Keras - High-level neural networks API

PRESENTED BY -
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Education -

- MS in Business Analytics, Carlson School of Management, University of Minnesota, 2017
- B.Tech in Electrical Engineering, Malaviya National Institute of Technology, India, 2013

Experience –

- >4 years in Data science, Currently working as Data scientist for Land O' Lakes, Inc.
- Moderator and rank 3rd at https://www.analyticsvidhya.com/
- Kaggle Expert - https://www.kaggle.com/aayushmnit

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Agenda

Introduction to Keras

Why Keras?

Modules

Demo

Keras is an open source Deep learning library

- Written in Python and capable of running over Theano, TensorFlow, CNTK, MXNet, Deeplearning4j
- Runs seamlessly on CPU and GPU
- Supports both CNNs and RNNs, as well as the combination of two
- Developed as a part of research project ONEIROS (Open-ended Neuro-Electronic Intelligent Robot Operating System)
- François Chollet - Primary Author and maintainer, Google Engineer
- Documentation – https://keras.io/

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Keras is built for enabling fast experimentation

Four guiding principles of Keras –

User friendliness –

- Keras is an API designed for human beings
- Keras follows best practices for reducing cognitive load
- Offers consistent & simple APIs

Modularity –

- A model is understood as a sequence or a graph of standalone
- Fully-configurable modules that can be plugged together with as little restrictions as possible.

Easy extensibility –

- New modules are simple to add (as new classes and functions)
- Existing modules provide ample examples

Work with Python –

- No separate models configuration files in a declarative format. Models are described in Python code, which is compact, easier to debug, and allows for ease of extensibility.

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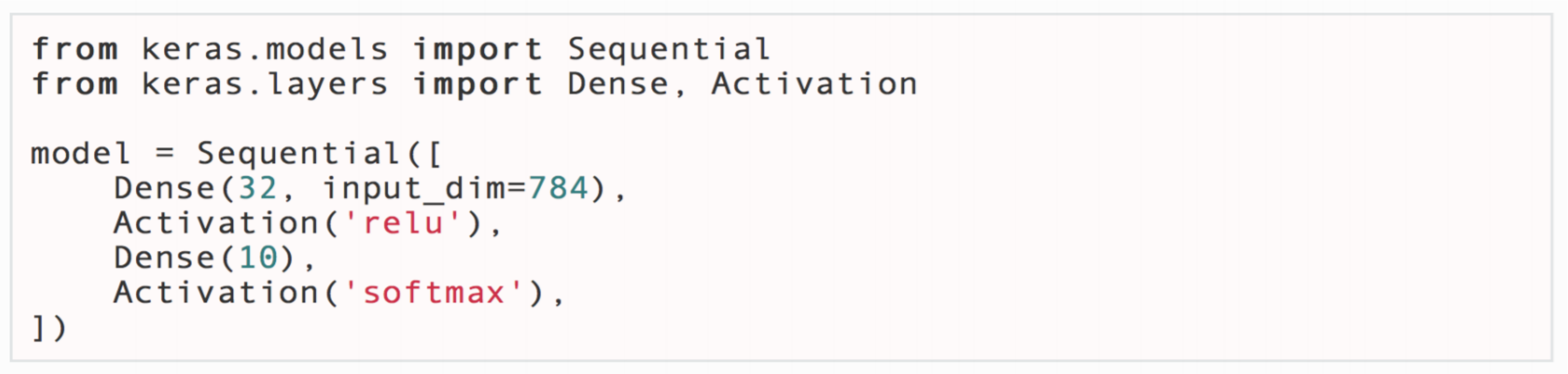
Introduction to Keras Sequential model

- The Sequential model is a linear stack of layers

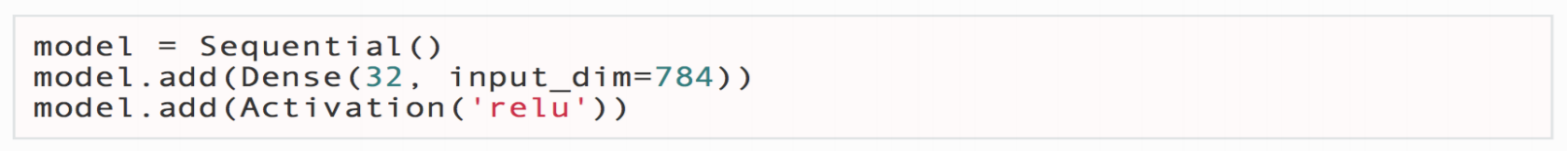
- We can create a Sequential model by passing a list of layer instances to the contructor



```
from keras.models import Sequential
from keras.layers import Dense, Activation

model = Sequential([
    Dense(32, input_dim=784),
    Activation('relu'),
    Dense(10),
    Activation('softmax'),
])
```

