Deep Learning
PyTorch Programming

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PyTorch Programming

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- PyTorch & Colab
  a. Setup
     i. Google Colab
        - ...easier to set up
     ii. NCC / local
        - ...a bit more responsive...
        - visdom
  b. Tensors
     i. Dynamic graph
  c. Devices

https://github.com/cwkx/ml-materials

https://colab.research.google.com/gist/cwkx/d1e5bb1776fd65b00fe2921f59c88871/classifier.ipynb

- Typical approach
  a. Data loaders
  b. Transforms
  c. Networks
     i. Init
     ii. Forward
  d. Setup optimisation strategy
  e. Training
     i. Sample
     ii. Zero grad
     iii. Forward
     iv. Loss
     v. Backward
     vi. Step
  f. Testing
  g. Plotting

$$\theta^{(t+1)} = \theta^{(t)} - \eta \nabla_\theta \mathcal{L}(\theta)$$

Note: this lecture is a live programming demonstration. The slides are minimal. The material can be downloaded here:

https://github.com/cwkx/ml-materials

The dataset doesn't fit in memory...

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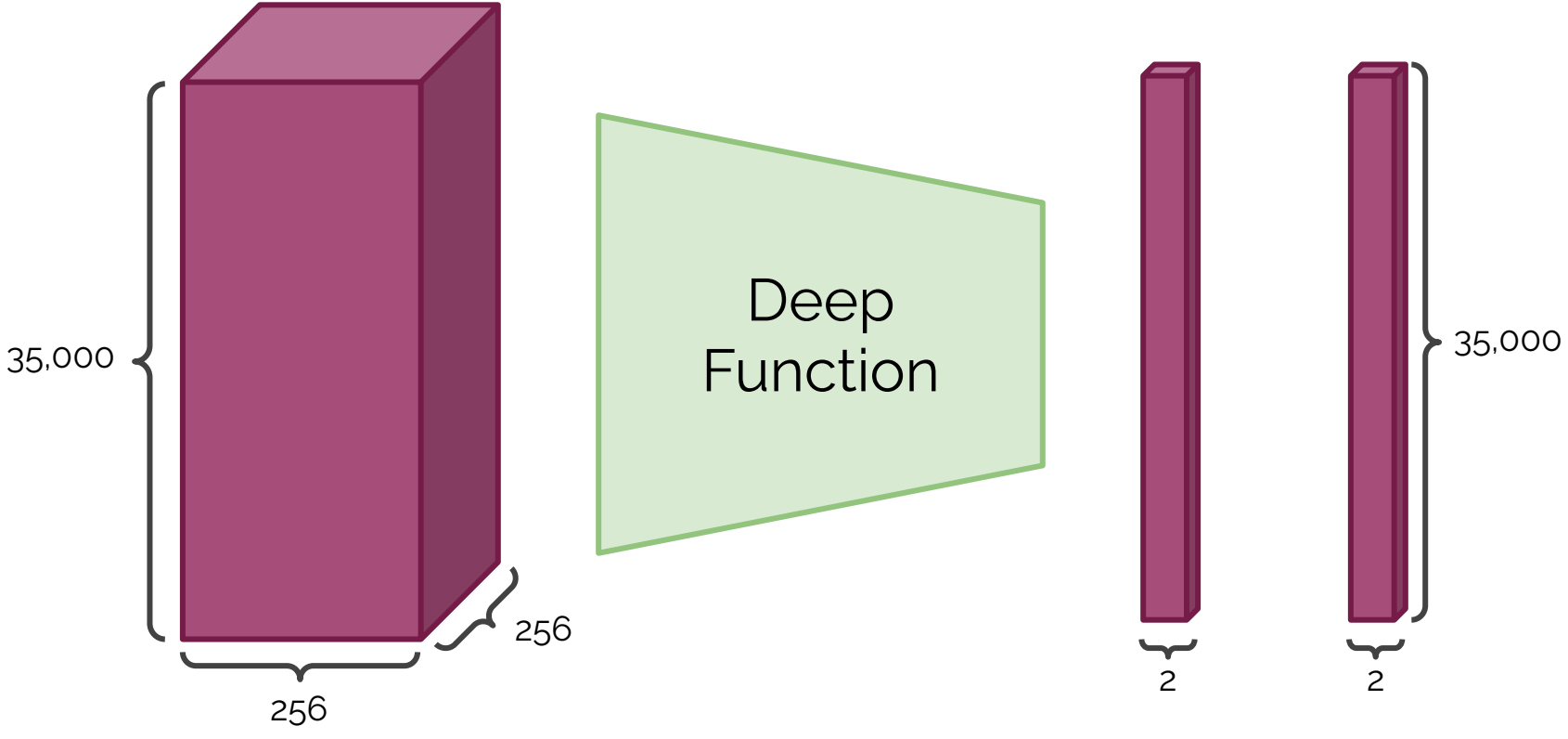
35,000 * 3 * 256 * 256 * (32 bits) = **27.52 gigabytes** *not including the model!*



