Python for scientific research Input, output and the filesystem

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February 11, 2020



Researcher Development



What we've done so far

- Declare variables using built-in data types and execute operations on them
- Use flow control commands to dictate the order in which commands are run and when
- Encapsulate programs into reusable functions, modules and packages
- Work with textual data and pattern matching
- Next working with files & the file system



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```

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wdir = os.getcwd() # returns pathname (as string)
print(wdir) # e.g., "C:\"
```

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import os, os.path # import modules
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```
1 import re, os, os.path # import the modules
```

```
import re, os, os.path # import the modules

# go to home dir
home_dir = os.path.expanduser("~")
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import re, os, os.path # import the modules

# go to home dir
home_dir = os.path.expanduser("~")

sos.chdir(home_dir)

# list all files in home dir
file_list = os.listdir() # ["Desktop", "Downloads",
...]
```

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3 # go to home dir
4 home_dir = os.path.expanduser("~")
5 os.chdir(home_dir)
6
7 # list all files in home dir
8 file_list = os.listdir() # ["Desktop", "Downloads",
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10 # declare list containing dirs with spaces
  dirs_with_spaces = []
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13 for file i in file list:
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10 # declare list containing dirs with spaces
  dirs_with_spaces = []
12
13 for file_i in file_list:
14
      # check for white space in filename and whether
          file is directory
15
      if re.search(r"\s",file_i) is not None and os.path.
          isdir(file_i):
```

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3 # go to home dir
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      if re.search(r"\s",file_i) is not None and os.path.
          isdir(file_i):
16
          dirs_with_spaces += [file_i] # append
```

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```

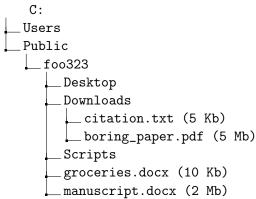
 Task: list all files anywhere within the home directory which have a size larger than 50 kB

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- Iterate over all files in any subdirectory within the home directory, using os.walk():

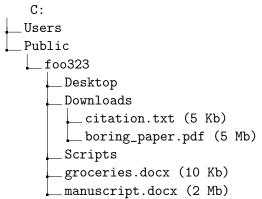
- Task: list all files anywhere within the home directory which have a size larger than 50 kB
- Iterate over all files in any subdirectory within the home directory, using os.walk():
 - os.walk() walks the directory tree, returning a tuple for each directory with (parent_dir, subdirectories, files)

 Task: list all files anywhere within the home directory which have a size larger than 1 Mb

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- Say, we have the following directory tree



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- Say, we have the following directory tree



 We should return Downloads/boring_paper.pdf and manuscript.docx

```
import os

2
3 # get home directory
4 homedir = os.path.expanduser("~")
```

```
import os

# get home directory
homedir = os.path.expanduser("~")

# iterate over all files nested in the home directory
for parent_dir, subdirs, files in os.walk(homedir):
```

```
import os

import os

# get home directory
homedir = os.path.expanduser("~")

# iterate over all files nested in the home directory
for parent_dir, subdirs, files in os.walk(homedir):
print(parent_dir) # C:\Users\Public\foo323
```

```
import os

get home directory
homedir = os.path.expanduser("~")

# iterate over all files nested in the home directory
for parent_dir, subdirs, files in os.walk(homedir):

print(parent_dir) # C:\Users\Public\foo323
print(subdirs) # ['Desktop', 'Downloads', 'Scripts']

print(files) # ['groceries.docx', 'manuscript.docx']
```

```
import os
  # get home directory
  homedir = os.path.expanduser("~")
5
  # iterate over all files nested in the home directory
  for parent_dir, subdirs, files in os.walk(homedir):
      print(parent_dir) # C:\Users\Public\foo323
      print(subdirs ) # ['Desktop', 'Downloads', 'Scripts
      print(files) # ['groceries.docx', 'manuscript.docx
10
      # quit after the first iteration
      break
13
```

```
import os, os.path
2

# get home directory
homedir = os.path.expanduser("-")
```

```
import os, os.path

# get home directory
homedir = os.path.expanduser(""")

# make a list to store the files
files_larger_imb = []

# iterate over all files nested in the home directory
for parent_dir, subdirs, files in os.walk(homedir):
```

```
import os, os.path

# get home directory
homedir = os.path.expanduser("~")

# make a list to store the files
files_larger_1mb = []

# iterate over all files nested in the home directory
for parent_dir, subdirs, files in os.walk(homedir):

for file in files:
```

```
import os, os.path

# get home directory
homedir = os.path.expanduser("~")

# make a list to store the files
files_larger_1mb = []

# iterate over all files nested in the home directory
for parent_dir, subdirs, files in os.walk(homedir):

for file in files:

# get the full path name
full_path = os.path.join(parent_dir, file)
```

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  # get home directory
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  # make a list to store the files
   files_larger_1mb = []
   # iterate over all files nested in the home directory
   for parent_dir, subdirs, files in os.walk(homedir):
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       for file in files:
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           # get the full path name
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17
           if os.path.exists(full_path):
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           if os.path.exists(full_path):
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               size = os.path.getsize(full_path)
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           if os.path.exists(full_path):
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               size = os.path.getsize(full_path)
19
               if size / 1024 > 1000:
                   files_larger_1mb += [full_path]
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           # get the full path name
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           full_path = os.path.join(parent_dir, file)
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           if os.path.exists(full_path):
18
               size = os.path.getsize(full_path)
19
               if size / 1024 > 1000:
                   files_larger_1mb += [full_path]
22
   # print folder contents
   print(files_larger_1mb)
```

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import shutil

3  # store a filename
filename = "new_file.txt"
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f = open("new_file.txt","w")
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f.close()

m now copy using shutil
shutil.copy(filename, "another_new_file.txt")
```

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  # now copy using shutil
  shutil.copy(filename, "another_new_file.txt")
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13 # list all the files in the current directory
14 # to see whether copied file exists
15 print(os.listdir("."))
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the_file_object.write("Hello world!")
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# any existing contents will be overwritten
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# write a string to the file
the_file_object.write("Hello world!")

