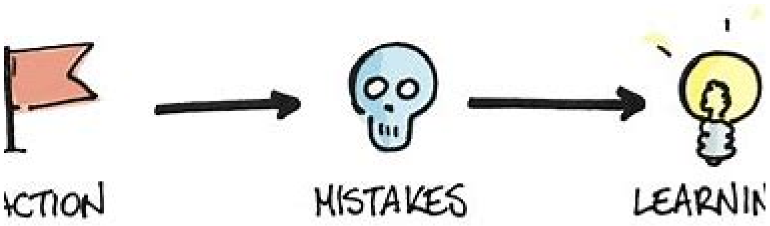
华夏中文学校 Python level-II

Learn From Mistakes

- My own mistakes
    - avoid mistakes made before

    - make mistake and learn

    - myassert/indexOutOfBound.py
- Other's mistake



- Pay attention to error message, especially last line

```
ModuleNotFoundError: No module named 'matplotlib'
```

```
Traceback (most recent call last):
  File "c:\Users\12818\workspace\python-II\cardGame\card5.py", line 82, in <module>
    club2 = Card(Faces.TWO, Suits.CLUBS)
TypeError: Can't instantiate abstract class Card with abstract method getValue
```

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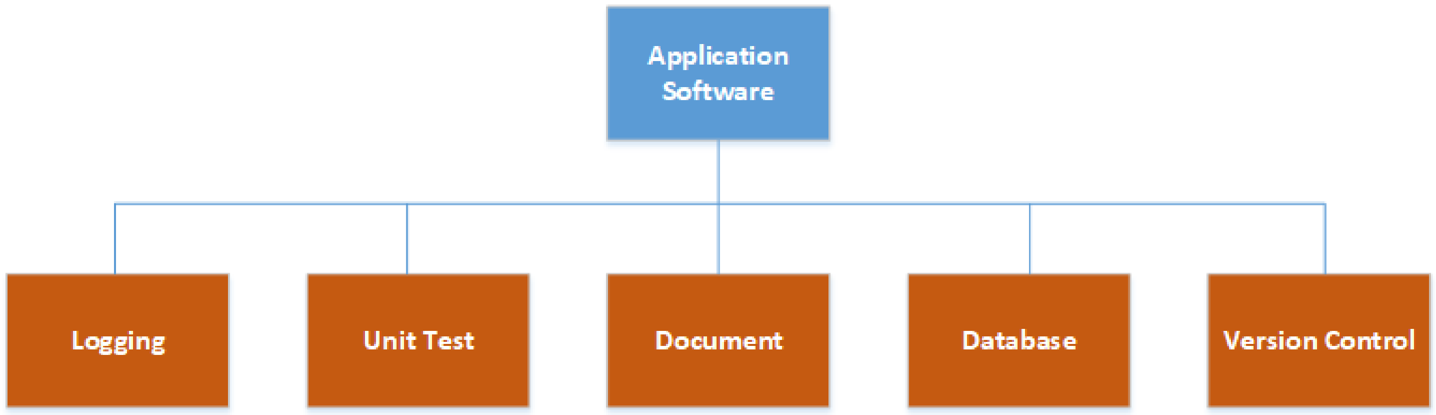
Python 编写应用软件的几大要素

1. logging (Python Logging)
2. Unit test (Unit Test)
3. Document (Python Document)
4. Database Access (Sqlite, MongoDB, MySQL, SQL Server)
5. Source Version Control (Git, GitHub)



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1. Git

- ./machineLearning/startup.py; display package version
  Source code version control
- check git availability
- get source code from GitHub
- frequently used git command

```
git --version
git config user.name "jwang1122"
git config user.email "jwang1122@gmail.com"
git status
git add .
git commit -m "some message"
git push
git pull
git clone https://github.com/jwang1122/python2.git
git log --oneline
git branch
git branch <new brance name>
git checkout <branch name>
```

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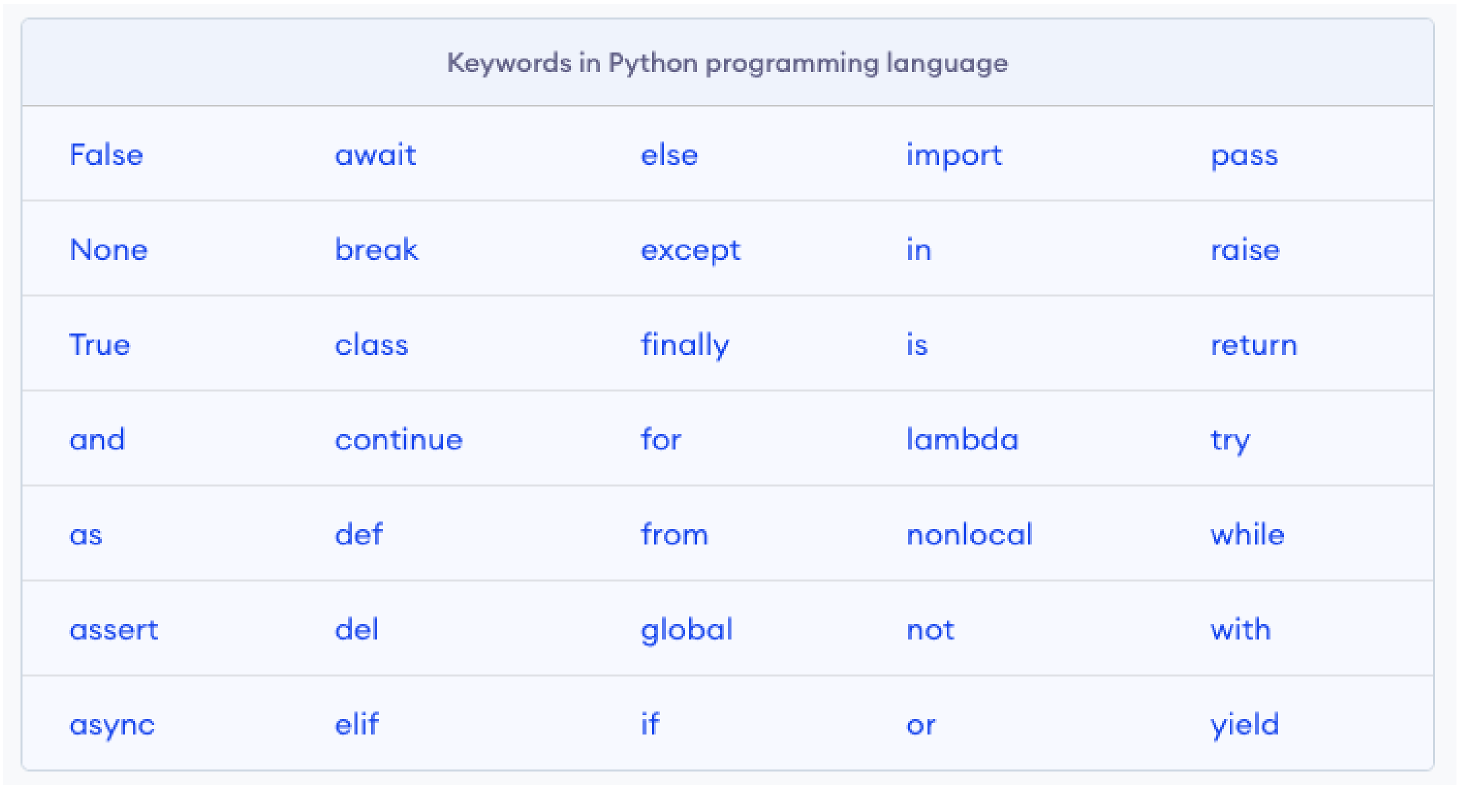
2. assert



Keywords in Python programming language				
False	await	else	import	pass
None	break	except	in	raise
True	class	finally	is	return
and	continue	for	lambda	try
as	def	from	nonlocal	while
assert	del	global	not	with
async	elif	if	or	yield

```
- [Practice]: write program using keywords we have learned.
```

./myassert

- assert0.py
- assert1.py
- assert2.py
- async1.py
- async2.py
- async3.py
- async4.py
- async5.py
- async6.py
- async7.py
- yield1.py
- yield2.py
- yield3.py

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3. Command Line Arguments

- What is **init**.py used for?

> The primary use of **init**.py is to initialize Python packages. The easiest way to demonstrate this is to take a look at the structure of a standard Python module.

> **init**.py can be an empty file but it is often used to perform setup needed for the package(import things, load things into path, etc).

