DEEP LEARNING DEMYSTIFIED

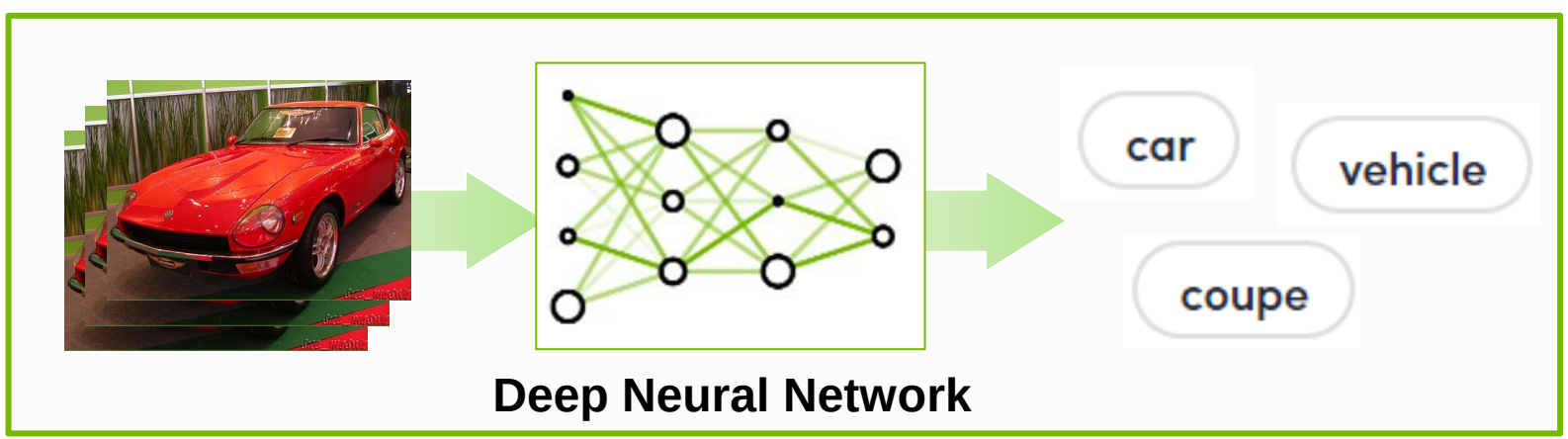
November 2016

A NEW COMPUTING MODEL

Algorithms that Learn from Examples

Traditional Approach

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



Deep Learning Approach

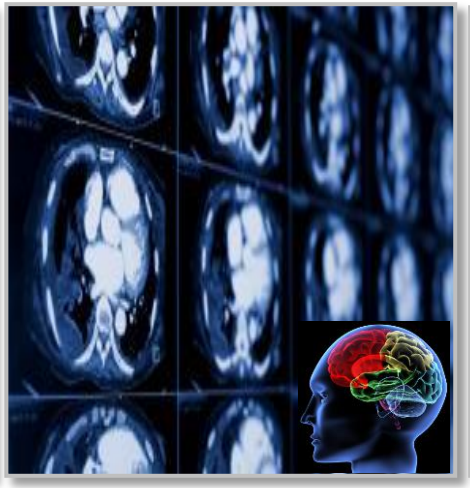
- ✓ Learn from data
- ✓ Easily to extend
- ✓ Speedup with GPUs

