## 00 Introduction

April 14, 2019

## In [1]: import IPython

## 1 Best-of the Python Standard Library

## 1.1 Batteries Included!

Python's standard library is very extensive - it come with every copy of Python. It contains hundreds of modules that provide tools for interacting with:

- the operating system
- interpreter (strings, numbers, data structures,...)
- internet

There is a 25 year history in the standard library, some modules may be redundant or similar, e.g. urllib, urllib2.

Let's have a look at the Python documentation: https://docs.python.org/2/library/index.html

- 1. Introduction
- 2. Built-in Functions
- 3. Non-essential Built-in Functions
- 4. Built-in Constants 4.1. Constants added by the site module
- 5. Built-in Types 5.1. Truth Value Testing 5.2. Boolean Operations and, or, not 5.3. Comparisons 5.4. Numeric Types int, float, long, complex 5.5. Iterator Types 5.6. Sequence Types str, unicode, list, tuple, bytearray, buffer, xrange 5.7. Set Types set, frozenset 5.8. Mapping Types dict 5.9. File Objects 5.10. memoryview type 5.11. Context Manager Types 5.12. Other Built-in Types 5.13. Special Attributes
- 6. Built-in Exceptions 6.1. **Exception** hierarchy
- 7. String Services 7.1. string Common string operations 7.2. re Regular expression operations 7.3. struct Interpret strings as packed binary data 7.4. difflib Helpers for computing deltas 7.5. StringIO Read and write strings as files 7.6. cStringIO Faster version of StringIO 7.7. textwrap Text wrapping and filling 7.8. codecs Codec registry and base classes 7.9. unicodedata Unicode Database 7.10. stringprep Internet String Preparation 7.11. fpformat Floating point conversions
- 8. Data Types 8.1. **datetime** Basic date and time types 8.2. **calendar** General calendar-related functions 8.3. **collections** High-performance container datatypes 8.4. **heapq** Heap queue algorithm 8.5. **bisect** Array bisection algorithm 8.6. **array** Efficient arrays of numeric values 8.7. **sets** Unordered collections of unique elements 8.8. **sched** Event scheduler 8.9. **mutex** Mutual exclusion support 8.10. **Queue** A synchronized queue

- class 8.11. **weakref** Weak references 8.12. **UserDict** Class wrapper for dictionary objects 8.13. **UserList** Class wrapper for list objects 8.14. **UserString** Class wrapper for string objects 8.15. **types** Names for built-in types 8.16. **new** Creation of runtime internal objects 8.17. **copy** Shallow and deep copy operations 8.18. **pprint** Data pretty printer 8.19. **repr** Alternate repr() implementation
- 9. Numeric and Mathematical Modules 9.1. **numbers** Numeric abstract base classes 9.2. **math** Mathematical functions 9.3. **cmath** Mathematical functions for complex numbers 9.4. **decimal** Decimal fixed point and floating point arithmetic 9.5. **fractions** Rational numbers 9.6. **random** Generate pseudo-random numbers 9.7. **itertools** Functions creating iterators for efficient looping 9.8. **functools** Higher-order functions and operations on callable objects 9.9. **operator** Standard operators as functions
- 10. File and Directory Access 10.1. os.path Common pathname manipulations 10.2. fileinput Iterate over lines from multiple input streams 10.3. stat Interpreting stat() results 10.4. statvfs Constants used with os.statvfs() 10.5. filecmp File and Directory Comparisons 10.6. tempfile Generate temporary files and directories 10.7. glob Unix style pathname pattern expansion 10.8. fnmatch Unix filename pattern matching 10.9. linecache Random access to text lines 10.10. shutil High-level file operations 10.11. direache Cached directory listings 10.12. macpath Mac OS 9 path manipulation functions
- 11. Data Persistence 11.1. **pickle** Python object serialization 11.2. **cPickle** A faster pickle 11.3. **copy\_reg** Register pickle support functions 11.4. **shelve** Python object persistence 11.5. **marshal** Internal Python object serialization 11.6. **anydbm** Generic access to DBM-style databases 11.7. **whichdb** Guess which DBM module created a database 11.8. **dbm** Simple "database" interface 11.9. **gdbm** GNU's reinterpretation of dbm 11.10. **dbhash** DBM-style interface to the BSD database library 11.11. **bsddb** Interface to Berkeley DB library 11.12. **dumbdbm** Portable DBM implementation 11.13. **sqlite3** DB-API 2.0 interface for SQLite databases
- 12. Data Compression and Archiving 12.1. **zlib** Compression compatible with gzip 12.2. **gzip** Support for gzip files 12.3. **bz2** Compression compatible with bzip2 12.4. **zipfile** Work with ZIP archives 12.5. **tarfile** Read and write tar archive files
- 13. File Formats 13.1. csv CSV File Reading and Writing 13.2. ConfigParser Configuration file parser 13.3. robotparser Parser for robots.txt 13.4. netrc netrc file processing 13.5. xdrlib Encode and decode XDR data 13.6. plistlib Generate and parse Mac OS X .plist files
- 14. Cryptographic Services 14.1. **hashlib** Secure hashes and message digests 14.2. **hmac** Keyed-Hashing for Message Authentication 14.3. **md5** MD5 message digest algorithm 14.4. **sha** SHA-1 message digest algorithm
- 15. Generic Operating System Services 15.1. os Miscellaneous operating system interfaces 15.2. io Core tools for working with streams 15.3. time Time access and conversions 15.4. argparse Parser for command-line options, arguments and sub-commands 15.5. optparse Parser for command line options 15.6. getopt C-style parser for command line options 15.7. logging Logging facility for Python 15.8. logging.config Logging configuration 15.9. logging.handlers Logging handlers 15.10. getpass Portable password input 15.11. curses Terminal handling for character-cell displays 15.12. curses.textpad Text input widget for curses programs 15.13. curses.ascii Utilities for ASCII characters 15.14. curses.panel A panel stack extension for curses 15.15. platform Access to underlying platform's identifying data 15.16. errno Standard errno system symbols 15.17. ctypes A foreign function library for Python
- 16. Optional Operating System Services 16.1. **select** Waiting for I/O completion 16.2. **thread-**