./arguments

- arguments1.py; return list of commandline arguments
- arguments2.py; get one commandline argument
- parse.py; parse commandline arguments
    - get commandline arguments
    - define commandline arguments in **init**.py

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4. Python Document

- use python help
- help()
  _ dir()
  - dir(**spec**)
  - dir(**builtins**)

```
import datetime
dir(datetime)
dir(datetime.time)
help(datetime.date)
d1 = datetime.date(2020,1,1)
d1.isocalendar()
d1.isoformat()
```

Python Document

```
python -m pydoc -p 3144
b
```

Search: decorator

```
python -m pydoc -w json
```

- built in functions
- create my own document
  ./aDoc
- doc1.py; use """
- circle1.py; use **doc**
- simpleMath.py; document functions
- Python playgraound

```
import simpleMath
dir(simpleMath)
help(simpleMath)
help(simpleMath.add)
```

- Terminal

```
python -m pydoc
python -m pydoc aDoc.simpleMath
python -m pydoc math
```

The advantage of using pydoc is you don't need import the module first.

- Search for keyword

```
python -m pydoc -k add
python -m pydoc -k matplotlib
python -m pydoc -k sql
```

Homework 1

- Write Markdown
  - display link (website, Table of Content, other md file)
  - Greenshot (Greenshot-INSTALLER-1.2.10.6-RELEASE.exe)
  - display image
  - command line (command block)
  - Python source code block
  - bullet point

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5. enum

- enum1.py; Color extends from Enum, value, type...
- enum2.py; key and value unique
- enum3.py; duplicated key
- enum4.py; use name for key, ordered list
- enum5.py; use @unique decorator
- enum6.py; use auto() function for value if you don't care the value
- enum7.py; override *generate_next_value*() function use name as enum value
- enum8.py; compare enum by "is" or "is not"
- enum9.py; define function in enum
- enum10.py; callable Enum()
- enum11.py; use enum name or value as list index

- enum12.py; IntFlag enum can be used for bitwise operations
- enum13.py; add more value to enum
- enum14.py; generate value by using auto(), Object(), str. Practice use name as value
- enum15.py; generate squence number as enum value **new**()
- enum16.py; same as above, **init**()
- enum17.py; implements **gt**, **lt**,**ge**, **le** function for enum comparison

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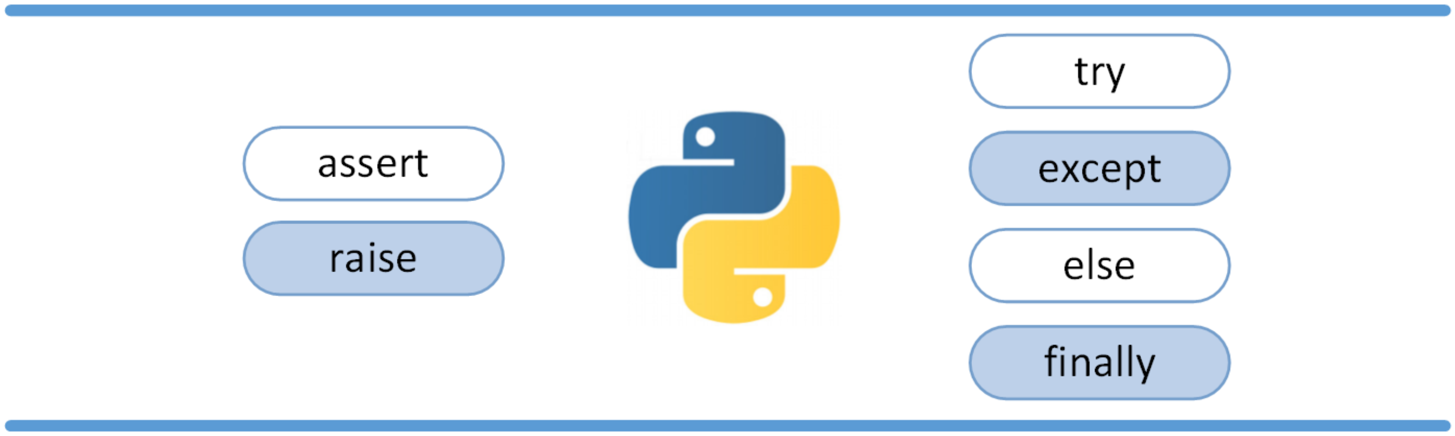
6. Try Except



- tryExcept1.py; Basic structure
- tryExcept2.py;

Why we need to use try-except block?

```
f = open('Errors.md')
```

- circle1.py
- raise Error

```
    if type(r) not in [int, float]:
        raise TypeError(f"The radius must be a real number, r={r}")
```

```
def addOver5(x, y):
    if x<5 or y<5:
        raise Exception('both x and y should > 5')
    return x + y
```

- circle2.py
- catch Error

```
try:
    area = circle_area(4)
    print("12:",area)
    area = circle_area(4.3)
    print("14:",area)
except Exception as error:
    print("12:",error)
```

- circle3.py
    - python > dir(**builtins**) > TypeError > ValueError
- circleTest1.py
- circleTest2.py
- finally.py;
- math1.py
- try-expectTest1.py; every function add try-expect
- try-expectTest2.py; one function
- assert error

  ./myassert
- assert0.py
- assert1.py
- assert2.py
- indexOutOfRange.py

```
def div(x,y):
    """
    if the condition is not meet, program stop running
    """
    assert y!=0, "divisor cannot be 0."
    return x/y
try:
    z = div(10,0)
except AssertionError as ae:
    print("Error: ", ae)
```

```
- assert1.py; assert empty list
- assert2.py; circle_area assert
```

- raise Exception
    - circle.py

```
from math import pi

def circle_area(r):
    return pi * (r**2)
```

test code with -2, 3+4j, "hello"
raise Exception
- circle1.py

```
    if type(r) not in [int, float]:
        raise TypeError("The radius must be a real number.")
    if r < 0:
        raise ValueError("The radius cannot be negative.")
```

do different test, show program terminated in the middle
- try-except/circleTest.py

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7. Unit Test

- Configure VS Code Unit Test
  Right-Click > Command Pallete.. > Phthon: Configure Tests > unittest > Root director > test_*.py
- test_Math.py
    - [Practice]: crete unit test for simple math add, sub, mul, div (tuple + int, tuple + tuple, list + list)
- test_card.py
- test_circleArea.py
- test_dealer.py
- test_deck.py
- test_math1.py
- test_player.py
- test_card5.py

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8. Understand Dunder Functions

		Built-in Functions		
abs()	delattr()	hash()	memoryview()	set()
all()	dict()	help()	min()	setattr()
any()	dir()	hex()	next()	slice()
ascii()	divmod()	id()	object()	sorted()
bin()	enumerate()	input()	oct()	staticmethod()
bool()	eval()	int()	open()	str()
breakpoint()	exec()	isinstance()	ord()	sum()
bytearray()	filter()	issubclass()	pow()	super()
bytes()	float()	iter()	print()	tuple()
callable()	format()	len()	property()	type()
chr()	frozenset()	list()	range()	vars()
classmethod()	getattr()	locals()	repr()	zip()
compile()	globals()	map()	reversed()	__import__()
complex()	hasattr()	max()	round()	

- dunder1.py; __len__, __gt__, __eq__, __contains__, __add__
- dunder2.py; implement __call__(), make class callable
- dunder3.py; make Product class callable __call__, __version__
- dunder4.py; check module level version __version__
- **init**.py; package level version in __init__.py file
- classDecorator.py;
- limitUser.py; (using user.py) __name__()
- range1.py; __next__, __iter__
  [**homework**](write your own xrange which return real number)
- sort1.py; __lt__(), __eq__()
- sort2.py; __lt__() only
- user.py; __name__
- person1.py; __subclasshook__

