

网络应用程序API的使用

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什么是API?

1.什么是API?

应用程序接口 (Application Programming Interface 简称:API)为: “ ‘电脑操作系统 (Operating system) ’ 或 ‘程序库’ 提供给应用程序调用使用的代码”。其主要目的是让应用程序开发人员得以调用一组例程功能,而无须考虑其底层的源代码为何、或理解其内部工作机制的细节。API本身是抽象的,它仅定义了一个接口,而不涉及应用程序在实际实现过程中的具体操作。

由于近年来软件的规模日益庞大,常常需要把复杂的系统划分成小的组成部分,编程接口的设计十分重要。程序设计的实践中,编程接口的设计首先要使软件系统的职责得到合理划分。良好的接口设计可以降低系统各部分的相互依赖,提高组成单元的内聚性,降低组成单元间的耦合程度,从而提高系统的维护性和扩展性。

API 的一个主要功能是提供通用功能集。程序员通过使用 API函数开发应用程序,从而可以避免编写无用程序,以减轻编程任务。API 同时也是一种中间件,为各种不同平台提供数据共享。

1.什么是API?

以文件操作来解释API

```
f = open("E:\\**.txt", "a+", encoding='utf-8')
```

我们在python中打开一个文件，操作起来很简单，我们调用open()函数来通知操作系统，让操作系统打开一个文件。

对于计算机操作系统来说，打开文件首先要扫描硬盘，找到文件的位置，然后从文件中读取一部分数据，将数据放进I/O缓冲区，放进内存；这些数据都是0、1序列，还要对照ASCII表或Unicode表‘翻译’成字符，再在显示器上显示出来。

操作系统想了一个办法来解决这个问题，它预先把这些复杂的操作写在一个函数里面，编译成一个组件（一般是动态链接库），随操作系统一起发布，并配上说明文档，程序员只需要简单地调用这些函数就可以完成复杂的工作，让编程变得简单有趣。

