

ANFIS_IMDB

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1 Computational Intelligence Project: Sentiment Analysis on IMDB dataset (Part III)

[Musab - 19030008]

In this Notebook, I have done implementing Hybrid Neuro Genetic Fuzzy System. In this approach, an optimization is applied to Neuro-fuzzy inference system using genetic algorithm. Neuro-fuzzy is also called ANFIS. Genetic Algorithm is used to optimize the hybrid model using different parameters i.e., 1. Number of layers 2. Number of parameters in Dense Layer specifically. 3. Different optimizers i.e., Adam, RMSProp, Adagrad, SGD 4. Different Activation Functions i.e., Sigmoid, Relu

1.1 Imports

```
[ ]: ###
from keras.layers import Input, Dense, Dropout
from keras.models import Model
from keras.datasets import mnist, imdb
import numpy as np
from keras import regularizers
import matplotlib.pyplot as plt
from FuzzyLayer import FuzzyLayer
from tensorflow.python.client import device_lib
from keras.utils import to_categorical
import re
```

1.2 Step 1| Loading Dataset

```
[ ]: (x_train, y_train), (x_test, y_test) = imdb.load_data(num_words=10000)
```

```
<string>:6: VisibleDeprecationWarning: Creating an ndarray from ragged nested
sequences (which is a list-or-tuple of lists-or-tuples-or ndarrays with
different lengths or shapes) is deprecated. If you meant to do this, you must
specify 'dtype=object' when creating the ndarray
/usr/local/lib/python3.7/dist-
packages/tensorflow/python/keras/datasets/imdb.py:159:
VisibleDeprecationWarning: Creating an ndarray from ragged nested sequences
```

(which is a list-or-tuple of lists-or-tuples-or ndarrays with different lengths or shapes) is deprecated. If you meant to do this, you must specify 'dtype=object' when creating the ndarray

```
x_train, y_train = np.array(xs[:idx]), np.array(labels[:idx])
/usr/local/lib/python3.7/dist-
```

```
packages/tensorflow/python/keras/datasets/imdb.py:160:
```

VisibleDeprecationWarning: Creating an ndarray from ragged nested sequences

(which is a list-or-tuple of lists-or-tuples-or ndarrays with different lengths or shapes) is deprecated. If you meant to do this, you must specify

'dtype=object' when creating the ndarray

```
x_test, y_test = np.array(xs[idx:]), np.array(labels[idx:])
```

Dataset statistics

```
[ ]: print("train_data ", x_train.shape)
      print("train_labels ", y_train.shape)
      print("_"*100)
      print("test_data ", x_test.shape)
      print("test_labels ", y_test.shape)
      print("_"*100)
      print("Maximum value of a word index ")
      print(max([max(sequence) for sequence in x_train]))
      print("Maximum length num words of review in train ")
      print(max([len(sequence) for sequence in x_train]))
```

```
train_data (25000,)
train_labels (25000,)
```

```
-----
test_data (25000,)
test_labels (25000,)
```

```
-----
Maximum value of a word index
9999
Maximum length num words of review in train
2494
```

Vectorizing the input makes the learning of model faster that's why i have applied Vectorization

```
[ ]: def vectorize_sequences(sequences, dimension=10000):
      results = np.zeros((len(sequences), dimension))
      for i, sequence in enumerate(sequences):
          results[i, sequence] = 1.
      return results
```

1.3 Step 2 | Splitting Dataset

As dataset contains the 50,000 reviews and is classified to positive and negative classes. Genetic Algorithm expands the training as it tries multiple generation, and population to optimize the network.

```
[ ]: x_train = vectorize_sequences(x_train)
      x_test = vectorize_sequences(x_test)

      print("x_train ", x_train.shape)
      print("x_test  ", x_test.shape)
```

```
x_train (25000, 10000)
x_test  (25000, 10000)
```

```
[ ]: y_train = np.asarray(y_train).astype('float32')
      y_test = np.asarray(y_test).astype('float32')
      print("y_train ", y_train.shape)
      print("y_test  ", y_test.shape)
```

```
y_train (25000,)
y_test  (25000,)
```

```
[ ]: x_val = x_train[:10000]
      partial_x_train = x_train[10000:]
      y_val = y_train[:10000]
      partial_y_train = y_train[10000:]

      print("x_val ", x_val.shape)
      print("partial_x_train ", partial_x_train.shape)
      print("y_val ", y_val.shape)
      print("partial_y_train ", partial_y_train.shape)
```

```
x_val (10000, 10000)
partial_x_train (15000, 10000)
y_val (10000,)
partial_y_train (15000,)
```

