE



Drive PX2

EMBEDDED



Jetson TX1

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	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 satisfy the <u>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?

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Review [examples of AI in action](#)

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July 6th Image Classification with DIGITS

<http://nv/InternDL1>

July 20th Object Detection with DIGITS

<http://nv/InternDL2>

Aug 8th Neural Network Deployment with DIGITS and TensorRT <http://nv/InternDL3>

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