这些封装好的函数，就叫做API(Application Programming Interface)，即应用程序编程接口。

说得更加通俗易懂一些，别人写好的代码，或者编译好的程序，提供给你使用，就叫做API。你使用了别人代码（或者程序）中的某个函数、类、对象，就叫做使用了某个API。



/02

Web API及scopus实践

2.Web API及scopus实践

web API, 网络应用程序接口。

是前面所讲的API的一种; 是浏览器提供的一套操作浏览器功能和页面元素的API。

它包含了广泛的功能, 网络应用通过API接口, 可以实现存储服务、消息服务、计算服务的能力, 利用这些能力可以进行开发出强大功能的web应用。

简单的说, 就是自己写了一个函数, 将它放到web上, 别人就可以通过web访问你的函数

web api与web service的区别

web api用的是http协议, web service用的是soap协议

web api无状态, 相对web service更轻量级。web api支持如get,post等http操作

2.Web API及scopus实践

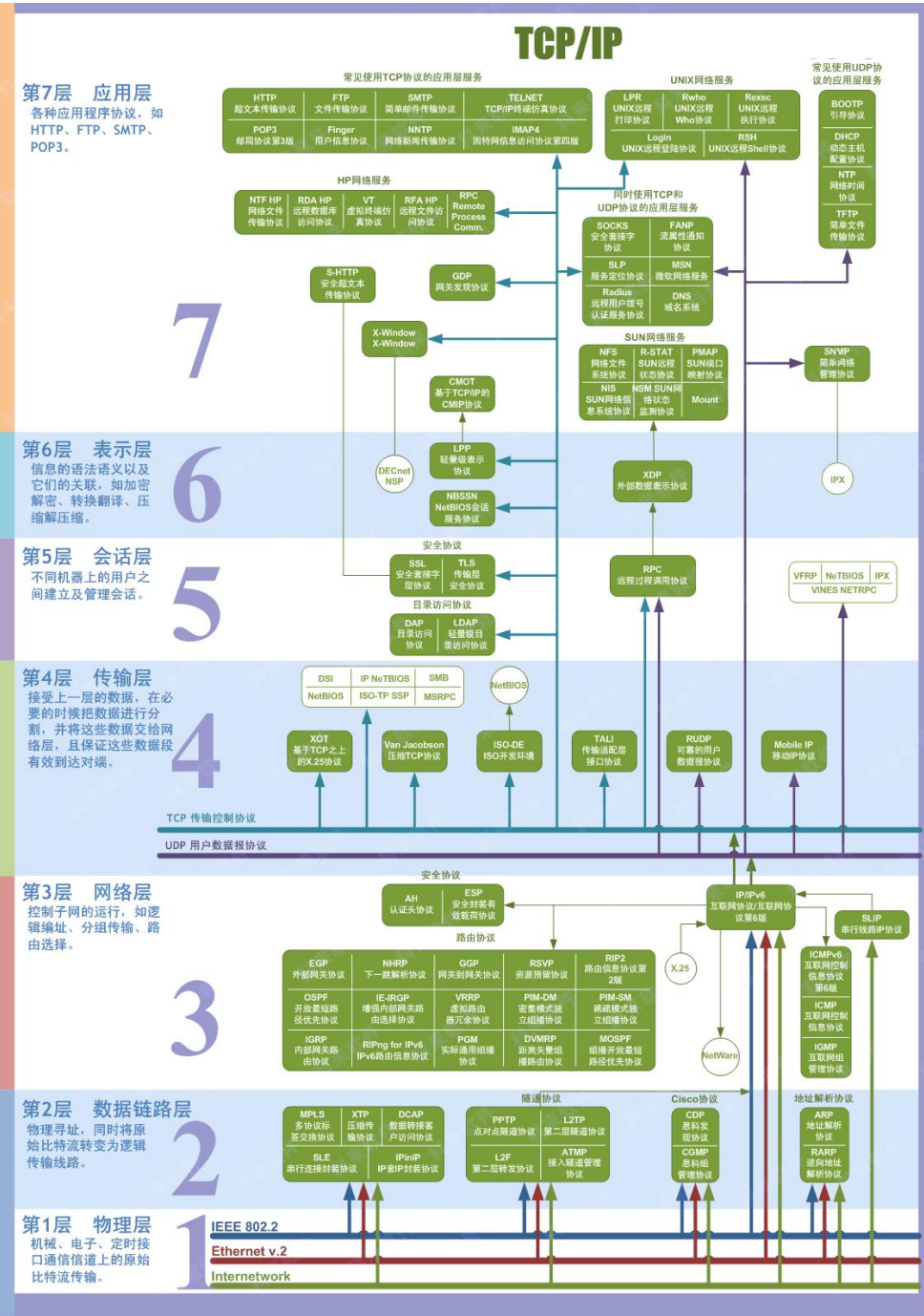
讲到 Web API , 还要涉及到 REST接口

REST是一种架构设计风格, 提供了设计原则和约束条件。而满足这些约束条件和原则的应用程序或设计就是RESTful架构或服务。通过HTTP协议定义的通用动词方法(GET、PUT、DELETE、POST), 以URI对网络资源进行唯一标识, 响应端根据请求端的不同需求, 通过无状态通信, 对其请求的资源进行表述。

RESTful API一般分为对外和对内。对外的RESTful API为面向公网的公共服务接口, 此类接口一般可以通过公网直接访问, 或者经过一定的安全认证后(一般使用OAuth 2)通过公网访问。而对内的RESTful API主要是一套系统内部各个子系统或模块之间交互的标准接口。

2.Web API及scopus实践

OSI中的层	功能	TCP/IP协议族
应用层	文件传输，电子邮件，文件服务，虚拟终端	TFTP, HTTP, SNMP, FTP, SMTP, DNS, Telnet
表示层	数据格式化，代码转换，数据加密	没有协议
会话层	解除或建立与别的接点的联系	没有协议
传输层	提供端对端的接口	TCP, UDP
网络层	为数据包选择路由	IP, ICMP, RIP, OSPF, BGP, IGMP
数据链路层	传输有地址的帧以及错误检测功能	SLIP, CSLIP, PPP, ARP, RARP, MTU
物理层	以二进制数据形式在物理媒体上传输数据	ISO2110, IEEE802, IEEE802.2



2.Web API及scopus实践

web API 的主要功能

1. 支持基于Http verb (GET, POST, PUT, DELETE)的CRUD (create, retrieve, update, delete)操作；通过不同的http动作表达不同的含义，这样就不需要暴露多个API来支持这些基本操作。
2. 请求的回复通过Http Status Code表达不同含义，并且客户端可以通过Accept header来与服务器协商格式，例如你希望服务器返回JSON格式还是XML格式。
3. 请求的回复格式支持 JSON, XML, 并且可以扩展添加其他格式。
4. 原生支持OData。
5. 支持Self-host或者IIS host。
6. 支持大多数MVC功能，例如Routing/Controller/Action Result/Filter/Model Builder/IOC Container/Dependency Injection。

2.Web API及scopus实践

一个完整的web api请求基本由这几个方面构成

请求地址：URL

请求方式：POST | GET | ...

请求参数：Param

返回结果：resp

另外，很重要的一点是进行web api

要安装requests库

请求一般需要 api key（密钥）；只有拥有密钥，web api 请求才能完成

使用web api 需要找到所使用的服务的网站给定的说明

才能够找到请求地址，请求方式，请求参数，以及会给你什么返回结果

2.Web API及scopus实践

首先, 进入 dev.elsevier.com
要使用web api 必须得有一个 key
(我就跳过了)

接下来进入
API Specification

Elsevier Developers

[My API key](#) [API Specification](#) [Interactive APIs](#) [How to Guides](#) [FAQ](#)

NOTICE: The legacy ScienceDirect Search API has been deprecated. Please see our [migration guide](#) . [Article Metadata API](#) now available.

Get started today!