1.4 Step 3 | Fuzzy System & Neural Network

1.4.1 Fuzzy Layer | Custom layer

```
[ ]: class FuzzyLayer(Layer):

      def __init__(self,
                    output_dim,
                    initializer_centers=None,
                    initializer_sigmas=None,
```

```

        **kwargs):
    if 'input_shape' not in kwargs and 'input_dim' in kwargs:
        kwargs['input_shape'] = (kwargs.pop('input_dim'),)
    self.output_dim = output_dim
    self.initializer_centers = initializer_centers
    self.initializer_sigmas = initializer_sigmas
    super(FuzzyLayer, self).__init__(**kwargs)

    def build(self, input_shape):
        self.input_dimensions = list(input_shape[:-1:-1])
        self.c = self.add_weight(name='c',
                                shape=(input_shape[-1], self.output_dim),
                                initializer= self.initializer_centers if self.
→initializer_centers is not None else 'uniform',
                                trainable=True)
        self.a = self.add_weight(name='a',
                                shape=(input_shape[-1], self.output_dim),
                                initializer=self.initializer_sigmas if self.
→initializer_sigmas is not None else 'ones',
                                trainable=True)
        super(FuzzyLayer, self).build(input_shape)

    def call(self, x):

        aligned_x = K.repeat_elements(K.expand_dims(x, axis = -1), self.
→output_dim, -1)
        aligned_c = self.c
        aligned_a = self.a
        for dim in self.input_dimensions:
            aligned_c = K.repeat_elements(K.expand_dims(aligned_c, 0), dim, 0)
            aligned_a = K.repeat_elements(K.expand_dims(aligned_a, 0), dim, 0)

        xc = K.exp(-K.sum(K.square((aligned_x - aligned_c) / (2 * aligned_a)),
→axis=-2, keepdims=False))
        #sums = K.sum(xc,axis=-1,keepdims=True)
        #less = K.ones_like(sums) * K.epsilon()
        return xc# xc / K.maximum(sums, less)

    def compute_output_shape(self, input_shape):
        return tuple(input_shape[:-1]) + (self.output_dim,)

```

1.4.2 Neural Network

```

[ ]: input_img = Input(shape=(10000,))
model = Dense(256, kernel_regularizer=regularizers.l1(0.0001),
→activation='relu')(input_img)

```

```

model = Dense(2,activation='relu')(model)
f_layer = FuzzyLayer(100)
model = f_layer(model)
model = Dense(1, activation='linear')(model)
imdb = Model(input_img, model)

```

```
[ ]: imdb.summary()
```

Model: "model"

Layer (type)	Output Shape	Param #
input_1 (InputLayer)	[(None, 10000)]	0
dense (Dense)	(None, 256)	2560256
dense_1 (Dense)	(None, 2)	514
fuzzy_layer (FuzzyLayer)	(None, 100)	400
dense_2 (Dense)	(None, 1)	101

Total params: 2,561,271
 Trainable params: 2,561,271
 Non-trainable params: 0

```
[ ]: imdb.compile(optimizer='sgd', loss='mse',metrics=['acc'])
```

1.4.3 Training

```

[ ]: imdb.fit(x_train, y_train,
             epochs=10,
             batch_size=64,
             shuffle=True,
             validation_data=(x_val, y_val))

###
weights = f_layer.get_weights()

```

Epoch 1/10
 391/391 [=====] - 2s 6ms/step - loss: 0.8652 - acc: 0.9521 - val_loss: 0.8380 - val_acc: 0.9539
 Epoch 2/10
 391/391 [=====] - 2s 5ms/step - loss: 0.8159 - acc: 0.9516 - val_loss: 0.7835 - val_acc: 0.9658
 Epoch 3/10

```

391/391 [=====] - 2s 5ms/step - loss: 0.7686 - acc:
0.9519 - val_loss: 0.7495 - val_acc: 0.9525
Epoch 4/10
391/391 [=====] - 2s 5ms/step - loss: 0.7240 - acc:
0.9516 - val_loss: 0.6999 - val_acc: 0.9536
Epoch 5/10
391/391 [=====] - 2s 5ms/step - loss: 0.6831 - acc:
0.9458 - val_loss: 0.6569 - val_acc: 0.9589
Epoch 6/10
391/391 [=====] - 2s 5ms/step - loss: 0.6369 - acc:
0.9520 - val_loss: 0.6070 - val_acc: 0.9691
Epoch 7/10
391/391 [=====] - 2s 5ms/step - loss: 0.5987 - acc:
0.9481 - val_loss: 0.5672 - val_acc: 0.9678
Epoch 8/10
391/391 [=====] - 2s 5ms/step - loss: 0.5625 - acc:
0.9432 - val_loss: 0.5548 - val_acc: 0.9242
Epoch 9/10
391/391 [=====] - 2s 5ms/step - loss: 0.5231 - acc:
0.9484 - val_loss: 0.5522 - val_acc: 0.8686
Epoch 10/10
391/391 [=====] - 2s 5ms/step - loss: 0.4918 - acc:
0.9413 - val_loss: 0.4713 - val_acc: 0.9480