- ing Higher-level threading interface 16.3. thread Multiple threads of control 16.4. dummy\_threading Drop-in replacement for the threading module 16.5. dummy\_thread Drop-in replacement for the thread module 16.6. multiprocessing Process-based "threading" interface 16.7. mmap Memory-mapped file support 16.8. readline GNU readline interface 16.9. rlcompleter Completion function for GNU readline
- 17. Interprocess Communication and Networking 17.1. **subprocess** Subprocess management 17.2. **socket** Low-level networking interface 17.3. **ssl** TLS/SSL wrapper for socket objects 17.4. **signal** Set handlers for asynchronous events 17.5. **popen2** Subprocesses with accessible I/O streams 17.6. **asyncore** Asynchronous socket handler 17.7. **asynchat** Asynchronous socket command/response handler
- 18. Internet Data Handling 18.1. email An email and MIME handling package 18.2. json JSON encoder and decoder 18.3. mailcap Mailcap file handling 18.4. mailbox Manipulate mailboxes in various formats 18.5. mhlib Access to MH mailboxes 18.6. mimetools Tools for parsing MIME messages 18.7. mimetypes Map filenames to MIME types 18.8. MimeWriter Generic MIME file writer 18.9. mimify MIME processing of mail messages 18.10. multifile Support for files containing distinct parts 18.11. rfc822 Parse RFC 2822 mail headers 18.12. base64 RFC 3548: Base16, Base32, Base64 Data Encodings 18.13. binhex Encode and decode binhex4 files 18.14. binascii Convert between binary and ASCII 18.15. quopri Encode and decode MIME quoted-printable data 18.16. uu Encode and decode uuencode files
- 19. Structured Markup Processing Tools 19.1. HTMLParser Simple HTML and XHTML parser 19.2. sgmllib Simple SGML parser 19.3. htmllib A parser for HTML documents 19.4. htmlentitydefs Definitions of HTML general entities 19.5. XML Processing Modules 19.6. XML vulnerabilities 19.7. xml.etree.ElementTree The ElementTree XML API 19.8. xml.dom The Document Object Model API 19.9. xml.dom.minidom Minimal DOM implementation 19.10. xml.dom.pulldom Support for building partial DOM trees 19.11. xml.sax Support for SAX2 parsers 19.12. xml.sax.handler Base classes for SAX handlers 19.13. xml.sax.saxutils SAX Utilities 19.14. xml.sax.xmlreader Interface for XML parsers 19.15. xml.parsers.expat Fast XML parsing using Expat
- 20. Internet Protocols and Support 20.1. webbrowser Convenient Web-browser controller 20.2. cgi Common Gateway Interface support 20.3. cgitb Traceback manager for CGI scripts 20.4. wsgiref WSGI Utilities and Reference Implementation 20.5. urllib Open arbitrary resources by URL 20.6. urllib2 extensible library for opening URLs 20.7. httplib HTTP protocol client 20.8. ftplib FTP protocol client 20.9. poplib POP3 protocol client 20.10. imaplib IMAP4 protocol client 20.11. nntplib NNTP protocol client 20.12. smtplib SMTP protocol client 20.13. smtpd SMTP Server 20.14. telnetlib Telnet client 20.15. uuid UUID objects according to RFC 4122 20.16. urlparse Parse URLs into components 20.17. SocketServer A framework for network servers 20.18. BaseHTTPServer Basic HTTP server 20.19. SimpleHTTPServer Simple HTTP request handler 20.20. CGIHTTPServer CGI-capable HTTP request handler 20.21. cookielib Cookie handling for HTTP clients 20.22. Cookie HTTP state management 20.23. xml-rpclib XML-RPC client access 20.24. SimpleXMLRPCServer Basic XML-RPC server 20.25. DocXMLRPCServer Self-documenting XML-RPC server
- 21. Multimedia Services 21.1. **audioop** Manipulate raw audio data 21.2. **imageop** Manipulate raw image data 21.3. **aifc** Read and write AIFF and AIFC files 21.4. **sunau** Read and write Sun AU files 21.5. **wave** Read and write WAV files 21.6. **chunk** Read IFF chunked data 21.7. **colorsys** Conversions between color systems 21.8. **imghdr** Determine the type of an image 21.9. **sndhdr** Determine type of sound file 21.10. **ossaudiodev**

