Demo document with computer code

HPL

Feb 28, 2016

1 Data file

Suppose we have some data in a file. The final result of including this file with `@@@CODE mydat.txt` (which implies a code environment starting with `!bc dat`) looks like this:

```
#      A          B          C          D          E
    -0.5253    -0.9315    -0.3427    -0.1613    -0.8472
    -0.9740    -0.2558    -0.5622    -0.7635    -0.0914
     0.9216     0.7702    -0.4818     0.2155     0.2967
```

2 Complete program and terminal output

The following program (which breaks a page) reads the data in the file and performs analysis (typeset with `!bc pypro`):

```
#!/usr/bin/env python

import numpy as np

def readfile(filename):
    """Read tabular data from file and return as numpy array."""
    f = open(filename, 'r')
    data = []  # list of rows in table
    for line in f:
        if line.startswith('#'):
            continue   # drop comment lines
        numbers = [float(w) for w in line.split()]
        data.append(numbers)
    return np.array(data)

def analyze(data):
    """Return statistical measures of an array data."""
    return np.mean(data), \
```

```
            np.std(data), \
            np.corrcoef(data)

if __name__ == '__main__':
    data = readfile('mydat.txt')
    # Treat each column as a variable
    m, s, c = analyze(data.transpose())
    print """
mean=%f
st.dev=%f
correlation matrix:
%s
""" % (m, s, c)
```

The output becomes (typeset with `!bc sys`):

```
Terminal> python fileread.py

mean=-0.006005
st.dev=0.583542
correlation matrix:
[[ 1.          0.0509676   0.52406366  0.20964645  0.1574504 ]
 [ 0.0509676   1.         -0.30920845 -0.12129049  0.7611538 ]
 [ 0.52406366 -0.30920845  1.          0.49355806 -0.42263817]
 [ 0.20964645 -0.12129049  0.49355806  1.         -0.38286589]
 [ 0.1574504   0.7611538  -0.42263817 -0.38286589  1.        ]]
```

3 Code snippet

Fortran 77 is also sometimes handy. Snippets in that language are typeset inside `!bc fcod` environments.

Fortran code box.

$$r_i = ca_i, \quad i = 1, \ldots, n$$

```
      subroutine process(a, n, c, r)
C     This subroutine returns array r = c*a
      integer n
      real*8 a(n), c, r(n)
      integer i
      do i = 1,n
         r(i) = c*a(i)
      end do
      return
      end
```