```

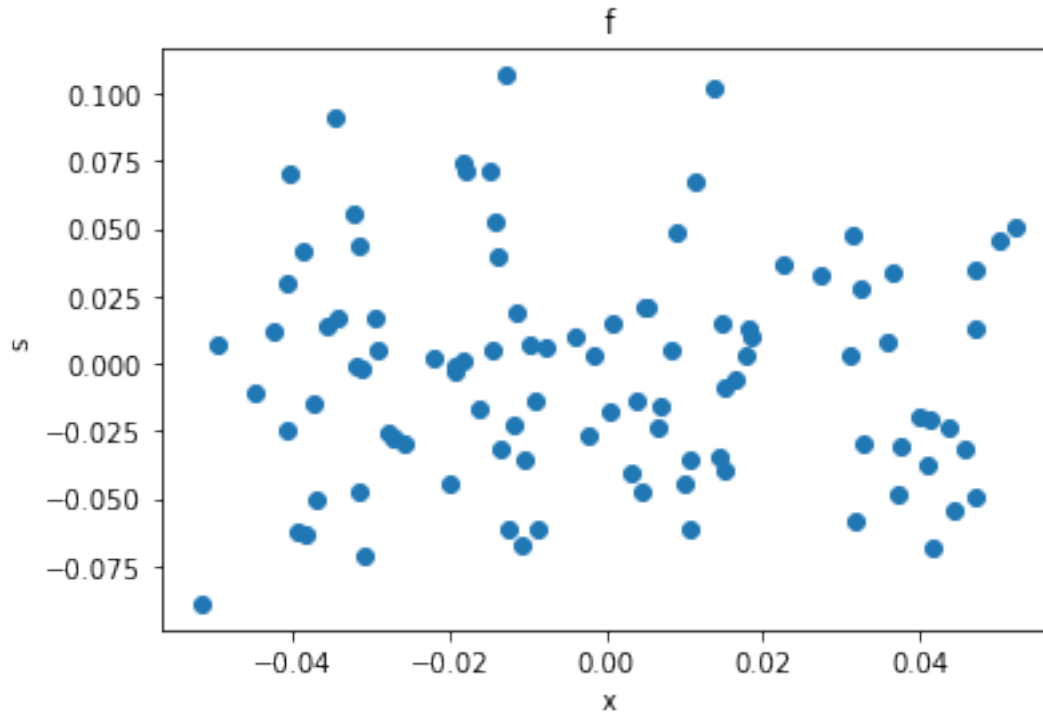
```

[ ]: plt.ion()
plt.show()
plt.clf()
plt.title('f')
plt.ylabel('s')
plt.xlabel('x')

tmpy = []
tmpx = []
for i in range(0, 100):
    tmpy.append(weights[0][0][i])
    tmpx.append(weights[0][1][i])

plt.scatter(tmpx, tmpy)
plt.show()

```



1.4.4 Evaluation on Test Set

```
[ ]: a = imdb.evaluate(x_test, y_test)
      print("Accuracy: ",a[1]*100)
```

782/782 [=====] - 2s 3ms/step - loss: 1.5183 - acc:
0.8836
Accuracy: 88.35600018501282

```
[ ]: a2 = imdb.evaluate(x_test, y_test)
      print("Accuracy: ",a2[1]*100)
```

782/782 [=====] - 2s 2ms/step - loss: 0.9327 - acc:
0.8811
Accuracy: 88.10799717903137

```
[ ]: prediction = imdb.predict(x_test)
      y_pred = (prediction > 0.5)
      from sklearn.metrics import f1_score, confusion_matrix
      print('F1-score: {0}'.format(f1_score(y_pred, y_test)))
      print('Confusion matrix:')
      confusion_matrix(y_pred, y_test)
```

F1-score: 0.879249421225783

Confusion matrix:

```
[1]: array([[11203, 1676],
           [ 1297, 10824]])
```

```
[2]: %cd drive/My\ Drive/
```

/content/drive/My Drive

```
[1]: !sudo apt-get install texlive-xetex texlive-fonts-recommended
      ↳texlive-generic-recommended
```

Reading package lists... Done

Building dependency tree

Reading state information... Done

The following package was automatically installed and is no longer required:

libnvidia-common-460

Use 'sudo apt autoremove' to remove it.

The following additional packages will be installed:

fonts-droid-fallback fonts-lato fonts-lmodern fonts-noto-mono fonts-texgyre
javascript-common libcupsfilters1 libcupsimage2 libgs9 libgs9-common
libijs-0.35 libjbig2dec0 libjs-jquery libkpathsea6 libpotrace0 libptexenc1
libruby2.5 libsynchronet1 libtexlua52 libtexluajit2 libzzip-0-13 lmodern
poppler-data preview-latex-style rake ruby ruby-did-you-mean ruby-minitest
ruby-net-telnet ruby-power-assert ruby-test-unit ruby2.5
rubygems-integration t1utils tex-common tex-gyre texlive-base
texlive-binaries texlive-latex-base texlive-latex-extra
texlive-latex-recommended texlive-pictures texlive-plain-generic tipa

Suggested packages:

fonts-noto apache2 | lighttpd | httpd poppler-utils ghostscript
fonts-japanese-mincho | fonts-ipafont-mincho fonts-japanese-gothic
| fonts-ipafont-gothic fonts-arphic-ukai fonts-arphic-uming fonts-nanum ri
ruby-dev bundler debhelper gv | postscript-viewer perl-tk xpdf-reader
| pdf-viewer texlive-fonts-recommended-doc texlive-latex-base-doc
python-pygments icc-profiles libfile-which-perl
libspreadsheet-parseexcel-perl texlive-latex-extra-doc
texlive-latex-recommended-doc texlive-pstricks dot2tex prerex ruby-tcltk
| libtcltk-ruby texlive-pictures-doc vprerex

