자연어처리 프로젝트 2차발표

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Python Document Search

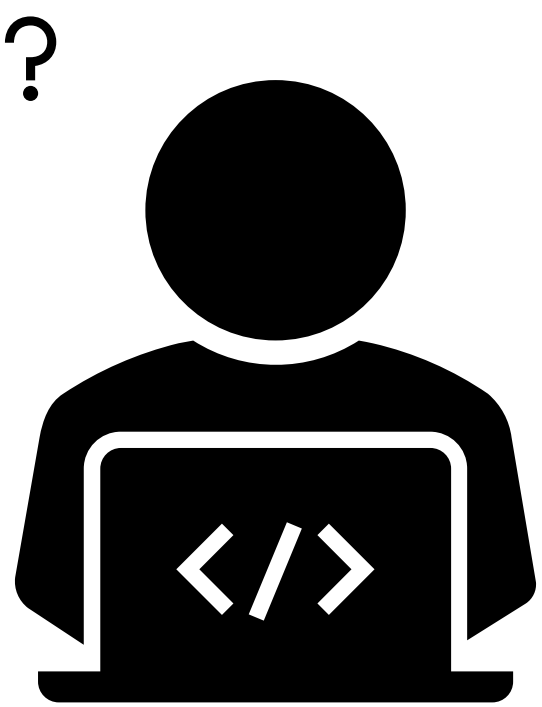
파이썬 문서 검색기

Why Python Document Search

I'm pretty new to Python and only want to extract the city for these clients' addresses:

```
clients = ["Peter, Calle Fantasia 15, Madrid", "Robert, Plaza de Perdas 2,
           Sevilla", "Paul, Calle Polo, Madrid", "Francesco, Plaza de Opo I, Segovia"]
```

Can someone help? Thank you very much in advance!



stackoverflow

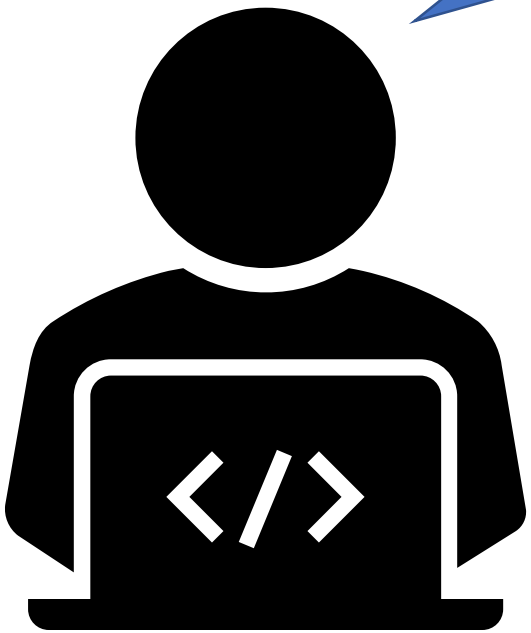
```
[i.split(',')[-1].strip() for i in clients]
# ['Madrid', 'Sevilla', 'Madrid', 'Segovia']
```

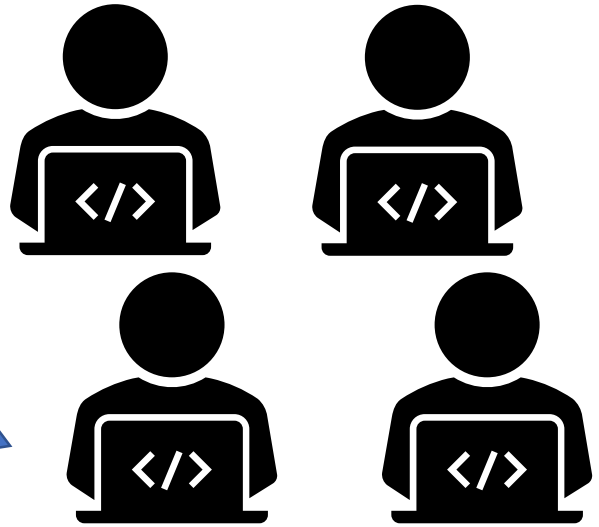
Answer URL
https://docs.python.org/3/tutorial/datastructures.html#list-comprehensions
https://docs.python.org/3/library/stdtypes.html#str.split

Question Source: https://stackoverflow.com/questions/55259601/extract-certain-values-from-a-list