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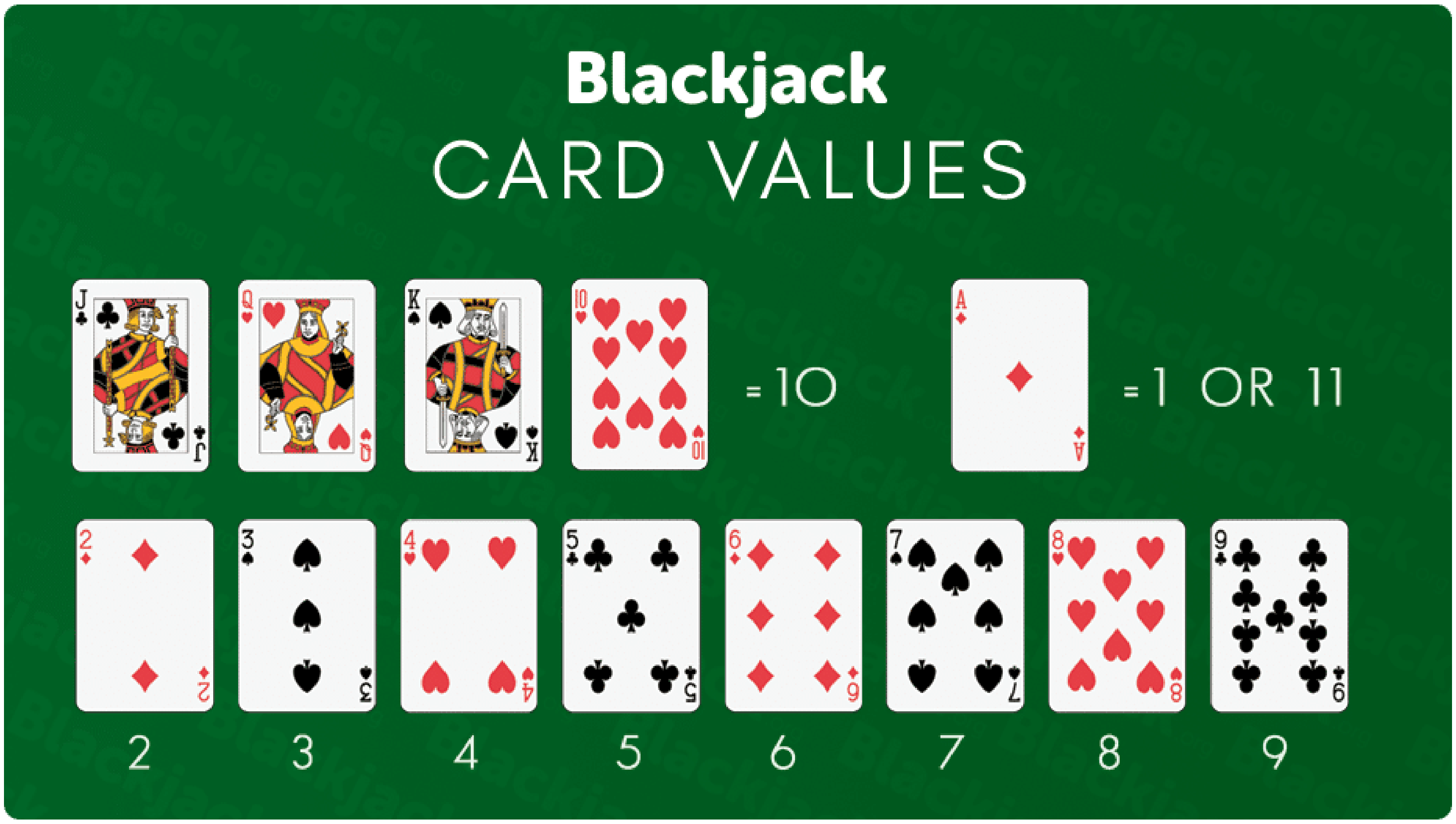
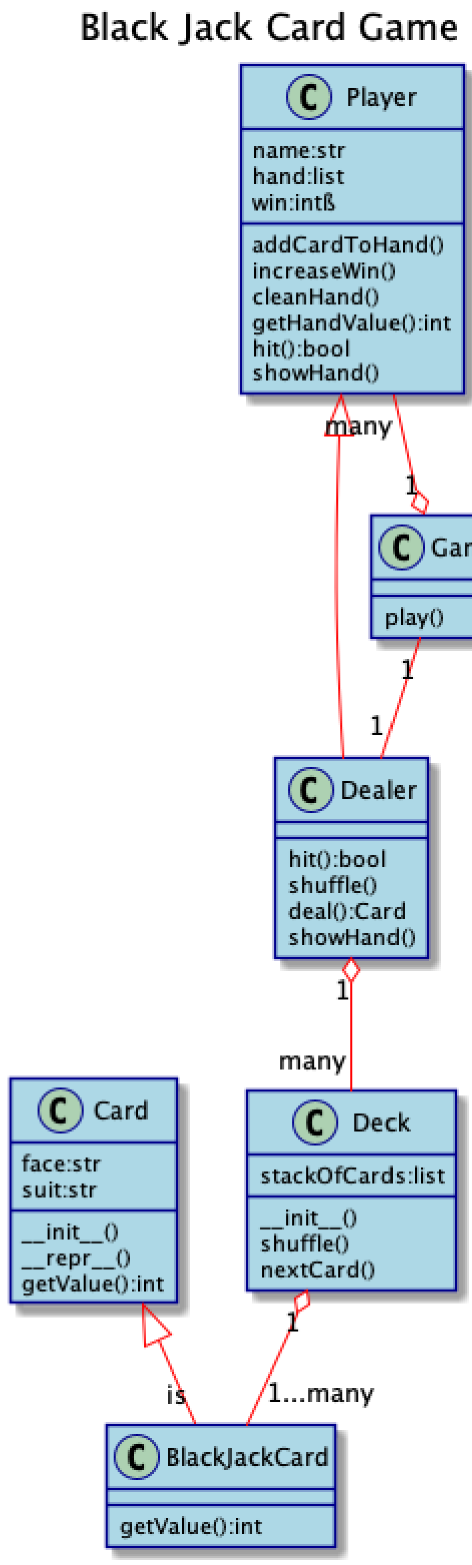
9. Blackjack Card Game

How to Play Blackjack

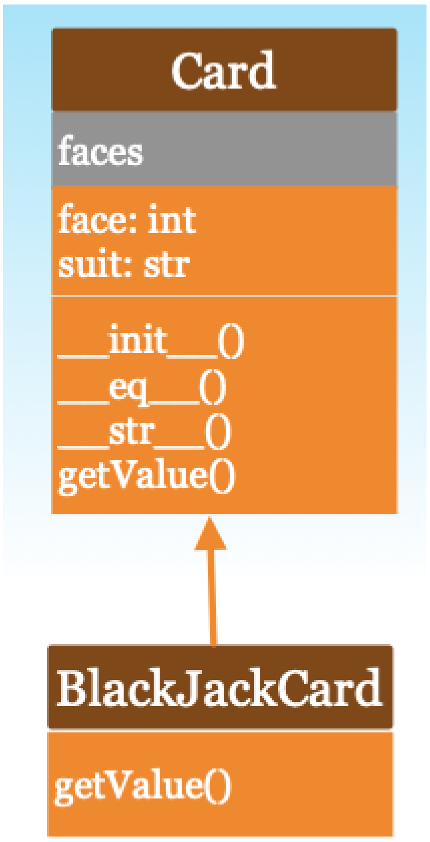




./Blackjack

- turtle7.py; draw card on frame
- card1.py; use string and int for face, causes issue that bad card can be generated
- card1Test.py;
- card2.py; use enum for both face and suit
- card2Test.py; leave it not passed

- Test Driven Development
  - test_Card2Test.py (==, <, >,)



- blackJackCard.py
- deck.py
- player.py
- dealer.py
  [Practice]: test_dealer() -> test_hit()
- test_card5.py; unit test to test card5.py
  - card.py > class Card (**init**(), **repr**())
  - class Card:
  - class BlackJackCard:
  - unittest test_card.py
  - check error on Grace machine
  - card.py > playGame()
  - Optimize the code > class Game:
  - Game.check4win()
  - [Homework]: write unit test for check4Win() and dealCards()
  - homework > modify code support multi player
  - [Practice]: add bit to players
  - Dealer > deal(), showHand()

- DealerTest.py
- def playGame():
- class Dealer(Player): **init**(), shuffle(), hit(), showHand()
- unittest test_dealer.py
- class Deck: > **init**(), nextCard(), shuffle()
- unittest test_deck.py
- class Player: > **init**(), **repr**(), addCardToHand(), cleanHand(), getHandValue(), getHandSize(), hit()
- unittest test_player.py

- Keep in mind, always test your code with small unit.
  - CardTestOne.py
  - DealerTest.py
  - DectTest.py
  - PlayerTest.py
  - PlayerTestOne.py
- BlackJack Card Game document
  Black Jack
- card.py
  - class Card:
  - class BlackJackCard(Card):
- ./cardGame/blackjack.py; > sample code online.
- ./cardGame/blackjack2.py; > another implementation
- ./cardGame/card0.py; single player agains dealer
  - class Card(ABC):
  - class BlackJackCard(Card):
  - class Deck:
  - class Player:
  - class Dealer(Player):
  - def playGame():
- ./cardGame/card1.py; Multi-Players vs Dealer Black Jack Card Game
- ./cardGame/card2.py; Multi-players vs Dealer Black Jack Card Game without if-else
- ./cardGame/card3.py; with decision table
- ./cardGame/card4.py; with decision table to get rid of if-else
- tableBuilder.py; build cardDecision.py to determin who is winner
- test the result
  - class Game
  - get rid of if-else
  - decision table