The following NEW packages will be installed:

fonts-droid-fallback fonts-lato fonts-lmodern fonts-noto-mono fonts-texgyre
javascript-common libcupsfilters1 libcupsimage2 libgs9 libgs9-common
libijs-0.35 libjbig2dec0 libjs-jquery libkpathsea6 libpotrace0 libptexenc1
libruby2.5 libsynchronet1 libtexlua52 libtexluajit2 libzzip-0-13 lmodern
poppler-data preview-latex-style rake ruby ruby-did-you-mean ruby-minitest
ruby-net-telnet ruby-power-assert ruby-test-unit ruby2.5
rubygems-integration t1utils tex-common tex-gyre texlive-base


```

texlive-binaries texlive-fonts-recommended texlive-generic-recommended
texlive-latex-base texlive-latex-extra texlive-latex-recommended
texlive-pictures texlive-plain-generic texlive-xetex tipa
0 upgraded, 47 newly installed, 0 to remove and 34 not upgraded.
Need to get 146 MB of archives.
After this operation, 460 MB of additional disk space will be used.
Get:1 http://archive.ubuntu.com/ubuntu bionic/main amd64 fonts-droid-fallback
all 1:6.0.1r16-1.1 [1,805 kB]
Get:2 http://archive.ubuntu.com/ubuntu bionic/main amd64 fonts-lato all 2.0-2
[2,698 kB]
Get:3 http://archive.ubuntu.com/ubuntu bionic/main amd64 poppler-data all
0.4.8-2 [1,479 kB]
Get:4 http://archive.ubuntu.com/ubuntu bionic/main amd64 tex-common all 6.09
[33.0 kB]
Get:5 http://archive.ubuntu.com/ubuntu bionic/main amd64 fonts-lmodern all
2.004.5-3 [4,551 kB]
Get:6 http://archive.ubuntu.com/ubuntu bionic/main amd64 fonts-noto-mono all
20171026-2 [75.5 kB]
Get:7 http://archive.ubuntu.com/ubuntu bionic/universe amd64 fonts-texgyre all
20160520-1 [8,761 kB]
Get:8 http://archive.ubuntu.com/ubuntu bionic/main amd64 javascript-common all
11 [6,066 B]
Get:9 http://archive.ubuntu.com/ubuntu bionic-updates/main amd64 libcupsfilters1
amd64 1.20.2-0ubuntu3.1 [108 kB]
Get:10 http://archive.ubuntu.com/ubuntu bionic-updates/main amd64 libcupsimage2
amd64 2.2.7-1ubuntu2.8 [18.6 kB]
Get:11 http://archive.ubuntu.com/ubuntu bionic/main amd64 libijs-0.35 amd64
0.35-13 [15.5 kB]
Get:12 http://archive.ubuntu.com/ubuntu bionic/main amd64 libjbig2dec0 amd64
0.13-6 [55.9 kB]
Get:13 http://archive.ubuntu.com/ubuntu bionic-updates/main amd64 libgs9-common
all 9.26~dfsg+0-0ubuntu0.18.04.14 [5,092 kB]
Get:14 http://archive.ubuntu.com/ubuntu bionic-updates/main amd64 libgs9 amd64
9.26~dfsg+0-0ubuntu0.18.04.14 [2,265 kB]
Get:15 http://archive.ubuntu.com/ubuntu bionic/main amd64 libjs-jquery all
3.2.1-1 [152 kB]
Get:16 http://archive.ubuntu.com/ubuntu bionic-updates/main amd64 libkpathsea6
amd64 2017.20170613.44572-8ubuntu0.1 [54.9 kB]
Get:17 http://archive.ubuntu.com/ubuntu bionic/main amd64 libpotrace0 amd64
1.14-2 [17.4 kB]
Get:18 http://archive.ubuntu.com/ubuntu bionic-updates/main amd64 libptexenc1
amd64 2017.20170613.44572-8ubuntu0.1 [34.5 kB]
Get:19 http://archive.ubuntu.com/ubuntu bionic/main amd64 rubygems-integration
all 1.11 [4,994 B]
Get:20 http://archive.ubuntu.com/ubuntu bionic-updates/main amd64 ruby2.5 amd64
2.5.1-1ubuntu1.9 [48.6 kB]
Get:21 http://archive.ubuntu.com/ubuntu bionic/main amd64 ruby amd64 1:2.5.1
[5,712 B]