Goal

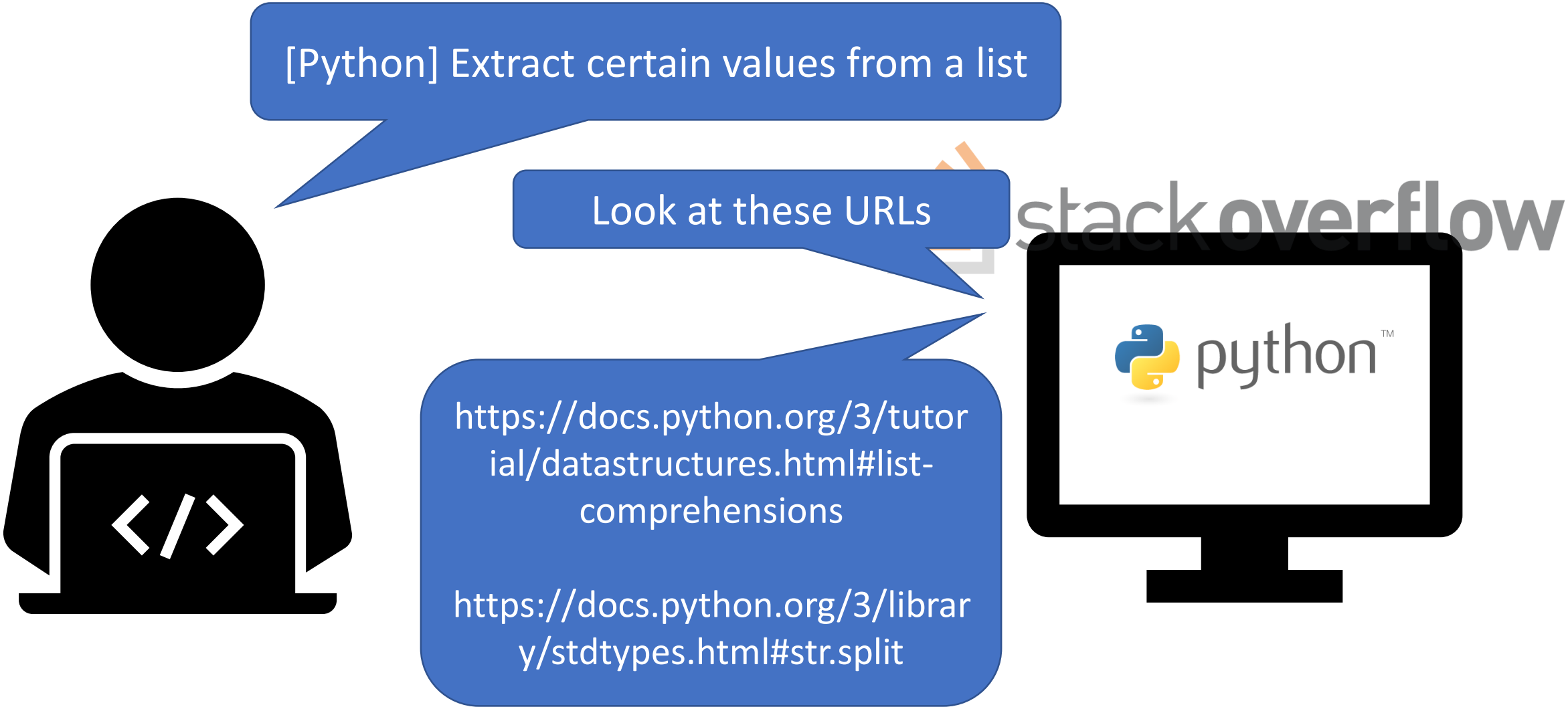
[Python] Extract certain values from a list





Question Source: https://stackoverflow.com/questions/55259601/extract-certain-values-from-a-list

Goal


[Python] Extract certain values from a list
Look at these URLs
https://docs.python.org/3/tutorial/datastructures.html#list-comprehensions
https://docs.python.org/3/library/stdtypes.html#str.split
stackoverflow
python

Contents

- Stackoverflow Python Q&A Dataset Review.
- Actual Works Explained
  - Data mining and Preprocessing
  - Word/Document Vector Representation
  - Web Service
- Evaluation
- Future Works