DEEP LEARNING IS SWEEPING ACROSS INDUSTRIES

Internet Services

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

Medicine

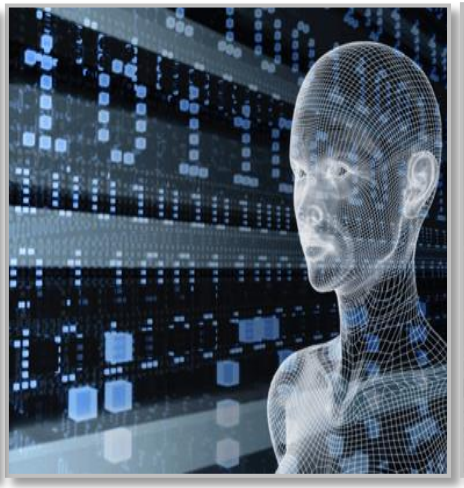


- Cancer cell detection
- Diabetic grading
- Drug discovery

Media & Entertainment

- Video captioning
- Content based search
- Real time translation

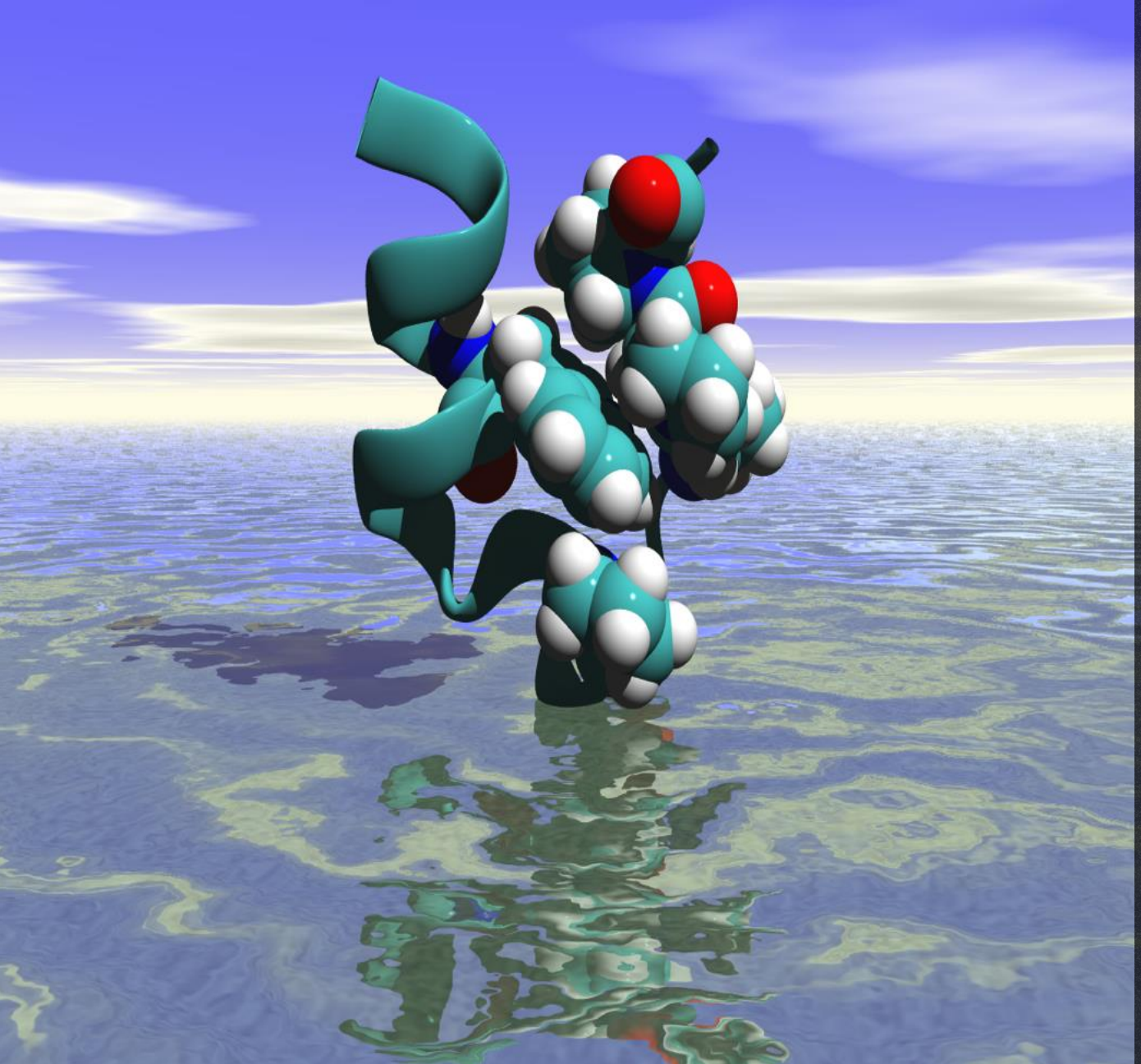
Security & Defense



- Face recognition
- Video surveillance
- Cyber security

Autonomous Machines

- Pedestrian detection
- Lane tracking
- Recognize traffic signs