We run out of memory...

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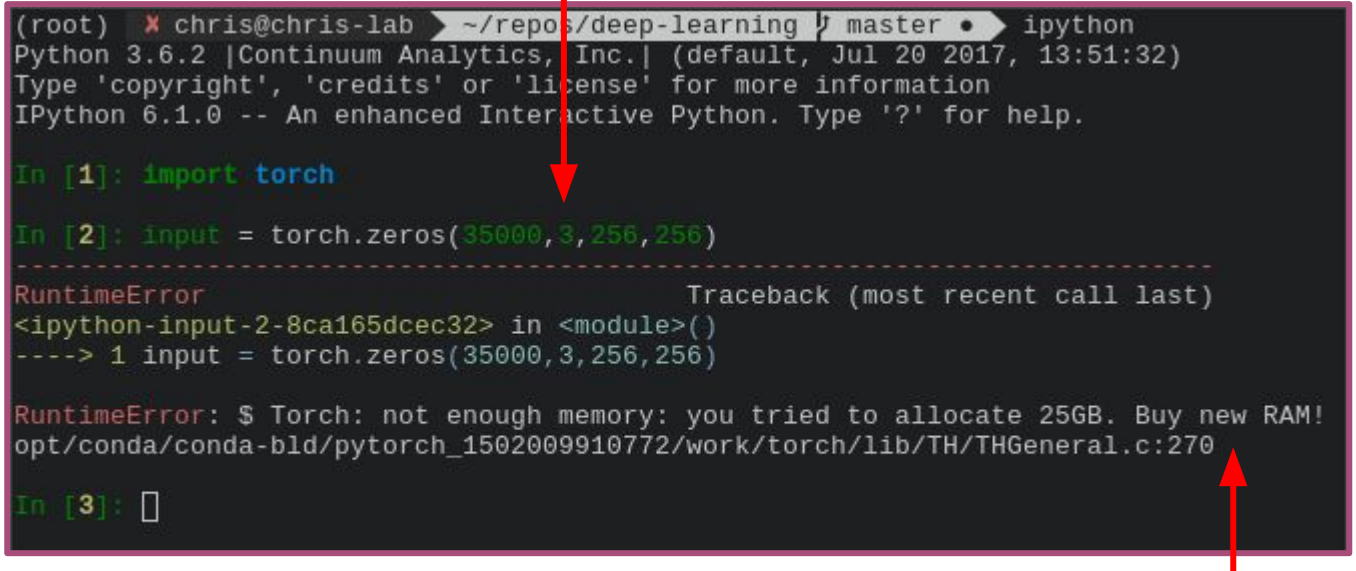
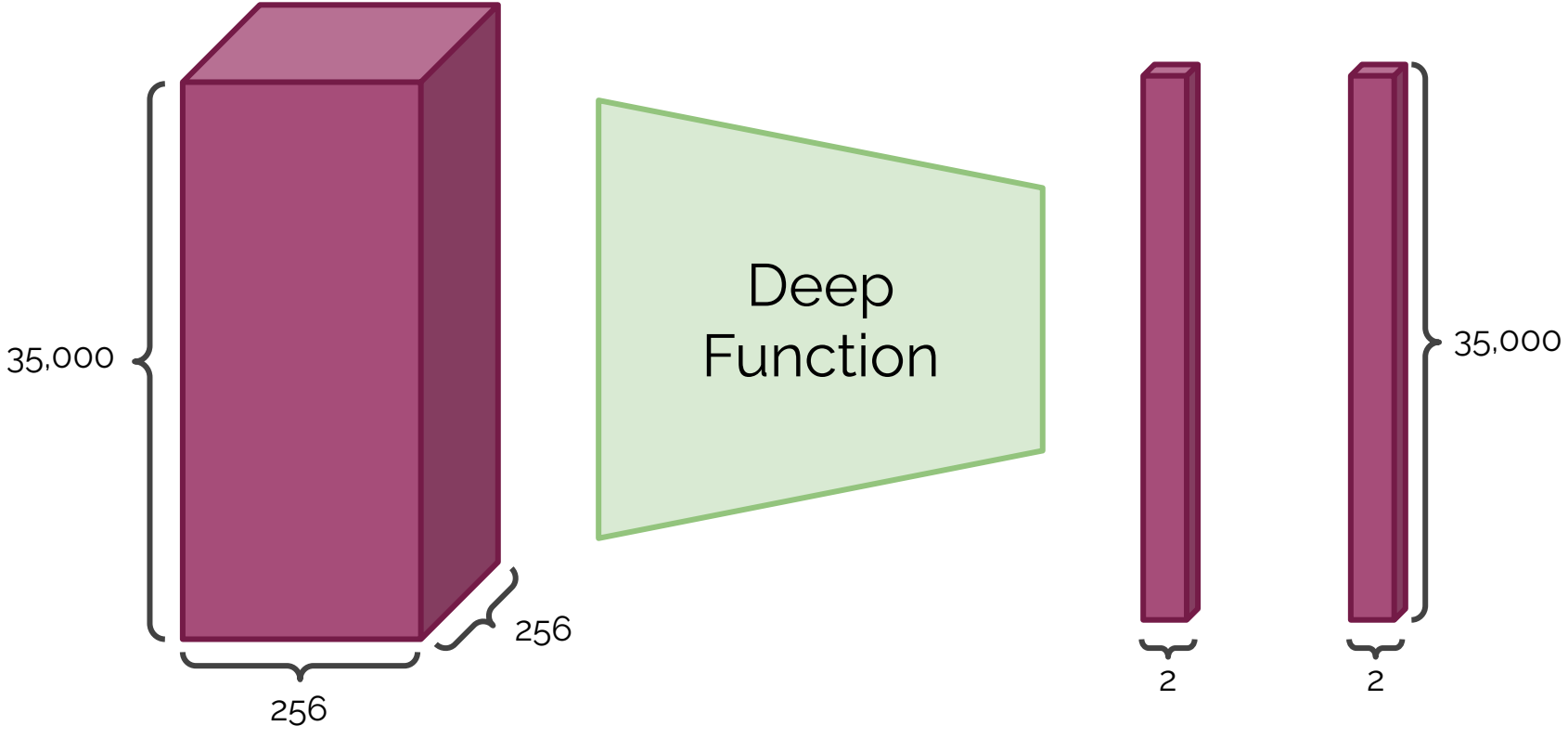
Try and create the tensor



Nope!

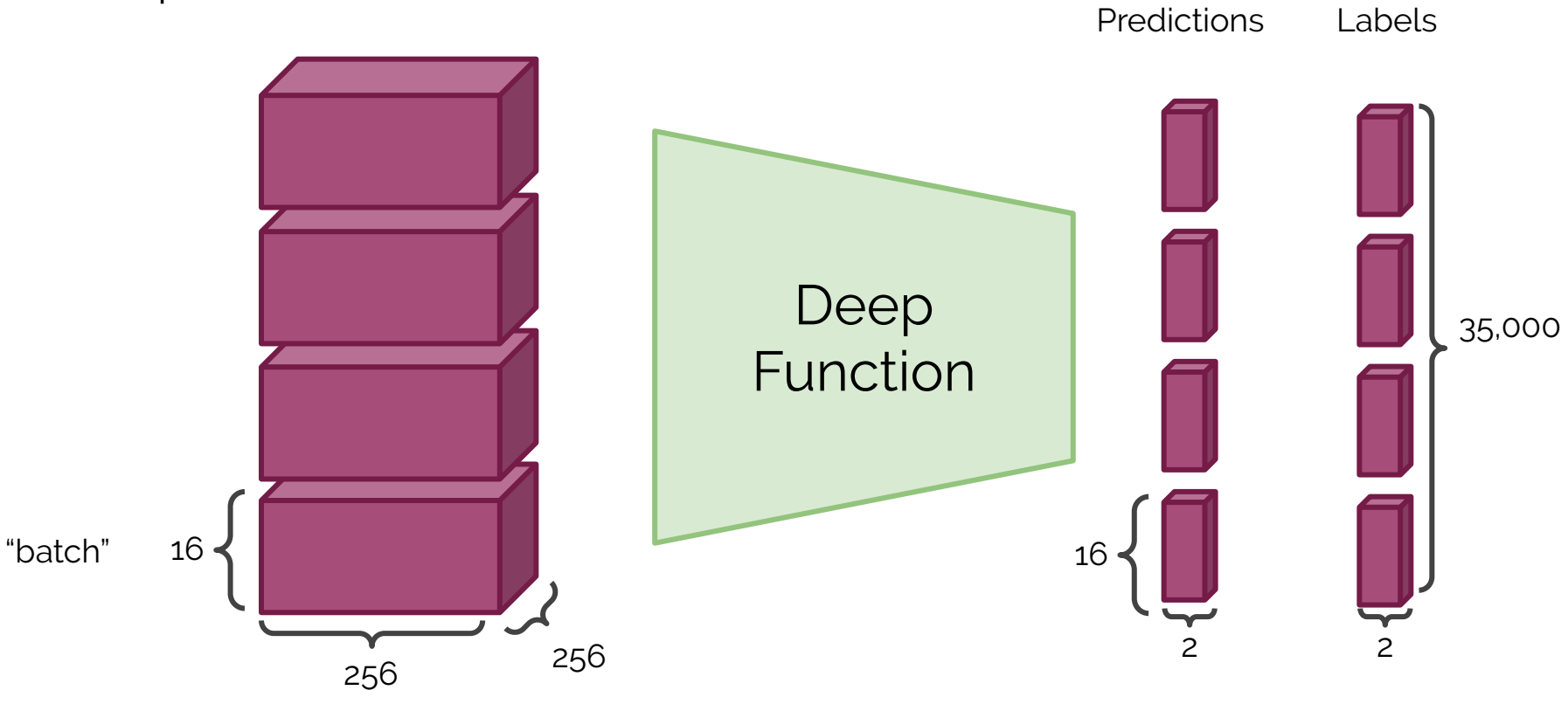
We run out of memory...

35,000 * 256 * 256 * 3 * (32 bits) = **27.52 gigabytes** *not including the model!*



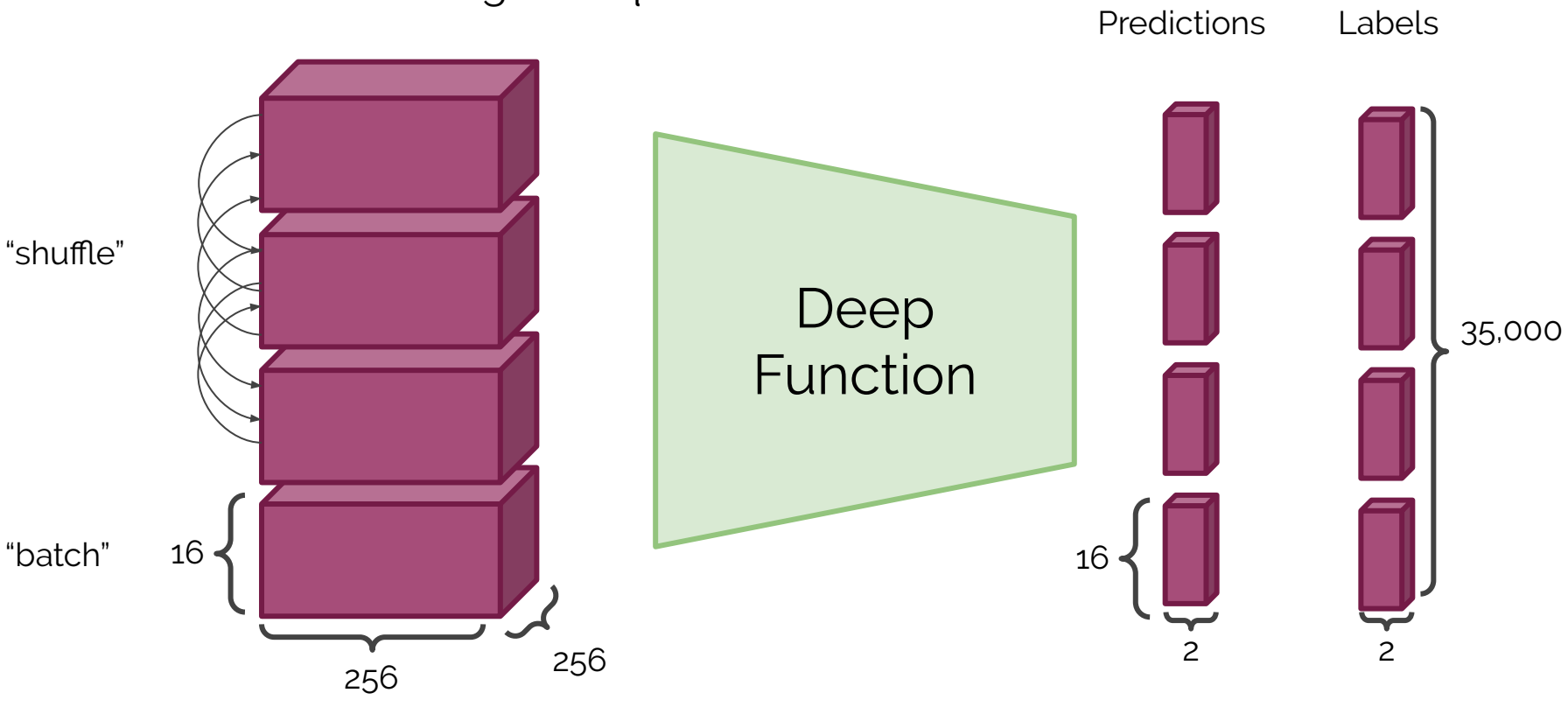
The Data Loader

- Split dataset into mini batches each iteration



The Data Loader

- Shuffle dataset to get unique batches



Mini batches in memory

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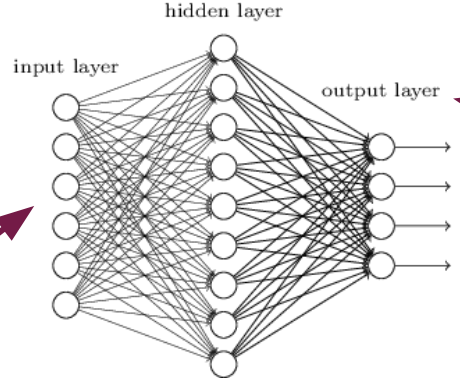
```
(root)  chris@chris-lab  ~/repos/deep-learning  master ●  ipython
Python 3.6.2 |Continuum Analytics, Inc.| (default, Jul 20 2017, 13:51:32)
Type 'copyright', 'credits' or 'license' for more information
IPython 6.1.0 -- An enhanced Interactive Python. Type '?' for help.

In [1]: import torch

