Tutorial 6 - Deep Learning

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Carleton University

Friday 16th October, 2020

Asynchronous Tutorial

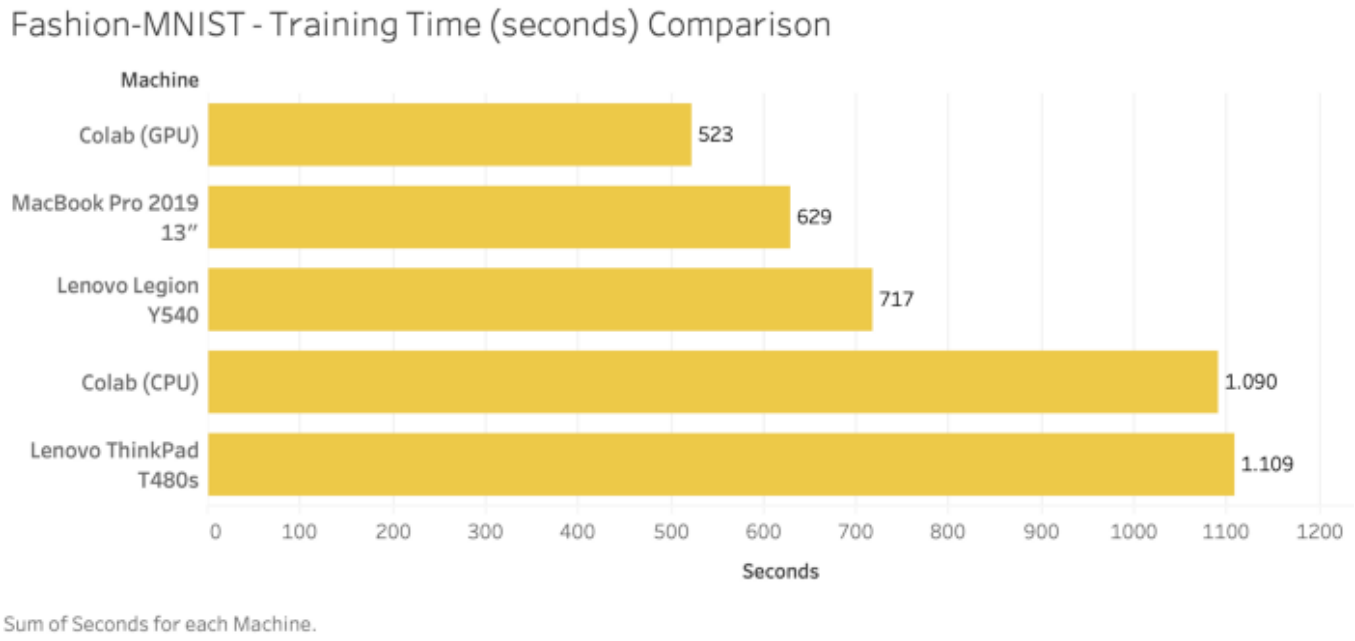
To watch and following along at your leisure

ML Weekly

Recent news events from the ML community

ML Weekly

1. **(ML)** Google Colab: How does it compare to a GPU-enabled laptop?