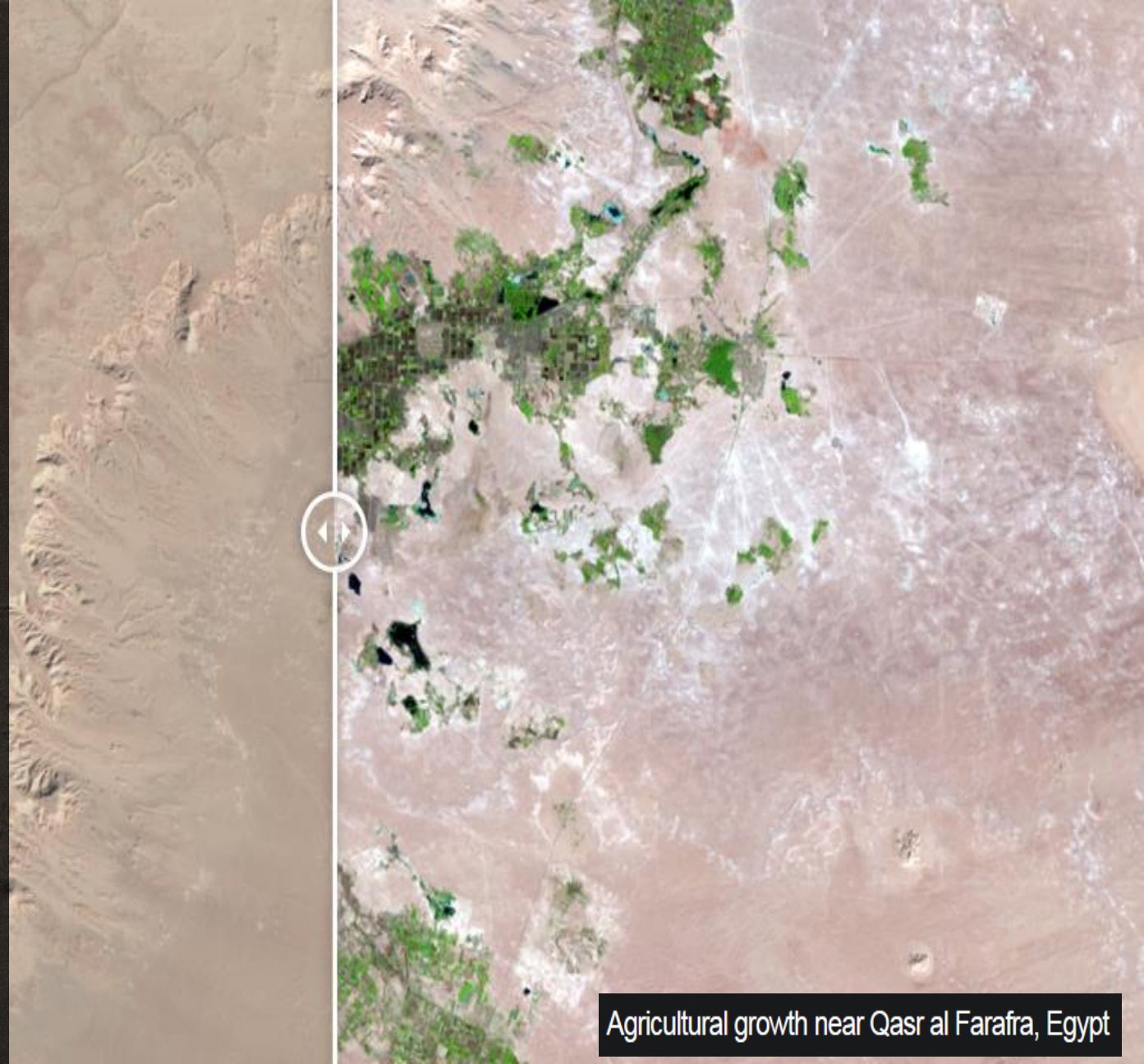
AN AI QUANTUM BREAKTHROUGH

Molecular energetics studies can lead to breakthroughs in drug discovery and materials science, but traditional computing approaches are time-consuming and expensive. Researchers at the University of Florida and the University of North Carolina leveraged GPU deep learning to develop ANAKIN-ME, which can reproduce molecular energy surfaces with super speed, extremely high accuracy, and at 1-10/millionth the cost of current computational methods.