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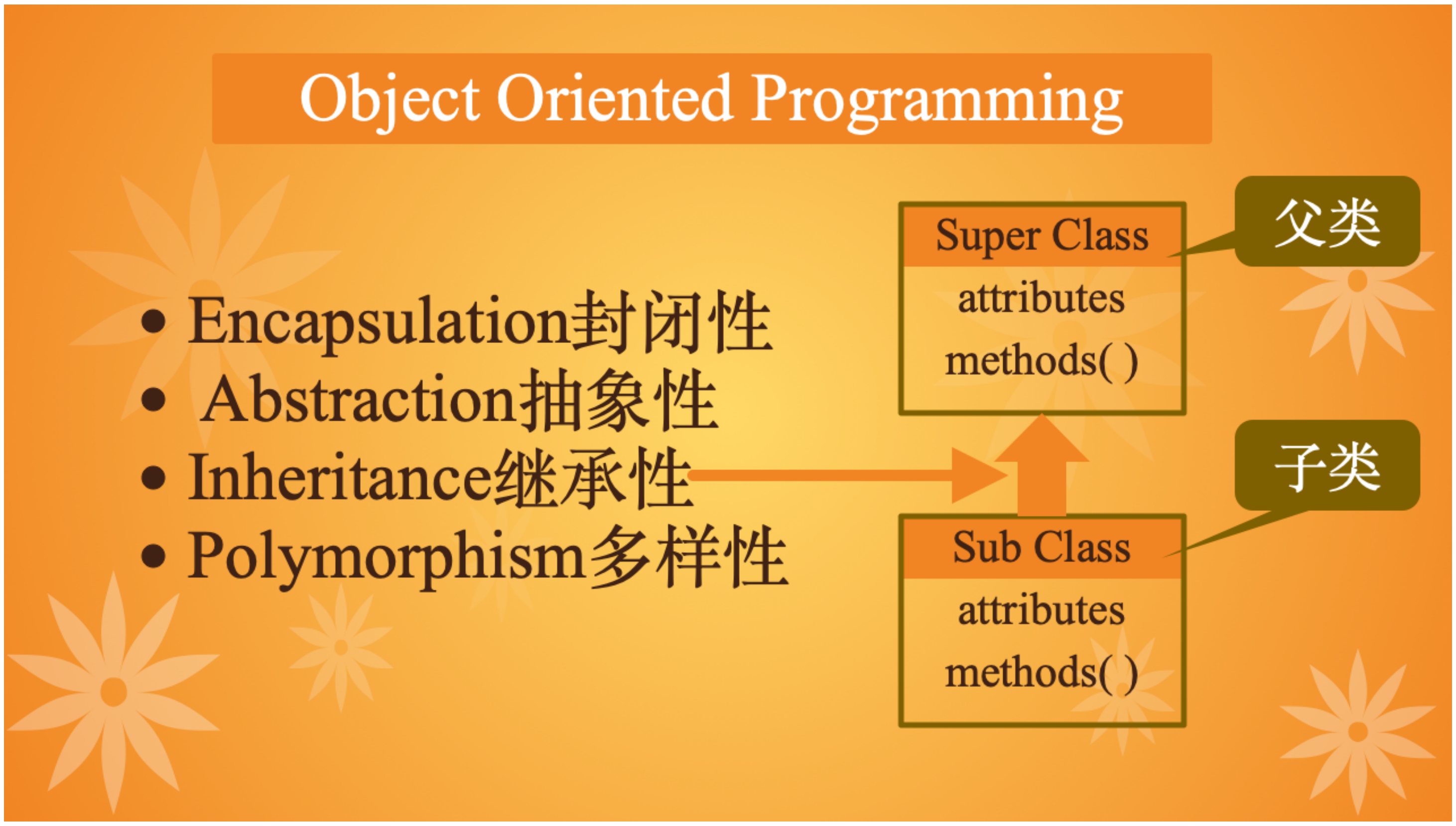
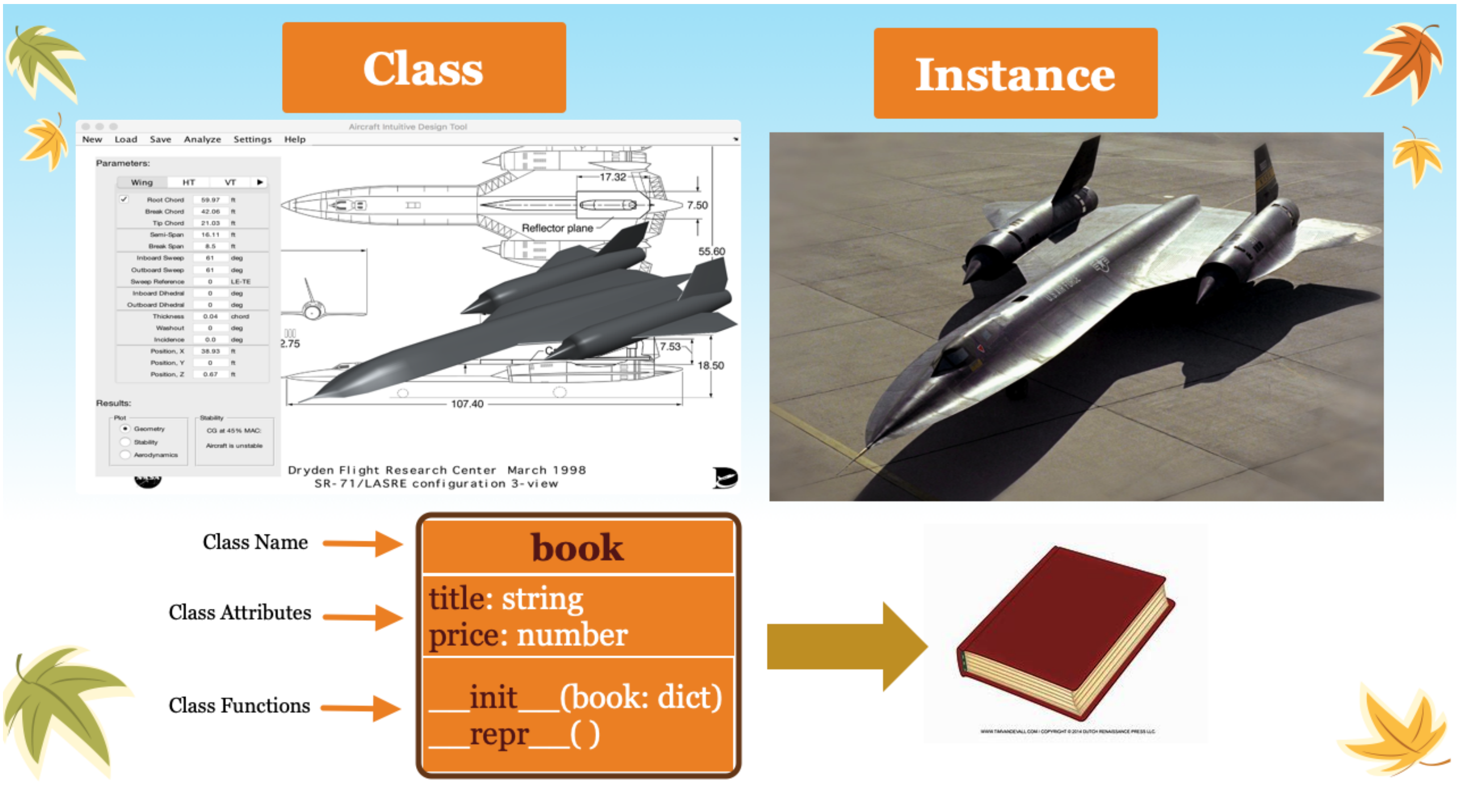
10. OOP Programming





./pythonClass

- MyClass.py; class with variable and function
- addNewMethod.py; add method to existing class
- student1.py; Simple class with **init**, **repr**, and increaseGrade()
    - [Practice]: look around, find anything catch your eye, create a class of it
- inheritence.py; empty subclass
- person1.py; class Person:
- student2.py; class Student(Person) using person1.py
- person2.py; class Employee(Person)
- student3.py; load csv file, build student objects
    - [Practice]: create a super class and sub class
- intervace
    - interface1.py; implementation class with no abstract function defined
    - interface2.py; Compare student by interface Comparable
    - super class (person.py)
    - sub class (employee, manager)
- abstract class
    - abstractClass1.py; @abc.abstractmethod
    - abstractClass2.py; no implementation area() function
    - abstractClass3.py; @Shape.register useless
    - abstractClass4.py; check type, polymorphism
- polymorphism.py (person1.py, student2.py, teacher.py)
- encapsulation.py (private variable: __ssn) project ssn to be accessed directly
  You need getter/setter to access them.