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- **Stackoverflow Python Q&A Dataset Review.**
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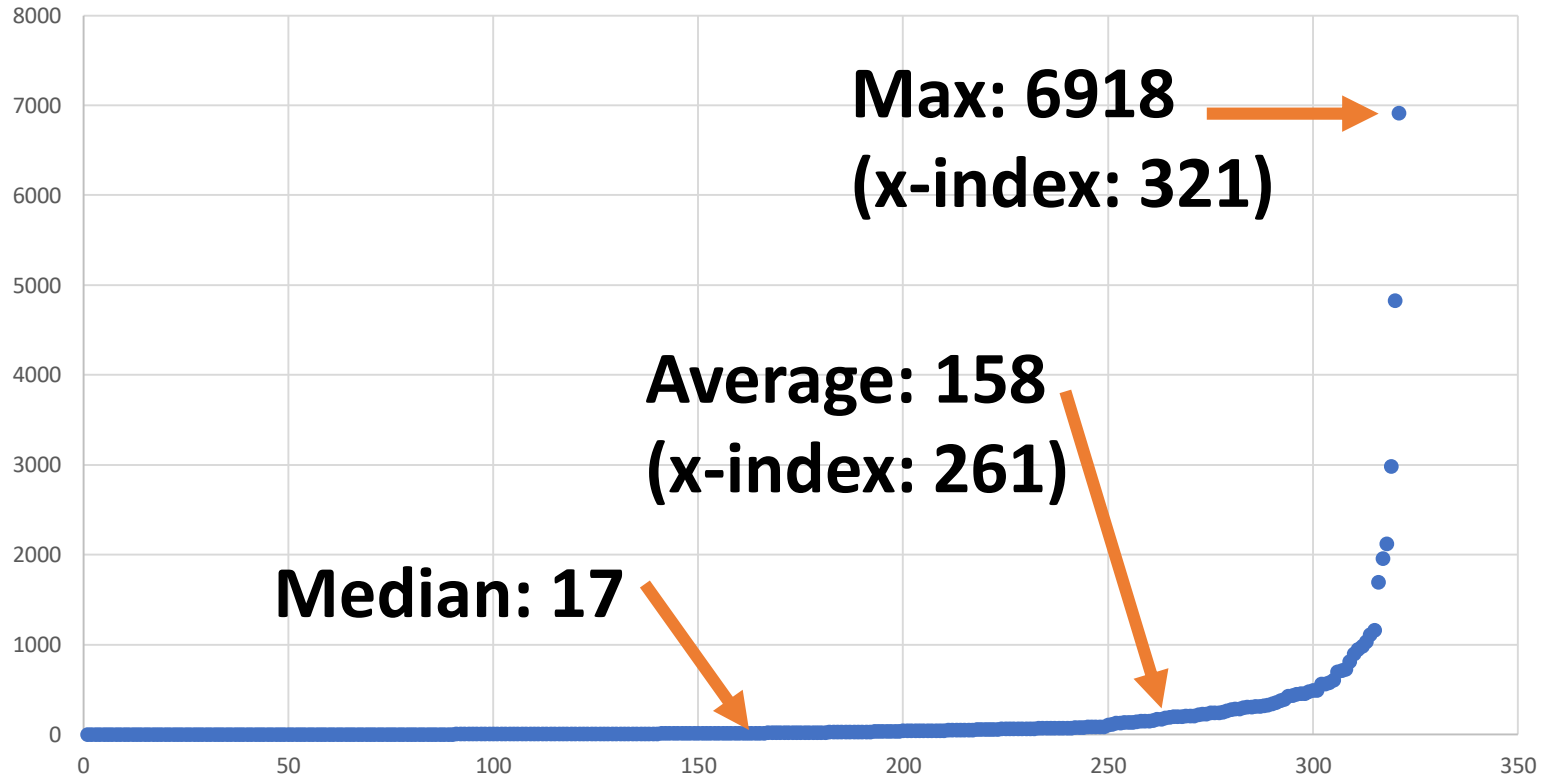
Stackoverflow Python Q&A Dataset

- **47491 Q&As, 87 MB size**
- Some are duplicated Q&A (redirected question)
- Constraints
  - [Python] tagged Q&A questions.
  - The page should contain the link to “docs.python.org/3/”

- You can download this dataset at
  - https://github.com/cushionbadak/PyMaker/tree/master/PyMaker/datas/object3
- Unrefined data is also available at
  - https://github.com/cushionbadak/PyMaker/tree/master/PyMaker/datas/object2
- Stackoverflow’s all user contributions are licensed under Creative Commons Attribution-Share Alike.

Stackoverflow Python Q&A Dataset

- Chart: The Number of times mentioned for each link.
  - X – index number of each link
  - Y – # of times
- Small & Biased



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Previous(April) Data mining Works

- Construct Stackoverflow Python Q&A Dataset
- We need to collect **Python Document itself** too.

Collecting Python Document - contents

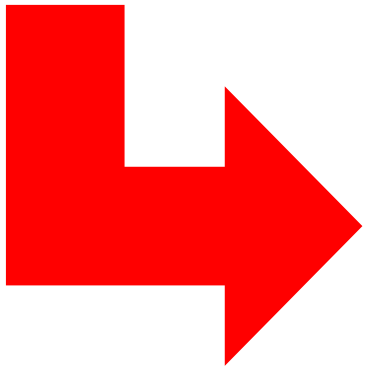
Path.**write_bytes**(*data*)

