TensorFlow Examples and Tutorials

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- Introduction to MNIST Dataset.

1 - Introduction

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- DCGAN (Deep Convolutional Generative Adversarial Networks) (notebook).
 Build a Deep Convolutional Generative Adversarial Network (DCGAN) to generate images from noise.

4 - Utilities

- **Save and Restore a model** (<u>notebook</u>). Save and Restore a model with TensorFlow 2.0.
- Build Custom Layers & Modules (<u>notebook</u>). Learn how to build your own layers / modules and integrate them into TensorFlow 2.0 Models.

5 - Data Management

- **Load and Parse data** (<u>notebook</u>). Build efficient data pipeline with TensorFlow 2.0 (Numpy arrays, Images, CSV files, custom data, ...).
- **Build and Load TFRecords** (<u>notebook</u>). Convert data into TFRecords format, and load them with TensorFlow 2.0.
- Image Transformation (i.e. Image Augmentation) (notebook). Apply various image augmentation techniques with TensorFlow 2.0, to generate distorted images for training.

TensorFlow v1

The tutorial index for TF v1 is available here: <u>TensorFlow v1.15 Examples</u>. Or see below for a list of the examples.

Dataset

Some examples require MNIST dataset for training and testing. Don't worry, this dataset will automatically be downloaded when running examples. MNIST is a database of handwritten digits, for a quick description of that dataset, you can check <u>this notebook</u>.

Official Website: http://yann.lecun.com/exdb/mnist/.

Installation

To download all the examples, simply clone this repository:

git clone https://github.com/aymericdamien/TensorFlow-Examples
To run them, you also need the latest version of TensorFlow. To install it:

pip install tensorflow
or (with GPU support):

pip install tensorflow_gpu

For more details about TensorFlow installation, you can check <u>TensorFlow Installation</u> Guide

TensorFlow v1 Examples - Index

The tutorial index for TF v1 is available here: <u>TensorFlow v1.15 Examples</u>.

0 - Prerequisite

- Introduction to Machine Learning.
- Introduction to MNIST Dataset.

1 - Introduction

 Hello World (notebook) (code). Very simple example to learn how to print "hello world" using TensorFlow.

- **Basic Operations** (<u>notebook</u>) (<u>code</u>). A simple example that cover TensorFlow basic operations.
- TensorFlow Eager API basics (notebook) (code). Get started with TensorFlow's Eager API.

2 - Basic Models

- **Linear Regression** (<u>notebook</u>) (<u>code</u>). Implement a Linear Regression with TensorFlow.
- **Linear Regression (eager api)** (notebook) (code). Implement a Linear Regression using TensorFlow's Eager API.
- **Logistic Regression** (<u>notebook</u>) (<u>code</u>). Implement a Logistic Regression with TensorFlow.
- Logistic Regression (eager api) (notebook) (code). Implement a Logistic Regression using TensorFlow's Eager API.
- **Nearest Neighbor** (<u>notebook</u>) (<u>code</u>). Implement Nearest Neighbor algorithm with TensorFlow.
- **K-Means** (notebook) (code). Build a K-Means classifier with TensorFlow.
- Random Forest (<u>notebook</u>) (<u>code</u>). Build a Random Forest classifier with TensorFlow.
- **Gradient Boosted Decision Tree (GBDT)** (<u>notebook</u>) (<u>code</u>). Build a Gradient Boosted Decision Tree (GBDT) with TensorFlow.
- Word2Vec (Word Embedding) (notebook) (code). Build a Word Embedding Model (Word2Vec) from Wikipedia data, with TensorFlow.

3 - Neural Networks

Supervised

- **Simple Neural Network** (<u>notebook</u>) (<u>code</u>). Build a simple neural network (a.k.a Multi-layer Perceptron) to classify MNIST digits dataset. Raw TensorFlow implementation.
- **Simple Neural Network (tf.layers/estimator api)** (notebook) (code). Use TensorFlow 'layers' and 'estimator' API to build a simple neural network (a.k.a Multi-layer Perceptron) to classify MNIST digits dataset.
- **Simple Neural Network (eager api)** (notebook) (code). Use TensorFlow Eager API to build a simple neural network (a.k.a Multi-layer Perceptron) to classify MNIST digits dataset.

- **Convolutional Neural Network** (<u>notebook</u>) (<u>code</u>). Build a convolutional neural network to classify MNIST digits dataset. Raw TensorFlow implementation.
- Convolutional Neural Network (tf.layers/estimator api) (notebook) (code).
 Use TensorFlow 'layers' and 'estimator' API to build a convolutional neural network to classify MNIST digits dataset.
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- **Bi-directional Recurrent Neural Network (LSTM)** (notebook) (code). Build a bi-directional recurrent neural network (LSTM) to classify MNIST digits dataset.
- **Dynamic Recurrent Neural Network (LSTM)** (notebook) (code). Build a recurrent neural network (LSTM) that performs dynamic calculation to classify sequences of different length.

Unsupervised

- **Auto-Encoder** (notebook) (code). Build an auto-encoder to encode an image to a lower dimension and re-construct it.
- **Variational Auto-Encoder** (<u>notebook</u>) (<u>code</u>). Build a variational auto-encoder (VAE), to encode and generate images from noise.
- **GAN (Generative Adversarial Networks)** (notebook) (code). Build a Generative Adversarial Network (GAN) to generate images from noise.
- DCGAN (Deep Convolutional Generative Adversarial Networks) (notebook)
 (code). Build a Deep Convolutional Generative Adversarial Network (DCGAN) to generate images from noise.

4 - Utilities

- Save and Restore a model (notebook) (code). Save and Restore a model with TensorFlow.
- **Tensorboard Graph and loss visualization** (notebook) (code). Use Tensorboard to visualize the computation Graph and plot the loss.
- **Tensorboard Advanced visualization** (<u>notebook</u>) (<u>code</u>). Going deeper into Tensorboard; visualize the variables, gradients, and more...

5 - Data Management

• **Build an image dataset** (<u>notebook</u>) (<u>code</u>). Build your own images dataset with TensorFlow data queues, from image folders or a dataset file.

- **TensorFlow Dataset API** (<u>notebook</u>) (<u>code</u>). Introducing TensorFlow Dataset API for optimizing the input data pipeline.
- **Load and Parse data** (<u>notebook</u>). Build efficient data pipeline (Numpy arrays, Images, CSV files, custom data, ...).
- **Build and Load TFRecords** (<u>notebook</u>). Convert data into TFRecords format, and load them.
- **Image Transformation (i.e. Image Augmentation)** (<u>notebook</u>). Apply various image augmentation techniques, to generate distorted images for training.

6 - Multi GPU

- **Basic Operations on multi-GPU** (<u>notebook</u>) (<u>code</u>). A simple example to introduce multi-GPU in TensorFlow.
- Train a Neural Network on multi-GPU (notebook) (code). A clear and simple
 TensorFlow implementation to train a convolutional neural network on multiple
 GPUs.