```

Get:22 <http://archive.ubuntu.com/ubuntu> bionic-updates/main amd64 rake all
12.3.1-1ubuntu0.1 [44.9 kB]
Get:23 <http://archive.ubuntu.com/ubuntu> bionic/main amd64 ruby-did-you-mean all
1.2.0-2 [9,700 B]
Get:24 <http://archive.ubuntu.com/ubuntu> bionic/main amd64 ruby-minitest all
5.10.3-1 [38.6 kB]
Get:25 <http://archive.ubuntu.com/ubuntu> bionic/main amd64 ruby-net-telnet all
0.1.1-2 [12.6 kB]
Get:26 <http://archive.ubuntu.com/ubuntu> bionic/main amd64 ruby-power-assert all
0.3.0-1 [7,952 B]
Get:27 <http://archive.ubuntu.com/ubuntu> bionic/main amd64 ruby-test-unit all
3.2.5-1 [61.1 kB]
Get:28 <http://archive.ubuntu.com/ubuntu> bionic-updates/main amd64 libruby2.5
amd64 2.5.1-1ubuntu1.9 [3,072 kB]
Get:29 <http://archive.ubuntu.com/ubuntu> bionic-updates/main amd64 libsyntax
amd64 2017.20170613.44572-8ubuntu0.1 [41.4 kB]
Get:30 <http://archive.ubuntu.com/ubuntu> bionic-updates/main amd64 libtexlua52
amd64 2017.20170613.44572-8ubuntu0.1 [91.2 kB]
Get:31 <http://archive.ubuntu.com/ubuntu> bionic-updates/main amd64 libtexluajit2
amd64 2017.20170613.44572-8ubuntu0.1 [230 kB]
Get:32 <http://archive.ubuntu.com/ubuntu> bionic-updates/main amd64 libzip-0-13
amd64 0.13.62-3.1ubuntu0.18.04.1 [26.0 kB]
Get:33 <http://archive.ubuntu.com/ubuntu> bionic/main amd64 lmodern all 2.004.5-3
[9,631 kB]
Get:34 <http://archive.ubuntu.com/ubuntu> bionic/main amd64 preview-latex-style
all 11.91-1ubuntu1 [185 kB]
Get:35 <http://archive.ubuntu.com/ubuntu> bionic/main amd64 t1utils amd64 1.41-2
[56.0 kB]
Get:36 <http://archive.ubuntu.com/ubuntu> bionic/universe amd64 tex-gyre all
20160520-1 [4,998 kB]
Get:37 <http://archive.ubuntu.com/ubuntu> bionic-updates/main amd64 texlive-
binaries amd64 2017.20170613.44572-8ubuntu0.1 [8,179 kB]
Get:38 <http://archive.ubuntu.com/ubuntu> bionic/main amd64 texlive-base all
2017.20180305-1 [18.7 MB]
Get:39 <http://archive.ubuntu.com/ubuntu> bionic/universe amd64 texlive-fonts-
recommended all 2017.20180305-1 [5,262 kB]
Get:40 <http://archive.ubuntu.com/ubuntu> bionic/universe amd64 texlive-plain-
generic all 2017.20180305-2 [23.6 MB]
Get:41 <http://archive.ubuntu.com/ubuntu> bionic/universe amd64 texlive-generic-
recommended all 2017.20180305-1 [15.9 kB]
Get:42 <http://archive.ubuntu.com/ubuntu> bionic/main amd64 texlive-latex-base all
2017.20180305-1 [951 kB]
Get:43 <http://archive.ubuntu.com/ubuntu> bionic/main amd64 texlive-latex-
recommended all 2017.20180305-1 [14.9 MB]
Get:44 <http://archive.ubuntu.com/ubuntu> bionic/universe amd64 texlive-pictures
all 2017.20180305-1 [4,026 kB]
Get:45 <http://archive.ubuntu.com/ubuntu> bionic/universe amd64 texlive-latex-
extra all 2017.20180305-2 [10.6 MB]

```

Get:46 http://archive.ubuntu.com/ubuntu bionic/universe amd64 tipa all 2:1.3-20
[2,978 kB]
Get:47 http://archive.ubuntu.com/ubuntu bionic/universe amd64 texlive-xetex all
2017.20180305-1 [10.7 MB]
Fetched 146 MB in 5s (29.8 MB/s)
debconf: unable to initialize frontend: Dialog
debconf: (No usable dialog-like program is installed, so the dialog based
frontend cannot be used. at /usr/share/perl5/Debconf/FrontEnd/Dialog.pm line 76,
<> line 47.)
debconf: falling back to frontend: Readline
debconf: unable to initialize frontend: Readline
debconf: (This frontend requires a controlling tty.)
debconf: falling back to frontend: Teletype
dpkg-preconfigure: unable to re-open stdin:
Selecting previously unselected package fonts-droid-fallback.
(Reading database ... 160690 files and directories currently installed.)
Preparing to unpack .../00-fonts-droid-fallback_1%3a6.0.1r16-1.1_all.deb ...
Unpacking fonts-droid-fallback (1:6.0.1r16-1.1) ...
Selecting previously unselected package fonts-lato.
Preparing to unpack .../01-fonts-lato_2.0-2_all.deb ...
Unpacking fonts-lato (2.0-2) ...
Selecting previously unselected package poppler-data.
Preparing to unpack .../02-poppler-data_0.4.8-2_all.deb ...
Unpacking poppler-data (0.4.8-2) ...
Selecting previously unselected package tex-common.
Preparing to unpack .../03-tex-common_6.09_all.deb ...
Unpacking tex-common (6.09) ...
Selecting previously unselected package fonts-lmodern.
Preparing to unpack .../04-fonts-lmodern_2.004.5-3_all.deb ...
Unpacking fonts-lmodern (2.004.5-3) ...
Selecting previously unselected package fonts-noto-mono.
Preparing to unpack .../05-fonts-noto-mono_20171026-2_all.deb ...
Unpacking fonts-noto-mono (20171026-2) ...
Selecting previously unselected package fonts-texgyre.
Preparing to unpack .../06-fonts-texgyre_20160520-1_all.deb ...
Unpacking fonts-texgyre (20160520-1) ...
Selecting previously unselected package javascript-common.
Preparing to unpack .../07-javascript-common_11_all.deb ...
Unpacking javascript-common (11) ...
Selecting previously unselected package libcupsfilters1:amd64.
Preparing to unpack .../08-libcupsfilters1_1.20.2-0ubuntu3.1_amd64.deb ...
Unpacking libcupsfilters1:amd64 (1.20.2-0ubuntu3.1) ...
Selecting previously unselected package libcupsimage2:amd64.
Preparing to unpack .../09-libcupsimage2_2.2.7-1ubuntu2.8_amd64.deb ...
Unpacking libcupsimage2:amd64 (2.2.7-1ubuntu2.8) ...
Selecting previously unselected package libijs-0.35:amd64.
Preparing to unpack .../10-libijs-0.35_0.35-13_amd64.deb ...
Unpacking libijs-0.35:amd64 (0.35-13) ...