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11. Type Sensitive

./typing

```
pip install mypy
```

- circle.py
- circleTest.py
- typing1.py

- typing2.py
- typing3.py
- typing4.py
- typing5.py
- typing6.py; no run time error, but mypy find input data type mismatch
- typing7.py; no way to check decorator function input data type
- typing8.py; cannot check input arguments type by mypy

Typing Read Me

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12. Functional Programming

./function

- variableArgs.py; variable arguments
- func.py; pass function to function, return function from function
- func0.py; another sample for passing and return function
- func1.py; calculate area by passing function to function
- func2.py; inner function: define function in function
- func3.py; return function from function conditionally
- func4.py; use parameter generate different math function
    - [Practice]: define average function (assert1.py)
    - [Practice]: pass function, return function
- func5.py; use one function to do sample math
- funcAttribute.py; getattr()
- funcEither.py; Left/Right with logging
- area1.py; if-else calculate areas
- area2.py(areaTable.py)
- classDecorator.py;
- decoratorFunctionWithArguments
- decoratorWithArguments.py
- defineFunction.py;
- entry_exit1.py; @entry_exit
- entry_exit2.py; @entry_exit **init**() **call**()
  ./timerDecorator

- my_timer.py
- my_timer1.py
- my_timer2.py;
- my_timer3.py;
- timerDecorator.py;
- switch.py; use Month as dict
- switcher.py; store function in dict
- recursion1.py; simple but slow way
- recursion2.py; cache the calculated value
- recursion3.py; use existing tools to handle cache
- recursion4.py; handle wrong input value
- annotation1.py

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13. Logging

- Python Logging
- Logging System
- Python playground

```
import logging
help(logging)
```

./loggin

- logging3.py (using logging2.py)
- Logging Configuration
- logging1.py; use logging.basicConfig()
    - [Practice]: add logging in simple math add, sub, mul, div
    - [Practice]: write logging to card game
- logging3.py; (use logging2.py and default configuration)
- logging4.py; more information in the log message
- logging5.py; (use logging.conf file to configure the logger)

```
logging.config.fileConfig(fname, defaults=None, disable_existing_loggers=True)
```

- Logging Formatter
- Share File
- Logging Cookbook

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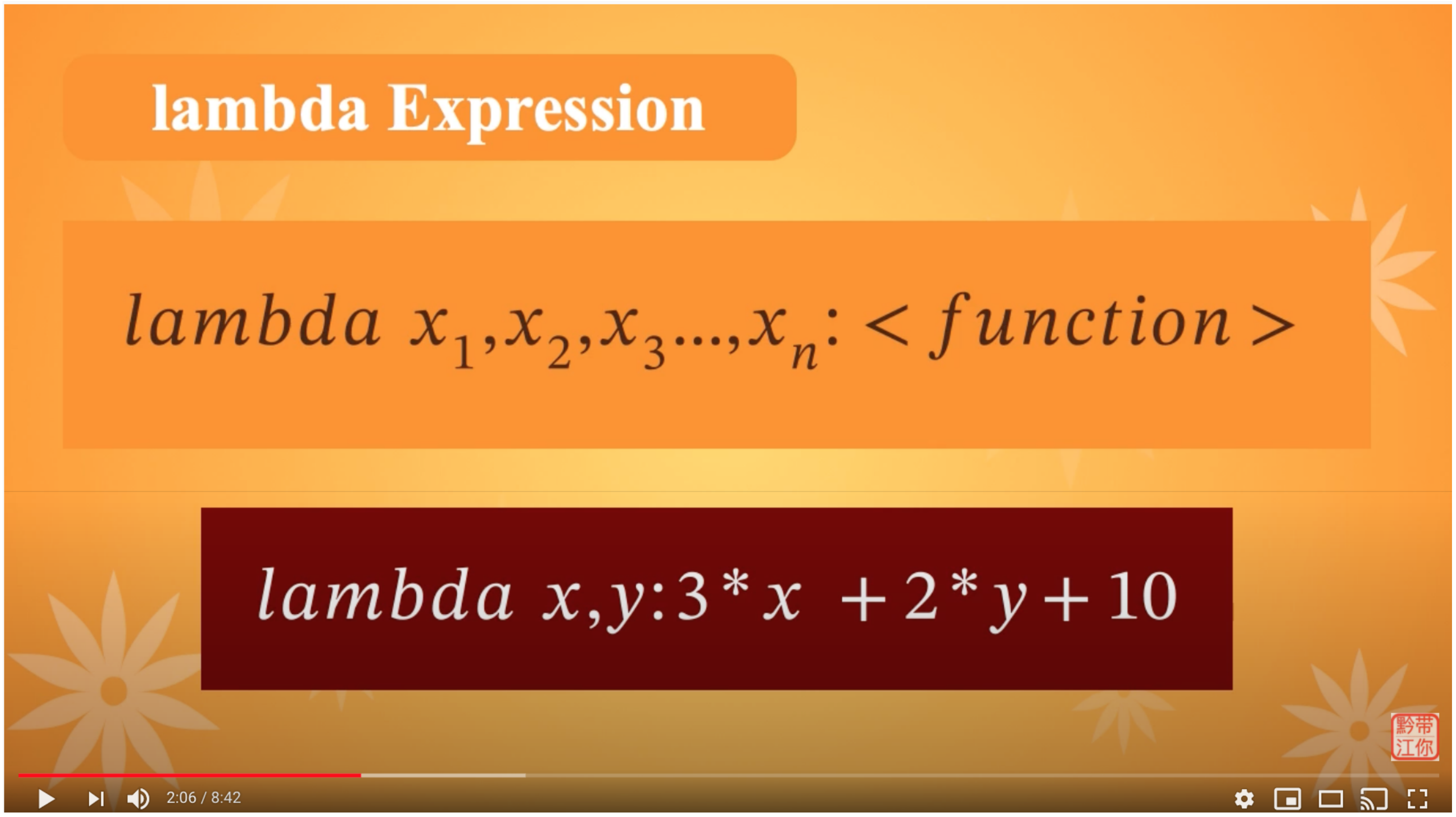
14. Lambda Expression


lambda Expression

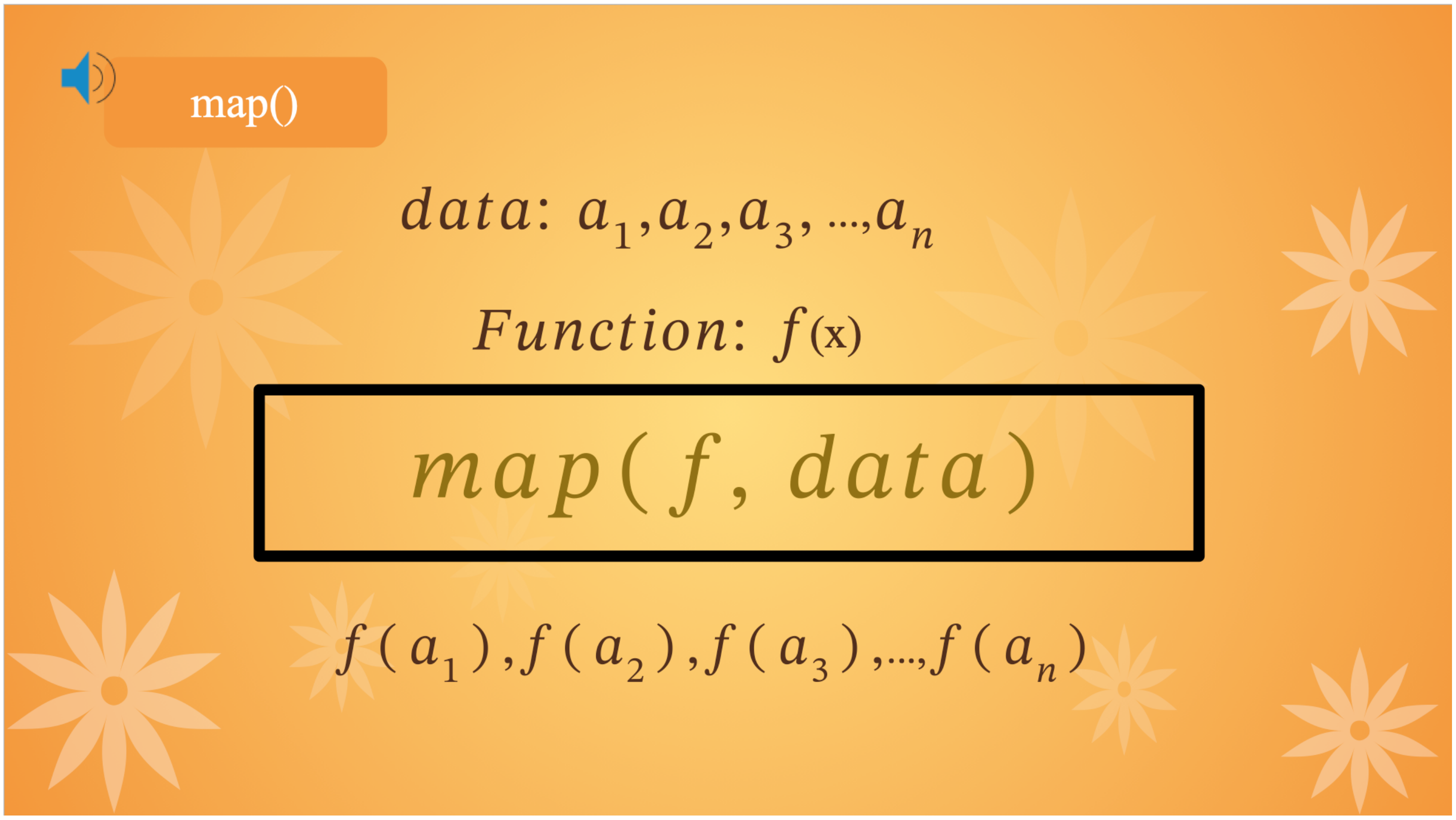
$$lambda\ x_1, x_2, x_3 \ldots, x_n : < function >$$

$$lambda\ x, y : 3 * x + 2 * y + 10$$

- >>> dir(**builtins**) > map, filter, reduce (no loop)
- >>> help(map) > map(function, iterable, ...)
- >>> help(filter)

./lambda/...