# always close the file
the_file_object.close()
```

• open a file for reading, using the read() command

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```
1 # the 'r' flag reflects that we read from a file
2 the_file_object = open("my_first_file","r")
```

open a file for reading, using the read() command

```
# the 'r' flag reflects that we read from a file
the_file_object = open("my_first_file","r")

# get the file contents as a string
file_contents = the_file_object.read()
```

open a file for reading, using the read() command

```
# the 'r' flag reflects that we read from a file
the_file_object = open("my_first_file","r")

# get the file contents as a string
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# always close the file
the_file_object.close()
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• open a file for reading, using the read() command

```
# the 'r' flag reflects that we read from a file
the_file_object = open("my_first_file","r")

# get the file contents as a string
file_contents = the_file_object.read()

# always close the file
the_file_object.close()

# process file output
print(file_contents) # Hello World!
```

Other file operations

 File operations can be specified by the flag provided to open() function

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Flag	File operation
"w"	Write to a file, file will be truncated first
"r"	Reading from a file
"r+"	Reading and writing to a file
"a"	Append to a file
"a+"	Read from and write (by appending) to a file
"x"	Exclusive creation, fails if file exists

```
1 # first write something to a new file
2 myfile = open("myfile","w")
```

```
1 # first write something to a new file
2 myfile = open("myfile","w")
3 myfile.write("I wrote this to a file!")
4 myfile.close()
5
6 myfile = open("myfile","a+")
```

```
# first write something to a new file
myfile = open("myfile","w")
myfile.write("I wrote this to a file!")
myfile.close()

myfile = open("myfile","a+")
myfile.write("\nAnd now I also wrote this!")

# get the file contents as a string
file_contents = myfile.read()
```

```
# first write something to a new file
myfile = open("myfile","w")
myfile.write("I wrote this to a file!")
myfile.close()

myfile = open("myfile","a+")
myfile.write("\nAnd now I also wrote this!")

# get the file contents as a string
file_contents = myfile.read()

# always close the file
myfile.close()
```

```
1 # first write something to a new file
2 myfile = open("myfile","w")
3 myfile.write("I wrote this to a file!")
4 myfile.close()
5
6 myfile = open("myfile", "a+")
  myfile.write("\nAnd now I also wrote this!")
  # get the file contents as a string
  file_contents = myfile.read()
11
  # always close the file
  myfile.close()
14
15 # process file output
16 print(file_contents) # Nothing!
```

Append text to a previously opened file using the a+ flag

```
1 # first write something to a new file
2 myfile = open("myfile","w")
  myfile.write("I wrote this to a file!")
  myfile.close()
5
6 myfile = open("myfile", "a+")
  myfile.write("\nAnd now I also wrote this!")
  # get the file contents as a string
  file_contents = myfile.read()
11
  # always close the file
  myfile.close()
14
15 # process file output
16 print(file_contents) # Nothing!
```

 No output because the internal file pointer used by file.read() is at the end of the file!

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```

```
# first write something to a new file
proper property myfile = open("myfile","w")
myfile.write("I wrote this to a file!")
myfile.close()
myfile = open("myfile","a+")
```

```
# first write something to a new file
myfile = open("myfile","w")
myfile.write("I wrote this to a file!")
myfile.close()

myfile = open("myfile","a+")
myfile.write("\nAnd now I also wrote this!")

# move the file pointer to the Oth byte of the file
myfile.seek(0)
```

```
1 # first write something to a new file
2 myfile = open("myfile","w")
3 myfile.write("I wrote this to a file!")
4 myfile.close()
5
  myfile = open("myfile", "a+")
  myfile.write("\nAnd now I also wrote this!")
  # move the file pointer to the Oth byte of the file
  myfile.seek(0)
11
  # get the file contents as a string
  file_contents = myfile.read()
14
15 # always close the file
16 myfile.close()
```

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3 myfile.write("I wrote this to a file!")
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  myfile = open("myfile", "a+")
  myfile.write("\nAnd now I also wrote this!")
  # move the file pointer to the Oth byte of the file
  myfile.seek(0)
11
  # get the file contents as a string
  file_contents = myfile.read()
14
15 # always close the file
  myfile.close()
17
18 print(file_contents) # I wrote this to a file!
19
                        # And now I also wrote this!
```

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  myfile = open("myfile", "a+")
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  # move the file pointer to the Oth byte of the file
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  # get the file contents as a string
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14
15 # always close the file
  myfile.close()
17
18 print(file_contents) # I wrote this to a file!
19
                        # And now I also wrote this!
```