What is DIGITS
Deep Learning GPU Training System
DevBox and DIGITS

**DIGITS DevBox**
- Four TITAN X GPU
  - 7TFlops single precision
  - 336.5 GB/s memory bandwidth
  - 12GB
- Ubuntu 14.04
- w/Caffe, Torch, Theano, cuDNN v2, CUDA 7.0

**DIGITS**
- NVIDIA Deep Learning GPU Training System (DIGITS)
DIGITS
Interactive Deep Learning GPU Training System

Data Scientists & Researchers:

- Quickly design the best deep neural network (DNN) for your data
- Visually monitor DNN training quality in real-time
- Manage training of many DNNs in parallel on multi-GPU systems
- DIGITS 2 - Accelerate training of a single DNN using multiple GPUs

https://developer.nvidia.com/digits
DIGITS
Deep Learning GPU Training System

- Visualization tool for DNN training
- Use default network, import one, or design your own
- Import your training data from disk or web
- Monitor multiple training in parallel
DIGITS

Deep Learning GPU Training System

Who it is for

- Deep learning researchers
- Automotive
- Medical Researchers
- Defense
- Intelligent Video Analytics
- Web Companies
- Startups
DIGITS
Deep Learning GPU Training System

- Available at developer.nvidia.com/digits
- Free to use
- v2.0 supports classification on images
- Future versions: More problem types and data formats (video, speech)

(Also available on Github for advanced developers)
Using DIGITS
Deep Learning GPU Training System
How to start DIGITS

Two options

- "digits-devserver"
  - Starts a development server that listens on port 5000

- "digits-server"
  - Gunicorn application that listens on port 8080. You can configure this with nginx, and access DIGITS @ [http://localhost/](http://localhost/)

DIGITS Main Console
DIGITS Workflow

Create your database
Configure your model

Main Console

Choose your database
Create your dataset
Configure your Network
Choose a default network, modify one, or create your own
Start Training
DIGITS Workflow

Create your database
Configure your model

- Create your database
- Configure your model
- Choose your database
- Choose a default network, modify one, or create your own
- Start Training
- Configure your Network
- Main Console
- Home
- Datasets: In progress, Completed
- Create your dataset
- Models: In progress, Completed
- Choose a default network, modify one, or create your own
- New Model
- New Dataset
- New Image Classification Model
Create the Database

Create your dataset

DIGITS can automatically create your training and validation set

OR

Insert the path to your train and validation set

OR use a URL list

Image parameter options
Create the Database

DIGITS creates your training and validation set for you.

Insert the path to your images here

images directory on host machine
Create the Database

Create Training and Validation Set

Training
- truck
- person
- planes
- cats
- house
- bikes
- cars
- dogs

Validation
- bikes
- dogs
- cats
- planes
- house
- person
- trucks
- cars
Create the Database

New Image Classification Dataset

- Image type: Color
- Image encoding: PNG (lossless)
- Image size: 256 x 256
- Resize transformation: Squash

Set: Training, Validation, Test
- Text file: path/train.txt, path/valid.txt
- Image folder (optional)

- Apply rotation, color distortion, noise to training set

Dataset Name

Create
Create the Database

Training and validation data set information

Category data information is posted
DIGITS Workflow

Create your database
Configure your model

Choose your database
Start Training
Choose a default network, modify one, or create your own

Configure your Network
Create your dataset
Network Configuration

Select training dataset:
- Select Dataset
  - \textit{ue_cropped}

Data Transformations:
- Crop Size
- Subtract Mean File

Choose a preconfigured network:
- Standard Networks
- Previous Networks
- Custom Network

Choose a preconfigured network:
- \textbf{Network} \hspace{1cm} \textbf{Details} \hspace{1cm} \textbf{Intended image size}
  - LeNet: Original paper (1989) \hspace{1cm} 28x28 (gray)
  - AlexNet: Original paper (2012) \hspace{1cm} 224x224
  - GoogLeNet: Original paper (2014) \hspace{1cm} 299x299

Start training:
- \textbf{Model Name: }
- \textbf{Create}
Network Configuration

Select a standard network and start training

OR

Customize a Standard Network
Network Configuration

Select a standard network and start training

OR

Customize a Standard Network
Network Configuration

Select a standard network and start training

OR

Customize a Standard Network
Network Configuration

Select a standard network and start training

OR

Customize a Standard Network
Network Configuration

Select a standard network and start training

OR

Customize a Standard Network

Select training dataset

OR choose a previous configuration

OR choose a preconfigured network

Start training
DIGITS

Visualize DNN performance in real time

Compare networks

Download network files

Training status

Accuracy and loss values during training

Learning rate
DIGITS
Visualize DNN performance in real time
Compare networks

Download network files

Accuracy and loss values during training

Learning rate

Classification on the with the network snapshots

Classification
DIGITS

Compare networks
DIGITS

Classify Multiple Images

Upload a text file with URLs or images on the host machine
NVIDIA® DIGITS Roadmap

Version 1
March 2015
- Support for image classification networks
- Visualize layer-wise responses
- Run locally, manage single-GPU jobs

Caffe

Version 2
- Additional image analysis network types
- Richer visual analysis tools
- Run locally, more job management options

Version 3
- Continued improvement to visualization tools
- Front end to cluster task scheduler
- API for easy frameworks integration

Features
Framework Support
2015
NVIDIA Resources

- Try out GPU Computing: developer.nvidia.com/cuda-education-training
- Subscribe to Parallel Forall blog: devblogs.nvidia.com/parallelforall
  - CUDACasts at: bit.ly/cudacasts
- Self-paced labs: nvidia.qwiklab.com
  - 90-minute labs, simply need a supported web browser
- Sign up as a Registered developer: www.nvidia.com/paralleldeveloper
- Technical Questions:
  - NVIDIA Developer forums devtalk.nvidia.com
  - Search or ask on stackoverflow.com/tags/cuda
- GPU Technology Conference: www.gputechconf.com
Development

Data Scientist

Solver
Network
Dashboard

Select Training Dataset
Select Solver
Design the Neural Network
Train
Profile and Debug

Deployment

Model

Feedback

Classification Detection Segmentation

Cloud Database
Thank you!