Working with Strings

Hurst Day (when?) - Syllabus

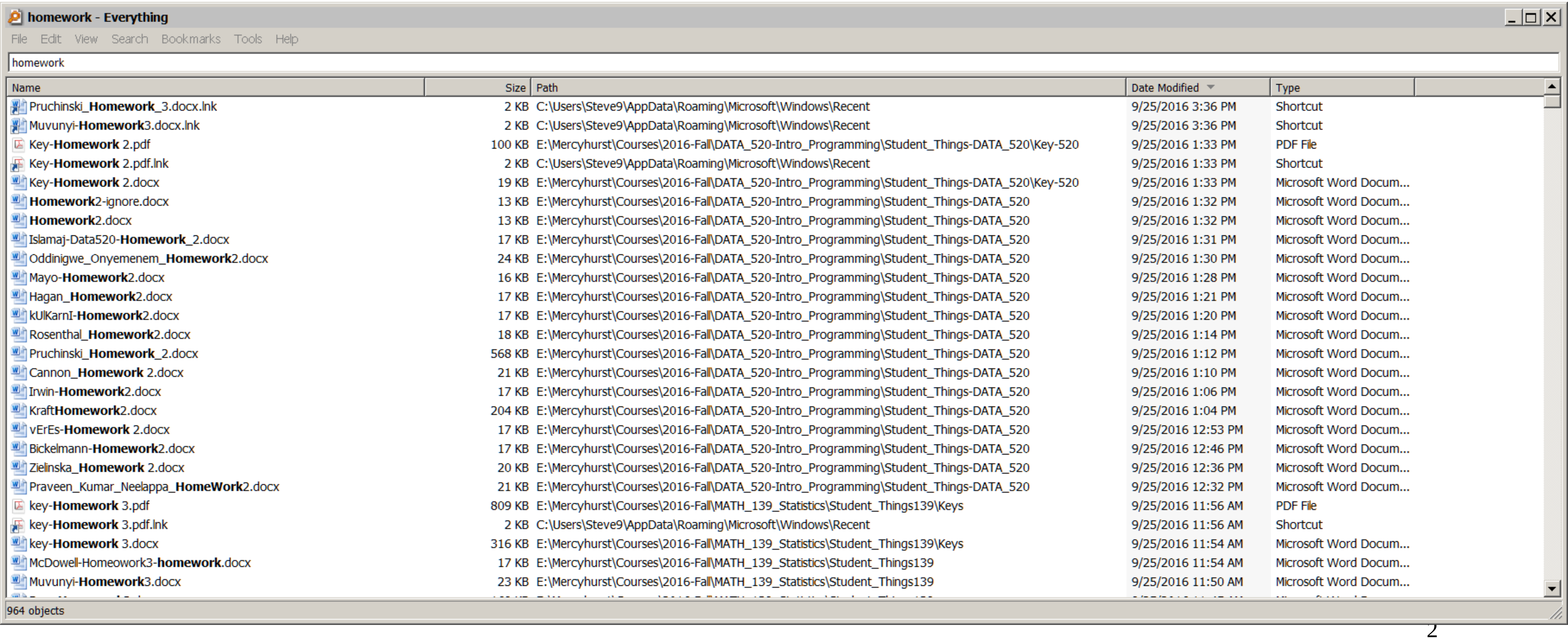
Strings and formatting

Text Strings to aid input

Text Strings in output

Another Useful Application: Everything

Finding files, working on files related to a project (https://www.voidtools.com/)



homework

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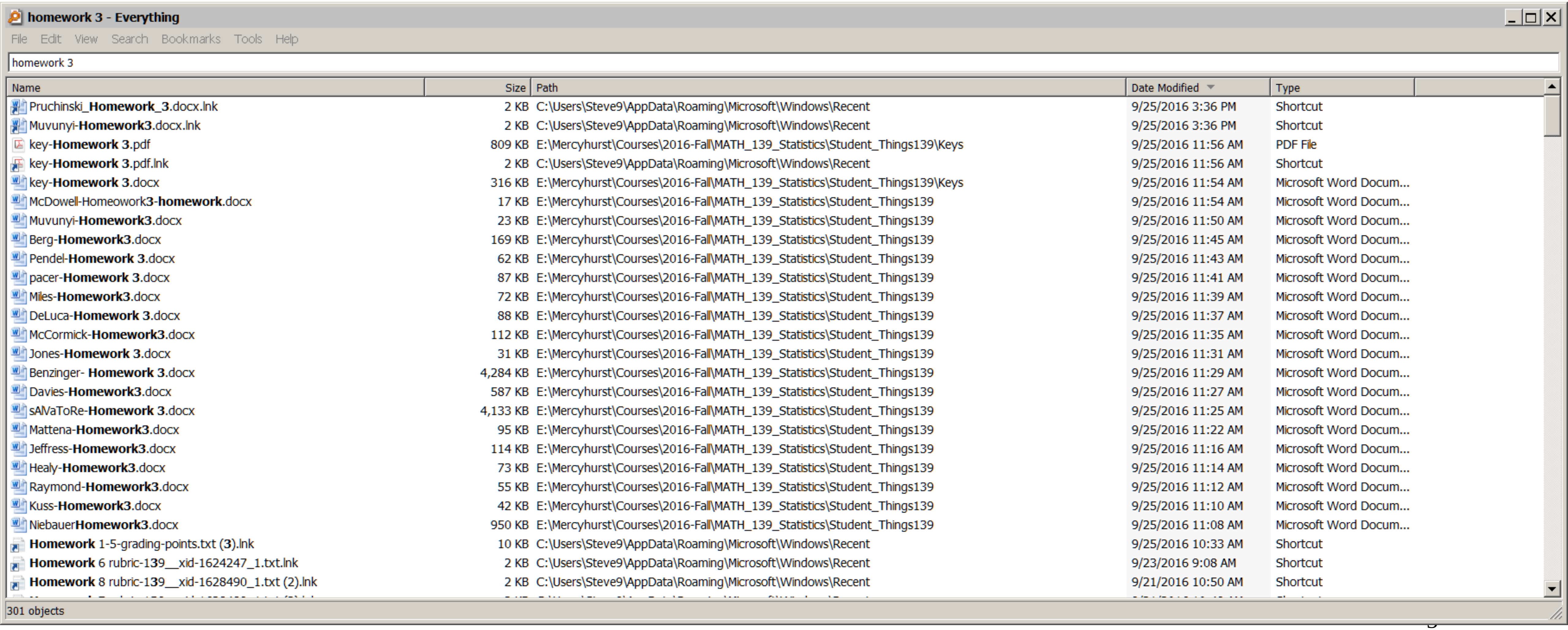
964 objects

Another Useful Application: Everything

Finding files, working on files related to a project: a "launcher"



homework 3

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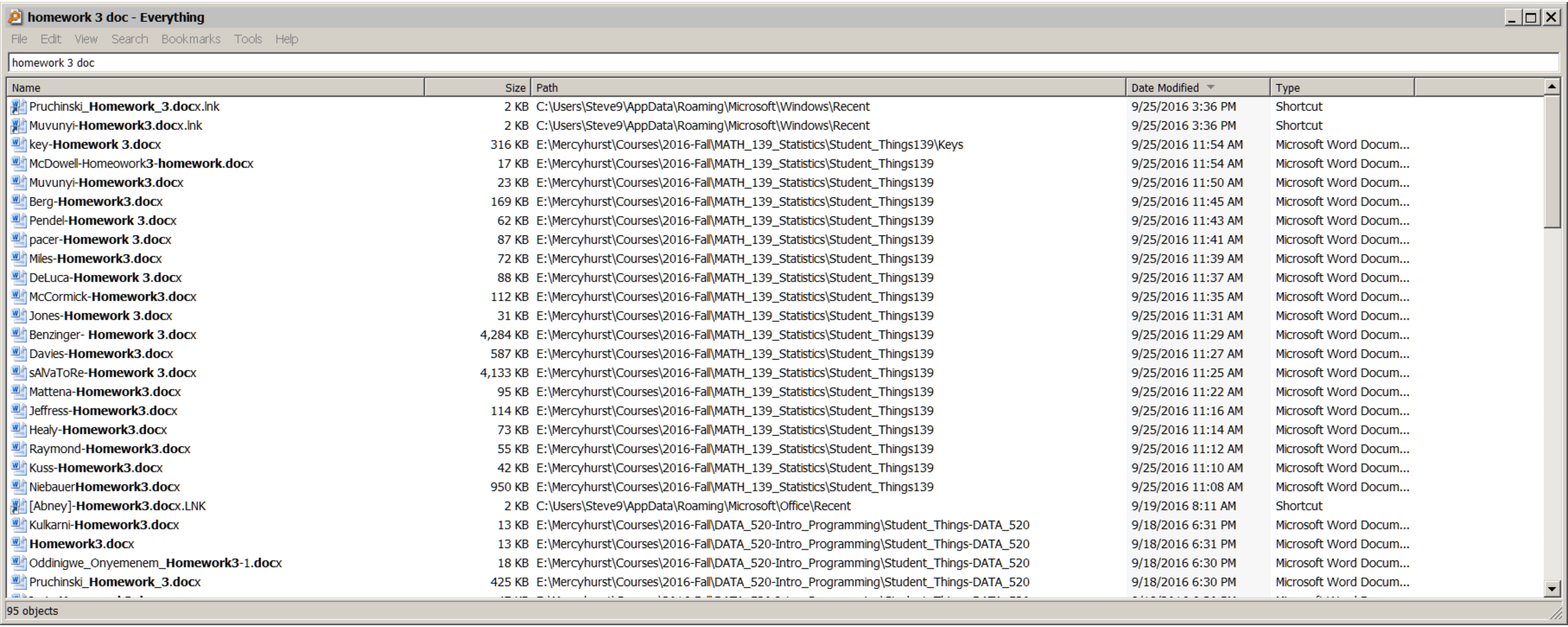
301 objects

