

Constructing Models in Keras



Jerry Kurata

CONSULTANT

@jerrykur



Models

Sequential

Easy to understand

Sequence of Layers

Automatic layer interconnection

Easy and quick

Model Class with Functional API

More complex Neural Networks

Layers arranged into functional units

User defined layer connection

Detailed and more powerful



Rules of Thumb for Starting Number of Hidden Layers

# Hidden Layers	Result
0	Only represent linearly separable
1	Continuous mapping from one finite space to another.
2	Can represent arbitrary decision boundary
3 or more	Addition layers can learn complex representations

Heaton, Jeff

<http://www.heatonresearch.com/2017/06/01/hidden-layers.html>



Rules of Thumb for Starting Number of Neurons in Hidden Layers

- \geq size of input layer AND \leq size of output layer
- $(2/3 * \text{size of input layers}) + \text{size of output layer}$
- $< 2 * \text{size of input layer}$

Heaton, Jeff

<http://www.heatonresearch.com/2017/06/01/hidden-layers.html>



Visualization

summary()

Layers

Shape

of trainable parameters

Output to stdout

plot_model()

Model layer hierarchy

Shows connections

Output is graphic file

Presentation quality



Callbacks

Collect information on training

Remotely monitor training

Tune parameters while training

Create checkpoints

Terminate training early

API for user defined callbacks



Saving and Restoring

`.save(filepath)` – saves model to HDF5 file

`.load_model(filepath)` – loads model from HDF5 file

`.model_to_json`, `.model_to_yaml` – saves only model layer structural architecture to json or yaml string

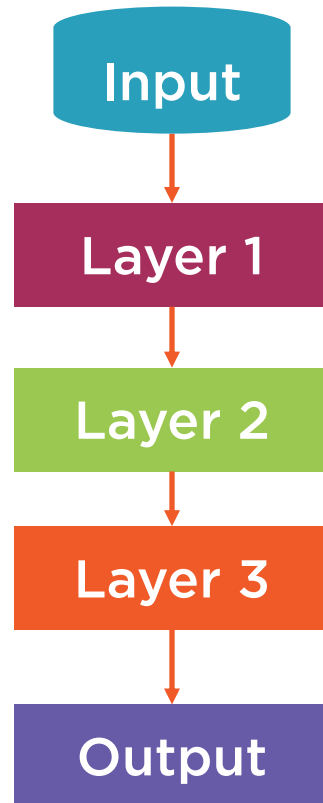
`.model_from_json`, `.model_from_yaml` – restores only model layer structural architecture from json or yaml string

`.save_weights(filepath)` – saves only the model weights to HDF5 file

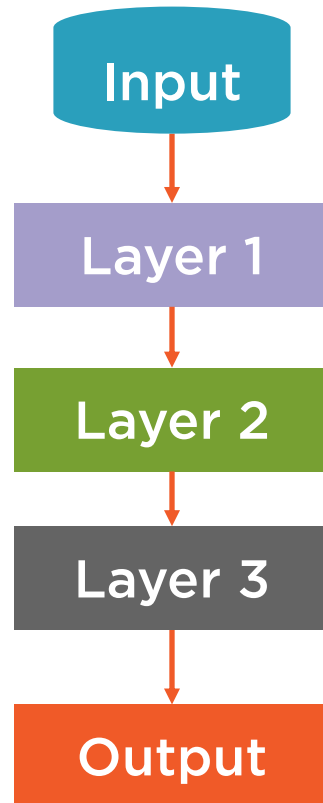
`.load_weights(filepath)` – restores only the model weights from HDF5 file