- func.py; pass function to function
- lambda.py;
- lambda1.py;
- map0.py; two variables lambda function


map()
data: $a_1, a_2, a_3, \ldots, a_n$
Function: $f(x)$
$\boxed{map(f, data)}$
$f(a_1), f(a_2), f(a_3), \ldots, f(a_n)$

```
- map(function, iterable, ...)
```

- map1.py; convert city temperatures
- map2.py; define the lambda function outside
- map3.py; two variables lambda action on two list
- map4.py; convert list of temperatures
- map5.py; more variables for lambda function
- map6.py; create Card set by using lambda function
- filter0.py; reduce the size of list by certain condition
- filter1.py; reduce the list of temperatures by condition
- filter2.py; find prime by filter function
- reduce.py; use reduce to do sum
- reduce1.py; use reduce to find min and max
- kleisliCompose.py; Compose two functions
- sort0.py; sort by string or object attribute
- sort1.py; sorted vs. sort
- sort2.py; sort temperature
- sort3.py; sort tuple
- sumByTuple.py;
- zip1.py; zip two list
- zip2.py; sum zipped list
- zip3.py;

- ./lambda/shoppingMonad1.py (use list bind functions)
- ./lambda/writePythonMonad.py (use monad bind functions)

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15. either

- either1.py; isEven() function return Either Right or Left
- either2.py; isEven() check input data type
- either3.py; bind multiple functions
- airlineseat.py;

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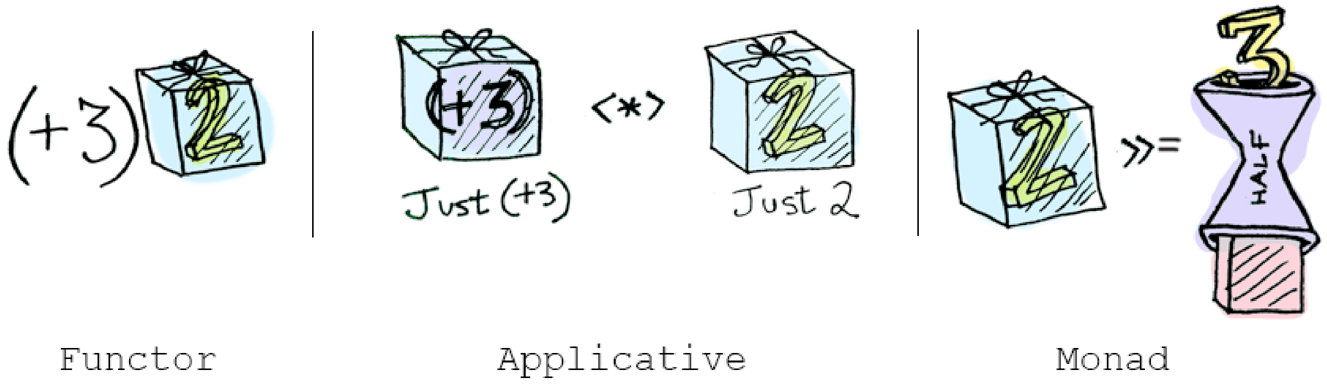
16. monad

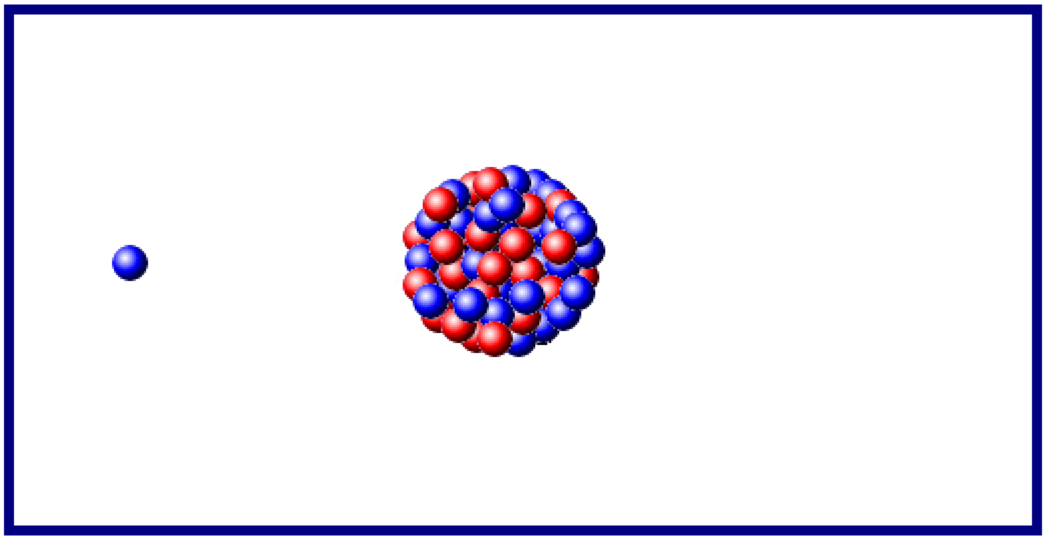
- circle1.py; calculate circle area without type checking. **doc**()
- circle2.py; raise exception when input data has wrong type. application terminated in middle
- circle2test.py; surround with try-except to avoid termination
- circle3.py; return Either Right or Left for circle area calculation. better for web service.

Concepts

- Functor: Wrapper Class type with implementation of fmap() function. Functor-Map
- Applicative: Wrapper Class type with implementation of fmap(), amap() functions. Applicative-Map
- Monad: Wrapper Class type with implementation of fmap(), amap() and bind() functions.



- functor.py; add3 * Just(2)
- applicative.py; add * Just(3) & Just(2)
- monad.py; Just(2) >> add3 >> mul4



- monad1.py; understand Functor
- monad2.py; understand Applicative
- monad3.py; applicative regular call
- monad4.py; function compose
- monad5.py; more compose on list.
- option1.py; understand implementation of Option by using mymonad.py
- option2.py; Rx: Reactive x to write function chain.
- monad6.py; Nothing > wrapper None with Maybe
- monad7.py; _List.map(), _List.then()
- monad8.py; normal function don't know how to handle wrappered variables.
- monad9.py; bind list function
- monad10.py; bind list function
- monad11.py; Use Maybe solve the None issue
- shoppingMonad1.py; monad function chain
- shoppingMonad2.py; combination of RX Observer and Monad
- shoppingMonad3.py; monad with map
- math1.py; monad function chain
- math2.py; compination of Observer and Monad