```

```

Selecting previously unselected package libjbig2dec0:amd64.
Preparing to unpack .../11-libjbig2dec0_0.13-6_amd64.deb ...
Unpacking libjbig2dec0:amd64 (0.13-6) ...
Selecting previously unselected package libgs9-common.
Preparing to unpack .../12-libgs9-common_9.26~dfsg+0-0ubuntu0.18.04.14_all.deb
...
Unpacking libgs9-common (9.26~dfsg+0-0ubuntu0.18.04.14) ...
Selecting previously unselected package libgs9:amd64.
Preparing to unpack .../13-libgs9_9.26~dfsg+0-0ubuntu0.18.04.14_amd64.deb ...
Unpacking libgs9:amd64 (9.26~dfsg+0-0ubuntu0.18.04.14) ...
Selecting previously unselected package libjs-jquery.
Preparing to unpack .../14-libjs-jquery_3.2.1-1_all.deb ...
Unpacking libjs-jquery (3.2.1-1) ...
Selecting previously unselected package libkpathsea6:amd64.
Preparing to unpack .../15-libkpathsea6_2017.20170613.44572-8ubuntu0.1_amd64.deb
...
Unpacking libkpathsea6:amd64 (2017.20170613.44572-8ubuntu0.1) ...
Selecting previously unselected package libpotrace0.
Preparing to unpack .../16-libpotrace0_1.14-2_amd64.deb ...
Unpacking libpotrace0 (1.14-2) ...
Selecting previously unselected package libptexenc1:amd64.
Preparing to unpack .../17-libptexenc1_2017.20170613.44572-8ubuntu0.1_amd64.deb
...
Unpacking libptexenc1:amd64 (2017.20170613.44572-8ubuntu0.1) ...
Selecting previously unselected package rubygems-integration.
Preparing to unpack .../18-rubygems-integration_1.11_all.deb ...
Unpacking rubygems-integration (1.11) ...
Selecting previously unselected package ruby2.5.
Preparing to unpack .../19-ruby2.5_2.5.1-1ubuntu1.9_amd64.deb ...
Unpacking ruby2.5 (2.5.1-1ubuntu1.9) ...
Selecting previously unselected package ruby.
Preparing to unpack .../20-ruby_1%3a2.5.1_amd64.deb ...
Unpacking ruby (1:2.5.1) ...
Selecting previously unselected package rake.
Preparing to unpack .../21-rake_12.3.1-1ubuntu0.1_all.deb ...
Unpacking rake (12.3.1-1ubuntu0.1) ...
Selecting previously unselected package ruby-did-you-mean.
Preparing to unpack .../22-ruby-did-you-mean_1.2.0-2_all.deb ...
Unpacking ruby-did-you-mean (1.2.0-2) ...
Selecting previously unselected package ruby-minitest.
Preparing to unpack .../23-ruby-minitest_5.10.3-1_all.deb ...
Unpacking ruby-minitest (5.10.3-1) ...
Selecting previously unselected package ruby-net-telnet.
Preparing to unpack .../24-ruby-net-telnet_0.1.1-2_all.deb ...
Unpacking ruby-net-telnet (0.1.1-2) ...
Selecting previously unselected package ruby-power-assert.
Preparing to unpack .../25-ruby-power-assert_0.3.0-1_all.deb ...
Unpacking ruby-power-assert (0.3.0-1) ...

