

파이썬 자연어 처리

이성주

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<http://localhost:8888/tree>

jupyter \curvearrowleft http://localhost:8888
"내 컴퓨터"

Logout

Files Running Clusters

Select items to perform actions on them.

ROOT ≈ USERHOME

Upload New

	Name	Last Modified
<input type="checkbox"/>	Contacts	4 months ago
<input type="checkbox"/>	Desktop	32 minutes ago
<input type="checkbox"/>	Documents	an hour ago
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< >

← → http://localhost:8888/tree/Documents/pynlp 🔍 × Documents/pynlp/ × Logout

jupyter

Files Running Clusters

Select items to perform actions on them.

작성 경로

Upload New ↗

Name ↑ Last Modified ↑

<input type="checkbox"/>	<input type="checkbox" value="▼"/>	📁 / Documents / pynlp
		Name ↑ Last Modified ↑
<input type="checkbox"/>	<input type="checkbox"/>	📁 .. seconds ago
<input type="checkbox"/>	<input type="checkbox"/>	📄 사전확인.txt 3 months ago

인트라넷 설정은 기본적으로 꺼져 있습니다. 이 메시지를 다시 표시 안 함(D) 인트라넷 설정 켜기(I) ×

http://localhost:8888/notebooks/Documents/pynlp/Day%201.ipynb

Documents/pynlp/ Day 1

jupyter Day 1 ≈ 파일명.ipynb

Logout

Notebook IPython Notebook Trusted Python 3

File Edit View Insert Cell Kernel Widgets Help

실행

In [1]: 인사 = '파이썬 자연어 처리 입문입니다!'
print(인사)
print('셀 실행은 shift+Enter')

파이썬 자연어 처리 입문입니다!
셀 실행은 shift+Enter] ← 셀 출력

In []:

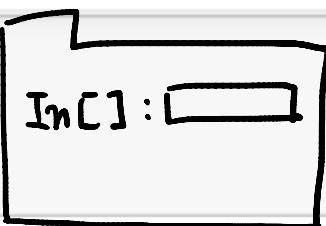
File Edit View Insert Cell Kernel Widgets Help



In [1]:

```
인사 = '파이썬 자연어 처리 입문입니다!'
print(인사)
print('셀 실행은 shift+Enter')
```

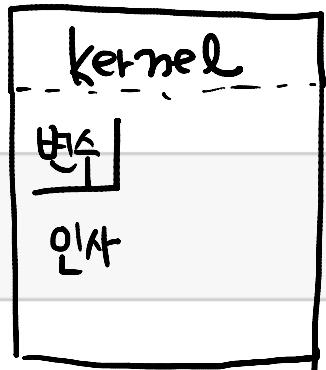
파이썬 자연어 처리 입문입니다!
셀 실행은 shift+Enter



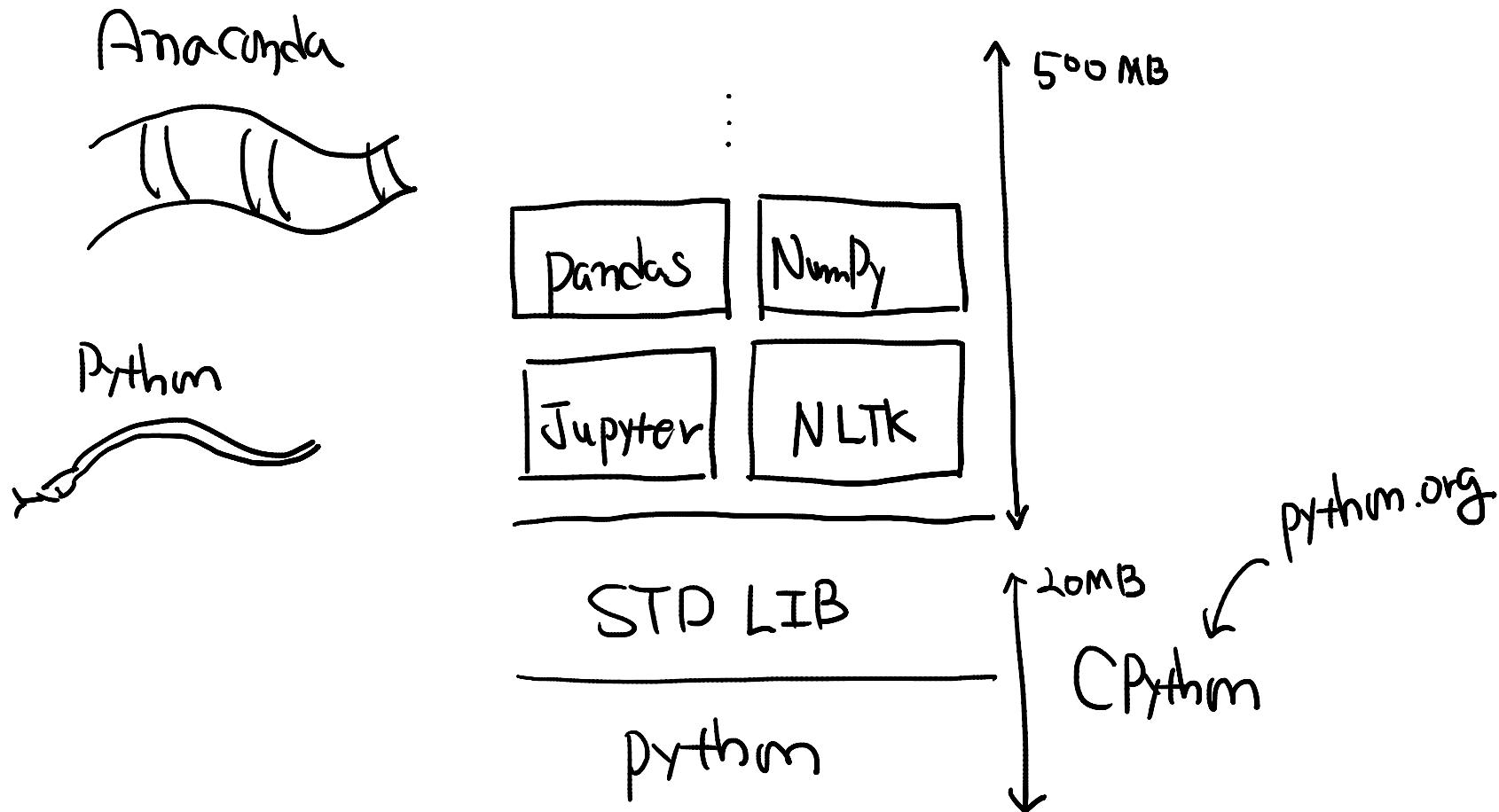
In [2]:

```
인사 += '\n저는 이성주입니다.'
print(인사)
```

파이썬 자연어 처리 입문입니다!
저는 이성주입니다.



In []:



Downloads | Anaconda - Chrome

안전함 | https://www.anaconda.com/download/#windows

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packages and environments with conda create interactive visualizations

Windows macOS Linux

Anaconda 5.0.1 For Windows Installer

Python 3.6 version *

2008 Python 2.7 version *

[64-Bit Graphical Installer \(515 MB\)](#) [32-Bit Graphical Installer \(420 MB\)](#)

[64-Bit Graphical Installer \(500 MB\)](#) [32-Bit Graphical Installer \(403 MB\)](#)

[Behind a firewall?](#)
[How to get Python 3.5 or other Python versions](#)
[How to Install ANACONDA](#)

Get Started



License Agreement

Please review the license terms before installing Anaconda3 5.0.1 (64-bit).

Press Page Down to see the rest of the agreement.

=====

Anaconda End User License Agreement

=====

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Anaconda, Inc. _____

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Advanced Installation Options

Customize how Anaconda integrates with Windows

Advanced Options

- Add Anaconda to my PATH environment variable



체크

Anaconda Prompt 사용 권장

- Register Anaconda as my default Python 3.6

This will allow other programs, such as Python Tools for Visual Studio
PyCharm, Wing IDE, PyDev, and MSI binary packages, to automatically
detect Anaconda as the primary Python 3.6 on the system.

Anaconda, Inc.

< Back

Install

Cancel



In [2]: 인사 += '\n저는 이성주입니다.'
print(인사)

파이썬 자연어 처리 입문입니다!
저는 이성주입니다.

[2] → [4] → [5]

In [5]: print(x)
인사 x print(x)
1

In [4]: x = 1

In []:

New Notebook



Open...