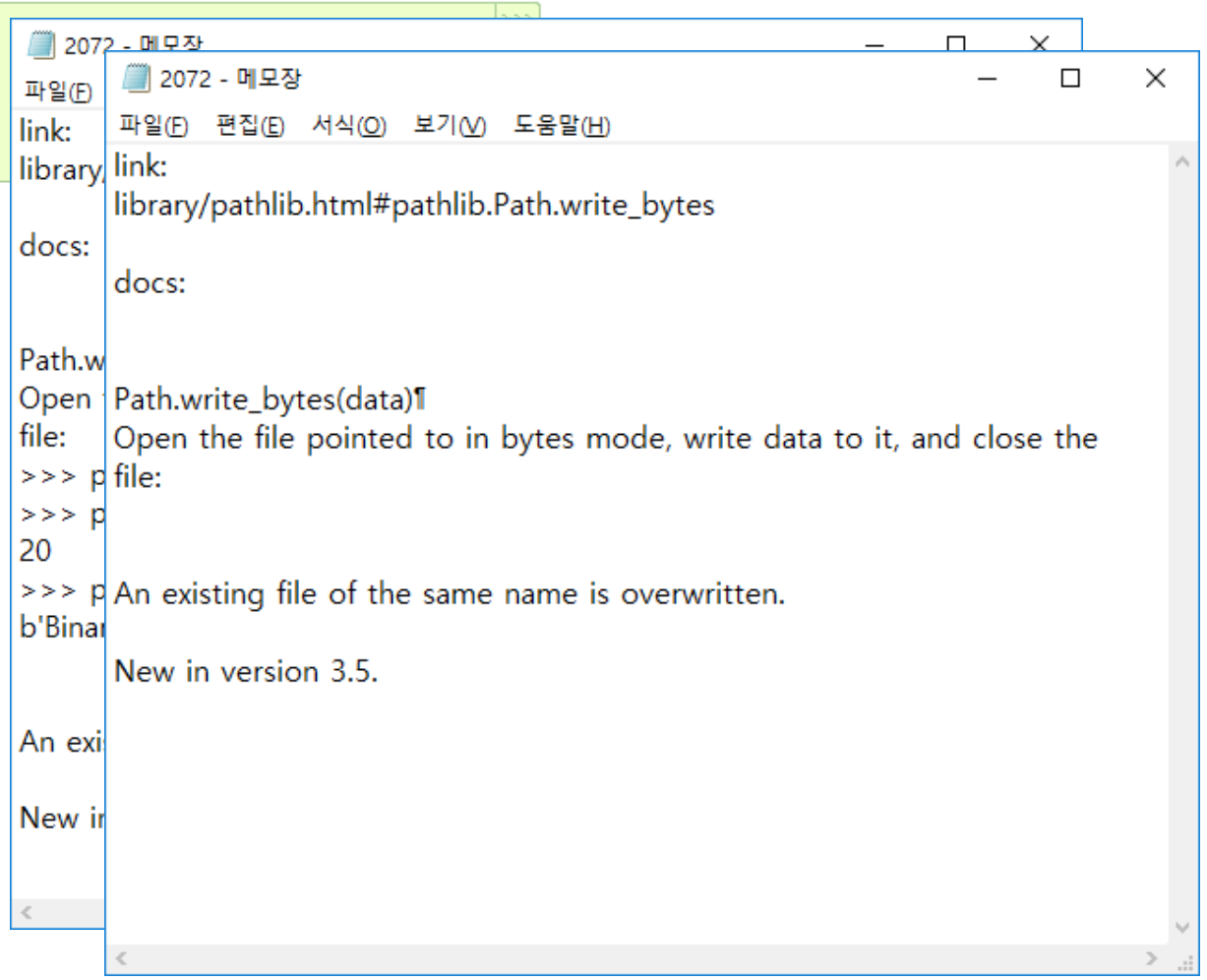
Open the file pointed to in bytes mode, write *data* to it, and close the file:

```
>>> p = Path('my_binary_file')
>>> p.write_bytes(b'Binary file contents')
20
>>> p.read_bytes()
b'Binary file contents'
```