ML Weekly

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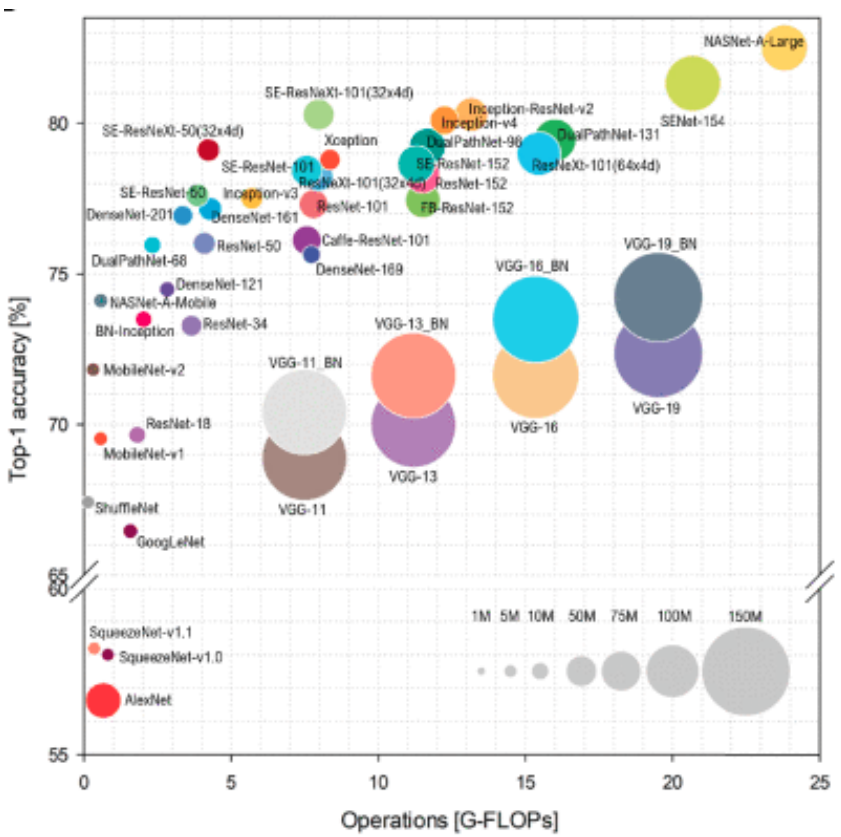
4. **(Vision)** Benchmark analysis of representative deep neural network architectures



Tutorial Intuition

Building an Intuition for the Concepts of this Tutorial

Introducing the Keras API: Deep Network in < 30 Lines

The core data structures of Keras are **layers** and **models**. The simplest type of model is the **Sequential model**, a linear stack of layers.

Algorithm 1 Pseudocode for Building a Deep Learning (Vision) Model

Input: model parameters
Output: model object implementing architecture

```
initialized model object, m
m ← add input layer
for each hidden layer, h_i, in {h_1, h_2, ..., h_n} do
    m ← add a convolutional layer
    m ← add an activation layer (optional)
    m ← add a normalization layer (optional)
    m ← add a pooling layer (optional)
    m ← add a dropout layer (optional)
end for
m ← add output layer
return m
```

Introducing the Keras API

```
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense

model = Sequential() # a linear stack of layers

# stacking layers is as easy as .add():
#
#

# configure model learning process with .compile():
#
#
#

# (Optional) further configure your optimizer.
#
#
#

# x_train and y_train are Numpy arrays akin to Scikit-Learn API.
#

# Evaluate your test loss and metrics in one line:
#

# Or generate predictions on new data:
#
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# stacking layers is as easy as .add():
model.add(Dense(units=64, activation='relu'))
model.add(Dense(units=10, activation='softmax'))

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# configure model learning process with .compile():
model.compile(loss='categorical_crossentropy',
              optimizer='sgd',
              metrics=['accuracy'])

# (Optional) further configure your optimizer.
model.compile(loss=keras.losses.categorical_crossentropy,
              optimizer=keras.optimizers.SGD(learning_rate=0.01,
              momentum=0.9, nesterov=True))

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# x_train and y_train are Numpy arrays akin to Scikit-Learn API.
model.fit(x_train, y_train, epochs=5, batch_size=32)

# Evaluate your test loss and metrics in one line:
#

# Or generate predictions on new data:
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# x_train and y_train are Numpy arrays akin to Scikit-Learn API.
model.fit(x_train, y_train, epochs=5, batch_size=32)

# Evaluate your test loss and metrics in one line:
loss_and_metrics = model.evaluate(x_test, y_test, batch_size=128)

# Or generate predictions on new data:
classes = model.predict(x_test, batch_size=128)
```

Into the Notebooks we Go...

We will cover one new notebook today!

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