```

```

Selecting previously unselected package ruby-test-unit.
Preparing to unpack .../26-ruby-test-unit_3.2.5-1_all.deb ...
Unpacking ruby-test-unit (3.2.5-1) ...
Selecting previously unselected package libruby2.5:amd64.
Preparing to unpack .../27-libruby2.5_2.5.1-1ubuntu1.9_amd64.deb ...
Unpacking libruby2.5:amd64 (2.5.1-1ubuntu1.9) ...
Selecting previously unselected package libsyntax1:amd64.
Preparing to unpack .../28-libsyntax1_2017.20170613.44572-8ubuntu0.1_amd64.deb
...
Unpacking libsyntax1:amd64 (2017.20170613.44572-8ubuntu0.1) ...
Selecting previously unselected package libtexlua52:amd64.
Preparing to unpack .../29-libtexlua52_2017.20170613.44572-8ubuntu0.1_amd64.deb
...
Unpacking libtexlua52:amd64 (2017.20170613.44572-8ubuntu0.1) ...
Selecting previously unselected package libtexluaajit2:amd64.
Preparing to unpack
.../30-libtexluaajit2_2017.20170613.44572-8ubuntu0.1_amd64.deb ...
Unpacking libtexluaajit2:amd64 (2017.20170613.44572-8ubuntu0.1) ...
Selecting previously unselected package libzip-0-13:amd64.
Preparing to unpack .../31-libzip-0-13_0.13.62-3.1ubuntu0.18.04.1_amd64.deb ...
Unpacking libzip-0-13:amd64 (0.13.62-3.1ubuntu0.18.04.1) ...
Selecting previously unselected package lmodern.
Preparing to unpack .../32-lmodern_2.004.5-3_all.deb ...
Unpacking lmodern (2.004.5-3) ...
Selecting previously unselected package preview-latex-style.
Preparing to unpack .../33-preview-latex-style_11.91-1ubuntu1_all.deb ...
Unpacking preview-latex-style (11.91-1ubuntu1) ...
Selecting previously unselected package tlutils.
Preparing to unpack .../34-tlutils_1.41-2_amd64.deb ...
Unpacking tlutils (1.41-2) ...
Selecting previously unselected package tex-gyre.
Preparing to unpack .../35-tex-gyre_20160520-1_all.deb ...
Unpacking tex-gyre (20160520-1) ...
Selecting previously unselected package texlive-binaries.
Preparing to unpack .../36-texlive-
binaries_2017.20170613.44572-8ubuntu0.1_amd64.deb ...
Unpacking texlive-binaries (2017.20170613.44572-8ubuntu0.1) ...
Selecting previously unselected package texlive-base.
Preparing to unpack .../37-texlive-base_2017.20180305-1_all.deb ...
Unpacking texlive-base (2017.20180305-1) ...
Selecting previously unselected package texlive-fonts-recommended.
Preparing to unpack .../38-texlive-fonts-recommended_2017.20180305-1_all.deb ...
Unpacking texlive-fonts-recommended (2017.20180305-1) ...
Selecting previously unselected package texlive-plain-generic.
Preparing to unpack .../39-texlive-plain-generic_2017.20180305-2_all.deb ...
Unpacking texlive-plain-generic (2017.20180305-2) ...
Selecting previously unselected package texlive-generic-recommended.
Preparing to unpack .../40-texlive-generic-recommended_2017.20180305-1_all.deb

```

```

...
Unpacking texlive-generic-recommended (2017.20180305-1) ...
Selecting previously unselected package texlive-latex-base.
Preparing to unpack .../41-texlive-latex-base_2017.20180305-1_all.deb ...
Unpacking texlive-latex-base (2017.20180305-1) ...
Selecting previously unselected package texlive-latex-recommended.
Preparing to unpack .../42-texlive-latex-recommended_2017.20180305-1_all.deb ...
Unpacking texlive-latex-recommended (2017.20180305-1) ...
Selecting previously unselected package texlive-pictures.
Preparing to unpack .../43-texlive-pictures_2017.20180305-1_all.deb ...
Unpacking texlive-pictures (2017.20180305-1) ...
Selecting previously unselected package texlive-latex-extra.
Preparing to unpack .../44-texlive-latex-extra_2017.20180305-2_all.deb ...
Unpacking texlive-latex-extra (2017.20180305-2) ...
Selecting previously unselected package tipa.
Preparing to unpack .../45-tipa_2%3a1.3-20_all.deb ...
Unpacking tipa (2:1.3-20) ...
Selecting previously unselected package texlive-xetex.
Preparing to unpack .../46-texlive-xetex_2017.20180305-1_all.deb ...
Unpacking texlive-xetex (2017.20180305-1) ...
Setting up libgs9-common (9.26~dfsg+0-0ubuntu0.18.04.14) ...
Setting up libkpathsea6:amd64 (2017.20170613.44572-8ubuntu0.1) ...
Setting up libjs-jquery (3.2.1-1) ...
Setting up libtexlua52:amd64 (2017.20170613.44572-8ubuntu0.1) ...
Setting up fonts-droid-fallback (1:6.0.1r16-1.1) ...
Setting up libsynchronetex1:amd64 (2017.20170613.44572-8ubuntu0.1) ...
Setting up libptexenc1:amd64 (2017.20170613.44572-8ubuntu0.1) ...
Setting up tex-common (6.09) ...
debconf: unable to initialize frontend: Dialog
debconf: (No usable dialog-like program is installed, so the dialog based
frontend cannot be used. at /usr/share/perl5/Debconf/FrontEnd/Dialog.pm line
76.)
debconf: falling back to frontend: Readline
update-language: texlive-base not installed and configured, doing nothing!