'파이썬 자연어 처리 입문입니다! '

인사)

Make a Copy...

셀 실행은 shift+Enter')

Rename...

자연어 처리 입문입니다!

Save and Checkpoint

은 shift+Enter

Revert to Checkpoint

'\n저는 이성주입니다. '

인사)

Print Preview

자연어 처리 입문입니다!

Download as

입니다.

Trusted Notebook

Kernel Halt
"정지"

Close and Halt

()

File Edit View Insert

Cell Kernel Widgets Help



In [1]:

```
인사 = '파이썬 자연어 처리입니다'
print(인사)
print('셀 실행은 shift+enter')
```

파이썬 자연어 처리입니다
셀 실행은 shift+enter

In [2]:

```
인사 += '\n저는 이성주입니다'
print(인사)
```

파이썬 자연어 처리입니다
저는 이성주입니다

In [2]:

```
x = 1
```

In [3]:

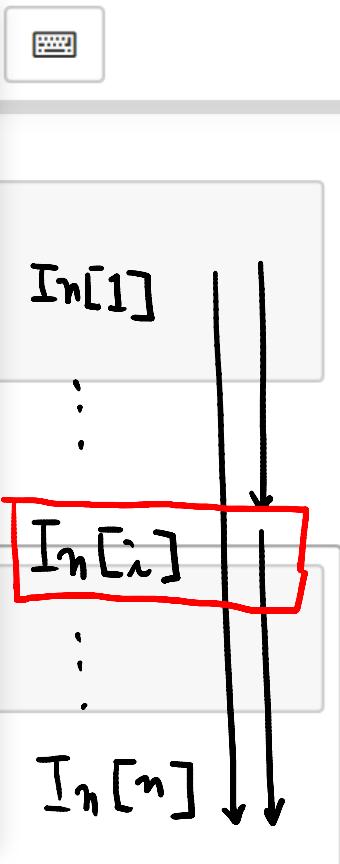
```
print(x)
```

- Run Cells
- Run Cells and Select Below
- Run Cells and Insert Below
- Run All
- Run All Above
- Run All Below

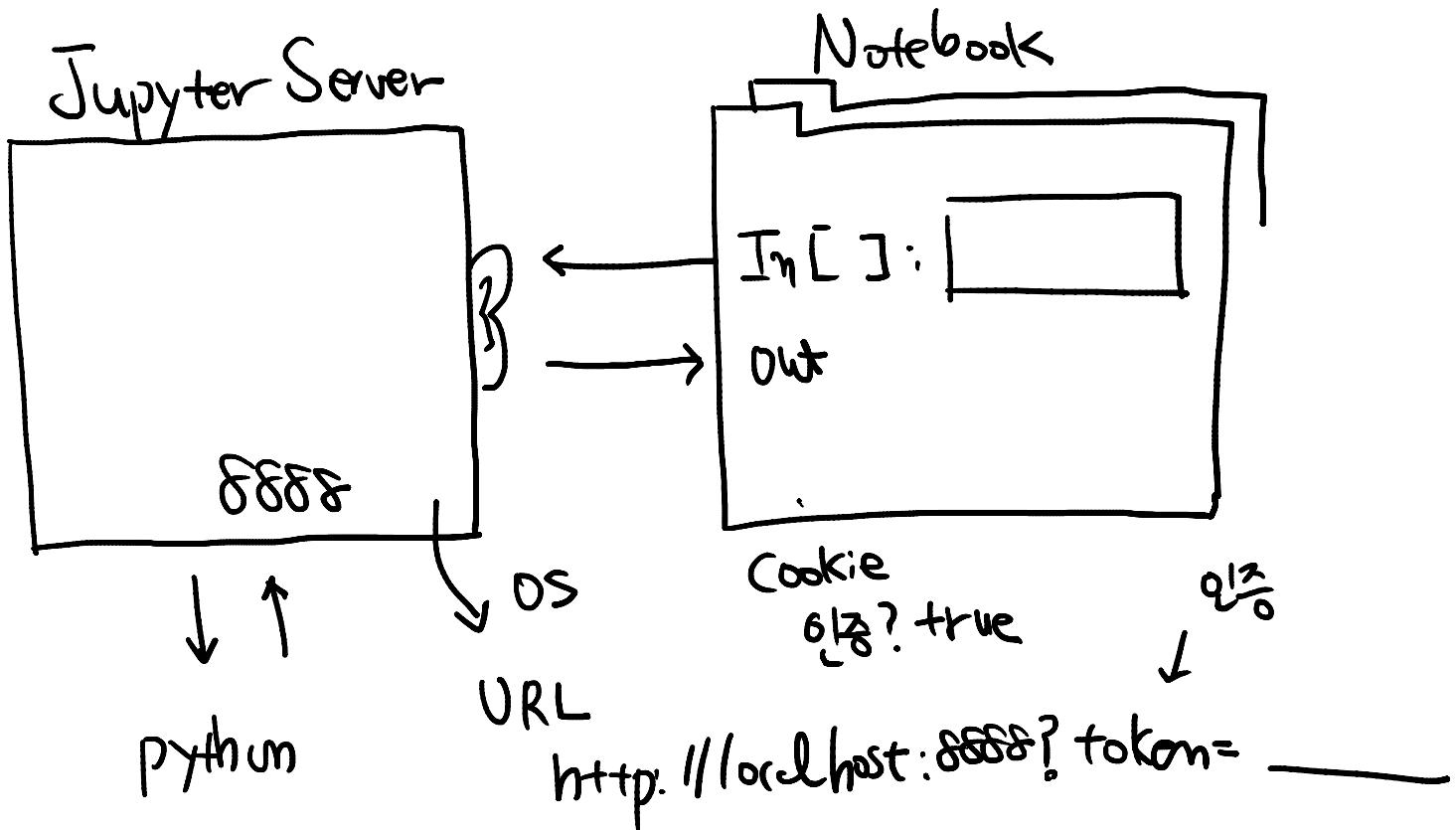
Cell Type

Current Outputs

All Output



Win / Mac / Linux



```
Jupyter Notebook
[I 10:10:23.647 NotebookApp] Writing notebook server cookie secret to C:\Users\student\AppData\Roaming\jupyter\runtime\notebook_cookie_secret
[I 10:10:24.240 NotebookApp] Serving notebooks from local directory: C:\Users\student
[I 10:10:24.240 NotebookApp] 0 active kernels
[I 10:10:24.241 NotebookApp] The Jupyter Notebook is running at: http://localhost:8888/?token=515db805f3ff775425469a56af1bca56b0079d73767c87b6
[I 10:10:24.241 NotebookApp] Use Control-C to stop this server and shut down all
kernels (twice to skip confirmation).
[C 10:10:24.242 NotebookApp]

Copy/paste this URL into your browser when you connect for the first time,
to login with a token:
http://localhost:8888/?token=515db805f3ff775425469a56af1bca56b0079d73767
c87b6
[I 10:10:24.504 NotebookApp] Accepting one-time-token-authenticated connection from ::1
[W 10:14:46.478 NotebookApp] 404 GET /tree/Documents/undefined ::1 21.00ms referer=None
[I 10:14:46.480 NotebookApp] Creating new notebook in /Documents/pynlp
[I 10:14:46.502 NotebookApp] Writing notebook-signing key to C:\Users\student\AppData\Roaming\jupyter\notebook_cookie_secret
[I 10:14:48.130 NotebookApp] Kernel started: 5fa83239-32fd-4ad0-abbc-99b8af22c22
2
[I 10:16:47.901 NotebookApp] Saving file at /Documents/pynlp/Day 1.ipynb
```

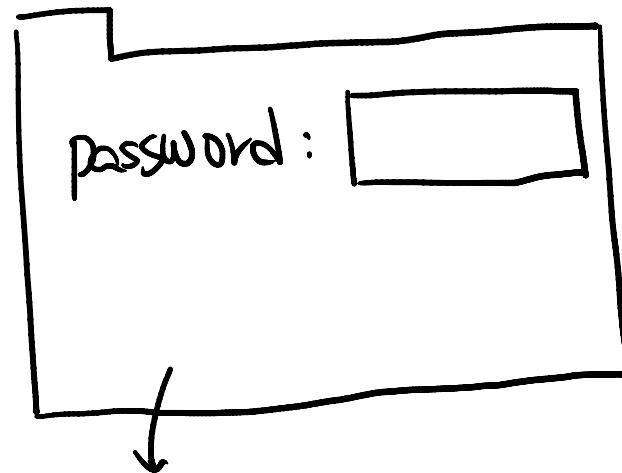
Notebook password

prompt
→

\$ jupyter notebook password

Enter password:

Restart Server



Cookie
인증? true

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1

서식 + 일반 텍스트

유형

제목1

파이썬 자연어 처리 입문

본문

→ 자연어 처리의 문제를 파이썬을 활용하는 방법을 논의합니다.

제목2

진행

수자주

1. 환경설정과 활용
1. 파이썬 문법 리뷰
1. NLTK 활용
1. 한국어 자원 활용

"실행"

Shift+Enter

In []:

File Edit View Insert Cell Kernel Widgets Help



РЕДАКТОР

파이썬 자연어 처리 입문입니다!
저는 이성주입니다.

ESC
명령 ← 편집 ←
|
|

In [3]: x = 1

In []:

↑ Above

In [4]: print(x)

1

↙ Below

In []:

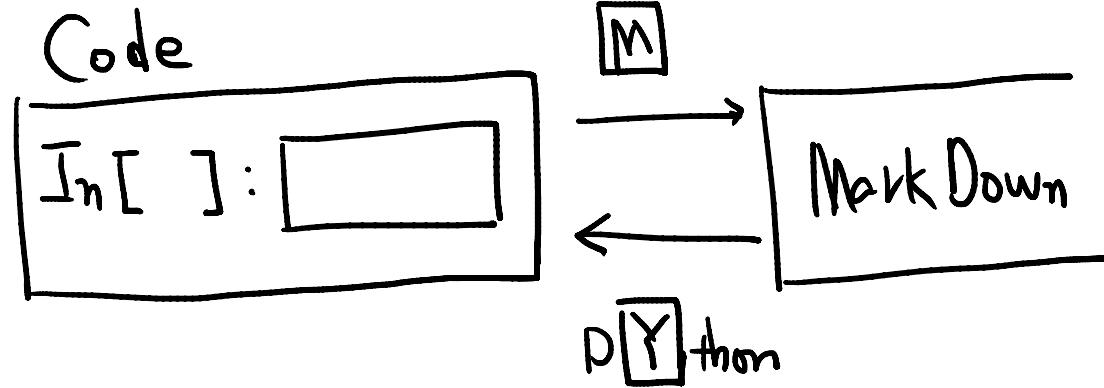
In []:

my.ipynb

{

JSON

}



자료형과 변수	자료구조	제어	함수	MEN	FS, 네트워크, DB
				입출력	
int	str	[]	()	def	Open()
float		{ k:v, }			Driver
bool					Request

데이터가공 → Pandas

(영어) 자연어처리 → NLTK

(한국어) 자연어처리 → Pyko

File Edit View Insert Cell Kernel Widgets Help



파이썬 사용어 서리 읽습니다!

저는 이성주입니다.

In [3]: `x = 1`

py2 | py3

str

unicode → str

In [4]: `print(x)`

1

In [5]: 문장 = '파이썬으로 자연어를 잘 처리하려면 무엇이 필요한가요?'

In [6]: `type(문장)`

Out [6]: str

In []:

File Edit View Insert Cell Kernel Widgets Help



In [6]: `type(문장)`

Out [6]: `str`



In [7]: 문장 += '\n일단 파이썬을 알아야지'

작제표는
~ 프로그래밍은

In [8]: 문장



Out [8]: '파이썬으로 자연어를 잘 처리하려면 무엇이 필요한가요?\n일단 파이썬을 알아야지'

In [9]: `print(문장)`

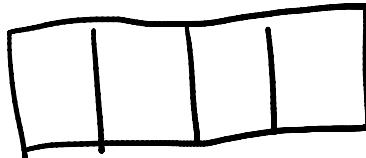
파이썬으로 자연어를 잘 처리하려면 무엇이 필요한가요?
일단 파이썬을 알아야지



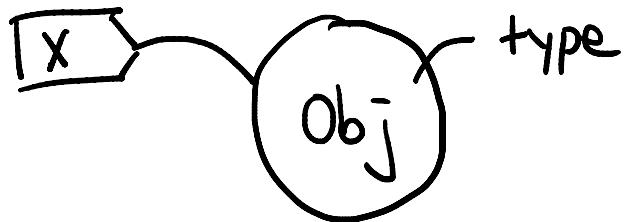
In []:

C/C++, Java, ...

int x



Python, ...



File Edit View Insert Cell Kernel Widgets Help



In [15]: 양식 = '{0} {1}.x 버전을 사용합니다.'

↖
%

In [17]: type(양식)

이름 : { }

0 1

Out[17]: str

Str . format(언어, 버전)

In [16]: 양식

↓ ↓
{0} {1}

Out[16]: '{0} {1}.x 버전을 사용합니다.'

Str

In [18]: 문구 = 양식.format(언어, 버전)
print(문구)

파이썬 3.x 버전을 사용합니다.

In []:

File Edit View Insert Cell Kernel Widgets Help

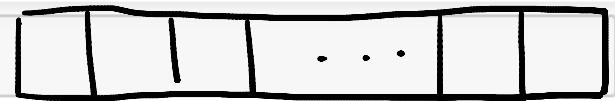


0

1

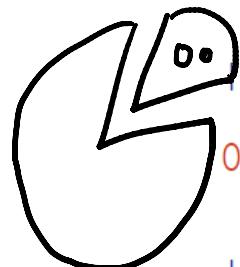


n-1



In [19]: 문구

Out [19]: '파이썬 3.x 버전을 사용합니다.'



In [20]: 문구[0:3]

0 ≤ 색인 < 3

Out [20]: '파이썬'

[시작: 끝]

In [21]: 문구[:3]

Out [21]: '파이썬'

연습

문구에서 "3.x"라는 부분만 선택하기

In []:

File Edit View Insert Cell Kernel Widgets Help

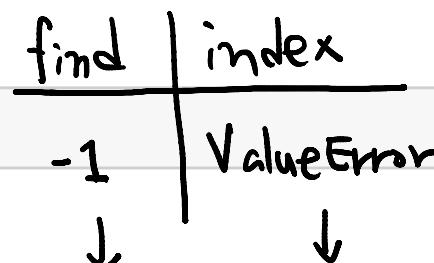


문구에서 "3.x"라는 부분만 선택하기

In [22]: 문구.find('3')

Str

Out[22]: 4



In [25]: 문구.index('3')

Out[25]: 4

In [23]: 문구[4:7] 4 5 6

if try / catch

Out[23]: '3.x'

In [26]: 문구.find('4')

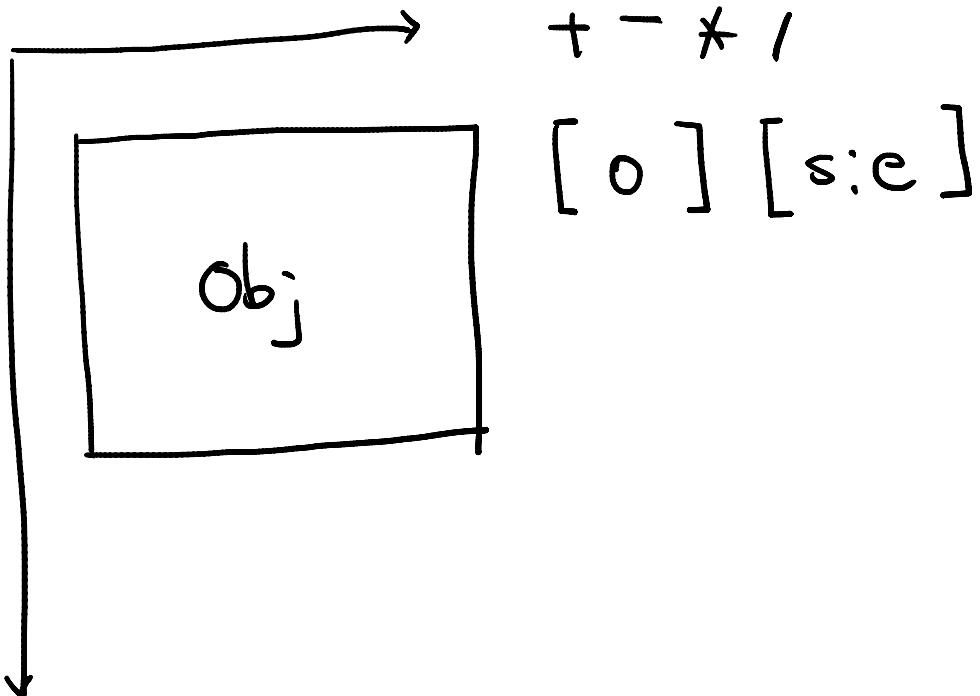
Out[26]: -1

In [27]: 문구.index('4')

ValueError
| last)

Traceback (most recent ca

"간결"



"표현"

• method()

File Edit View Insert Cell Kernel Widgets Help



In [30]: '파이썬' in 문구

Speech → Text

Out[30]: True



목적
—
도깨비

동사
—
검색 →

In [31]: '자바' in 문구



Out[31]: False

In [32]: 문구

Turing Test

Out[32]: '파이썬 3.x 버전을 사용합니다.' →



In [33]: 문구.split()

Out[33]: ['파이썬', '3.x', '버전을', '사용합니다.']}

In []:

Use
Used
Using → Use

File Edit View Insert Cell Kernel Widgets Help



Out [33]: ['파이썬', '3.x', '버전을', '사용합니다.']

e.g. ',',

In [34]: 날말들 = 'a, b, c'

Str.Split(구분자)

In [37]: 정리된날말들 = []
 for 항목 in 날말들.split(','):
 정리된날말들.append(항목.strip())

$[x_1, x_2, x_3]$ list
 ↓ ↓ ↓ (for)

In [38]: 정리된날말들

$[f(x_1), f(x_2), f(x_3)]$

Out [38]: ['a', 'b', 'c']
 (for) 내장 리스트

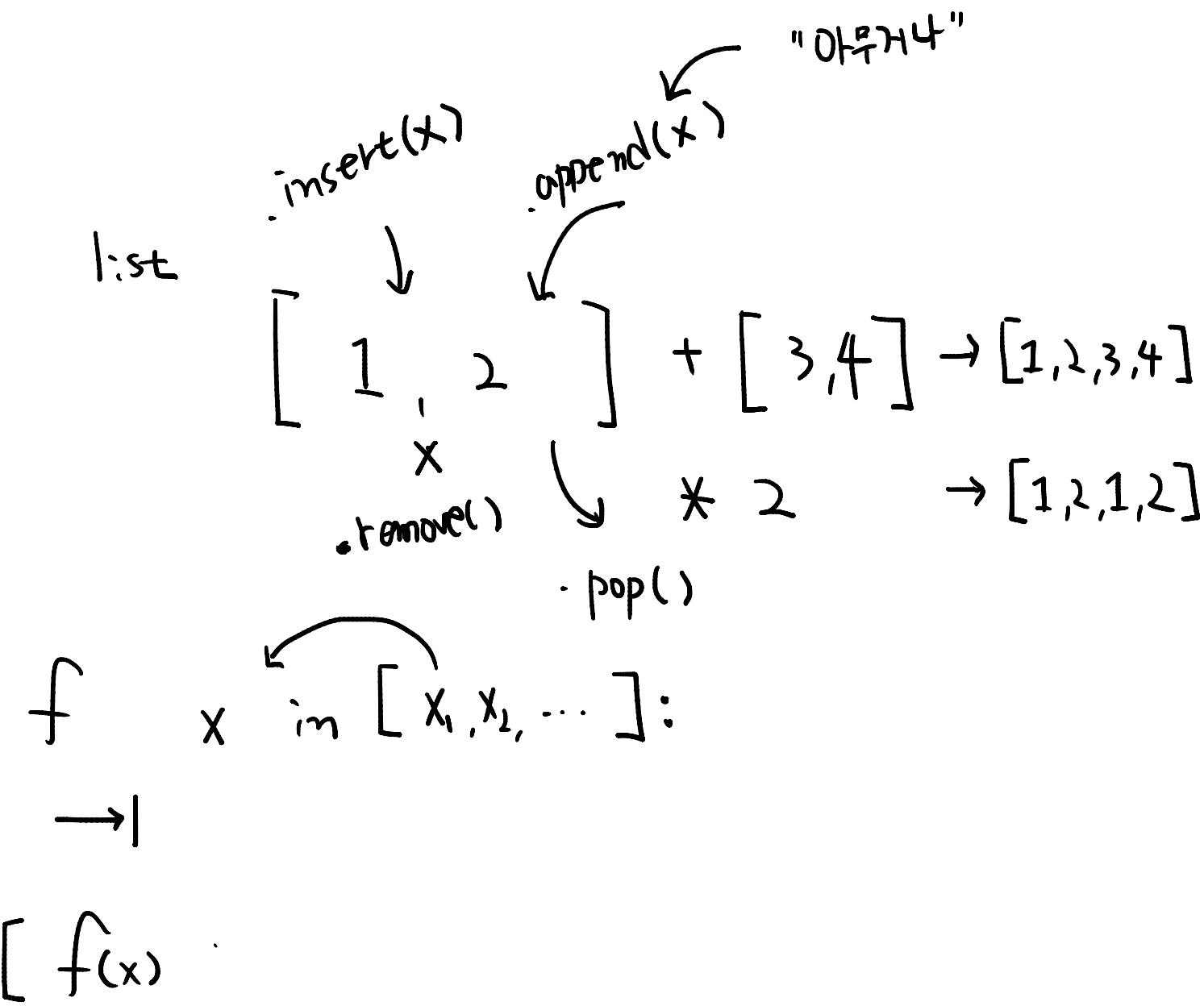
e.g. Str.strip

In [39]: [항목.strip() for 항목 in 날말들.split(',', ',')]

Out [39]: ['a', 'b', 'c']

[for in]

In []:



File Edit View Insert Cell Kernel Widgets Help



In [65]: 좌표

"UNZIP"

Out[65]: (1.2, 2.3, 3.4)

Unpacking "풀기"

In [66]: x, y, z = 좌표

In [67]: x, y = y, x
(y, x)

SWAP

In [68]: x, y

Out[68]: (2.3, 1.2)

In [57]: 프로필 = {'이름': '이성주'}

In [58]: type(프로필)

Out[58]: dict

In [59]: 프로필['성별'] = '남'

File Edit View Insert Cell Kernel Widgets Help



In [69]: `x, *나머지 = 좌표` $(1.2, \underline{2.3}, 3.4)$

In [70]: `x` ~~x~~

Out[70]: 1.2
 $x, 나머지 = 좌표[0], 좌표[1:]$

In [71]: `나머지`

Out[71]: [2.3, 3.4]

In [72]: `*나머지, z = 좌표`

In [73]: `z`

Out[73]: 3.4

In [74]: `나머지`

Out[74]: [1.2, 2.3]

In [57]: `프로필 = {'이름': '이성주'}`

File Edit View Insert Cell Kernel Widgets Help

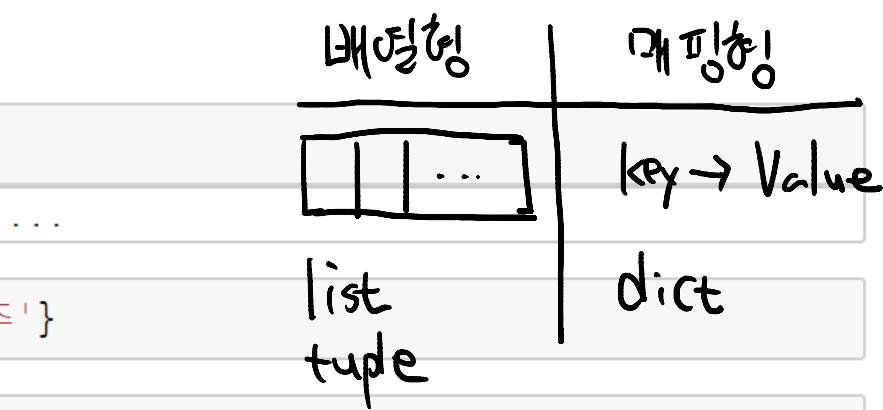


Out [54]: 1.2

In [55]: 좌표[0:2]

Out [55]: (1.2, 2.3)

In [56]: 좌표[0] = 4.5



In [57]: 프로필 = {'이름': '이성주'}

In [58]: type(프로필)

Out [58]: dict

In []:

File Edit View Insert Cell Kernel Widgets Help



In [56]: 좌표[0] = 4.5

...

In [57]: 프로필 = {'이름': '이성주'}

In [58]: type(프로필)

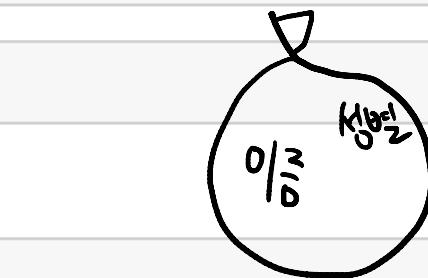
Out[58]: dict

In [59]: 프로필['성별'] = '남'

In [60]: 프로필

Out[60]: {'성별': '남', '이름': '이성주'}

In []:



순서 x

File Edit View Insert Cell Kernel Widgets Help



Out[58]: dict

In [59]: 프로필['성별'] = '남'

dict['']

In [60]: 프로필

Out[60]: {'성별': '남', '이름': '이성주'}

In [63]: 양식 = '이름은 {0[이름]}, 성별은 {0[성별]}입니다.'

In [64]: 문구 = 양식.format(프로필)
print(문구)

0

이름은 이성주, 성별은 남입니다.

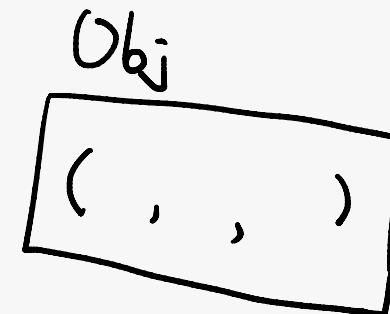
In []:

File Edit View Insert Cell Kernel Widgets Help



In [86]:

```
def 주스기(재료='딸기'):
    메뉴 = {'딸기': 10, '사과': 20}
    if not 재료 in 메뉴:
        return
    주스 = 재료 + '주스'
    가격 = 메뉴[재료]
    return 주스, 가격
```



In [87]: 주스기()

Out [87]: ('딸기주스', 10) tuple

In [88]: 주스기('사과')

Out [88]: ('사과주스', 20)

In [89]: 주스기('강아지')

In []:

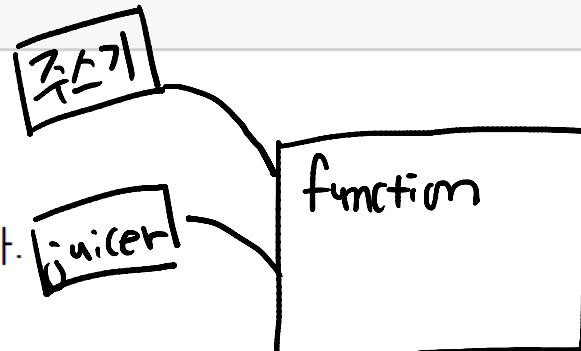
File Edit View Insert Cell Kernel Widgets Help



Out [88]: ('사과주스', 20)

In [89]: 주스기('강아지')

1. "함수도 객체"
2. 객체는 변수를 할당할 수 있다.
3. 함수 정의에 변수를 할당할 수 있다.



In [90]: juicer = 주스기

In [91]: juicer()

Out [91]: ('딸기주스', 10)

In []:

File Edit View Insert Cell Kernel Widgets Help



In [96]: `def 집계(방법, 데이터):
 결과 = 방법(데이터)
 return 결과` () "호출"

In [97]: `def 제곱합(데이터):
 return sum(n**2 for n in 데이터)`

In [98]: `data = list(range(1, 11))
data`

Out[98]: [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]

Py2 | Py3
range
xrange → range

In [99]: `집계(sum, data)`

Out[99]: 55

In [100]: `집계(제곱합, data)`

Out[100]: 385

In []:

File Edit View Insert Cell Kernel Widgets Help



In [100]: 집계(제곱합, data)

Out[100]: 385

In [101]: range(10)

Out[101]: range(0, 10)

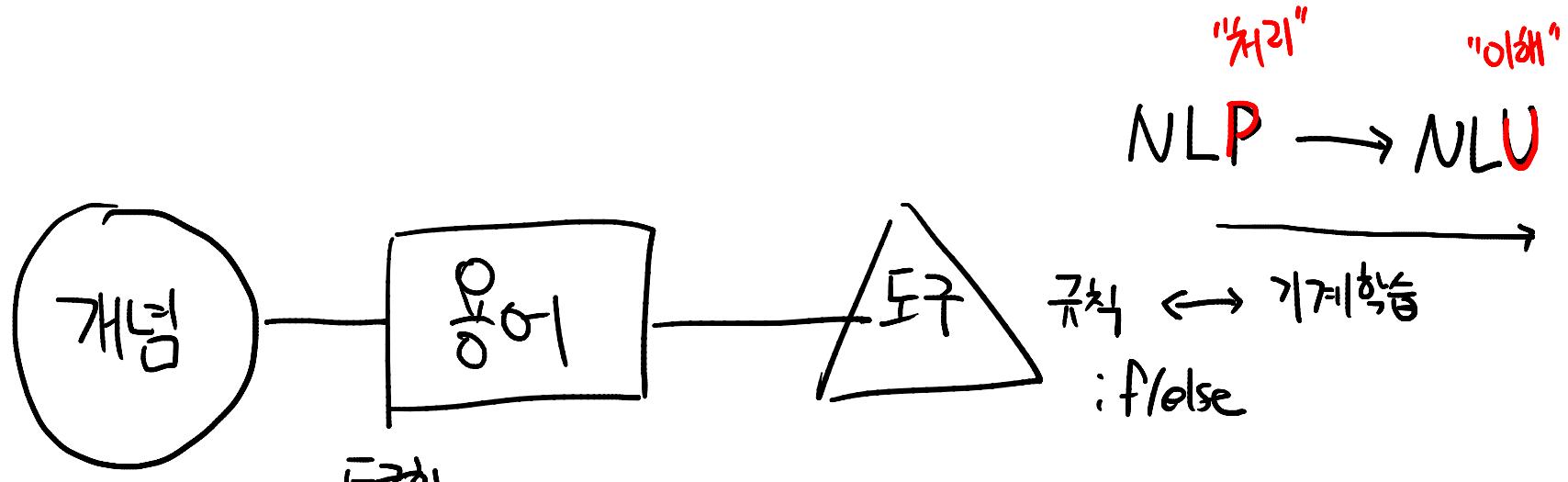
In [102]: list(range(10))

Out[102]: [0, 1, 2, 3, 4, 5, 6, 7, 8, 9]

In [103]: range(10**10)

Out[103]: range(0, 10000000000)

In []:

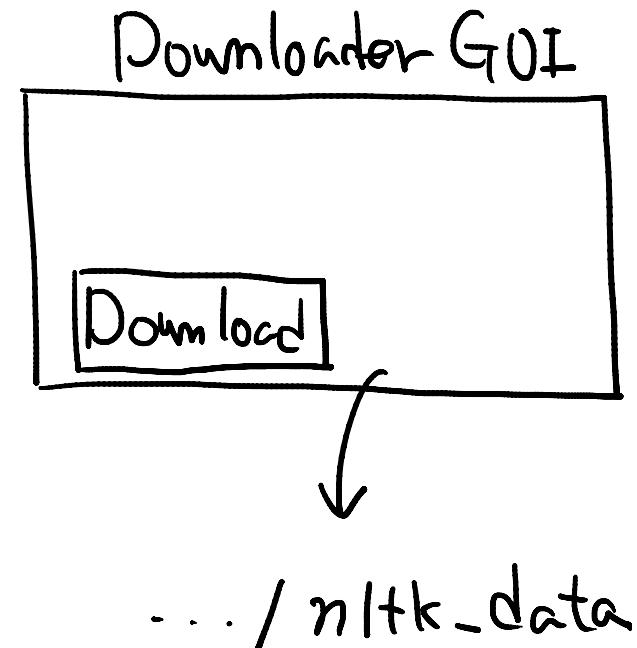


파이썬을 $\xrightarrow{\text{도구화}}$ 파이썬/을 \longrightarrow Python?