- Access to OSS-compatible audio devices
- 22. Internationalization 22.1. **gettext** Multilingual internationalization services 22.2. **locale** Internationalization services
- 23. Program Frameworks 23.1. **cmd** Support for line-oriented command interpreters 23.2. **shlex** Simple lexical analysis
- 24. Graphical User Interfaces with Tk 24.1. **Tkinter** Python interface to Tcl/Tk 24.2. **ttk** Tk themed widgets 24.3. **Tix** Extension widgets for Tk 24.4. **ScrolledText** Scrolled Text Widget 24.5. **turtle** Turtle graphics for Tk 24.6. **IDLE 24.7**. Other Graphical User Interface Packages
- 25. Development Tools 25.1. pydoc Documentation generator and online help system 25.2. doctest Test interactive Python examples 25.3. unittest Unit testing framework 25.4. 2to3 Automated Python 2 to 3 code translation 25.5. test Regression tests package for Python 25.6. test.support Utility functions for tests
- 26. Debugging and Profiling 26.1. **bdb** Debugger framework 26.2. **pdb** The Python Debugger 26.3. **Debugger Commands** 26.4. **The Python Profilers 26.5.** hotshot\*\* High performance logging profiler 26.6. **timeit** Measure execution time of small code snippets 26.7. **trace** Trace or track Python statement execution
- 27. Software Packaging and Distribution 27.1. **distutils** Building and installing Python modules 27.2. **ensurepip** Bootstrapping the pip installer
- 28. Python Runtime Services 28.1. sys System-specific parameters and functions 28.2. sysconfig Provide access to Python's configuration information 28.3. builtin Built-in objects 28.4. future\_builtins Python 3 builtins 28.5. main Top-level script environment 28.6. warnings Warning control 28.7. contextlib Utilities for with-statement contexts 28.8. abc Abstract Base Classes 28.9. atexit Exit handlers 28.10. traceback Print or retrieve a stack traceback 28.11. future Future statement definitions 28.12. gc Garbage Collector interface 28.13. inspect Inspect live objects 28.14. site Site-specific configuration hook 28.15. user User-specific configuration hook 28.16. fpectl Floating point exception control
- 29. Custom Python Interpreters 29.1. **code** Interpreter base classes 29.2. **codeop** Compile Python code
- 30. Restricted Execution 30.1. **rexec** Restricted execution framework 30.2. **Bastion** Restricting access to objects
- 31. Importing Modules 31.1. imp Access the import internals 31.2. importlib Convenience wrappers for import() 31.3. imputil Import utilities 31.4. zipimport Import modules from Zip archives 31.5. pkgutil Package extension utility 31.6. modulefinder Find modules used by a script 31.7. runpy Locating and executing Python modules
- 32. Python Language Services 32.1. parser Access Python parse trees 32.2. ast Abstract Syntax Trees 32.3. symtable Access to the compiler's symbol tables 32.4. symbol Constants used with Python parse trees 32.5. token Constants used with Python parse trees 32.6. keyword Testing for Python keywords 32.7. tokenize Tokenizer for Python source 32.8. tabnanny Detection of ambiguous indentation 32.9. pyclbr Python class browser support 32.10. py\_compile Compile Python source files 32.11. compileall Byte-compile Python libraries 32.12. dis Disassembler for Python bytecode 32.13. pickle-tools Tools for pickle developers
- 33. Python compiler package 33.1. The basic interface 33.2. Limitations 33.3. Python Abstract Syntax 33.4. Using Visitors to Walk ASTs 33.5. Bytecode Generation
- 34. Miscellaneous Services 34.1. **formatter** Generic output formatting
- 35. MS Windows Specific Services 35.1. **msilib** Read and write Microsoft Installer files 35.2.