Elsevier's API program allows you to integrate content and data from Elsevier products into your own website and applications. [Learn more...](#)

1. Look at use cases >
2. Get API Key > [Default API key settings](#)
3. Start coding > Check out our [Python SDK](#), the [Interactive APIs](#) and the [How to Guides](#)

如何获取API Key

这里是官方给的如何用python调用api服务的一个参考

Product APIs

- [About APIs >](#)
- [Scopus APIs >](#)
- [ScienceDirect APIs >](#)
- [SciVal API >](#)
- [Engineering Village APIs >](#)
- [Embase APIs >](#)
- [Geofacets APIs >](#)
- [SUSHI COP5 API >](#)

2.Web API及scopus实践

API Specification
里面列举了他的一系列api服务

我在实践中用了
Affiliation Retrieval

检索隶属特定机构的所有文献

Elsevier Developers

My API key

API Specification

Interactive APIs

How to Guides

FAQ

API Interface Specification

Interactive/swagger APIs are available [here](#)

General Purpose APIs

Authentication API

Product Specific APIs

ScienceDirect APIs	Scopus APIs	Engineering Village APIs	Embase APIs	SciVal API
ScienceDirect Search V2 [Search Tips] Article Metadata [Search Tips]	Affiliation Search [Search Tips] Author Search [Search Tips] Scopus Search [Search Tips]	Engineering Village Search API	EMBASE Search	SciVal Author Lookup SciVal Country Lookup SciVal Country Group Lookup SciVal Institution Lookup SciVal Institution Group Lookup SciVal Subject Area SciVal Topic Lookup SciVal Topic Cluster Lookup SciVal World Lookup
Article Retrieval Article Entitlement Retrieval Article Hosting Permission API Object Retrieval	Abstract Retrieval Affiliation Retrieval Author Retrieval	Engineering Village Retrieval API	EMBASE Retrieval	
Serial Title Metadata Nonserial Title Metadata Subject Classifications	Citations Count Metadata Citations Overview PlumX Metrics Serial Title Metadata Subject Classifications			
Holdings Report	Author Feedback			
PharmaPendium API		Geofacets API	SUSHI API	
Activity Services Chemistry Services Documents Services Efficacy Services FAERS Services Metabolizing Enzymes Services Pharmacokinetic Services Safety Services		Geofacets Search	SUSHI COPS API	



隶属关系查询

2.Web API及scopus实践

Content Affiliation Retrieval API

可以看到这个api服务可以通过
affiliation_id或者eid
检索制定机构的文献资源

我使用的是affiliation_id
在scopus的检索页面检索机构得到
农大的affiliation_id: 60013551

如此便可以构造 请求地址:
address='https://api.elsevier.com/content/af
filiation/affiliation_id/60013551'

请求方式 get

my library | my representation | my institution | my list of queries

Content Affiliation Retrieval API

This represents the interface to retrieve a SCOPUS Affiliation Profile. The response can contain links to [Scopus Search](#) and [Author Profiles](#). The affiliation profiles are indexed and can be searched using [Affiliation Search API](#).

Schemas for the 'institution-profile' element of the full affiliation profile can be found at <https://schema.elsevier.com/dtds/document/profile/>.

The following chart shows the Affiliation Retrieval Views.

Summary	api服务地址 (url)	请求方式	简要的描述
Resource	https://api.elsevier.com/content/affiliation/affiliation_id/{affiliation_id}	GET	Affiliation Retrieval API: This represents retrieval of a SCOPUS Affiliation Profile by unique Affiliation ID.
	https://api.elsevier.com/content/affiliation/eid/{eid}	GET	Affiliation Retrieval API: This represents retrieval of a SCOPUS Affiliation Profile by EID (Electronic Identifier).

2.Web API及scopus实践

Content Affiliation Retrieval API

接下来阅读详细说明如何构造param

根据这说明页面构建了

```
param = {'apiKey': key, 'httpAccept':  
'application/json', 'startref': start,  
'refcount':count, 'view':  
'DOCUMENTS'}
```

query params		
httpAccept	xsd:string options: text/xml, application/xml, application/json, application/rdf+xml	Override for HTTP header Accept, this represents the acceptable mime types for which the response can be generated.
		这个参数代表返回的是什么的返回结果
access_token	xsd:string	Override for HTTP header Authorization, this contains the OAuth bearer access token, where the format of the field is "<token>" (where the token represents the end-user session key). The presence of a bearer token implies the request will be executed against user-based entitlements.
insttoken	xsd:string	Override for HTTP header X-ELS-Insttoken, this represents a institution token. If provided, this key (in combination with its associated APIKey) is used to establish the credentials needed to access content in this resource.
apiKey	xsd:string	Override for HTTP header X-ELS-APIKey, this represents a unique application developer key providing access to resource.
reqId	xsd:string	Override for HTTP header X-ELS-ReqId, this is a client-defined request identifier, which will be logged in all trace messages of the service. This identifier can be used to track a specific transaction in the service's message logs. Note that this should be a unique identifier for the client, and used to track a single transaction.
ver	xsd:string	Override for HTTP header X-ELS-ResourceVersion, this represents the version of the resource that should be received.
view	xsd:string default: LIGHT options: LIGHT, STANDARD, DOCUMENTS, AUTHORS, ENTITLED	Use which view, I flipped after I felt it should be returning which content This alias represents the list of elements that will be returned in the response.
		使用哪种视图，我翻开之后觉得应该是返回哪种内容
field	xsd:string	The following chart shows the Affiliation Retrieval Views. This alias represents the name of specific fields that should be returned. The list of fields include all of the fields returned in the response payload (see view). Multiple fields can be specified, delimited by commas. Note that this is cannot be used in conjunction with responses associated with the specific views DOCUMENTS and AUTHORS. ex. field=url,identifier,description Numeric value representing the results offset: (i.e. starting position for the search results). The maximum for this value is a system-level default (varies with search cluster) minus the number of results requested. If not specified the offset will be set to zero (i.e. first search result)
		对view的详细介绍
startref	xsd:string	
		查询的起始记录
refcount	xsd:string	ex. startref=5 Numeric value representing the maximum number of results to be returned for the search. If not provided this will be set to a system default based on service level. In addition the number cannot exceed the maximum system default - if it does an error will be returned.
		每次返回多少个结果，最大值500（我尝试的结果）