UF | UNIVERSITY of FLORIDA

AN AI MONITOR OF EARTH'S VITALS

The Earth's climate has changed throughout history, but in recent years there have been record increases in temperature, glacial retreat and rising sea levels. NASA Ames is using satellite imagery to measure the effects of carbon and greenhouse gas emissions on the planet. To do so, they developed DeepSat — a deep learning framework for satellite image classification trained on a GPU-powered supercomputer. The enhanced satellite imagery will help scientists plan to protect ecosystems and farmers improve crop production.



Agricultural growth near Qasr al Farafra, Egypt

DEEP LEARNING

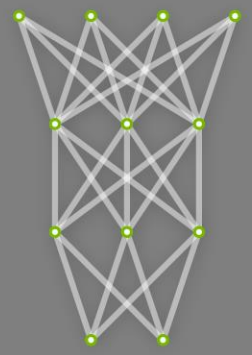
TRAINING

Learning a new capability
from existing data

INFERENCE

Applying this capability
to new data

Untrained
Neural Network
Model

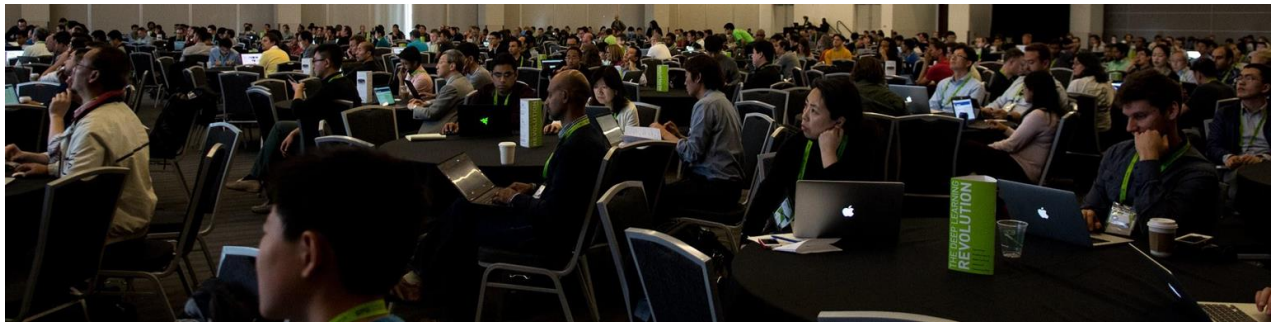


CHALLENGES

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

NVIDIA DEEP LEARNING INSTITUTE

Hands-on Training for Data Scientists and Software Engineers



Training organizations and individuals to solve challenging problems using Deep Learning

On-site workshops and online courses presented by certified experts

Covering complete workflows for proven application use cases

Self-driving cars, recommendation engines, medical image classification, intelligent video analytics and more

www.nvidia.com/dli

DIGITS DEEP LEARNING WORKFLOWS

New in DIGITS 5

IMAGE CLASSIFICATION

98% Dog

2% Cat

Classify images into classes or categories

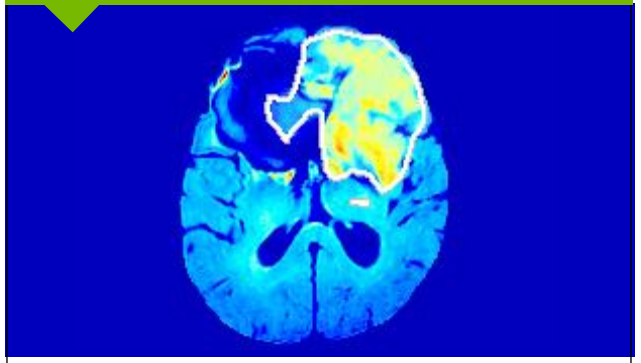
Object of interest could be anywhere in the image