Another Useful Application: Everything

Finding files, working on files related to a project



homework 3 doc

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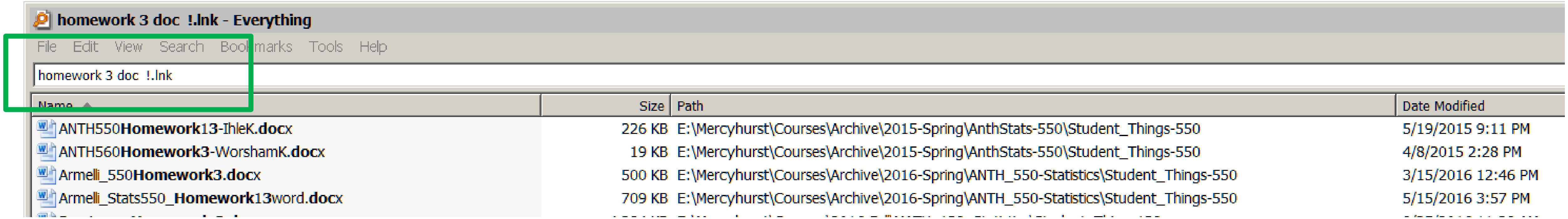
95 objects

Another Useful Application: Everything

Finding files, working on files related to a project



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Another Useful Application: Everything

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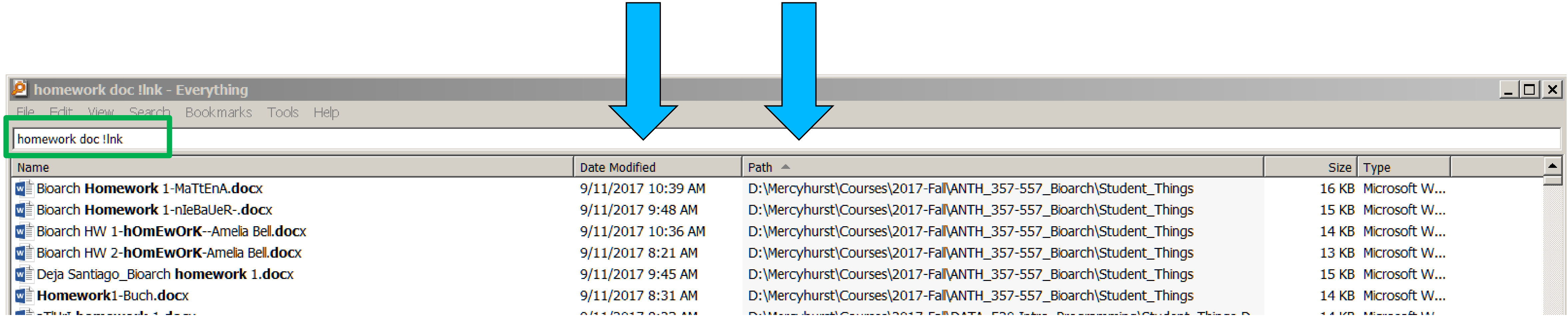

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homework doc !.lnk

- then sort by Date or path

Strings

So far we have run functions knowing what to input

```
convert_to_celsius(68)
```

But it is more natural to answer prompts

- reminds us of what we are trying to do in the first place
- helps us enter data in the correct order
- can prompt for special formats (dates, numbers)

