```
from keras.models import Sequential
from keras.layers.core import Dense, Dropout, Activation
from keras.optimizers import SGD
import numpy as np
```

```
Using TensorFlow backend.
```

```
x_data = [[0, 0],
          [0, 1],
          [1, 0],
          [1, 1]]

y_data = [[0],
          [1],
          [1],
          [0]]

x_data = np.array(x_data, dtype=np.float32)
y_data = np.array(y_data, dtype=np.float32)



model = Sequential()
model.add(Dense(2, input_dim=2))
model.add(Activation('tanh'))
model.add(Dense(1))
model.add(Activation('sigmoid'))

'''
model = Sequential()
model.add(Dense(2, input_dim=2))
model.add(Activation('tanh'))
model.add(Dense(2))
model.add(Activation('tanh'))
model.add(Dense(1))
model.add(Activation('sigmoid'))
'''
```

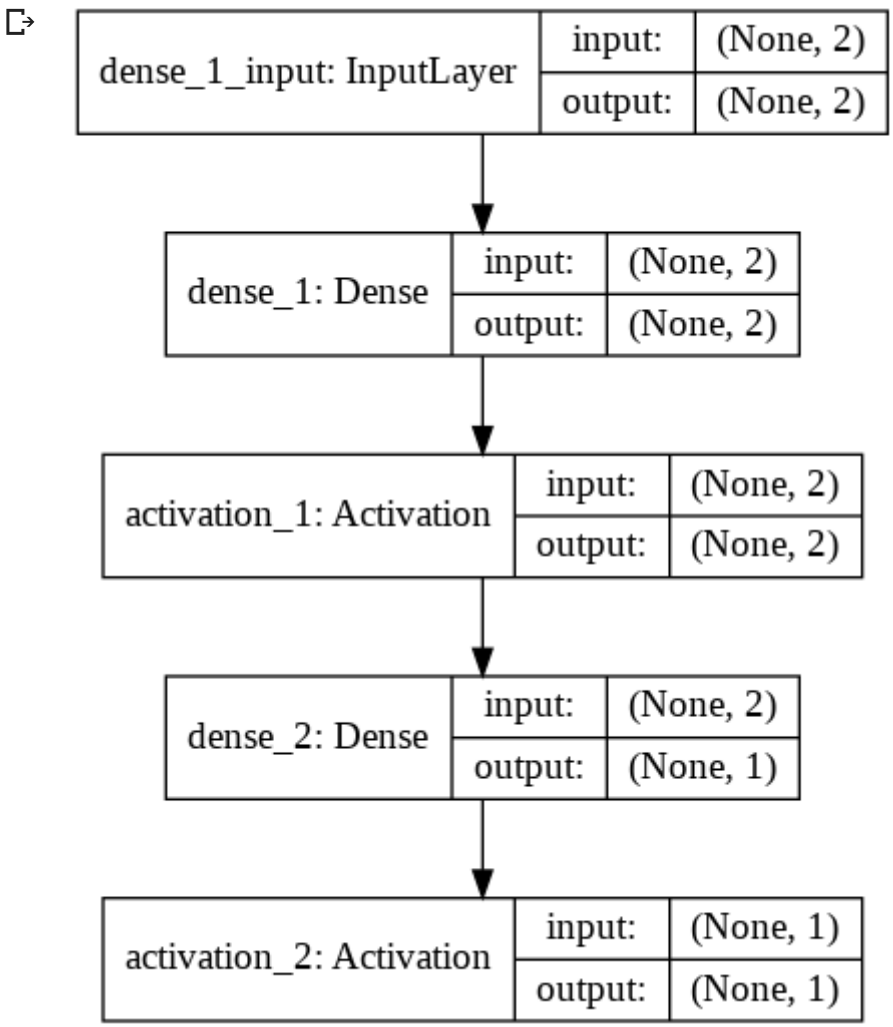
```
"₩nmodel = Sequential()₩nmodel.add(Dense(2, input_dim=2))₩nmodel.add(Activation('tanh'))₩nmoc
```

```
sgd = SGD(lr=0.1)
model.compile(loss='binary_crossentropy', optimizer=sgd)

model.summary()
```

```
Model: "sequential_1"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
dense_1 (Dense)              (None, 2)                 6
_________________________________________________________________
activation_1 (Activation)    (None, 2)                 0
_________________________________________________________________
dense_2 (Dense)              (None, 1)                 3
_________________________________________________________________
activation_2 (Activation)    (None, 1)                 0
=================================================================
```

```
from keras.utils import plot_model
plot_model(model, to_file='model_xor.png', show_shapes=True)
```




```
model.fit(x_data, y_data, batch_size=1, nb_epoch=1000)
```

```
/usr/local/lib/python3.6/dist-packages/ipykernel_launcher.py:1: UserWarning: The `nb_epoch` a
  """Entry point for launching an IPython kernel.
Epoch 1/1000
4/4 [==============================] - 0s 67ms/step - loss: 0.8073
Epoch 2/1000
4/4 [==============================] - 0s 3ms/step - loss: 0.7912
Epoch 3/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.7771
Epoch 4/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.7671
Epoch 5/1000
4/4 [==============================] - 0s 3ms/step - loss: 0.7558
Epoch 6/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.7487
Epoch 7/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.7429
Epoch 8/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.7367
Epoch 9/1000
4/4 [==============================] - 0s 3ms/step - loss: 0.7323
Epoch 10/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.7292
Epoch 11/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.7250
Epoch 12/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.7221
Epoch 13/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.7201
Epoch 14/1000
4/4 [==============================] - 0s 3ms/step - loss: 0.7168
Epoch 15/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.7149
Epoch 16/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.7110
Epoch 17/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.7103
Epoch 18/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.7083
Epoch 19/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.7054
Epoch 20/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.7040
Epoch 21/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.7029
Epoch 22/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.7020
Epoch 23/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.7004
Epoch 24/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.6996
Epoch 25/1000
4/4 [==============================] - 0s 3ms/step - loss: 0.6973
Epoch 26/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.6973
Epoch 27/1000
4/4 [==============================] - 0s 3ms/step - loss: 0.6957
Epoch 28/1000
4/4 [==============================] - 0s 3ms/step - loss: 0.6949
```

```
Epoch 29/1000
4/4 [==============================] - 0s 1ms/step - loss: 0.6941
Epoch 30/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.6928
Epoch 31/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.6917
Epoch 32/1000
4/4 [==============================] - 0s 3ms/step - loss: 0.6906
Epoch 33/1000
4/4 [==============================] - 0s 4ms/step - loss: 0.6901
Epoch 34/1000
4/4 [==============================] - 0s 3ms/step - loss: 0.6890
Epoch 35/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.6881
Epoch 36/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.6861
Epoch 37/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.6860
Epoch 38/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.6849
Epoch 39/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.6838
Epoch 40/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.6826
Epoch 41/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.6816
Epoch 42/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.6805
Epoch 43/1000
4/4 [==============================] - 0s 3ms/step - loss: 0.6790
Epoch 44/1000
4/4 [==============================] - 0s 3ms/step - loss: 0.6771
Epoch 45/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.6771
Epoch 46/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.6759
Epoch 47/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.6746
Epoch 48/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.6728
Epoch 49/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.6713
Epoch 50/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.6706
Epoch 51/1000
4/4 [==============================] - 0s 3ms/step - loss: 0.6696
Epoch 52/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.6679
Epoch 53/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.6658
Epoch 54/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.6658
Epoch 55/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.6638
Epoch 56/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.6628
Epoch 57/1000
4/4 [==============================] - 0s 2ms/step - loss: 0.6606
```