```

```
[5]: !jupyter nbconvert --to pdf ANFIS_IMDB.ipynb
```

```

[NbConvertApp] WARNING | pattern u'ANFIS_IMDB.ipynb' matched no files
This application is used to convert notebook files (*.ipynb) to various other
formats.

```

```
WARNING: THE COMMANDLINE INTERFACE MAY CHANGE IN FUTURE RELEASES.
```

```
Options
```

```
-----
```

```
Arguments that take values are actually convenience aliases to full
```

Configurables, whose aliases are listed on the help line. For more information on full configurables, see '--help-all'.

--execute

Execute the notebook prior to export.

--allow-errors

Continue notebook execution even if one of the cells throws an error and include the error message in the cell output (the default behaviour is to abort conversion). This flag is only relevant if '--execute' was specified, too.

--no-input

Exclude input cells and output prompts from converted document.

This mode is ideal for generating code-free reports.

--stdout

Write notebook output to stdout instead of files.

--stdin

read a single notebook file from stdin. Write the resulting notebook with default basename 'notebook.*'

--inplace

Run nbconvert in place, overwriting the existing notebook (only relevant when converting to notebook format)

-y

Answer yes to any questions instead of prompting.

--clear-output

Clear output of current file and save in place, overwriting the existing notebook.

--debug

set log level to logging.DEBUG (maximize logging output)

--no-prompt

Exclude input and output prompts from converted document.

--generate-config

generate default config file

--nbformat=<Enum> (NotebookExporter.nbformat_version)

Default: 4

Choices: [1, 2, 3, 4]

The nbformat version to write. Use this to downgrade notebooks.

--output-dir=<Unicode> (FilesWriter.build_directory)

Default: ''

Directory to write output(s) to. Defaults to output to the directory of each notebook. To recover previous default behaviour (outputting to the current working directory) use . as the flag value.

--writer=<DottedObjectName> (NbConvertApp.writer_class)

Default: 'FilesWriter'

Writer class used to write the results of the conversion

--log-level=<Enum> (Application.log_level)

Default: 30

Choices: (0, 10, 20, 30, 40, 50, 'DEBUG', 'INFO', 'WARN', 'ERROR', 'CRITICAL')

Set the log level by value or name.

```

--reveal-prefix=<Unicode> (SlidesExporter.reveal_url_prefix)
    Default: u''
    The URL prefix for reveal.js (version 3.x). This defaults to the reveal CDN,
    but can be any url pointing to a copy of reveal.js.
    For speaker notes to work, this must be a relative path to a local copy of
    reveal.js: e.g., "reveal.js".
    If a relative path is given, it must be a subdirectory of the current
    directory (from which the server is run).
    See the usage documentation
    (https://nbconvert.readthedocs.io/en/latest/usage.html#reveal-js-html-slideshow)
    for more details.
--to=<Unicode> (NbConvertApp.export_format)
    Default: 'html'
    The export format to be used, either one of the built-in formats
    ['asciidoc', 'custom', 'html', 'latex', 'markdown', 'notebook', 'pdf',
    'python', 'rst', 'script', 'slides'] or a dotted object name that represents
    the import path for an `Exporter` class
--template=<Unicode> (TemplateExporter.template_file)
    Default: u''
    Name of the template file to use
--output=<Unicode> (NbConvertApp.output_base)
    Default: ''
    overwrite base name use for output files. can only be used when converting
    one notebook at a time.
--post=<DottedOrNone> (NbConvertApp.postprocessor_class)
    Default: u''
    PostProcessor class used to write the results of the conversion
--config=<Unicode> (JupyterApp.config_file)
    Default: u''
    Full path of a config file.

```

To see all available configurables, use `--help-all`

Examples

The simplest way to use nbconvert is

```
> jupyter nbconvert mynotebook.ipynb
```

which will convert mynotebook.ipynb to the default format (probably HTML).

You can specify the export format with `--to`.

Options include ['asciidoc', 'custom', 'html', 'latex', 'markdown', 'notebook', 'pdf', 'python', 'rst', 'script', 'slides'].

```
> jupyter nbconvert --to latex mynotebook.ipynb
```


Both HTML and LaTeX support multiple output templates. LaTeX includes 'base', 'article' and 'report'. HTML includes 'basic' and 'full'. You can specify the flavor of the format used.

```
> jupyter nbconvert --to html --template basic mynotebook.ipynb
```

You can also pipe the output to stdout, rather than a file

```
> jupyter nbconvert mynotebook.ipynb --stdout
```

PDF is generated via latex

```
> jupyter nbconvert mynotebook.ipynb --to pdf
```

You can get (and serve) a Reveal.js-powered slideshow

```
> jupyter nbconvert myslides.ipynb --to slides --post serve
```

Multiple notebooks can be given at the command line in a couple of different ways:

```
> jupyter nbconvert notebook*.ipynb
```

```
> jupyter nbconvert notebook1.ipynb notebook2.ipynb
```

or you can specify the notebooks list in a config file, containing::

```
c.NbConvertApp.notebooks = ["my_notebook.ipynb"]
```

```
> jupyter nbconvert --config mycfg.py
```

[]: