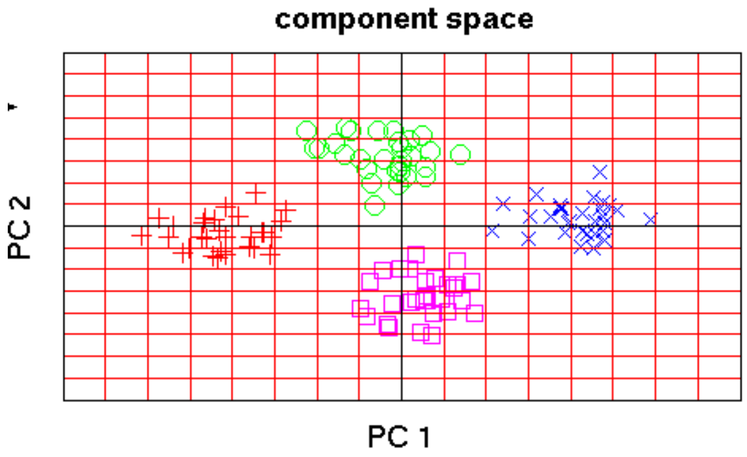
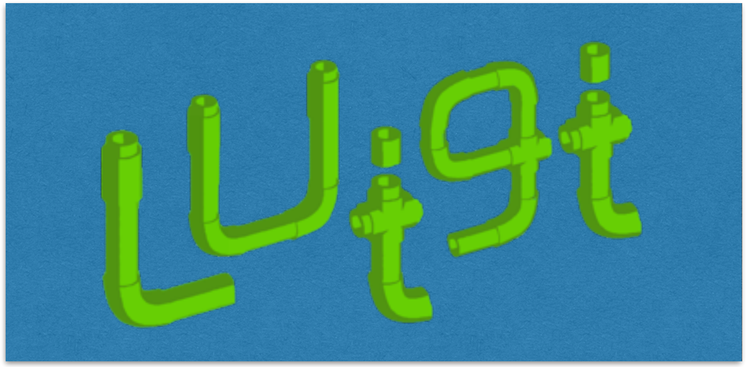
- **Introduction of Luigi**
  - **Digital Analysis Tasks**
  - **Example**

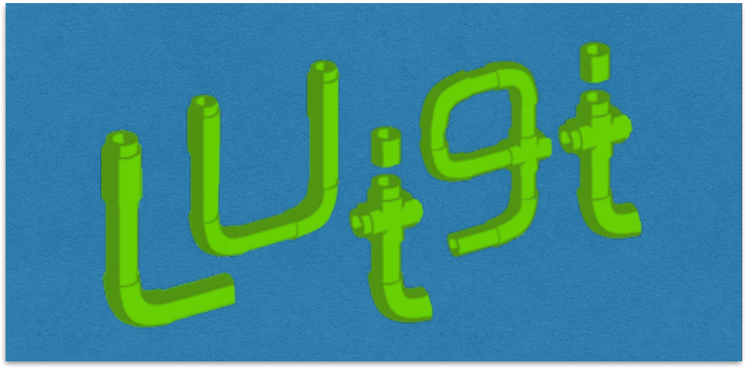


- **Introduction of PCA**
  - **Basic Introduction**
  - **hands on**

LLM
Tit



- Spotify
- 複雜批次處理任務管理系統
- 任務依賴管理、工作流管理、任務可視化...
- 需要依賴於外部的調度器來觸發工作流:crontab



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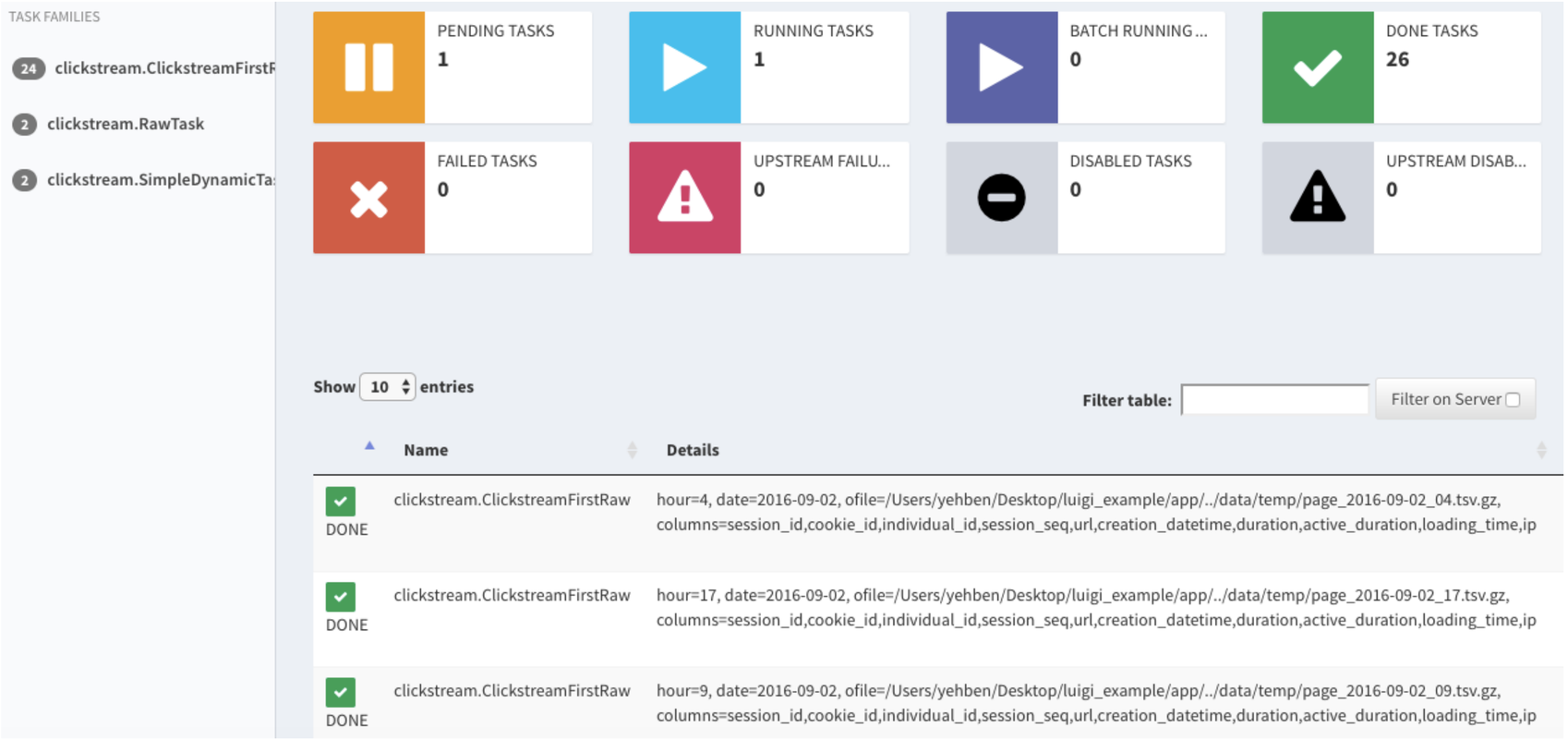
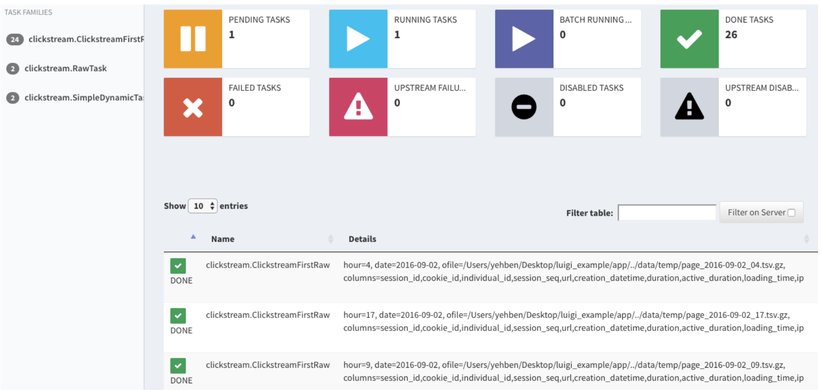
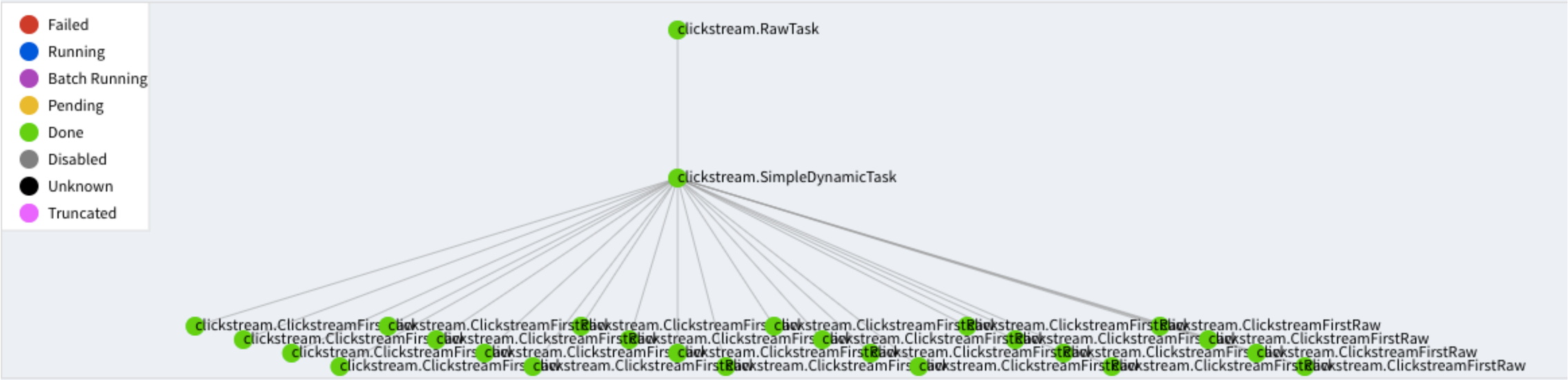