In [2]: images = torch.zeros(16,3,256,256)

In [3]: output = torch.zeros(16,2,1,1)

In [4]: images.size()
Out[4]: torch.Size([16, 3, 256, 256])

In [5]: output.size()
Out[5]: torch.Size([16, 2, 1, 1])

In [6]:
```

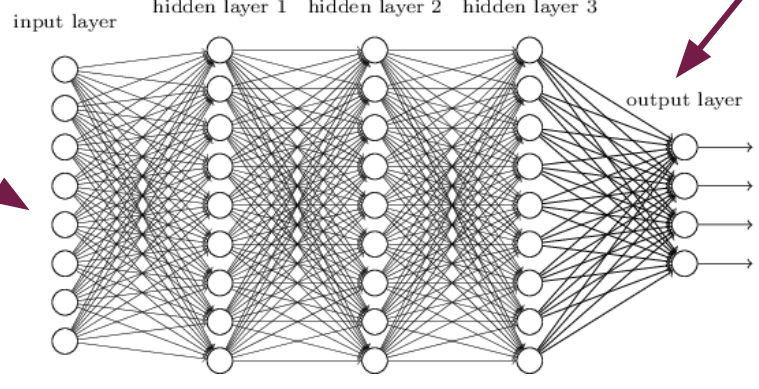
12.58 megabytes
much better!

Two simple networks on **Fashion MNIST**

32*32 = 1024 pixels



10 output classes



Lecture Materials

https://github.com/cwkx/ml-materials

Homework:

https://pytorch.org/tutorials/

NCC documentation:

http://ncc.clients.dur.ac.uk/

- You need to request access and read the documentation.

Colab:

http://colab.research.google.com/