- Similary the same layers can be added via the .add() method:



```
model = Sequential()
model.add(Dense(32, input_dim=784))
model.add(Activation('relu'))
```

Components of CNN and their Keras equivalents

Typical CNN contains primarily the following components –

Dense layer of neural network –

- Git link - https://github.com/fchollet/keras/blob/master/keras/layers/core.py
- Sample code - model.add(Dense(<number of units>))

Activation function –

- Git link - https://github.com/fchollet/keras/blob/master/keras/activations.py
- Usually all the universal activation functions like linear, sigmoid, tanh, relus etc. are present
- Sample code – model.add(Activation('relu'))

Advanced activation function-

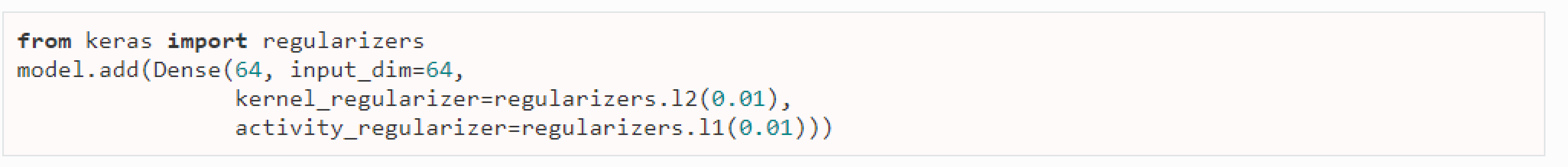
- Git link - https://github.com/fchollet/keras/blob/master/keras/layers/advanced_activations.py
- Activation functions like LeakyReLU, Parametric ReLU, SReLU

Components of CNN and their Keras equivalents(Cont..)

Typical CNN contains primarily the following components –

Regularizers –

- Git link - https://github.com/fchollet/keras/blob/master/keras/regularizers.py
- Regularizes like L1 and L2 weight penalty



```
from keras import regularizers
model.add(Dense(64, input_dim=64,
                kernel_regularizer=regularizers.l2(0.01),
                activity_regularizer=regularizers.l1(0.01)))
```

Dropout –

- Git link - https://github.com/fchollet/keras/blob/master/keras/layers/core.py
- Code sample - model.add(Dropout(0.5))

Convolutional Layer –

- Git link - https://github.com/fchollet/keras/blob/master/keras/layers/convolutional.py
- Code sample – model.add(Convolutional2D(32,3,3,border_mode =‘same’, input_shape=<shape>)

Pooling

- Git link - https://github.com/fchollet/keras/blob/master/keras/layers/pooling.py
- Code sample - model.add(MaxPooling2D((2,2), strides=(2,2)))