So we need to know how to use strings in Python

Strings

```
Must use balanced quotation marks
"Einstein'
SyntaxError: EOL while scanning string literal

len("Einstein') # length of a string
SyntaxError: EOL while scanning string literal
- but can be mixed IF balanced
# "add strings: concatenation
>>> "Einstein" + ' was only ' + "a man!"
'Einstein was only a man!'
# ^^ notice the single quotation marks!

>>> len("Einstein" + ' was only ' + "a man!")
24
```

Strings

Empty strings - nothing between, can concatenate with other strings

- will not change string

```
''
""
len("")
0
len('')
0
# an empty string?
len("''")

# spaces are counted
len (' ')
1
```

Strings

Can we "concatenate" a string and number? "add them?

```
>>>>'SDO' + 10
Traceback (most recent call last):
  File "<pyshell#1>", line 1, in <module>
    'SDO' + 10
TypeError: must be str, not int
# all okay to print:
print ("10")
print ('10')
print (10)

# not okay: (notice +)
print('The answer is ' + 10)
```

Strings

```
# use a function to fix, force a string : the str() function
print('The answer is ' + str(10))

# what about floats?
xr1 = 23.584564
print('The answer is ' + round(xr1,2))
Traceback (most recent call last):
  File "<pyshell#3>", line 1, in <module>
    print('The answer is ' + round(xr1,2));
TypeError: must be str, not float
```

Strings

```
# what about floats?;
xr1 = 23.584564;
print('The answer is ' + format(xr1,'.2f')); # or str(round(xr1,2)))
The answer is 23.58
# use str(), int(), float(), format() to convert types

>>> int('a')
Traceback (most recent call last):
File "<stdin>", line 1, in <module>
ValueError: invalid literal for int() with base 10: 'a'
>>> float('b')
Traceback (most recent call last):
File "<stdin>", line 1, in <module>
ValueError: could not convert string to float: 'b'
```

Strings

```
# You CAN multiply (duplicate) strings
>>> 'ACGT' * 4
'ACGTACGTACGTACGT'

# special characters - quotation marks
'that ain't gonna work'
SyntaxError: invalid syntax

#SQL solution: double quotation marks
'that isn''t going to work'
'that aint gonna work'
# one solution: mix quotation marks, one inside the other
"that ain't gonna work"
```

Strings

British style of quoting inside a publication:

```
print("Armelagos (1992:34) stated, 'I have had enough'.")
```

American style of quoting inside a publication:

```
print('Armelagos (1992:34) stated, "I have had enough".')
```

```
# Python (and other programs) flexible solution: an escape character (\)
\ = escape character
\' = escape sequence
```

```
'that ain\'t gonna work'
'that ain't gonna work'
```

Strings

```
# escape character (\) and sequence
len('\')
1
len('\'')  # or len("\'") or len("\"") # hmmm, try len(""")
1
len ('it\'s')
4
Other escape sequences
\' Single quote
\" Double quote
\\ Backslash - useful for Windows directories 'C:\\Program Files\\'
\t Tab
\n Newline
\r Carriage return
```

Strings

```
# you can use three quotes in a row, paired, to input multiple lines
'''line 1
    line 2
    line 3'''
'line 1\n    line 2\n    line 3'

print("""line 1  # prints strings as we would expect
line 2
line 3"""  )

line 1
line 2
line 3
```

Strings

Windows uses carriage return and line feed for every end of line (\r\n)

Max OS X, Linux do not

But in screen output, \n is enough

```
# we can use tabs and newlines best with print
print('one\ttwo\nthree\tfour\n')
one   two
three four
print('one' + '\t' + 'two' + '\n' + 'three' + '\t' + 'four' + '\n')

print('one\t two\n three\t four\n') # more readable - different?
print('one \ttwo \nthree \tfour \n') # more readable? - different?
```

Printing numbers and text

```
# print will print number or string sequences, and add a line feed at the end
print (1,2,3) # commas insert a space by default
1 2 3
print ('Stan','is','the',"man!") # commas insert a space by default
Stan is the man!
# mix types - notice the commas
print(3,"The",'Great',6,'Santini')
3 The Great 6 Santini
# is this different? mix + and comma
print(3,"The" + 'Great',6,'Santini')

radius = 5
pi = 3.1415926
print("The circumference of the circle is", radius * 2 * pi, "cm.")
```