Cloud API

e.g. Google Cloud API

```
>>> import nltk  
>>> nltk.download()
```



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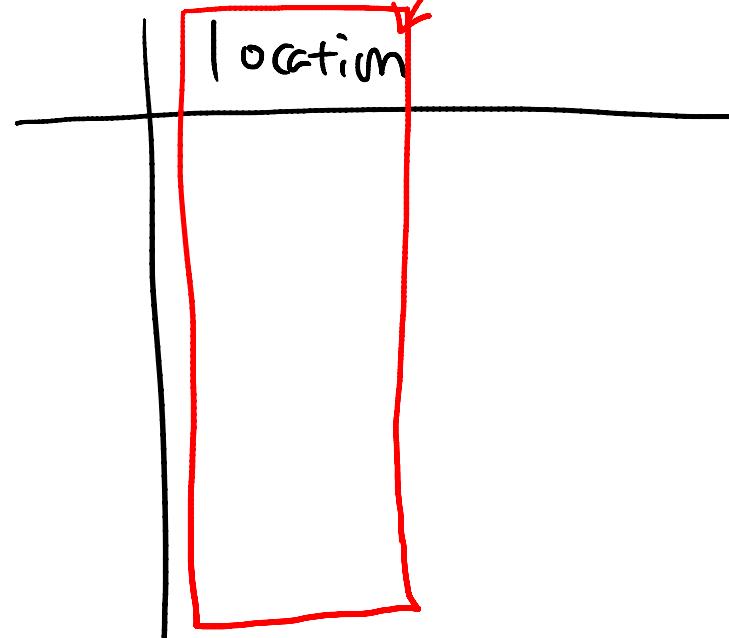
In [109]: `weather[:5]`

...
Dataframe ($n=2$)
Series ($n=1$)

In [110]: `weather['location']`

Out[110]:

0	seoul
1	seoul
2	seoul
3	seoul
4	seoul
5	seoul
6	seoul
7	seoul
8	seoul
9	seoul
10	seoul
11	seoul
12	seoul
13	seoul
14	seoul
15	seoul
16	seoul
17	seoul





In [114]: weather['weather'].str.contains('비')

Out[114]: 0 구름많음 → False
1 흐림/안개/비 → True
2 흐림/소나기
3 흐림/소나기/안개
4 구름많음/안개/천둥번개/비
5 구름많음/안개/천둥번개/비
6 구름많음
7 구름많음/안개
8 흐림/안개
9 구름많음/안개/천둥번개/비
10 구름많음/안개
11 구름많음
12 구름조금
13 구름많음
14 구름많음/소나기
15 구름많음/소나기
16 구름많음
17 흐림/안개/비
18 구름조금/안개/비
19 구름조금
20 구름조금

"각 문자열에 대해"

Series.str.method()

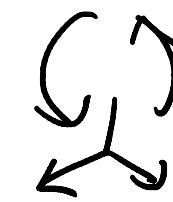
for 항목 in weather:

if '비' in 항목:

else:

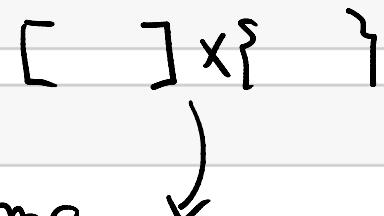
불리언 색인

[1 , -2 , 3]
↓ ↓ ↓
True , False , True
↓ ↓
1 , 3]





Code

In [128]: `data = [1,2,3,4]`In [129]: `data`Out[129]: `[1, 2, 3, 4]`In [130]: `pd.Series(data)`

Out[130]:

0	1
1	2
2	3
3	4

`dtype: int64`

.index *.values*

"각별석원"

DataFrame

Columns

I
D
X

Values

2d

In [132]: `pd.Series(data, index=list('abcd'))`

Out[132]:

a	1
b	2
c	3
d	4

`dtype: int64`

In []:



```
In [133]: import nltk
```

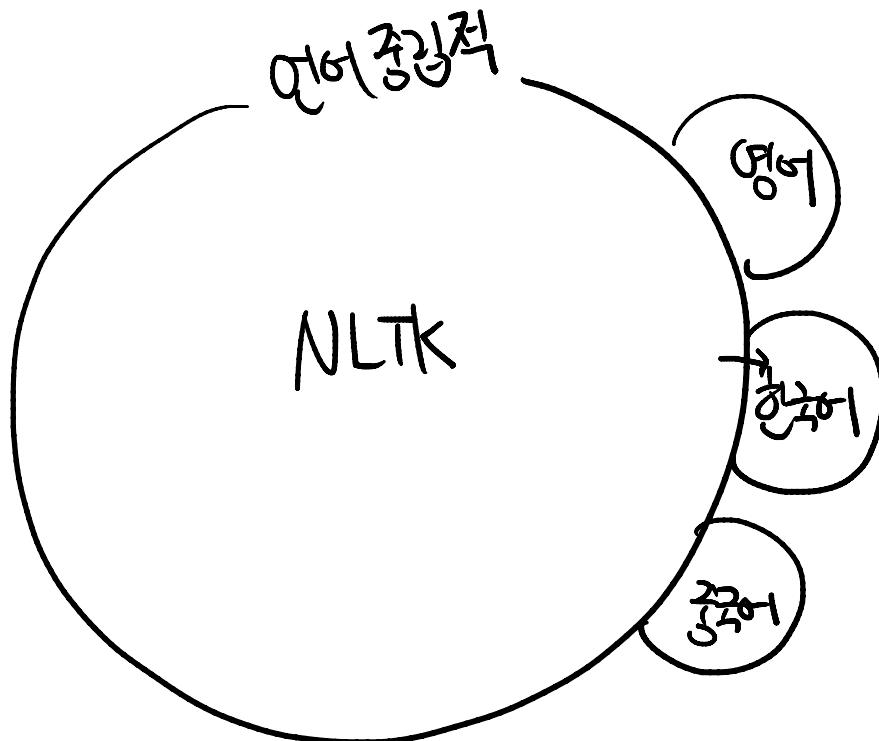
```
In [134]: import nltk.book as book
```

```
*** Introductory Examples for the NLTK Book ***
Loading text1, ..., text9 and sent1, ..., sent9
Type the name of the text or sentence to view it.
Type: 'texts()' or 'sents()' to list the materials.
text1: Moby Dick by Herman Melville 1851
text2: Sense and Sensibility by Jane Austen 1811
text3: The Book of Genesis
text4: Inaugural Address Corpus
text5: Chat Corpus
text6: Monty Python and the Holy Grail
text7: Wall Street Journal
text8: Personals Corpus
text9: The Man Who Was Thursday by G . K . Chesterton 1908
```



```
In [ ]:
```

자연어 처리



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In [135]: book.text1

Out[135]: <Text: Moby Dick by Herman Melville 1851>

In [136]: type(book.text1)

Out[136]: nltk.text.Text

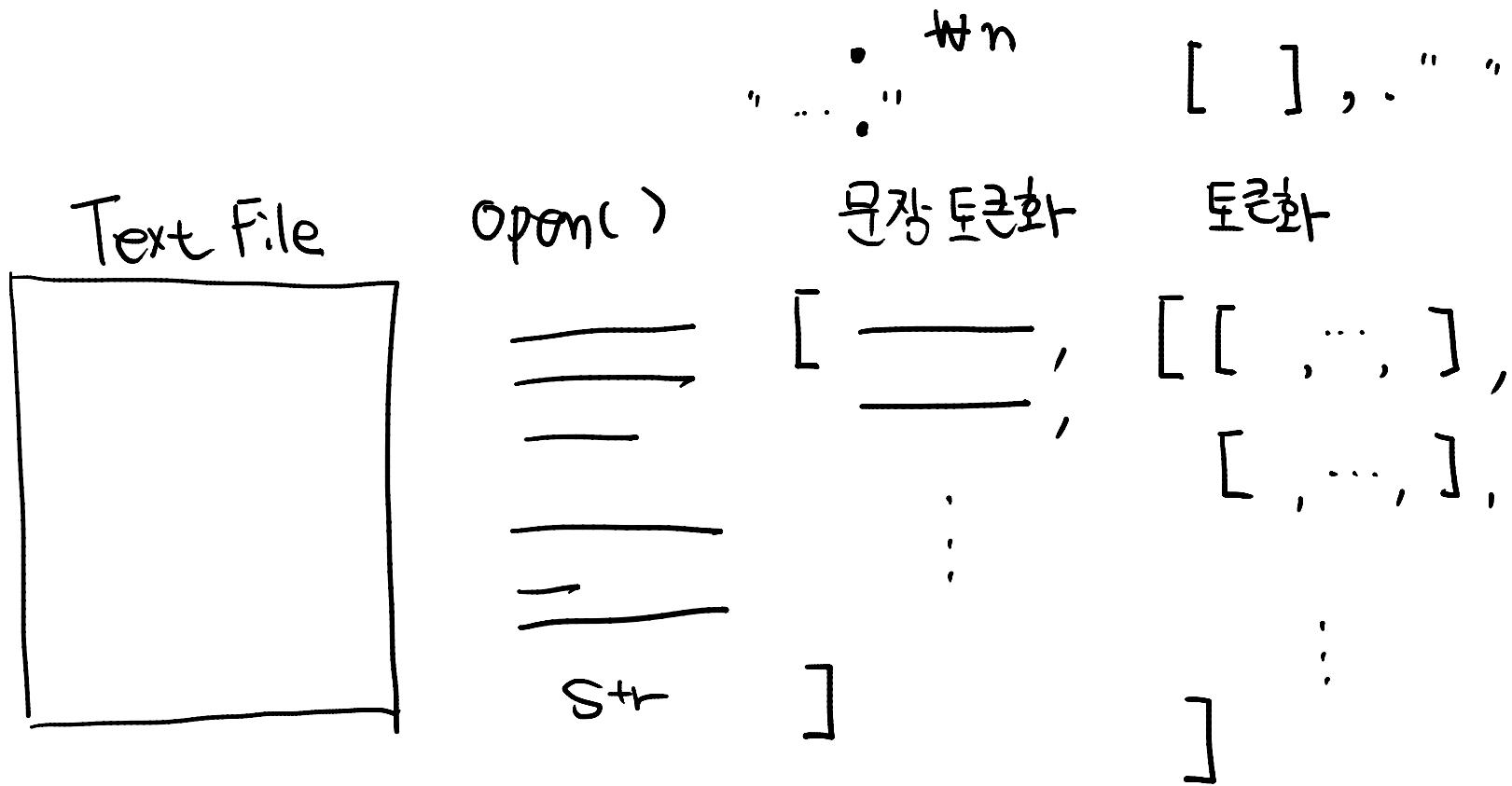
raw

In [142]: 경로 = r'C:\Users\student\AppData\Roaming\nltk_data\corpora'

In [143]: print(경로)

C:\Users\student\AppData\Roaming\nltk_data\corpora

In []:





```
In [159]: with open(경로) as file:  
    content = file.read()
```

```
In [161]: content[:1000].split('.')
```

Out[161]:

```
['[Moby Dick by Herman Melville 1851]\n\nETYMOLOGY',  
 '(Supplied by a Late Consumptive Usher to a Grammar School)\n  
 The pale Usher--threadbare in coat, heart, body, and brain; I see  
 him now',  
 ' He was ever dusting his old lexicons and grammars, with a queer  
 handkerchief, mockingly embellished with all the gay flags of all  
 the unknown nations of the world',  
 ' He loved to dust his old grammars; it somehow mildly reminded  
 him of his mortality',  
 ' "While you take in hand to school others, and to teach them by  
 what name a whale-fish is to be called in our tongue leaving out,  
 through ignorance, the letter H, which almost alone maketh the  
 signification of the word, you deliver that which is not true",  
 ' --HACKLUYT\n\n"WHALE",  
 ' ',  
 ' ',  
 ' ',  
 ' Sw',  
 ' and Dan',
```

if
else

제일 ~ 정규표현식 ~
 ~
 ~
 ~

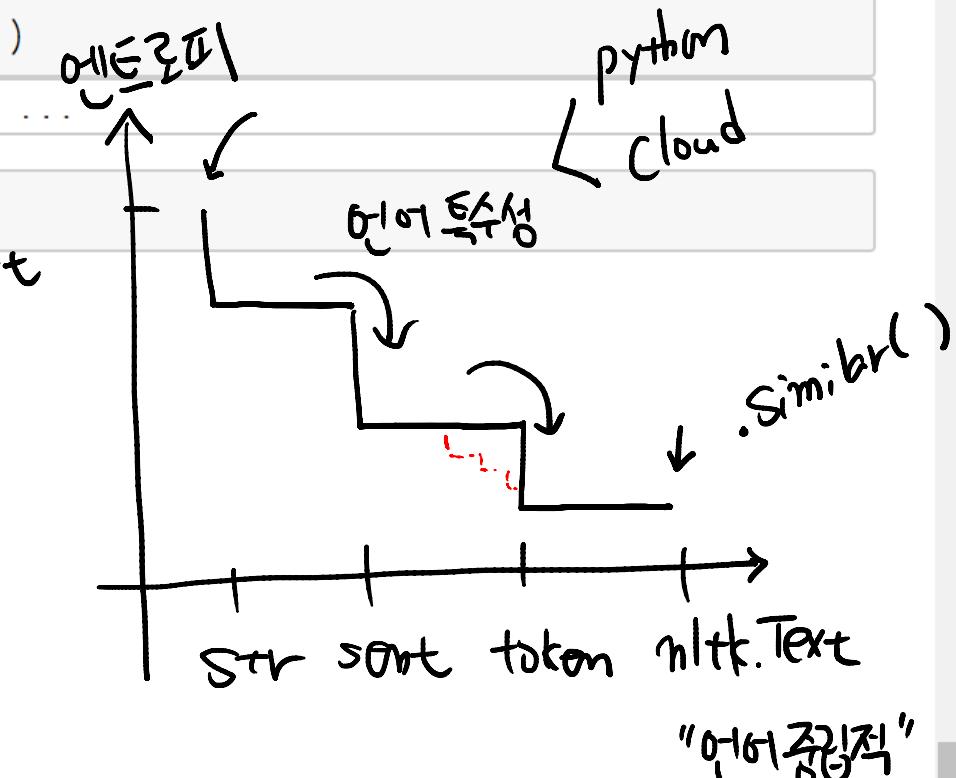


```
In [159]: with open(경로) as file:  
    content = file.read()
```

```
In [161]: content[:1000].split('.')
```

```
In [162]: book.text1[:100]
```

Out[162]: [',
'Moby',
'Dick',
'by',
'Herman',
'Melville',
'1851',
',',
'ETYMOLOGY',
',',
'(',
'Supplied',
'by',
'a',
'Late',
,



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Search

In [163]: book.text1.similar('monstrous')

true contemptible christian abundant few part mean careful puzzled
mystifying passing curious loving wise doleful gamesome singular
delightfully perilous fearless

? w_{-1} w_0 w_1

In [164]: book.text2

Out[164]: <Text: Sense and Sensibility by Jane Austen 1811>

I $\boxed{\text{Clothes}}$

In [165]: book.text2.similar('monstrous')

very so exceedingly heartily a as good great extremely remarkably
sweet vast amazingly

buy
purchase

In []:

일반

영수

File Edit View Insert Cell Kernel Widgets Help



In [164]: book.text2

Out[164]: <Text: Sense and Sensibility by Jane Austen 1811>

In [165]: book.text2.similar('monstrous')

very so exceedingly heartily a as good great extremely remarkably
sweet vast amazingly

In [166]: len(book.text1)

[..., moby, dick, by, melville, ...]

Out[166]: 260819

In [168]: len(content) len('...moby dick by melville...')

Out[168]: 1220066

In []:

File Edit View Insert Cell Kernel Widgets Help



sweet vast amazing

In [166]: `len(book.text1)`

Out[166]: 260819

In [168]: `len(content)`

Out[168]: 1220066

token
nltk.Text

In [170]: `tokens = pd.Series(token for token in book.text1)`

In [171]: `len(tokens)`

Out[171]: 260819



In [172]: `tokens.value_counts()`

Out[172]:

,	18713
the	13721
.	6862
of	6536
and	6024
a	4569

Text 1

Text 2

• , the , a , is , ...

• , the a is ...

File Edit View Insert Cell Kernel Widgets Help



In [172]: tokens.value_counts()

...

In [173]: 단어유형 = tokens.drop_duplicates()

In [175]: 단어유형.value_counts()

Out [175]:

disgusted	1
lurked	1
rock	1
103	1
scratches	1
shilling	1
sobbing	1
Gin	1
WHALEBONE	1
Dart	1
flouts	1
disorderly	1
rheumatic	1
meaning	1
lap	1

Gin

WHALEBONE

Dart



In [172]: tokens.value_counts()

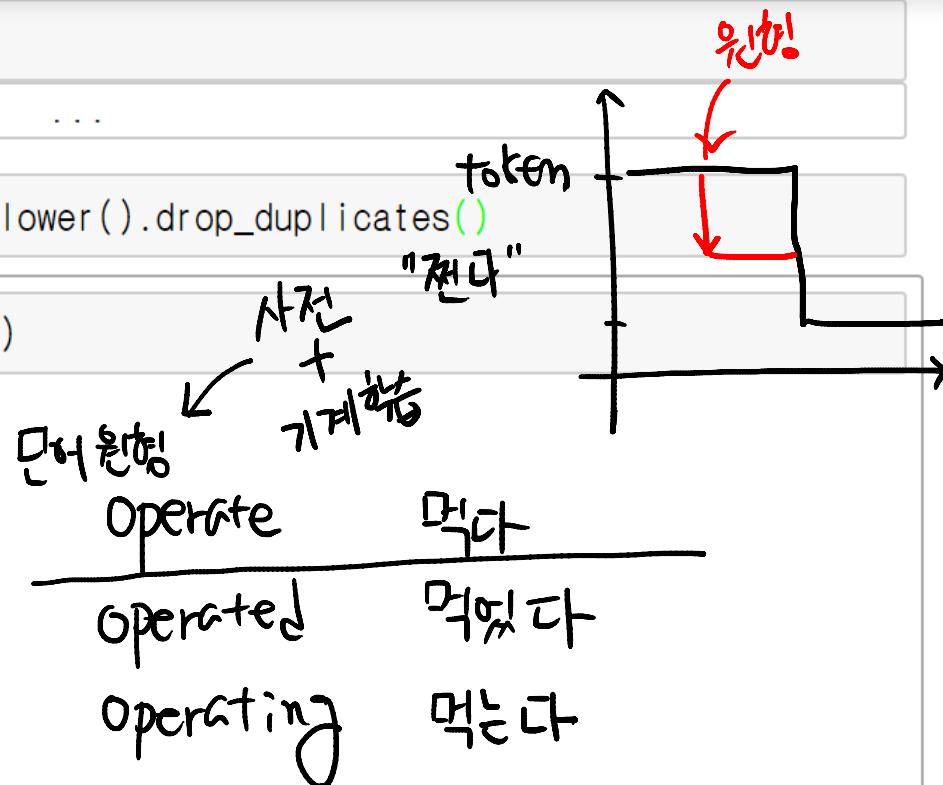
...

In [176]: 단어유형 = tokens.str.lower().drop_duplicates()

In [177]: 단어유형.value_counts()

Out[177]:

단어유형	빈도수
disgusted	1
genteeel	1
saw	1
operating	1
emotions	1
cure	1
!"	1
nightmare	1
twins	1
events	1
americans	1
cetacea	1
blanc	1
refusing	1
ended	1
phrenologists	1



I eat apple

strange

:



In [194]: 평균빈도_시리즈 = pd.Series(어휘평균빈도사전)

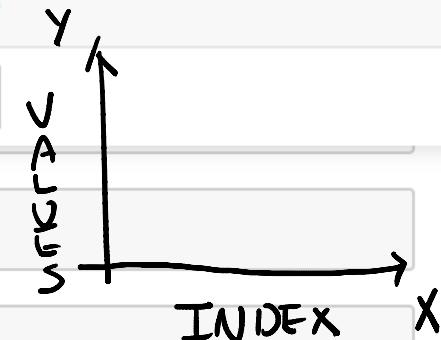
In [197]: 평균빈도_시리즈 = 평균빈도_시리즈.sort_values()

"매직" 설정

In [199]: %matplotlib inline

In [201]: 평균빈도_시리즈.plot(kind='barh')

Out[201]: <matplotlib.axes._subplots.AxesSubplot at 0x1d5cfdd8>

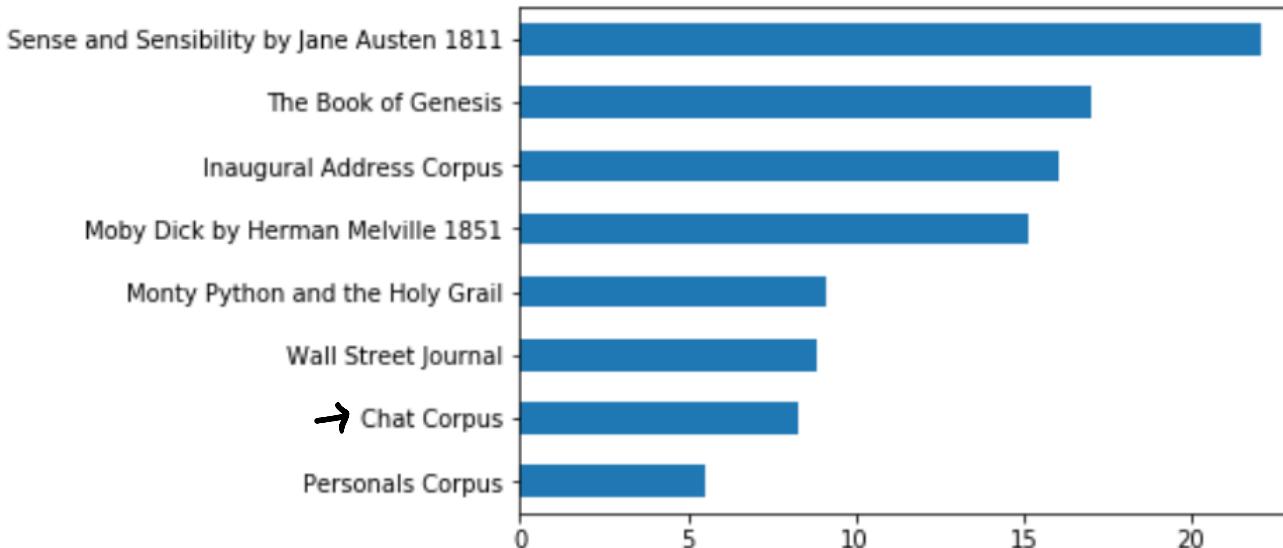


그래프 뜻임

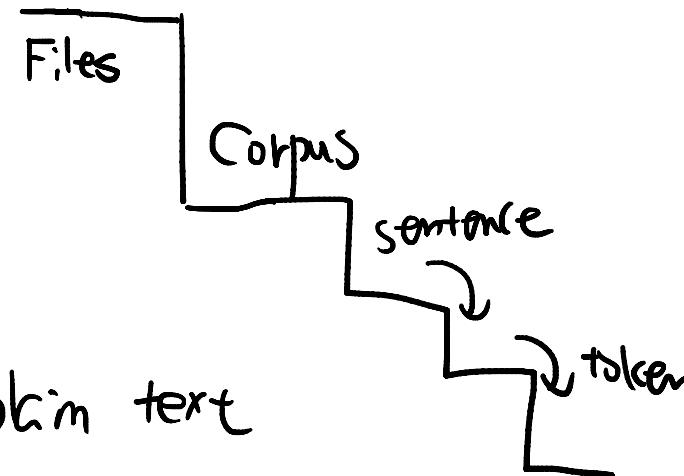
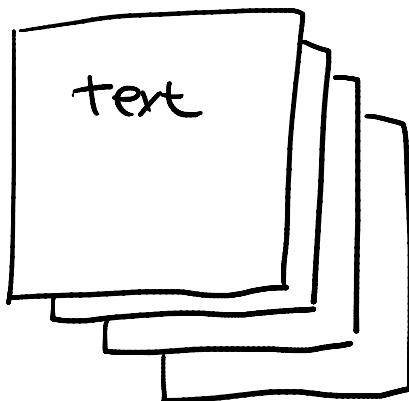
matplotlib

Series.plot()

Austen →



말뭉치 Corpus



DB

field1	field2

"SELECT"



```
In [204]: tokens5 = pd.Series(t for t in book.text5)
```

```
In [208]: tokens5[tokens5.str.len() > 14]
```

Out [208]: 528
592
609
689
2786

jamahotnipllickme

1 2 3 4 5 6 7 8 9 10

iamahotnipwithpics

jamahotnipwithhotnippics

2900

mike

.....

!!!!!!

5065
2025

ooooooooooooo onnnnnnnnnneeeeeeeeessssss . . .

5517

WEEEEEEEEE

5518

!!!!!!

5784

n i t e e e e e e e e e e e e e e e e

8922

#talkcity_adults

8943

<http://forums.talkcity.com/tc-adults/start>

8951

#talkcity_adults

8965

<http://www.shadowbots.com>

1027

((((((()))))))))

1027