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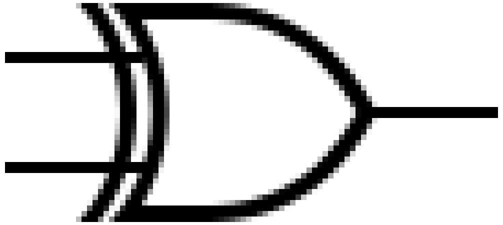
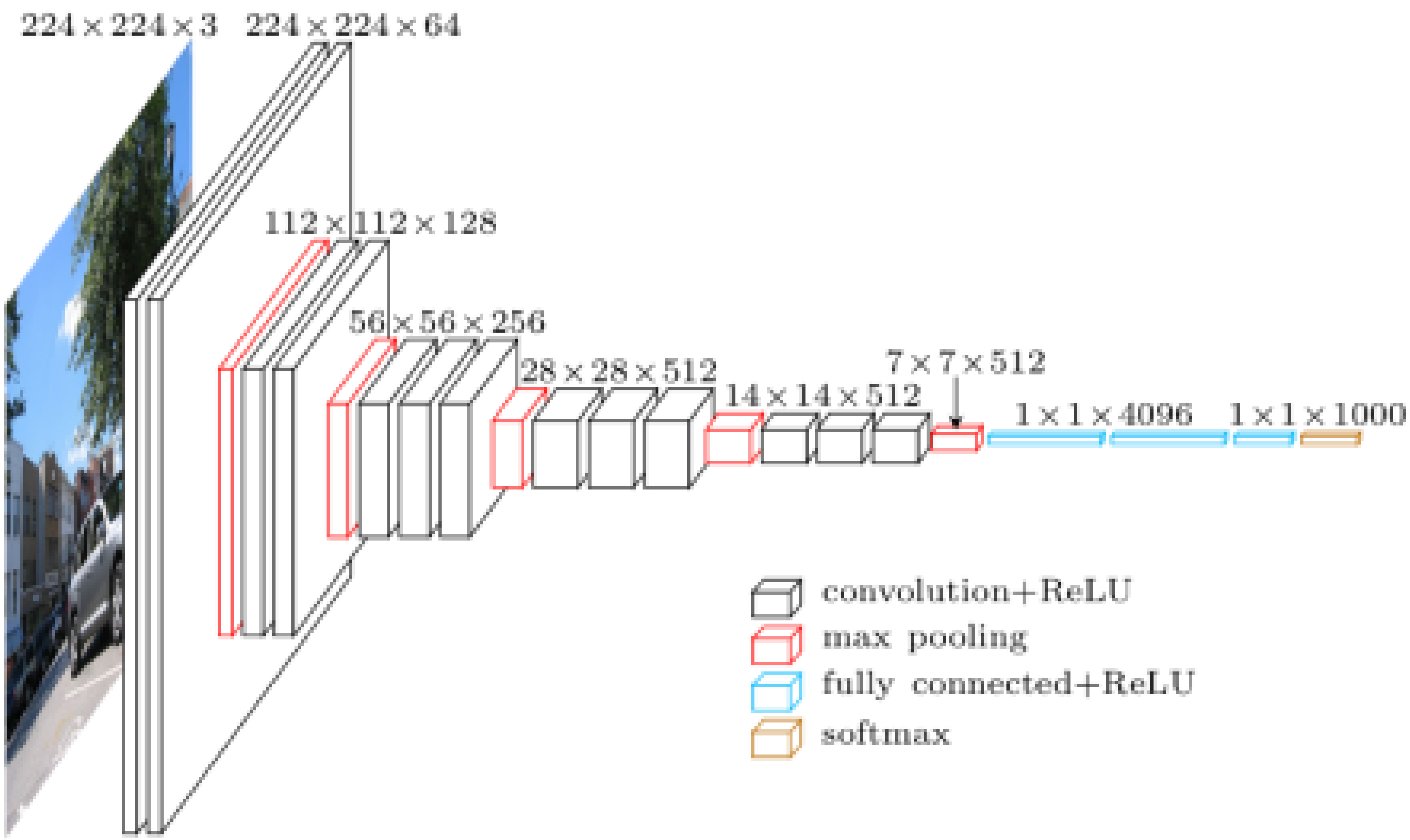
Lets train a simple neural net to learn XOR gate



Input 1	Input 2	Output
0	0	0
0	1	1
1	0	1
1	1	0

Lets look at a VGG16 model



Deep learning path Suggestion

Data science path - https://www.analyticsvidhya.com/blog/2017/01/the-most-comprehensive-data-science-learning-plan-for-2017/

My Deep learning track –

1) Machine learning by Andre NG(his first course and the most popular course in MOOC history) -> https://www.coursera.org/learn/machine-learning (Low difficulty)

2) Deep learning by Google on udacity - https://www.udacity.com/course/deep-learning--ud730 (Hard)

3) Practical deep learning for Coders by Jeremy Howard (Former Kaggle #1) - http://course.fast.ai/ (Medium/Hard)

4) A book on deep learning (Goodfellow) - http://www.deeplearningbook.org/ (If you need to understand deep math)

5) Andrew NGs deep learning track - https://www.coursera.org/specializations/deep-learning (easy/medium)

6) Just some collection of good blogs - http://colah.github.io/

Thank You!