2.Web API及scopus实践

Content Affiliation Retrieval API

Affiliation Retrieval Views.
对不同view选择返回的内容作了介绍
选择了 view=DOCUMENTS

Affiliation Retrieval Views

Access to views or fields marked with an * may be restricted due to entitlements

Field	Field Definition	BASIC	LIGHT	STANDARD
link ref=scopus-affiliation	Scopus details URL			
link ref=self	Content Affiliation Retrieval URI for affiliation			
prism:url	Content Affiliation Retrieval URI for affiliation			
dc:identifier	Affiliation identifier			
eid	Electronic ID			
link ref=search	Content Search for the document results affiliation			
affiliation-name	Affiliation name			
name-variant	Name variant			
address	Street address			
city	City			
country	Country			
author-count	# of authors			
document-count	# of documents			
institution-profile	Original text			

The DOCUMENTS view contains the following elements for each abstract-document returned.	
Field	Description
prism:url	Content Abstract Retrieval API URI
dc:title	Article Title
prism:aggregationType	Document Type, using label
prism:publicationName	Source Title
prism:issn	ISSN
prism:volume	Volume
prism:issueIdentifier	Issue
prism:pageRange	Page
prism:coverDate	Publication Date
prism:coverDisplayDate	Publication Date
dc:identifier	Scopus ID
eid	Electronic ID
prism:doi	DOI
dc:creator	Author
affiliation	Affiliation
affilname	Affiliation name
affiliation-url	Affiliation URL
afid	Affiliation ID
author	Author
authseq	Author sequence
author-url	Author URL
authid	Author ID
authname	Author name
orcid	ORCID
given-name	Given name
surname	Surname
initials	Initials
afid	Affiliation ID
Links	
link ref=self	Content Affiliation Retrieval URI for affiliation
link ref=scopus	Scopus details URL
link ref=scopus-citedby	Scopus cited by URL

The AUTHORS view contains the following elements for each author-document returned.	
Field	Description
dc:identifier	Author ID
eid	Electronic ID
preferred-name	Preferred Author last name
surname	Preferred Author last name
preferred-name	Preferred Author first name
given-name	Preferred Author first name
preferred-name	Author initials
initials	Author initials
name-variant	Author name variants (Maximum of 3)
affiliation-current	Current affiliations name
affiliation-name	Current affiliations name
affiliation-current	City
affiliation-city	City
affiliation-current	Country
affiliation-country	Country
affiliation-current	Affiliation ID
affiliation-url	Affiliation ID
affiliation-id	Affiliation ID
affiliation-history	Historical affiliations name
affiliation-name	Historical affiliations name
affiliation-history	Affiliation ID
affiliation-url	Affiliation ID
affiliation-id	Affiliation ID