OBJECT DETECTION

Find instances of objects in an image

Objects are identified with bounding boxes

IMAGE SEGMENTATION



Partition image into multiple regions

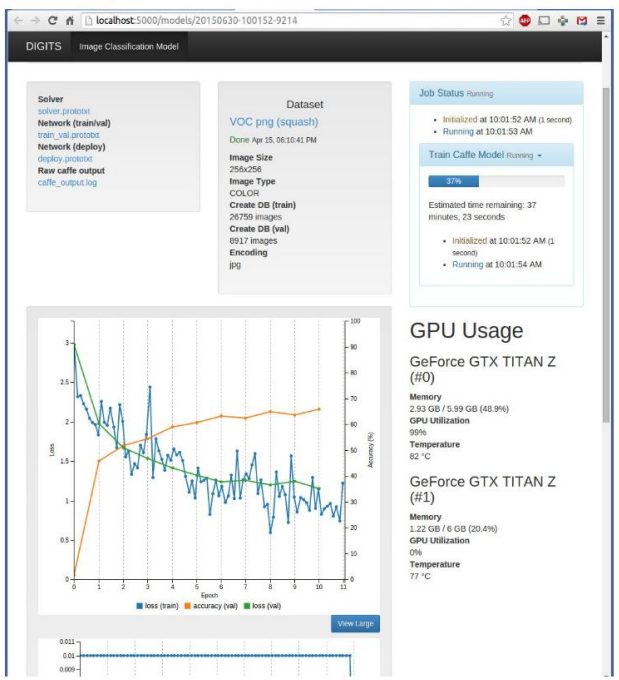
Regions are classified at the pixel level

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

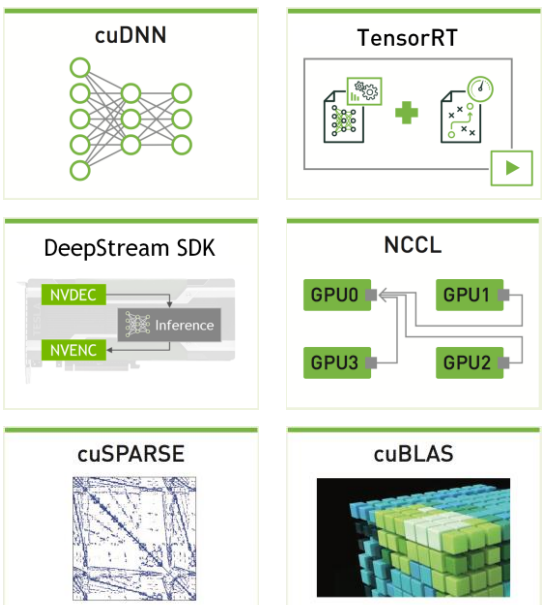
Design and train deep learning models using a high-level interface. Choose a deep learning framework that best suits your needs based on your choice of programming language, platform, and target application.

Learn more

Caffe
Chainer
DL4J Deeplearning4j
MINERVA
mxnet
Purine
KERAS
Microsoft CNTK
MatConvNet
TensorFlow
theano
torch

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

FULLY INTERGRATED DL SUPERCOMPUTER

DGX-1

DESKTOP

Titan X Pascal

DATA CENTER

Tesla P100

Tesla P40

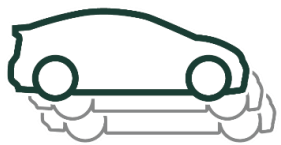
INFERENCE

DATA CENTER

Tesla P4

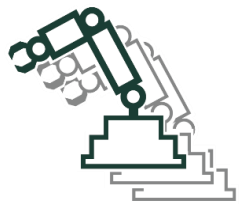
Tesla P40

AUTOMOTIVE



Drive PX2

EMBEDDED



Jetson TX1

CHALLENGES

Deep Learning Needs	NVIDIA Delivers
Data Scientists	DIGITS, DLI Training, GTC
Latest Algorithms	DL SDK, GPU-Accelerated Frameworks
Fast Training	DGX, P100, P40, TITAN X
Deployment Platform	TensorRT, P40, P4, Jetson, Drive PX