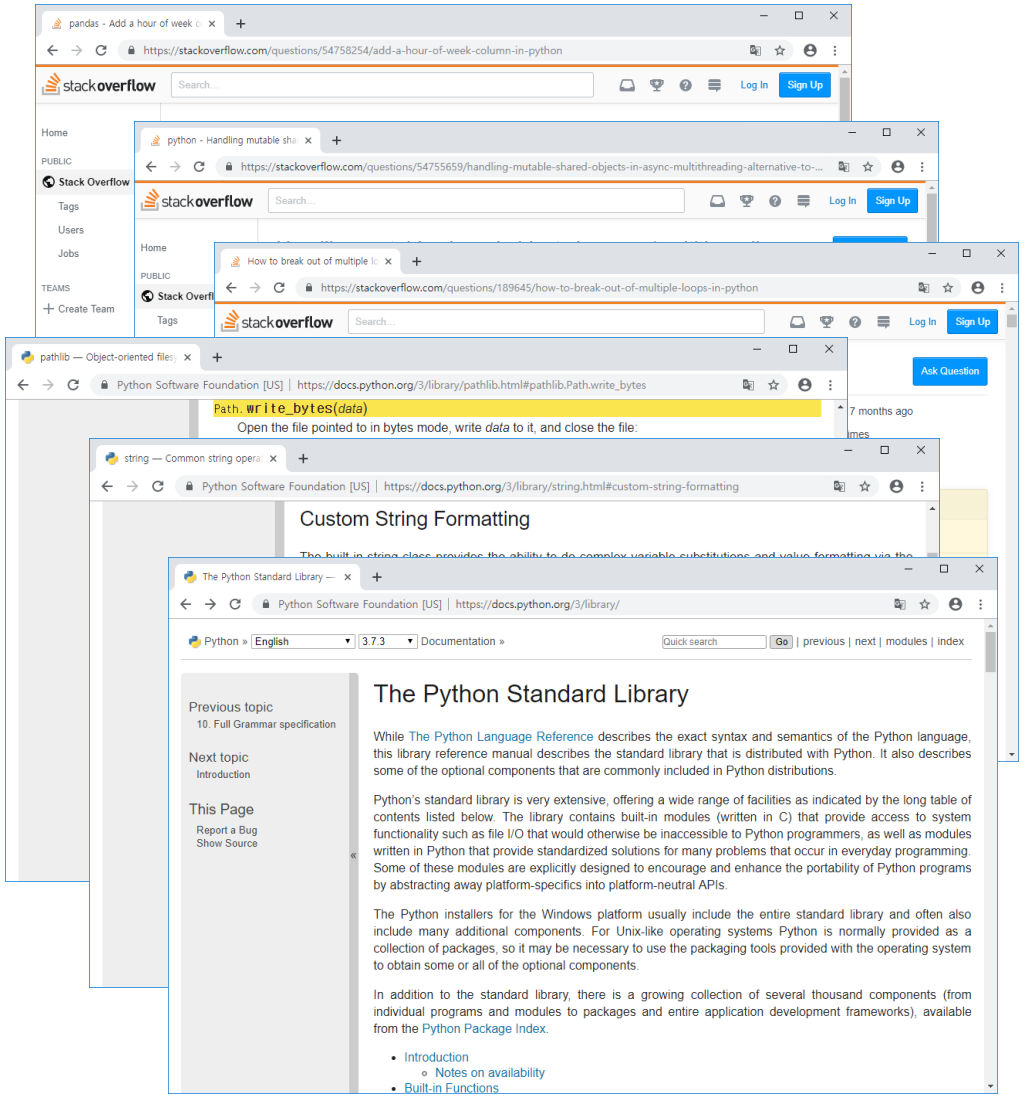
An existing file of the same name is overwritten.

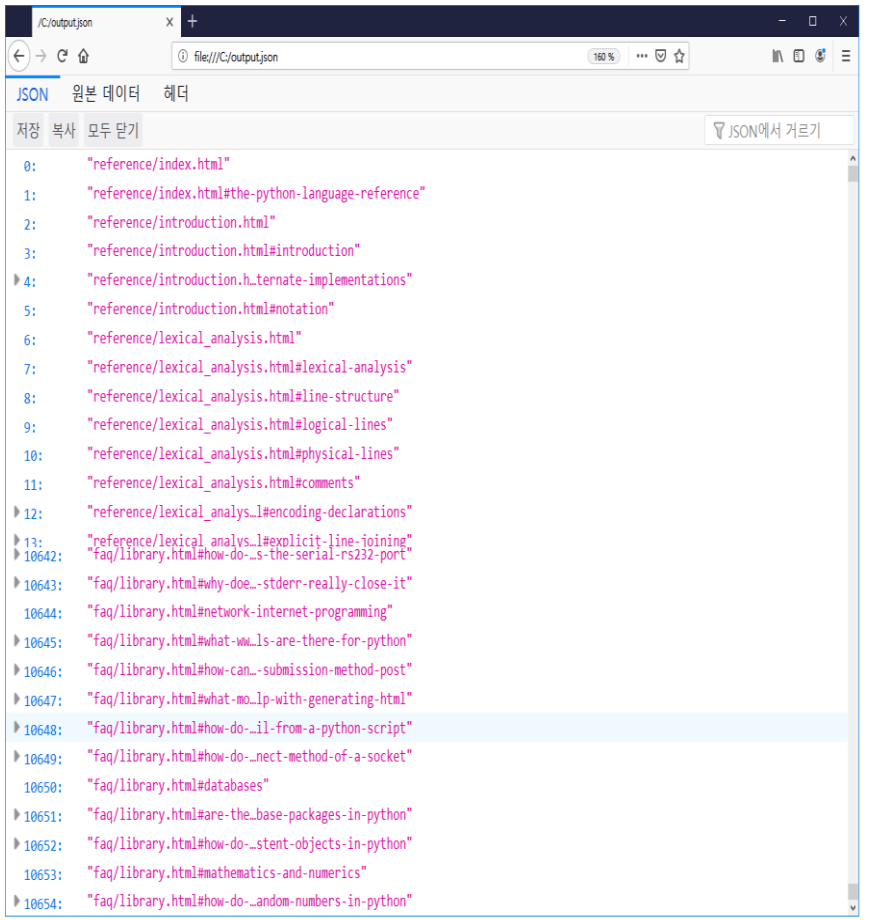
New in version 3.5.