2.Web API及scopus实践

至此，我们可以构建一个完成的api请求
此外，我们选择的是返回json格式
因此我们需要导入json库

```
key='123456789987654321'  
address='https://api.elsevier.com/content/affiliation/affiliation_id/60013551'
```

```
param = {'apiKey': key, 'httpAccept':  
'application/json', 'startref': 1,  
'refcount':25, 'view': 'DOCUMENTS'}  
response  
=requests.get(address,params=param)  
data= response.json()  
print(data)
```

```
In [2]: import json  
import requests  
from dotenv import load_dotenv  
import os  
  
load_dotenv()  
key=os.getenv('key')  
address='https://api.elsevier.com/content/affiliation/affiliation_id/60013551'  
  
param = {'apiKey': key, 'httpAccept': 'application/json', 'startref': 1, 'refcount':25, 'view': 'DOCUMENTS'}  
response = requests.get(address,params=param)  
data= response.json()  
print(data)  
  
{  
  'affiliation-retrieval-response': {  
    'coredata': {  
      'prism:url': 'https://api.elsevier.com/content/affiliation/affiliation_id/60013551',  
      'dc:identifier': 'AFFILIATION_ID:60013551',  
      'eid': '10-s2.0-60013551',  
      'link': [{  
        '@href': 'https://api.elsevier.com/content/affiliation/affiliation_id/60013551',  
        '@rel': 'self'},  
        {  
          '@href': 'https://api.elsevier.com/content/search/scopus?query=af-id%2860013551%29',  
          '@rel': 'search'},  
        {  
          '@href': 'https://www.scopus.com/affil/profile.uri?afid=60013551&partnerID=Hz0xMe3b&origin=inward',  
          '@rel': 'scopus-affiliation'}}],  
      'documents': {  
        '@start': '1',  
        '@count': '25',  
        '@total': '40752',  
        'abstract-document': [{  
          '@_fa': 'true',  
          'link': [{  
            '@href': 'https://api.elsevier.com/content/abstract/scopus_id/0000029968',  
            '@rel': 'self'},  
            {  
              '@href': 'https://www.scopus.com/inward/record.uri?partnerID=Hz0xMe3b&scp=0000029968&origin=inward',  
              '@rel': 'scopus'},  
            {  
              '@href': 'https://www.scopus.com/inward/citedby.uri?partnerID=Hz0xMe3b&scp=0000029968&origin=inward',  
              '@rel': 'scopus-citedby'}],  
          'prism:url': 'https://api.elsevier.com/content/abstract/scopus_id/0000029968',  
          'dc:identifier': 'SCOPUS_ID:0000029968',  
          'eid': '2-s2.0-0000029968',  
          'dc:title': 'A fluorescence quenching method for the determination of nitrite with indole',  
          'prism:publicationName': 'Microchemical Journal',  
          'prism:issn': '0026265X',  
          'prism:volume': '62',  
          'prism:issueIdentifier': '3',  
          'prism:pageRange': '371-376',  
          'prism:coverDate': '1999-12-01',  
          'prism:coverDisplayDate': '1999',  
          'prism:doi': '10.1006/mchj.1999.1746',  
          'prism:aggregationType': 'Journal',  
          'openaccess': '0',  
          'openAccessFlag': False,  
          'dc:creator': 'Jie, N.',  
          'affiliation': [{  
            '@_fa': 'true',  
            'affiliation-url': 'https://api.elsevier.com/content/affiliation/affiliation_id/60031031',  
            'afid': '60031031',  
            'affilname': 'Department of ChemistryShandong UniversityJinanChina'},  
            {  
              '@_fa': 'true',  
              'affiliation-url': 'https://api.elsevier.com/content/affiliation/affiliation_id/60010689',  
              'afid': '60010689',  
              'affilname': 'Reserch Center for Eco-Environmental ScienceChinese Academy of ScienceBeijingChina'},  
            {  
              '@_fa': 'true',  
              'affiliation-url': 'https://api.elsevier.com/content/affiliation/affiliation_id/107126229',  
              'afid': '107126229',  
              'affilname': 'Institute of Science and Technology Information of ChinaBeijingChina'},  
            {  
              '@_fa': 'true',  
              'affiliation-url': 'https://api.elsevier.com/content/affiliation/affiliation_id/60013551',  
              'afid': '60013551',  
              'affilname': 'College of Basic Science and TechnologyChina Agricultural Univer
```

2.Web API及scopus实践

大家可以发现我们返回的是一个json格式的结果，很不方便阅读

大家可以将返回的结果，复制到一些在线的json格式美化网站上进行格式调整

如: <http://json.cn/>

然后就可以比较流畅的阅读

方便我们进行json格式的数据处理
json是由看起来是由字典{}和列表[]构成的

所以我们用

```
data['affiliation-retrieval-  
response']['documents']['abstract-  
document'][i]['prism:url']
```

这种方式就能找到指定的信息

[在线Json格式化](#)、[在线格式化Json代码](#)、[Json代码美化器](#)、[Json在线压缩](#)、[Json \uxxxx格式解码](#)

Json代码进行美化、格式化、检查Json错误。也可以进行Json代码压缩处理,提供Json Unicode转换为对应字符! ! 将json \uxxxx类, 格式化相应的中文字符串! Json



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打开

待格式化JSON代码:

```

    'true', 'authseq': '3', 'author-url': 'https://api.elsevier.com/content/author/author_id/7201374161', 'authid': '7201374161', 'authname': 'Yuan, M.', 'give
    'true', '$': '60013551']]]], ['@fa': 'true', 'link': [['@href': 'https://api.elsevier.com/content/abstract/scopus_id/0034480408', 'href': 'self'], 'partnerID=HxzmXe3&scsp=0034480408&origin=inward', '@rel': 'scopus'], '@href': 'https://www.scopus.com/inward/citedby.url?partnerID=HxzmXe3&scsp=0034480408
    'https://api.elsevier.com/content/abstract/scopus_id/0034480408', 'dc:identifier': 'SCOPUS_ID:0034480408', 'dc:': 's-2-s-0-0034480408', 'dc:title': 'The path
    (Zea mays)', 'prism:publicationName': 'Chinese Science Bulletin', 'prism:issn': '10016538', 'prism:volume': '45', 'prism:issueIdentifier': '19', 'prism:pag
    'prism:coverDisplayDate': '2000', 'prism:doi': '10.1007/BF02896268', 'prism:aggregationType': 'Journal', 'openaccess': '0', 'openAccessFlag': False, 'dc:cre
    'https://api.elsevier.com/content/affiliation/affiliation_id/60013551', 'afid': '60013551', 'affilname': 'Department of Plant Genetics and Breeding China Agri
    'url': 'https://api.elsevier.com/content/affiliation/affiliation_id/60019499', 'afid': '60019499', 'affilname': 'Laboratory of Plant Genetics and Development
    Sciences Beijing 100080 China', 'authors': ['author': [['@fa': 'true', 'authseq': '1', 'author-url': 'https://api.elsevier.com/content/author/author_id/571
    'Zhihuan', 'surname': 'Gao', 'initials': 'Z.', 'afid': [['@fa': 'true', '$': '60013551']]], ['@fa': 'true', 'authseq': '1', 'author-url': 'https://api.els
    'authname': 'Gao, Z.', 'givenname': 'Zhihuan', 'surname': 'Gao', 'initials': 'Z.', 'afid': [['@fa': 'true', '$': '60019499']]], ['@fa': 'true', 'authseq'
    'https://api.elsevier.com/content/author/author_id/7402270589', 'authid': '7402270589', 'authname': 'Xue, Y.', 'givenname': 'Yongbiao', 'surname': 'Xue',
    'true', 'authseq': '3', 'author-url': 'https://api.elsevier.com/content/author/author_id/25937878000', 'authid': '25937878000', 'authname': 'Dai, J.', 'give
    'true', '$': '60013551']]]], ['@fa': 'true', 'link': [['@href': 'https://api.elsevier.com/content/abstract/scopus_id/0034480814', 'href': 'self'], 'partnerID=HxzmXe3&scsp=0034480814&origin=inward', '@rel': 'scopus'], '@href': 'https://www.scopus.com/inward/citedby.url?partnerID=HxzmXe3&scsp=0034480814