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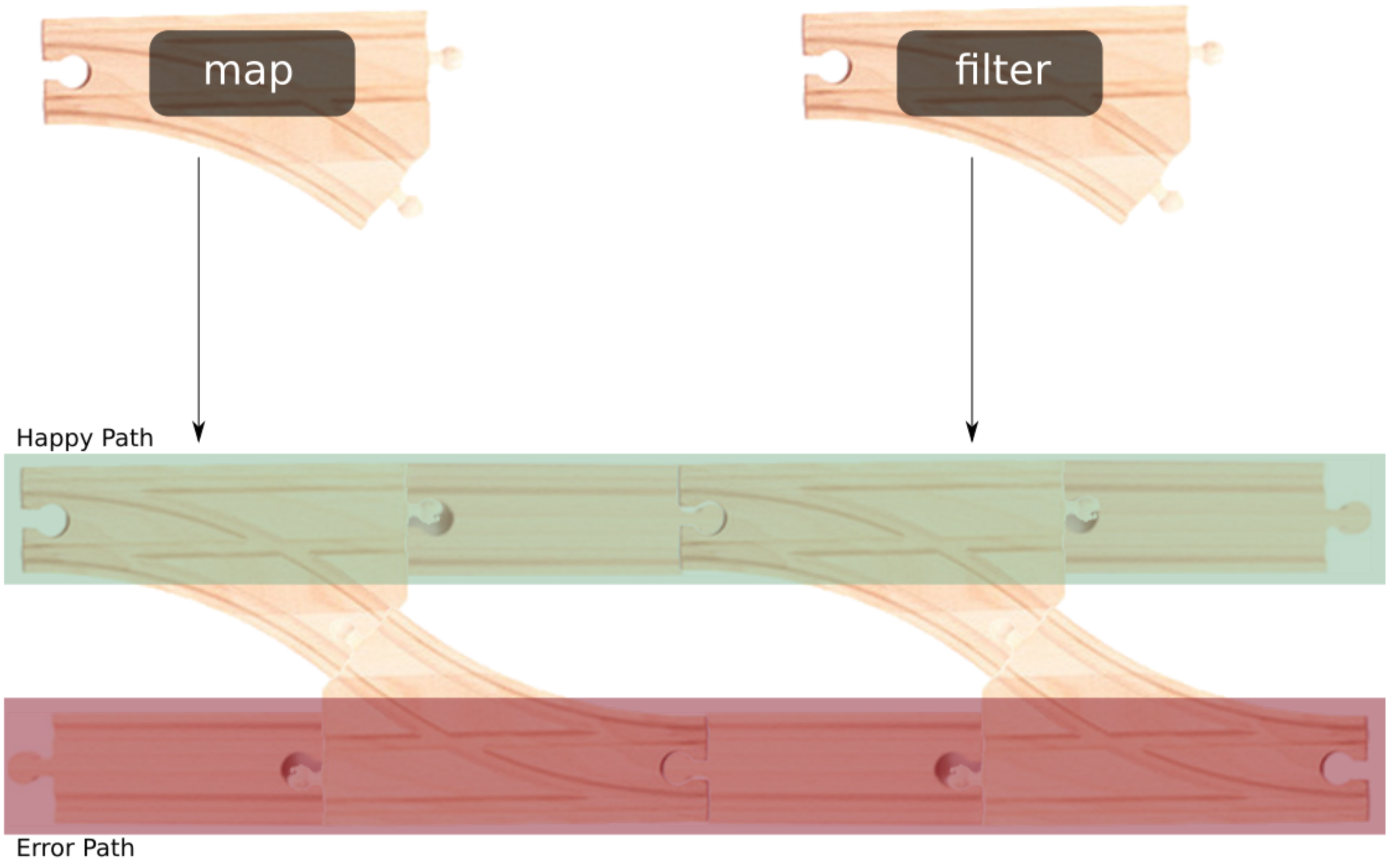
17. Rx Observer

- observer0.py; typical observer function chain
- observer1.py; simple way to create observer iterable
- observer2.py; operators function chain with pipe (map > filter)
- observer3.py; simplify observer2.py
- observer4.py; chain everything together
- observer5.py; internal function
- observer8.py; complete observer function chain

```
on_next is called each time an item is received.
on_completed is called when the observable completes on success.
on_error is called when the Observable completes on error.
```

- observer9.py; disposible
- observer10.py; error handlling



- observer11.py; multiple thread asynchronized processing
- observer12.py;
- observer13.py;
- observer14.py;
- observer15.py;

```
python ./observer/observer12.py
```

after server start up

```
telnet localhost 8888
foo
```

- observer13.py;

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18. Design Pattern

- command.py
- command5.py
- decorator.py
- decorator0.py
- decorator1.py
- decorator2.py
- decorator3.py
- decorator4.py
- iterator.py
- observer.py
- strategy.py
- strategy2.py

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19. Sqlite

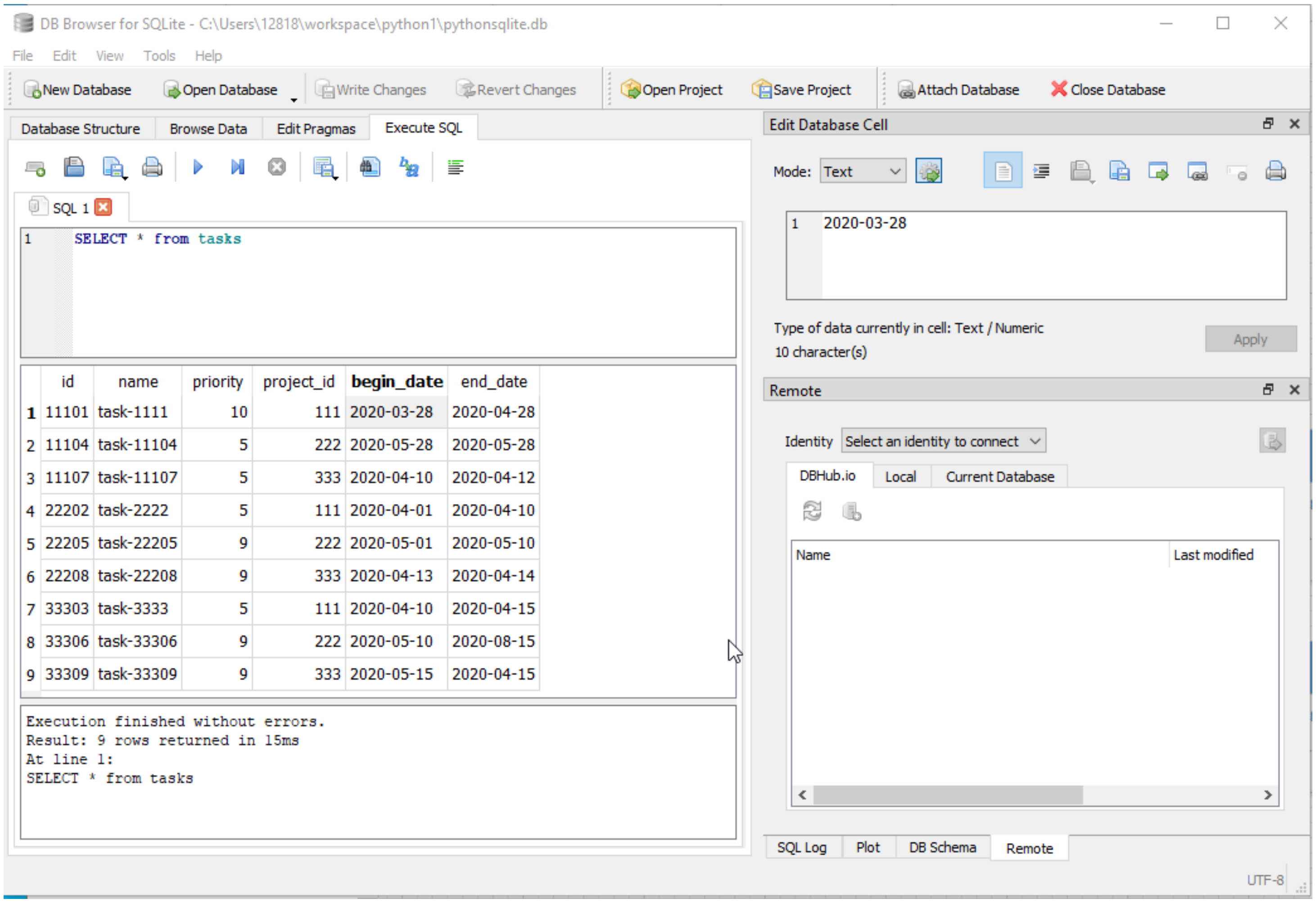
- sqlite0.py > create connection
- sqlite1.py
- sqlite2.py
- install DB browser for SQLite

Google Search: DB Browser for Sqlite

SQLite GUI Download Website

SQLite Browser for MacOS

File: DB.Browser.for.SQLite-3.12.1-win64-v2.msi



```
SELECT * from tasks
```

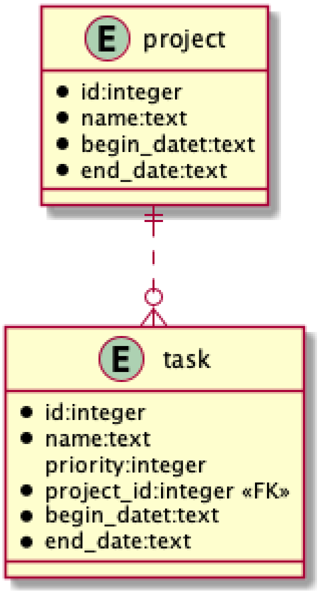
	id	name	priority	project_id	begin_date	end_date
1	11101	task-1111	10	111	2020-03-28	2020-04-28
2	11104	task-11104	5	222	2020-05-28	2020-05-28
3	11107	task-11107	5	333	2020-04-10	2020-04-12
4	22202	task-2222	5	111	2020-04-01	2020-04-10
5	22205	task-22205	9	222	2020-05-01	2020-05-10
6	22208	task-22208	9	333	2020-04-13	2020-04-14
7	33303	task-3333	5	111	2020-04-10	2020-04-15
8	33306	task-33306	9	222	2020-05-10	2020-08-15
9	33309	task-33309	9	333	2020-05-15	2020-04-15

```
Execution finished without errors.
Result: 9 rows returned in 15ms
At line 1:
SELECT * from tasks
```