Collecting Python Document - URLs





Collecting Python Document

- **10655 Documents, 28 MB size**
- Some are duplicated contents
  - For example, https://docs.python.org/3/reference/lexical_analysis.html#keywords
  - contents are included in https://docs.python.org/3/reference/lexical_analysis.html
- Constraints
  - We only collected URLs and content at https://docs.python.org/3/library/ and https://docs.python.org/3/reference/

- You can download this dataset at
  - https://github.com/cushionbadak/PyMaker/tree/master/PyMaker/datas/object4
- Licenses for Python documentation are located at the following links: https://docs.python.org/3/license.html

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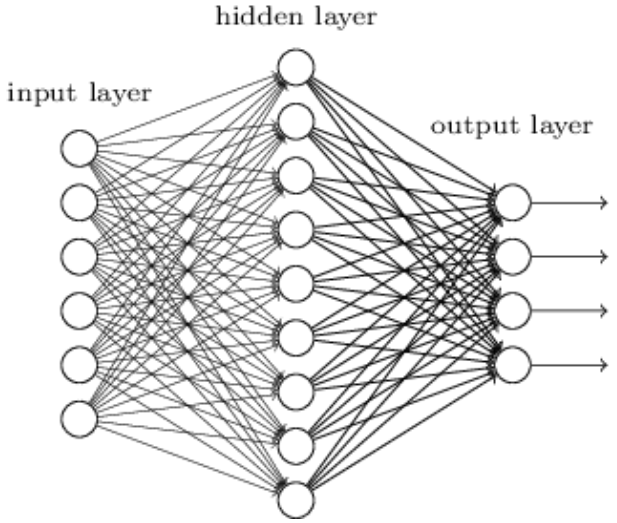
First Attempt (Failed)

- We first believed that bi-gram sentence classification would solve our problem.

Bi-gram representation

hash('Hello-Python') →



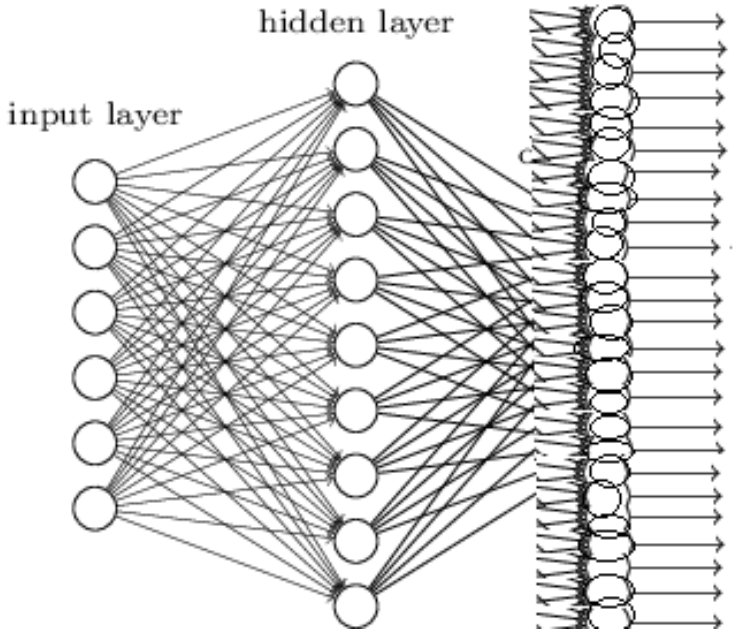
Scores for each URL

→ <1.1, 2.0, -0.7, …, 0.2>

- Image source: https://www.extremetech.com/wp-content/uploads/2016/05/tikz35.png

First Attempt (Failed)

- There were two big obstacles. One is the size of the classes.



There are **10655** URLs in https://docs.python.org/3

So we reduced it to **321** URLs

First Attempt (Failed)

- The other is lack of training data.

Stackoverflow Python Q&A Dataset

- Chart: The Number of times mentioned for each link.
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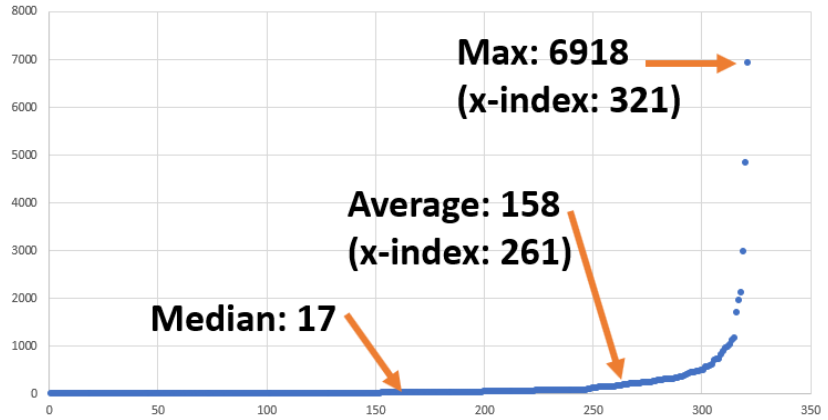
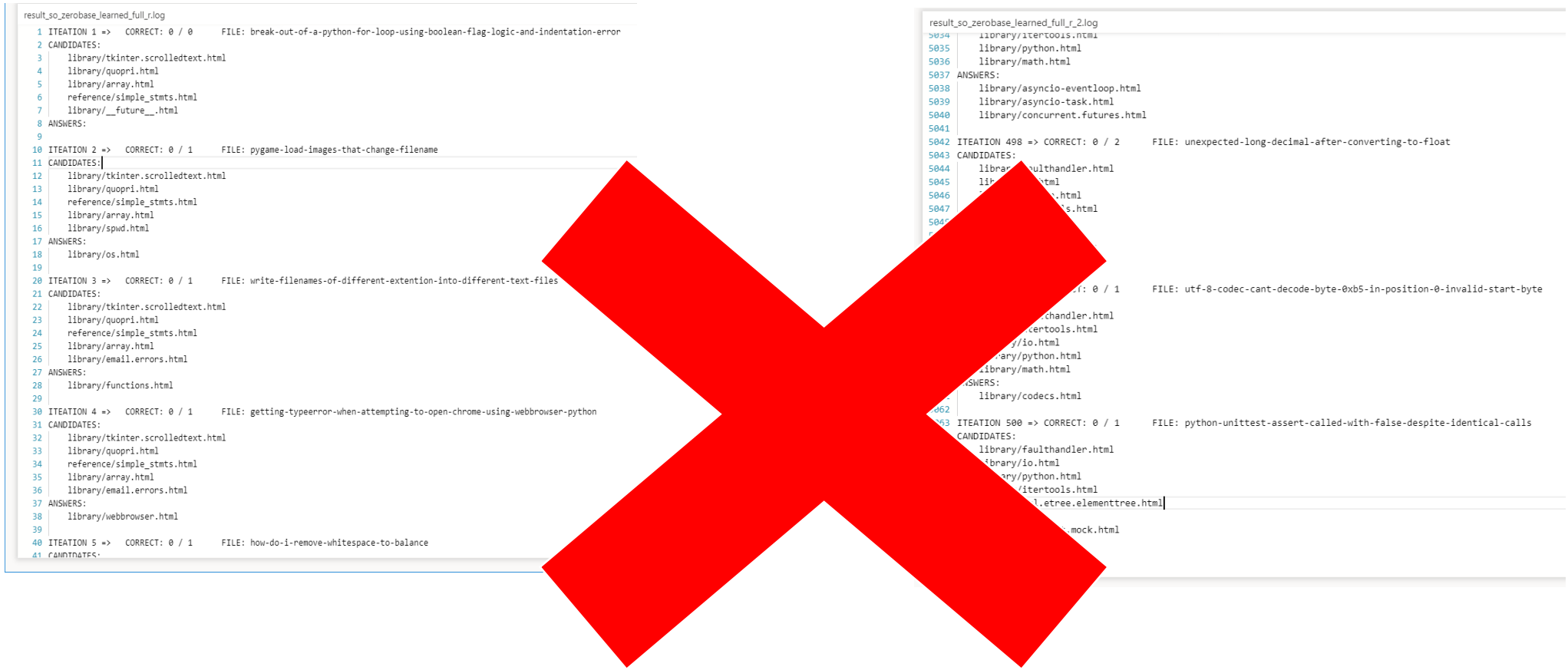


First Attempt (Failed)



Second Attempt

- Since our computing resource and data are limited, we decided to use pre-trained word2vec model.
- We use GoogleNews-vectors-negative300.bin (**3.6 GB, 300-dimensional, 3 million words and phrases,** trained with 100 billion Google News dataset)

- The model is available at https://code.google.com/archive/p/word2vec/

Second Attempt

< Classification Algorithm >

1. Convert every python document into vectors
   - **The vector is obtained by adding all the words in the document as vectors.**

1> 각각의 파이썬 문서에 대해 벡터 표현을 만든다.
(파이썬 문서를 이루는 각 단어의 벡터 표현을 더해서 구한다.)

Second Attempt

< Classification Algorithm >

1. Convert every python document into vectors
   - **The vector is obtained by adding all the words in the document as vectors.**
2. Convert query string into vector
   - Using the same method as 1

2> 질문 문장에 대해서도 1과 똑같은 방법으로 벡터 표현을 만든다.

Second Attempt

< Classification Algorithm >

1. Convert every python document into vectors
   - **The vector is obtained by adding all the words in the document as vectors.**
2. Convert query string into vector
   - Using the same method as 1
3. Find the most similar python document using **cosine similarity**.

3> 코사인 유사도를 이용해서 질문 문장과 가장 유사한 파이썬 문서를 찾는다.

Second Attempt

< Classification Algorithm >

1. Convert every python document into vectors
   - **The vector is obtained by adding all the words in the document as vectors.**
2. Convert query string into vector
   - Using the same method as 1
3. Find the most similar python document using **cosine similarity**.

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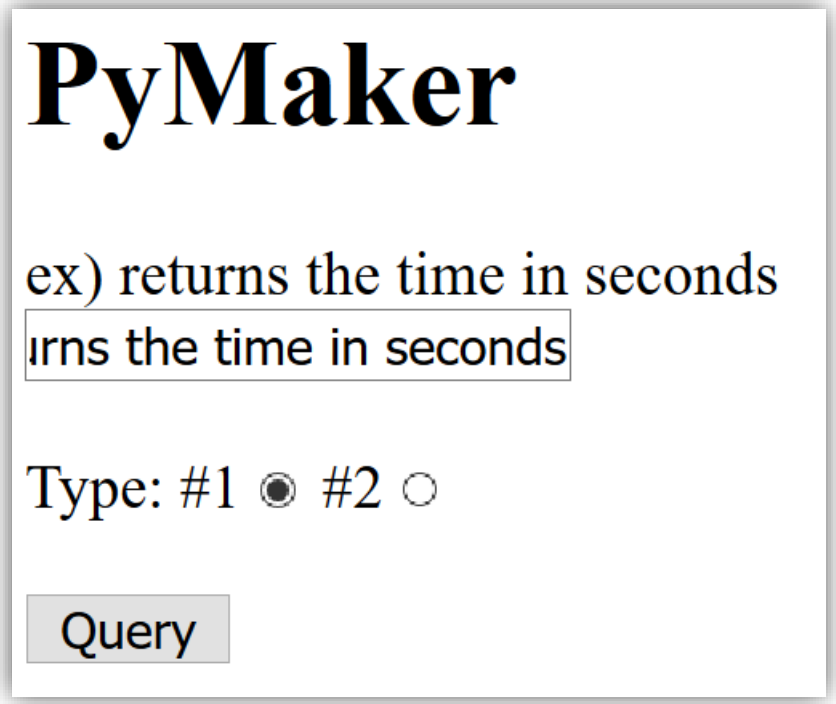
Web Service

- You can run the current version of our document search program at http://13.125.156.35:8000/Query/ (Opened temporarily.)



Web Service

- Result Page

Python Reference to "returns the time in seconds"

- https://docs.python.org/3/library/time.html
- https://docs.python.org/3/library/datetime.html
- https://docs.python.org/3/library/calendar.html
- https://docs.python.org/3/library/sched.html
- https://docs.python.org/3/library/asyncio-queue.html

New Query

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Evaluation

- There are no well-known benchmarks for python.
- So we measured our algorithm's classification accuracy with Stackoverflow Python Q&A Dataset.
- For now, our model successfully classifies **5781 of 41568 (13.9%).**
  - The model gives 5-candidates for each given Question-title sentence.
  - 5 Random selection will show only 1.6% of accuracy.)
- We hope to evaluate the accuracy of other web search engines on this Stackoverflow benchmark.
  - It is hard to gather the result pages of search engines.

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Future Works

- It is too naive to sum word representations to represent document into vector.
  - We'll continue to explore other method for better document-to-vector representation.
- If possible, we'll evaluate our Stackoverflow Q&A benchmark on other search engines.
- We will increase the usability of our Python document search engine.

Summary

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Summary

- Creativity
  - It’s Python Document Search Engine!
  - We made our own benchmark to evaluate this problem.
- Technical Completeness
  - Document classification: Base 1.6% → Our approach 13.9%
- Contribution
  - We publicly open our source codes and data at github.
  - We provide web services to better understand the project.

Q&A

감사합니다