```

！将你电脑文件直接拖入试试^_^

JSON格式化&美化

检查&压缩JSON

格式化后的JSON代码:

```
{
  'affiliation-retrieval-response': {
    'coredata': {
      'prism:url': 'https://api.elsevier.com/content/affiliation/affiliation_id/60013551',
      'dc:identifier': 'AFFILIATION_ID: 60013551',
      'eid': '10-s2.0-60013551',
      'link': [
        {
          '@href': 'https://api.elsevier.com/content/affiliation/affiliation_id/60013551',
          '@rel': 'self'
        },
        {
          '@href': 'https://api.elsevier.com/content/search/scopus?query=af-id%2860013551%29',
          '@rel': 'search'
        }
      ]
    }
  }
}
```

2.Web API及scopus实践

我使用 scopus api的服务将属于农大的4万多条数据下载下来
对其中的
url,title,document_type,sourcource_title,issn,page,scopus_id,electronic_id,doi,firstauthor,pub_date
进行了提取， 汇集得到如下图所示的结果

A	B	C	D	E	F	G	H	I	J	K	L	
	url	title	document_type	sourcource_title	issn	page	scopus_id	electronic_id	doi	firstauthor	pub_date	
0	https://e	A fluor	Journal	Microchemical Jour	0026265X	371-376	SCOPUS_ID:0000029968	2-s2.0-000002996	10.1006/mch	Jie, N.	1999-12-01	
1	https://e	Enviror	Journal	Journal of Agricul	00218634	273-283	SCOPUS_ID:0000046479	2-s2.0-000004647	10.1006/jae	McGechan, M. B.	1998-12-01	
2	https://e	Transfe	Journal	Science in China	(1001652X	817-824	SCOPUS_ID:0000144516	2-s2.0-000014451		Wang, G.	1995-07-01	
3	https://e	Effects	Journal	Journal of Plant N	15324087	675-685	SCOPUS_ID:0000157282	2-s2.0-000015728	10.1080/019	Han, Z.	1989-12-01	
4	https://e	Immunoc	Journal	Progress in Natura	10020071	232-233	SCOPUS_ID:0000168555	2-s2.0-000016855		Ren, D.	1999-12-01	
5	https://e	Distrib	Journal	Acta Botanica Sini	05777496	890-894	SCOPUS_ID:0000190924	2-s2.0-000019092		Li, Y.	1998-12-01	
6	https://e	Nicotir	Journal	Science in China,	10069305	650-656	SCOPUS_ID:0000200390	2-s2.0-000020039	10.1007/BF0	Wang, H.	1998-12-01	
7	https://e	Identif	Journal	Acta Botanica Sini	05777496	1303-1306	SCOPUS_ID:0000208615	2-s2.0-000020861		Zhao, H. -P.	1999-12-01	
8	https://e	Ultrast	Journal	Acta Botanica Sini	05777496	389-396	SCOPUS_ID:0000221772	2-s2.0-000022177		Zhang, D. -P.	1997-12-01	
9	https://e	Purific	Journal	Plant Physiology	00320889	1151-1155	SCOPUS_ID:0000263006	2-s2.0-000026300	10.1104/pp.	Liu, X.	1992-12-01	
10	https://e	Diaster	Journal	Journal of Organic	15206904	7364-7365	SCOPUS_ID:0000325499	2-s2.0-000032549	10.1021/jo0	Wang, M.	1995-11-01	
11	https://e	Nosema	Journal	Journal of Inverte	10960805	211-218	SCOPUS_ID:0000469880	2-s2.0-000046988	10.1016/002	Wang, L. -Y.	1991-12-01	
12	https://e	Regulat	Journal	Chinese Science Bu	10016538	919-923	SCOPUS_ID:0000491769	2-s2.0-000049176	10.1007/BF0	Zhou, X.	1999-12-01	
13	https://e	Rice tr	Journal	Chinese Science Bu	10016538	1810-1815	SCOPUS_ID:0000636867	2-s2.0-000063686	10.1007/BF0	Fu, Y.	1998-12-01	
14	https://e	Role of	Journal	Plant Physiology	00320889	1302-1305	SCOPUS_ID:0000648190	2-s2.0-000064819	10.1104/pp.	Zhang, F. -S.	1991-12-01	
15	https://e	Actin e	Journal	Chinese Science Bu	10016538	690-694	SCOPUS_ID:0000681709	2-s2.0-000068170	10.1007/BF0	Ren, D.	1998-12-01	
16	https://e	Extensi	Journal	Acta Botanica Sini	05777496	364-368	SCOPUS_ID:0000702796	2-s2.0-000070279		Wang, H. -B.	1999-04-01	
17	https://e	Identif	Journal	Chinese Science Bu	10016538	1864-1872	SCOPUS_ID:0000730048	2-s2.0-000073004	10.1007/BF0	Wang, X.	1998-12-01	



