C14200: FROM ZERO TO ONE - DEEP LEARNING WITH PYTORCH

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WHO AM I?

CURRENT: PRODUCT LEAD - PYTORCH

PREVIOUS:
- AI PRODUCT & PARTNERSHIPS LEAD @AMAZON
- DIR OF ML STRATEGY @INTEL

PASSIONATE ABOUT THE INTERSECTION OF OSS, AI AND COMMUNITY BUILDING
AGENDA

01
LIVE DEMO!

02
PYTORCH & THE COMMUNITY

03
PRIMER ON DEEP LEARNING

04
END TO END EXAMPLE USING JUPYTER

05
BREAK TIME & TRANSITION TO FMASSA
PROGRESSIVE GROWING OF GANS (PGAN)

By FAIR HDGAN

High-quality image generation of fashion, celebrity faces

```python
import torch
use_gpu = True if torch.cuda.is_available() else False

# trained on high-quality celebrity faces "celebA" dataset
# this model outputs 512 x 512 pixel images
model = torch.hub.load('facebookresearch/pytorch_GAN_zoo:hub', 'PGAN', model_name='celebA-HQ-512',
```

https://pytorch.org/hub/facebookresearch_pytorch-gan-zoo_pgan/
PYTORCH HUB | PYTORCH.ORG/HUB/

PYTORCH HUB
FOR RESEARCHERS

Explore and extend models from the latest cutting edge research.

MiDaS 456
The MiDaS v2 model for computing relative depth from a single image.

ntsnet 0?
classify birds using this fine-grained image classifier.
AI & PYTORCH TODAY
**INDUSTRY USAGE**

**PyTorch and Mars Petcare: Formulas, photos & feces**
At Mars Petcare, we are inspired every day by our Purpose: A Better World for Pets.

**How Lyft Uses PyTorch to Power Machine Learning for Their Self-Driving Cars**
Reducing the median job training time for heavy production jobs such as 2D and 3D detectors and segmenters to just 1 hour

**AI for AG: Production machine learning for agriculture**
Blue River Technology builds an intelligent sprayer that leverages PyTorch to targets weeds without harming crops.

**Applying PyTorch and Azure to accelerate drug discovery**

**Speeding up drug discovery with advanced machine learning**
AstraZeneca Biological Insights Knowledge Graph (BIKG) group uses PyTorch and Microsoft Azure Machine Learnings to speed up drug discovery

[https://medium.com/pytorch](https://medium.com/pytorch)
Object Navigation

"Go to toilet"
WHAT IS PYTORCH?
WHAT IS PYTORCH?

- EAGER & GRAPH-BASED EXECUTION
- DYNAMIC NEURAL NETWORKS
- DISTRIBUTED TRAINING
- HARDWARE ACCELERATION
- SIMPLICITY OVER COMPLEXITY
At the @PyTorch developer conference, I was part of a fascinating panel with @clattner_llvm, Yangqing Jia, and Noah Goodman. Expertly moderated by @soumithchintala. Here it is!

10 Oct 2018
~1,619 CONTRIBUTORS  50%+ YOY GROWTH  34K+ PYTORCH FORUM USERS
GROWING USAGE IN OPEN SOURCE

Paper Implementations grouped by framework

Source: https://paperswithcode.com/trends
WHAT IS DEEP LEARNING?
Deep learning algorithms attempt to draw similar conclusions as humans would by continually analyzing data with a given logical structure. To achieve this, deep learning uses a multi-layered structure of algorithms called neural networks.
**Training Data:** Known correct examples

**Input:** Images

**Patterns of Local Contrast**

**Face Features**

**Hidden Layer 1**

**Hidden Layer 2**

**Output Layer**

**Output:** New Prediction

**Loss:** How are we doing?

**Image from:** https://cdn.edureka.co/blog/wp-content/uploads/2017/05/Deep-Neural-Network-What-is-Deep-Learning-Edureka.png
SOFTWARE 1.0

*Explicit programming*

1. It consists of explicit instructions to the computer written by a programmer.

2. By writing each line of code, the programmer identifies a specific point in program space with some desirable behavior.

3. Written directly in C++, Python,..

SOFTWARE 2.0

*Optimization based - learned from data*

1. Can be written in much more abstract, human unfriendly language, such as the weights of a neural network.

2. No human is involved in writing this code because there are a lot of weights (typical networks might have millions), and coding directly in weights is basically impossible.

3. Weights are instead learned from iterating on data to learn a function - in a process known as training.

https://medium.com/@karpathy/software-2-0-a64152b37c35
JUPYTER + PYTORCH = ❤️
PYTORCH HAS NATIVE SUPPORT FOR COLAB

Welcome To Colaboratory
File Edit View Insert Runtime Tools Help

Table of contents
×
Getting started
Data science
Machine learning
More Resources
Machine Learning Examples
Section

+ Code + Text Copy to Drive

What is Colaboratory?

Colaboratory, or “Colab” for short, allows you to write and execute Python in your browser, with
- Zero configuration required
- Free access to GPUs
- Easy sharing

Whether you’re a student, a data scientist or an AI researcher, Colab can make your work easier. Watch Introduction to Colab to learn more, or just get started below!

Getting started

The document you are reading is not a static web page, but an interactive environment called a Colab notebook that lets you write and execute code.

For example, here is a code cell with a short Python script that computes a value, stores it in a variable, and prints the result:

```python
1 second_in_a_day = 24 * 60 * 60
```

To execute the code in the above cell, select it with a click and then either press the play button to the left of the code, or use the keyboard shortcut ‘Command/Ctrl+Enter’. To edit the code, just click the cell and start editing.
OPTION 1: LOADING A NB FROM GITHUB
OPTION 2: CLICK THROUGH ON PYTORCH.ORG

**PyTorch**

1.5.1

Tutorials (beta) Dynamic Quantization on an LSTM Word Language Model

- Run in Google Colab
- Download Notebook
- View on GitHub

**(BETA) DYNAMIC QUANTIZATION ON AN LSTM WORD LANGUAGE MODEL**

**Author:** James Reed  
**Edited by:** Seth Weidman

**Introduction**

Quantization involves converting the weights and activations of your model from float to int, which can result in smaller model size and faster inference with only a small hit to accuracy.

In this tutorial, we'll apply the easiest form of quantization - dynamic quantization - to an LSTM-based next word-prediction model, closely following the word language model from the PyTorch examples.

```python
# imports
import as from io import open

# model
model = LSTM( ... )
```
How to use TensorBoard with PyTorch

TensorBoard is a visualization toolkit for machine learning experimentation. TensorBoard allows tracking and visualizing metrics such as loss and accuracy, visualizing the model graph, viewing histograms, displaying images and much more. In this tutorial, we are going to cover TensorBoard installation, basic usage with PyTorch, and how to visualize data you logged in TensorBoard UI.

Installation

PyTorch should be installed to log models and metrics into TensorBoard log directory. The following command will install PyTorch 1.4+ via Anaconda (recommended):

```
$ conda install pytorch torchvision -c pytorch
```

or pip

```
$ pip install torch torchvision
```

Using TensorBoard in PyTorch

Let's now try using TensorBoard with PyTorch! Before logging anything, we need to create a `SummaryWriter` instance.
CHANGE YOUR RUNTIME TO GPU OR TPU.. :), SHIFT-ENTER AND YOU’RE OFF!!
SHALL WE LOOK AT SOME CODE?
(IN A JUPYTER NB OF COURSE... :)