Printing

```
help(print)
Help on built-in function print in module builtins:
print(...)
print(value, ..., sep=' ', end='\n', file=sys.stdout, flush=False)

Prints the values to a stream, or to sys.stdout by default.

Optional keyword arguments:
file: a file-like object (stream); defaults to the current sys.stdout.
sep: string inserted between values, default a space.
end: string appended after the last value, default a newline.
flush: whether to forcibly flush the stream.
# change a default value
print (1,2,3,4,5,6,7,8,23, sep = '#', end = 'Fin')
```

Getting Strings as Input

Now we can write interactive programs!

```
pop = 7000500
species = input('Enter a species name:')
print ('The population of ' + species + ' is ' + pop)
Traceback (most recent call last):
  File "C:/Users/sousley/AppData/Local/Programs/Python/Python35-32/tmp.py", line 3, in <module>
    print ('The population of ' + species + ' is ' + pop)
TypeError: Can't convert 'int' object to str implicitly

# try this: (KEY: Using PLUS vs. COMMA makes a difference.
print ('The population of ' + species + ' is ' + str(pop))
# OR use commas
print ('The population of', species, 'is' , pop)
```

So I suggest that you use commas by default for output, but…

Getting Strings as Input

```
species = input('Enter a species name:')
# Let us use input to shape the next prompt
# We MUST use + with an input statement containing a variable
pop = input('Enter the number of organisms represented by ' +  species + ': ')
# output - can use commas
print ('The population of', species, 'is:' , pop)
print ('The population of ' + species + ' is: ' + pop)

type(species)
<class 'str'>
type(pop)
<class 'str'>
```

Getting Strings as Input

Now we can write interactive programs!

```
species = input('Enter a species name:')
# What if we want to work with a number that is input?
pop = input('Enter the number of organisms represented by ' +  species + ': ')
pop = pop + 10
print ('The population of ', species, ' is ' , pop)
Traceback (most recent call last):
  File "C:/Users/Steve9/AppData/Local/Programs/Python/Python35-32/tmp.py", line 11, in <module>
    pop = pop + 1
TypeError: Can't convert 'int' object to str implicitly
```

Getting Strings as Input

Now we can write interactive programs!

```
species = input('Enter a species name:')
# What if we want to work with a number that is input?
pop = input('Enter the number of organisms represented by ' +  species + ': ')
pop = int(pop)  # coerce the type to integer
pop = pop + 10
print ('The population of ', species, ' is ' , pop)
```

```
type(pop)
<class 'int'>
```

Why did Python remember the variable names this time?

Getting Strings as Input

Now we can write interactive programs!

```
species = input('Enter a species name:')
# we can now use that variable, but we MUST use +
pop = input('Enter the number of organisms represented by ' +  species + ': ')
pop = int(pop)  # coerce the type to integer
pop = pop + 10
# this time I want the count on the next line
print ('The population of', species , 'is:', '\n', pop )

# this time I want the count on the next line after a tab
print ('The population of', species, 'is:', '\n', '\t', pop )
# Use pluses if you insist, but you MUST coerce pop to string:
print ('The population of '+ species + ' is:' + '\n' + '\t' + str(pop) )
```

Getting Strings as Input

Now we can write interactive programs!

```
# I put the code into a file, SpecCount.py
def SpecCount(): # no parameters, no help - I am lazy today.
    species = input('Enter a species name:')
    # we can now use that variable, but we MUST use +
    pop = input('Enter the number of organisms represented by ' +  species + ': ')
    pop = int(pop)  # coerce the type to integer
    pop = pop + 10
    # this time I want the count on the next line
    print ('The population of', species , 'is:', '\n', pop )
    # this time I want the count on the next line after a tab
    print ('The population of', species, 'is:', '\n', '\t', pop )
```

.. and run

```
>>> SpecCount()
```

Strings

Tabs and EOLs: Lining up for tables

When in doubt, use '''

```
print ('''
Individual \t Tscore \t Zscore  #careful, this comment is inside quotes!
Z345 \t\t 32.4 \t\t 2.34
Z346 \t\t 31.1 \t\t 2.14
Z348 \t\t 35.3 \t\t 2.54 \n
''')
```

```
print ('''
Ind \t TSco \t ZSco
Z345 \t 32.4 \t 2.34
Z346 \t 31.1 \t 2.14
Z348 \t 35.3 \t 2.54 \n
''')
```

```
print ('Ind \t TSco \t ZSco\nZ345 \t 32.4 \t 2.34\nZ346 \t 31.1 \t 2.14\nZ348 \t 35.3 \t 2.54\n')
```

Homework 4 due before class Monday

On page 75 in the Gries book:

Do 4.7, Exercises 1 through 5