/03

环境变量的管理

3.环境变量

在请求web api服务的过程中
我们需要提交：

请求地址：URL

请求方式：POST | GET | ...

请求参数：Param

返回结果：resp

在请求参数中Param，我们需要用到密钥

```
key='12das16468a4sda51c6a18s4d'
```

如果只是自己使用，那么我们可以放心的将密码放在自己的程序里

但是在工作中，我们可能会面临将程序分享出去，比如分享到Github

这个时候我们就要注意我们的密钥或者敏感信息了

此时就可以用到环境变量来进行管理了

3.环境变量

环境变量是在操作系统中一个具有特定名字的对象，它包含了一个或者多个应用程序所将使用到的信息。

例如Windows和DOS操作系统中的path环境变量，当要求系统运行一个程序而没有告诉它程序所在的完整路径时，系统除了在当前目录下面寻找此程序外，还应到path中指定的路径去找。用户通过设置环境变量，来更好的运行进程。

环境变量也可以运用于管理我们的前面提到的 API Key

还可以运用于任何需要改动或者从外部应用可以访问的东西

比如当我们连接到数据库的时候，需要有数据库的连接字符串，但是当数据库改变了地址或者重命名的时候；我们想要能够改变这些值而不需要回到程序中更新

这个时候就要用到环境变量

3.环境变量

读取环境变量 一般要用到 OS 库,调用其 getenv函数

```
import os
os_version=os.getenv('os')
print(os_version)
```

Windows_NT

```
In [2]: import os
os_version=os.getenv('os')
print(os_version)
```

Windows_NT

使用os库能够读取所有系统或者用户的环境变量

但是除了读取环境变量，我们还需要设置比如密钥等敏感信息

这时候我们可以用到 dotenv这个包，这个包基本在所有的编程环境中都有，python中 我安装的是 python-dotenv

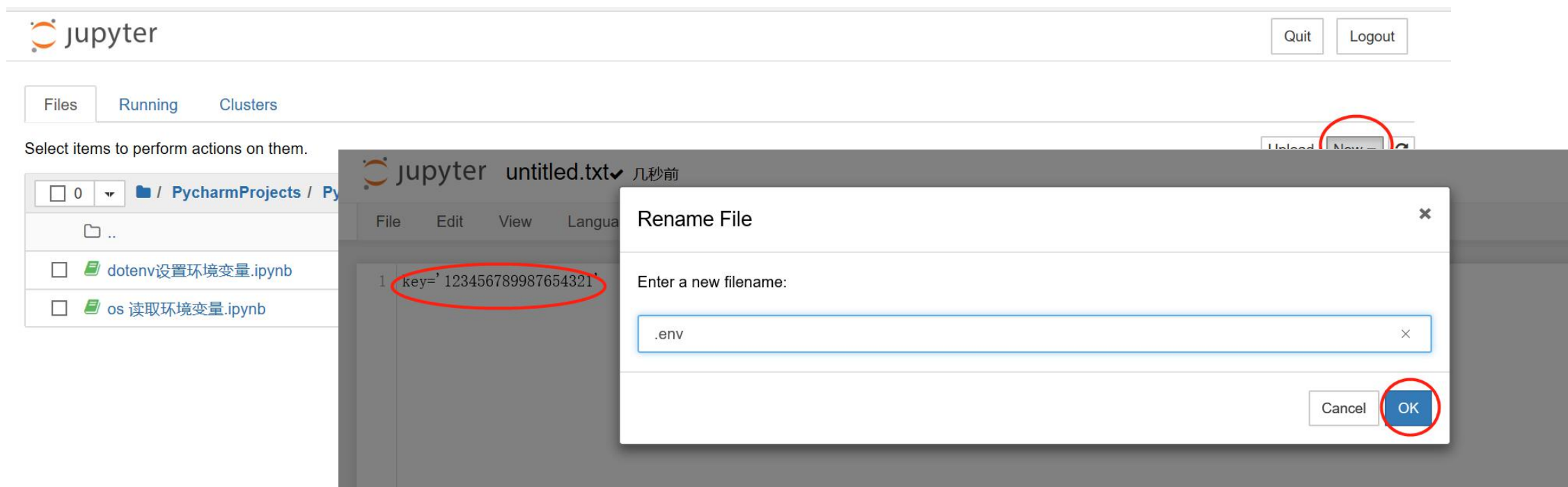
3.环境变量

使用dotenv这个包管理环境变量

一般情况下，我们要先创建一个 .env文件;可以在jupyter或者pycharm里创建

#.env file

在.env文件中我们需要输入我们的 key;比如
key='123456789987654321'