- **msvcrt** Useful routines from the MS VC++ runtime 35.3. \*\*\_winreg\*\* Windows registry access 35.4. **winsound** Sound-playing interface for Windows
- 36. Unix Specific Services 36.1. **posix** The most common POSIX system calls 36.2. **pwd** The password database 36.3. **spwd** The shadow password database 36.4. **grp** The group database 36.5. **crypt** Function to check Unix passwords 36.6. **dl** Call C functions in shared objects 36.7. **termios** POSIX style tty control 36.8. **tty** Terminal control functions 36.9. **pty** Pseudo-terminal utilities 36.10. **fcntl** The fcntl and ioctl system calls 36.11. **pipes** Interface to shell pipelines 36.12. **posixfile** File-like objects with locking support 36.13. **resource** Resource usage information 36.14. **nis** Interface to Sun's NIS (Yellow Pages) 36.15. **syslog** Unix syslog library routines 36.16. **commands** Utilities for running commands
- 37. Mac OS X specific services 37.1. ic Access to the Mac OS X Internet Config 37.2. MacOS Access to Mac OS interpreter features 37.3. macostools Convenience routines for file manipulation 37.4. findertools The finder's Apple Events interface 37.5. EasyDialogs Basic Macintosh dialogs 37.6. FrameWork Interactive application framework 37.7. autoGIL Global Interpreter Lock handling in event loops 37.8. Mac OS Toolbox Modules 37.9. ColorPicker\*\* Color selection dialog
- 38. MacPython OSA Modules 38.1. **gensuitemodule** Generate OSA stub packages 38.2. **aetools** OSA client support 38.3. **aepack** Conversion between Python variables and AppleEvent data containers 38.4. **aetypes** AppleEvent objects 38.5. **MiniAEFrame** Open Scripting Architecture server support
- 39. SGI IRIX Specific Services 39.1. al Audio functions on the SGI 39.2. AL Constants used with the al module 39.3. cd CD-ROM access on SGI systems 39.4. fl FORMS library for graphical user interfaces 39.5. FL Constants used with the fl module 39.6. flp Functions for loading stored FORMS designs 39.7. fm Font Manager interface 39.8. gl Graphics Library interface 39.9. DEVICE Constants used with the gl module 39.10. GL Constants used with the gl module 39.11. imgfile Support for SGI imglib files 39.12. jpeg Read and write JPEG files
- 40. SunOS Specific Services 40.1. **sunaudiodev** Access to Sun audio hardware 40.2. **SUNAU-DIODEV** Constants used with sunaudiodev
- 41. Undocumented Modules 41.1. Miscellaneous useful utilities 41.2. Platform specific modules 41.3. Multimedia 41.4. Undocumented Mac OS modules 41.5. Obsolete 41.6. SGI-specific Extension modules