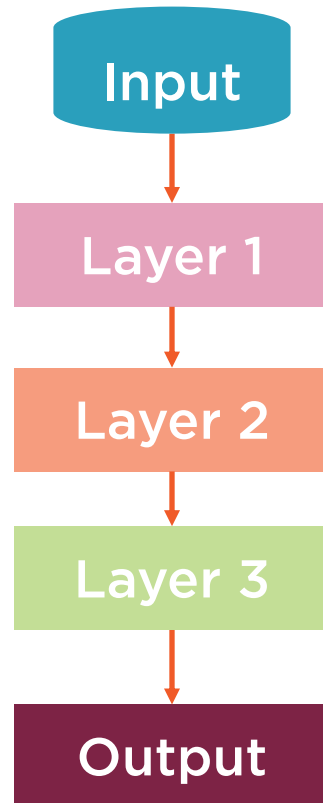
Sequential Model



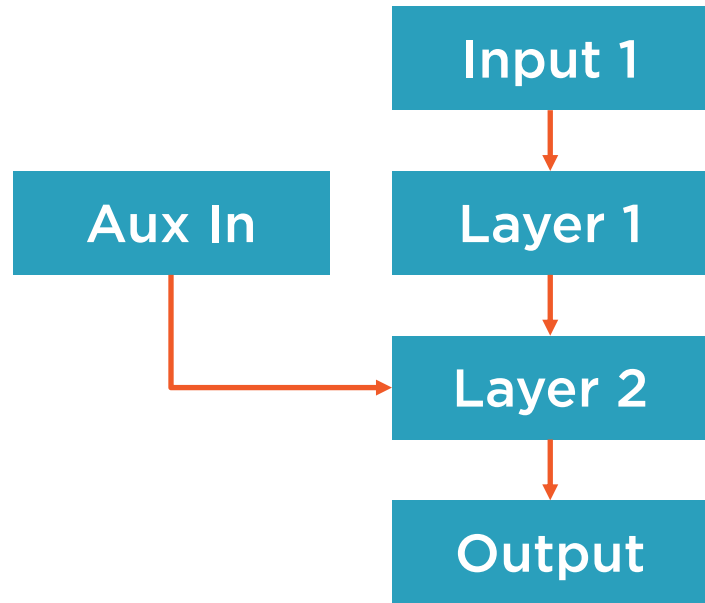
Sequential Model



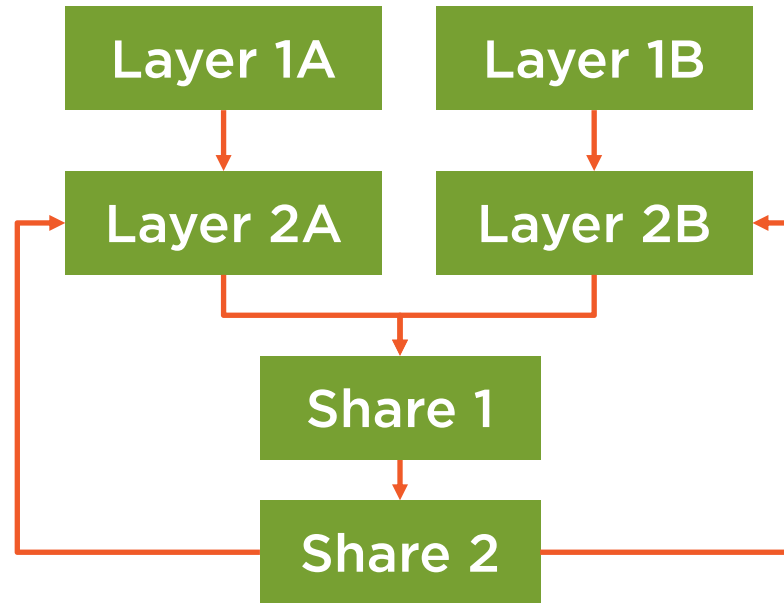
Sequential Model



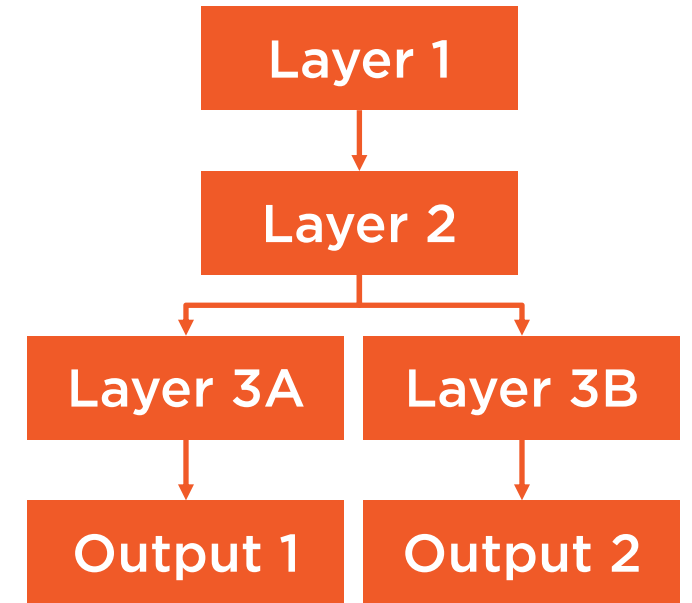
Complex NN Architectures



Multiple Inputs



Iterative Layers



Multiple Outputs



Functional API

Layers separate from model

User define layer connections

Function units of layers



Summary



Sequential Model API

Functional API

Support Methods

- Visualization
- Callbacks
- Save and Restore

