Python workshop

Week 1: Writing your first program barbera@van-schaik.org





About me

- During the day I'm a bioinformatician
- In my spare time I ...
 - Go to concerts and festivals
 - Cook (all cuisines)
 - Read (fantasy, popular science/philosophy, Dutch literature)
 - Make things (sewing, electronics, laser cutting, welding, 3d printing)
 - Grow vegetables in my garden





Overview of this workshop series

- Week 1: Writing your first program
- Week 2: Make choices and reuse code
- Week 3: Loops and strings
- Week 4: Files and lists
- Week 5: Dictionaries and tuples

Acknowledgments

- Charles Severance aka Dr Chuck
 - For teaching me Python
 - For releasing teaching material to the public
 - http://www.pythonlearn.com/
- He gives the course "Programming for <u>everybody</u>"
- Structure of this workshop is based on his book
- Several examples too





Why shouldn't you learn programming?

- Years of learning (to program really well)
- "Coding is not a goal. It's a tool for solving problems."
- Programming doesn't make you rich
- There are always people better than you http://www.fastcolabs.com/3020126/no-you-dont-need-to-learn-to-code



Why should you learn programming?

- It is fun and creative
- Because you can
- It is a tool for solving problems
 - Science
 - Apps
 - Games
 - Internet of things
 - Etc





- A computer is fast and good for repetitive work
- There is no existing program for your needs





Computers and language

Computer anatomy



Computer anatomy



Programming language

To give instructions



https://youtu.be/XiBYM6g8Tck

While music is playing: Left hand out and up Right hand out and up Flip left hand Flip right hand Left hand to right shoulder Right hand to right shoulder Left hand to back of head Right ham to back of head Left hand to right hik Right hand to left hik Left hand on left bottom Right hand on right bottom Wiggle Wiggle Jump

Programming language



Computer language

handle = open(filename, 'r')
song = handle.read()
words = song.split()
counts = dict()

for word in words: counts[word] = counts.get(word, 0) + 1 for word, count in counts.items(): print word, count

Why Python

- Easy to learn
- Very readable



- No long constructs
- No special cryptic characters
- Indentation is forced (more next week)
- Much code available (e.g. SciPy, NumPy)
- Cross-platform

http://helloworldcollection.de/

How smart is a computer?

• A computer (or phone) is not smart

- Limited vocabulary
- It needs literal instructions
- It will "complain" when instructions are not clear

out of memory out of disk space syntax error



Usually with a hint to guide you

Reserved words

and del for is raise assert elif from lambda return break else global not try class except if or while continue exec import pass yield def finally in print

Terminal, scripts, Python?





Windows



Mac OSX

Linux (Ubuntu)

Vroegah...

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Even earlier: the black window

A:\>dir /w

CSYS.INI

1:>>

:>>

:>>

Volume in drive A has no label Volume Serial Number is B83C-90D0 Directory of A:\

AM2100.DO 221ND.DO_ ELNKMC.DO IBMTOK.DO DIS39XR.DO IET.MS_ DEMDLC.INF EZNDIS.DO ROTMAN.EX_ SMC_ARC.DO

52 file(s)

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DEPCA.DO ELNK3.DO EXPAND.EXE LM21DRV.UP NE2000.DO

This is called a:

- Terminal
- Command-line (cmd)

Shell •



smmsp:x:25:25:SendMail Message Submission Program:/: listen:x:37:4:Network Admin:/usr/net/nls: qdm∶x:50:50:GDM Reserved UID:/: webservd:x:80:80:WebServer Reserved UID:/: postgres:x:90:90:PostgreSQL Reserved UID:/:/usr/bin/pfksh suctag:x:95:12:Service Tag UID:/: nobody:x:60001:60001:NFS Anonymous Access User:/: noaccess:x:60002:60002:No Access User:/: nobody4:x:65534:65534:SunOS 4.x NFS Anonymous Access User:/:

/etc/passwd" 17 lines, 677 characters testimage console login: root Password: Mar 29 11:36:16 testimage login: ROOT LOGIN /dev/console Last login: Sat Mar 29 11:04:43 on console Sun Microsystems Inc. SunOS 5.10 Generic January 2005 -bash-3.00#