1 2020-03-28

Type of data currently in cell: Text / Numeric
10 character(s)

- sqlite4.py
- sqlite5.py
- sqlite6.py



- sqlite7.py > build relational data
- sqlite8.py > show relation between project and task
- review bookdb.py
- sqlite9.py > create books table
- sqlite10.py > insert data into books table
- sqlitebookdb.py > build CRUD
- app5.py > use sqlitebookdb.py to provide service
  use Postman to check the service.
- CRUD huaxia book

```
cd workspace
git clone https://github.com/eagleboatblue/reactjs.git
cd reactjs
cd book-app
npm install
cd ../server
python -m venv env
.\env\Scripts\activate.bat
mongod
python app.py
cd ../book-app
npm start
```

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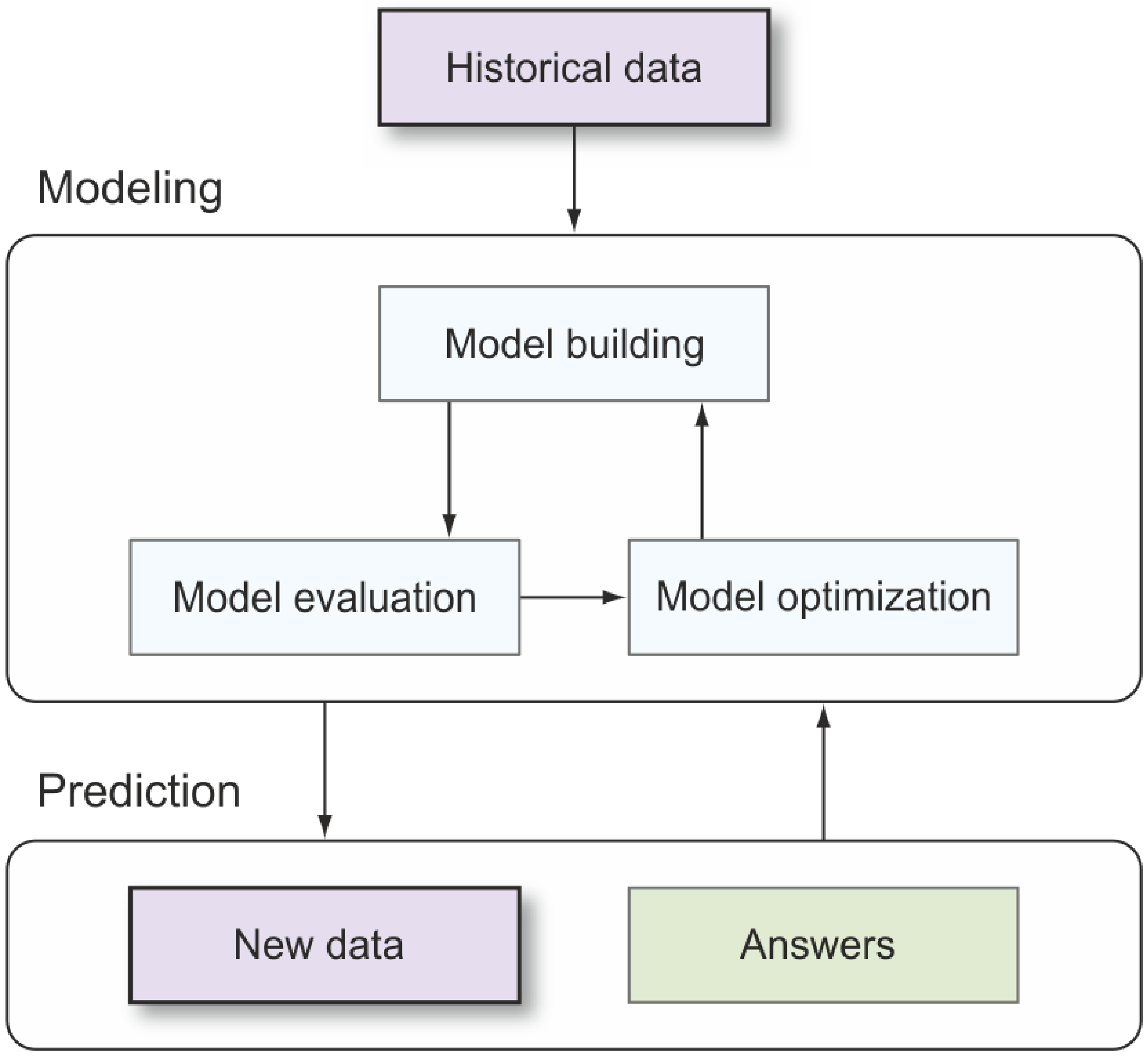
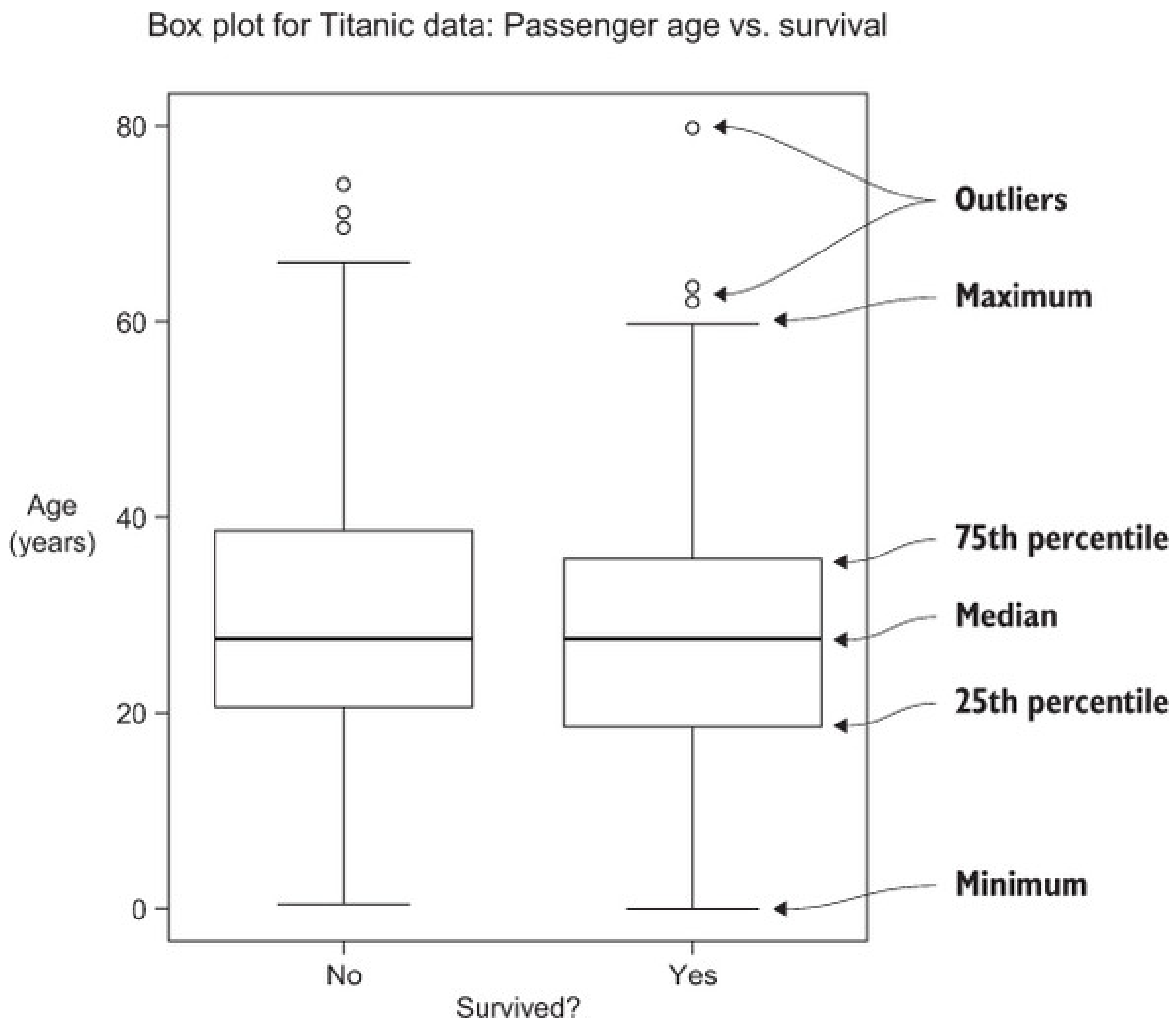
20. Machine Learning



./machineLearning

- setup.py; check version for all library
- machine1.py
- machine2.py
- machine3.py
- machine4.py
- machine5.py
- machine6.py
- machine7.py
- machine8.py

- machine9.py
- machine10.py
- machine11.py
- machine12.py
- machine13.py



How to Index, Slice and Reshape NumPy Arrays for Machine Learning

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