3.环境变量

随后在我们的应用程序里就可以运用 os 和 dotenv包读取key了

```
from dotenv import load_dotenv
import os
load_dotenv()
key=os.getenv('key')
print(key)
```

123456789987654321

此外，还需要创建一个 .gitignore文件
在里面写入 .env

作用是在使用git管理代码的时候
不会将.env文件发布出去，造成key泄露



The image shows a JupyterLab interface. At the top, there's a header with the Jupyter logo, the text "jupyter", and "dotenv设置环境变量 Last Checkpoint: 5 分钟前 (autosaved)". Below the header is a menu bar with "File", "Edit", "View", "Insert", "Cell", "Kernel", "Widgets", and "Help". Under the menu bar is a toolbar with icons for saving, adding, deleting, copying, pasting, navigating, running, and a dropdown menu currently set to "Code". The main area contains a code cell with the following Python code:

```
In [2]: from dotenv import load_dotenv
import os
load_dotenv()
key=os.getenv('key')
print(key)
```

Below the code cell, the output is displayed: 123456789987654321

3.环境变量

最后，我们将环境变量的设置应用于web api的服务请求中

就可以不在代码中出现我们的 API key

当API key 需要更改的时候，我们直接从.env文件里更改就可以了

提高了API key的安全性

```
In [2]: import json
import requests
from dotenv import load_dotenv
import os

load_dotenv()
key=os.getenv('key')
address='https://api.elsevier.com/content/affiliation/affiliation_id/60013551'

param = {'apiKey': key, 'httpAccept': 'application/json', 'startref': 1, 'refcount':25, 'view': 'DOCUMENTS'}
response = requests.get(address,params=param)
data= response.json()
print(data)

{'affiliation-retrieval-response': {'coredata': {'prism:url': 'https://api.elsevier.com/content/affiliation/affiliation_id/60013551', 'dc:
identifier': 'AFFILIATION_ID:60013551', 'eid': '10-s2.0-60013551', 'link': [{'@href': 'https://api.elsevier.com/content/affiliation/affili
ation_id/60013551', '@rel': 'self'}, {'@href': 'https://api.elsevier.com/content/search/scopus?query=af-id%2860013551%29', '@rel': 'search
h'}, {'@href': 'https://www.scopus.com/affil/profile.uri?afid=60013551&partnerID=HzOxMe3b&origin=inward', '@rel': 'scopus-affiliation'}]},
'documents': {'@start': '1', '@count': '25', '@total': '40752', 'abstract-document': [{'@_fa': 'true', 'link': [{'@href': 'https://api.els
evier.com/content/abstract/scopus_id/0000029968', '@rel': 'self'}, {'@href': 'https://www.scopus.com/inward/record.uri?partnerID=HzOxMe3b&
scp=0000029968&origin=inward', '@rel': 'scopus'}, {'@href': 'https://www.scopus.com/inward/citedby.uri?partnerID=HzOxMe3b&scp=0000029968&o
rigin=inward', '@rel': 'scopus-citedby'}]}, 'prism:url': 'https://api.elsevier.com/content/abstract/scopus_id/0000029968', 'dc:identifier':
'SCOPUS_ID:0000029968', 'eid': '2-s2.0-0000029968', 'dc:title': 'A fluorescence quenching method for the determination of nitrite with ind
ole', 'prism:publicationName': 'Microchemical Journal', 'prism:issn': '0026265X', 'prism:volume': '62', 'prism:issueIdentifier': '3', 'pri
sm:pageRange': '371-376', 'prism:coverDate': '1999-12-01', 'prism:coverDisplayDate': '1999', 'prism:doi': '10.1006/mchj.1999.1746', 'pris
m:aggregationType': 'Journal', 'openaccess': '0', 'openAccessFlag': False, 'dc:creator': 'Jie, N.', 'affiliation': [{'@_fa': 'true', 'affi
liation-url': 'https://api.elsevier.com/content/affiliation/affiliation_id/60031031', 'afid': '60031031', 'affilname': 'Department of Chem
istryShandong UniversityJinanChina'}, {'@_fa': 'true', 'affiliation-url': 'https://api.elsevier.com/content/affiliation/affiliation_id/600
10689', 'afid': '60010689', 'affilname': 'Reserch Center for Eco-Environmental ScienceChinese Academy of ScienceBeijingChina'}, {'@_fa':
'true', 'affiliation-url': 'https://api.elsevier.com/content/affiliation/affiliation_id/107126229', 'afid': '107126229', 'affilname': 'Ins
titute of Science and Technology Information of ChinaBeijingChina'}, {'@_fa': 'true', 'affiliation-url': 'https://api.elsevier.com/conten
t/affiliation/affiliation_id/60013551', 'afid': '60013551', 'affilname': 'College of Basic Science and TechnologyChina Agricultural Univer
```

The background features a light blue grid of thin lines with small dots at the intersections, creating a perspective effect that recedes into the distance. Overlaid on this grid are several translucent, light blue geometric shapes, including triangles and polygons, which add depth and a modern, architectural feel to the design.

Thanks