No fancy windows No icons No clicking

You need to type in commands to the computer

Directories and files

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cd somedirectoryname (go to directory, or Change Directory)dir(shows content of directory, windows)ls -l(shows content of directory, linux/mac)

Starting a program



The program "subl" is started (a text editor) After that the program "helloworld.py" Linux/mac: start "helloworld.py" with "python" before that Windows: you only need to type "helloworld.py"

Start the Python program

File Edit View Search Terminal Help narya@monk:~/ownCloud/course/python-zb45\$ python Python 2.7.3 (default, Mar 13 2014, 11:03:55) [GCC 4.7.2] on linux2 Type "help", "copyright", "credits" or "license" for more information. >>> []

> You can also start the interactive python program Linux/Mac: type "python" Windows: start "python commandline" from the start menu

> Note that the "prompt" has changed from blahblah\$ to >>> You are now in the python program

You can type python code, one line at the time

Python: first attempt

Open python and type:
 >> Hi there

- Then type:
 - >>> answer me!



One more try:
 >>> help

Python: help()

help> keywords help> if help> quit

It looks like you are bashing furiously on your keyboard. Do you want me to enable caps lock?

👌 Yes

Die in a fire, Mr Clippy

Û

Hello world

>>> print "Hello world"

Try this again without the last quotes

>>> 27+15

>>> x = 7
>>> print x
>>> x = x+2
>>> print x
>>> 1+2=3

>>> 1+2==3



Scripts

- Like a recipe, a set of instructions
- Open sublime, notepad++ or another editor
- Type the following in the editor and save the file as "myscript.py"

x = 7

print x

x = x + 2

Start the script from the commandline: cmd> python myscript.py

print x

Hello <your-name-here>

New script "helloworld.py"

name = raw_input("Enter your name:\n")

print "Hello", name

• Start the script from the commandline cmd> python helloworld.py



Data types

- Start an interactive Python session
- The basic data types:

>>> type(4)



string

- >>> type(3.141592653)
- >>> type("Yo")
- >>> type('Yo')
- >>> type("13")





integer

float

Variables

- Assign values to variables
- >>> message = "hello"
- >>> n = 2
- >>> pi = 3.1415926535897931
- >>> print n
- >>> print message
- >>> type(message)
- >>> type(n)
- >>> type(pi)



Variable names

- A combination of letters, numbers and underscores
- No reserved words!
- No special characters!
- Case sensitive!



Name has to start with letter or underscore

• Tip: use meaningful names

Variable names

- Doesn't work:
- >>> 7of9 = "borg"
- >>> mail@ = "barbera@van-schaik.org"

• Works:
>>> city = "Amsterdam"
>>> pin_code = 1234



Calculator

- Operators: +, -, *, /, **, %
- >>> 20+32
- >>> hour 1
- >>> hour * 60 + minute
- >>> minute / 60
- >>> 5**2

>>> (5+9)*(15-7)



Python and floats

>>> minute = 59

>>> minute/60

>>> minute/60.0



Order of operations

- Parenthesis: (1+2)*(3+1) = 3*4 = 12
- Exponentiation: $2^{**}1+1 = 2+1 = 3$
- Multiplication and division: 2*3-1 = 6-1 = 5
- Addition and subtraction: 5-3-1 = 2-1 = 1

Same precedence from left to right



String operations

- Concatenation
- >>> first = 10
- >> second = 15
- >>> print first + second >>> print n * word
- >>> first = '10' >>> second = '15' >>> print first + second

Multiplication



Comments

blah,blah, blah,whatever

- Programs tend to get long and unreadable
- Solutions:
 - Give meaningful variable names
 - Insert comments

Ask user for input hours = raw_input("How many hours did you work?\n") seconds = hours / 3600 # compute seconds of work

Next week

Next: Make choices and reuse code

- Want more practice?
 - Exercises in chapter 1 and 2 of the book
- See you next week!!