- Spotify
- 複雜批次處理任務管理系統
- 任務依賴管理、工作流管理、任務可視化、錯誤故障處理機制
- 需要依賴於外部的調度器來觸發工作流:crontab

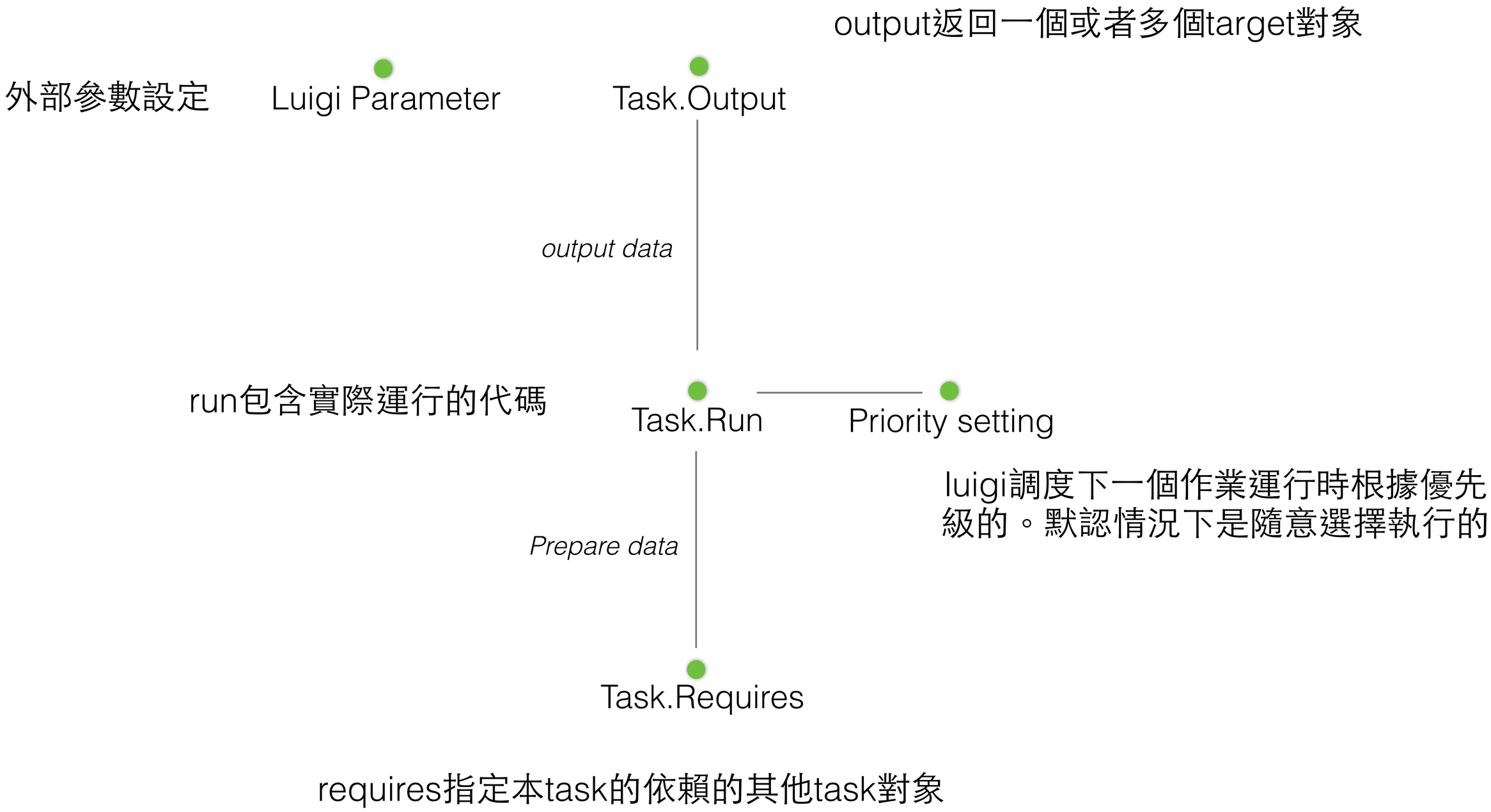



Task.Output
output data
Task.Run
Prepare data
Task.Requires

output返回一個或者多個target對象

run包含實際運行的代碼

requires指定本task的依賴的其他task對象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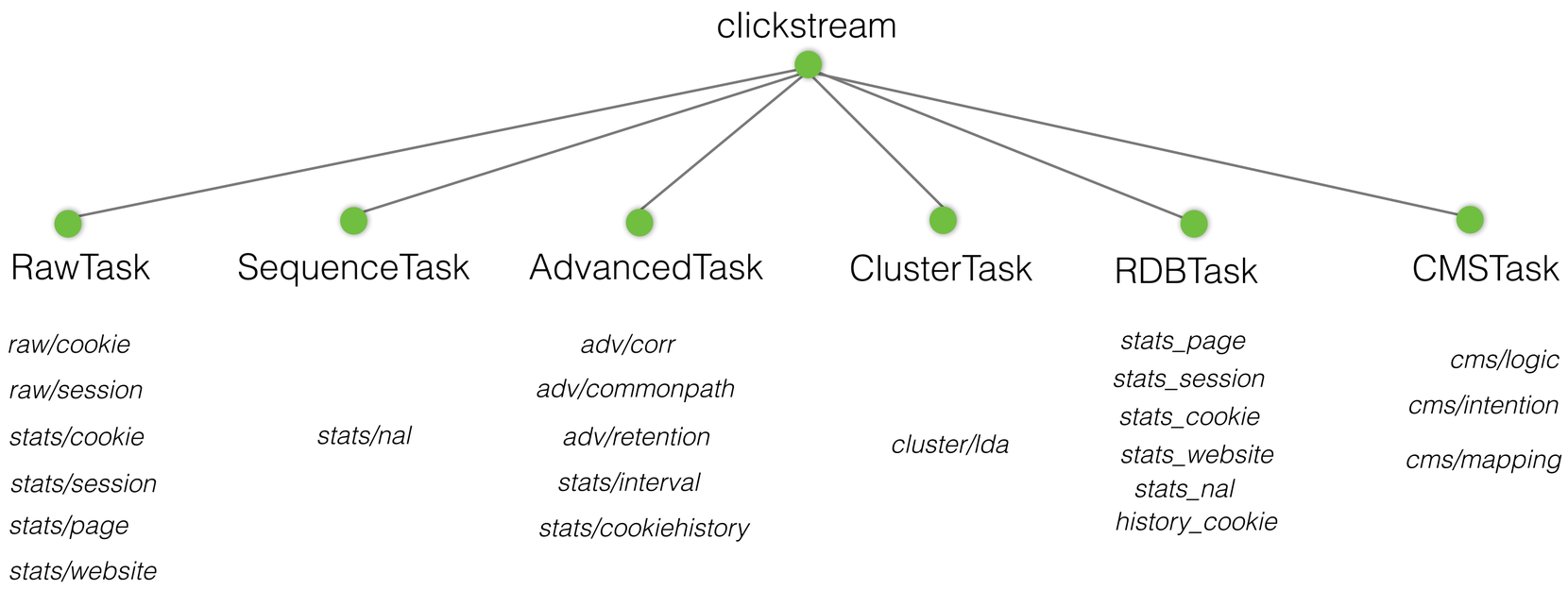
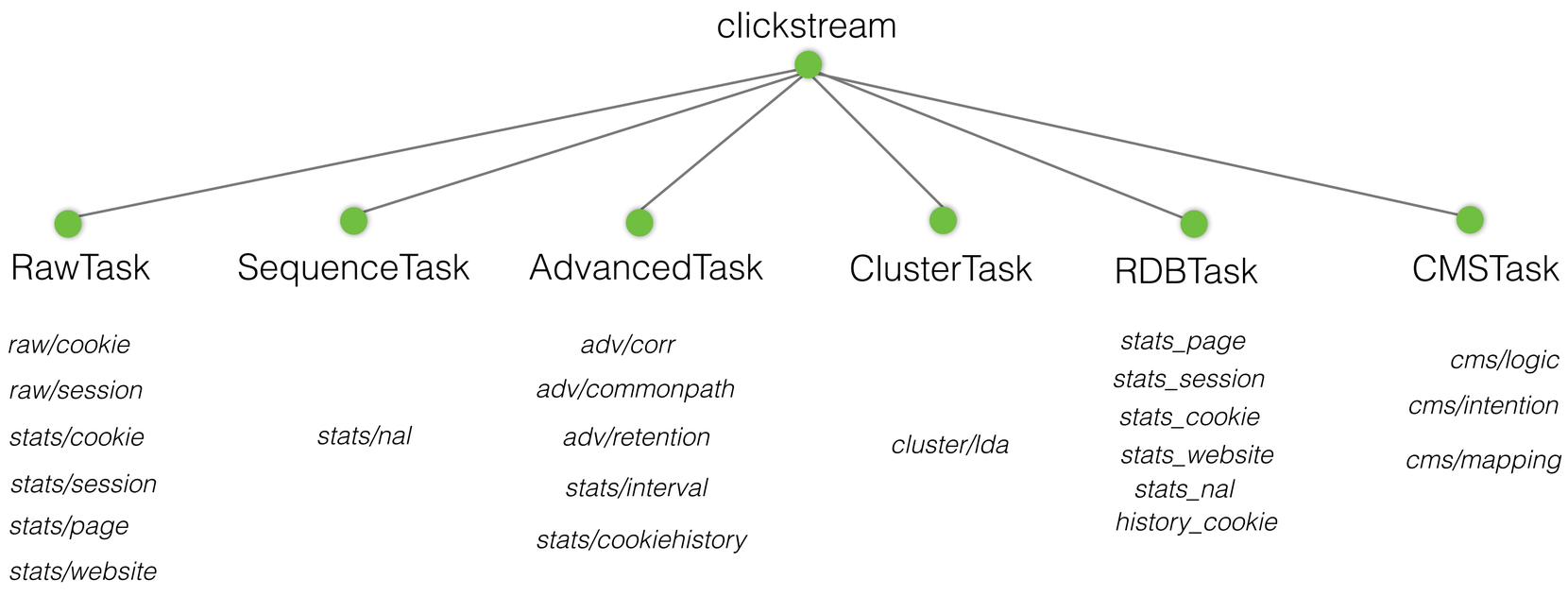
外部參數設定
Luigi Parameter
Task.Output
output data
run包含實際運行的代碼
Task.Run
Priority setting
luigi調度下一個作業運行時根據優先級的。默認情況下是隨意選擇執行的
Prepare data
Task.Requires
requires指定本task的依賴的其他task對象


clickstream
RawTask
SequenceTask
AdvancedTask
ClusterTask
RDBTask
CMSTask
raw/cookie
raw/session
stats/cookie
stats/session
stats/page
stats/website
stats/nal
adv/corr
adv/commonpath
adv/retention
stats/interval
stats/cookiehistory
cluster/lda
stats_page
stats_session
stats_cookie
stats_website
stats_nal
history_cookie
cms/logic
cms/intention
cms/mapping



基本統計數據

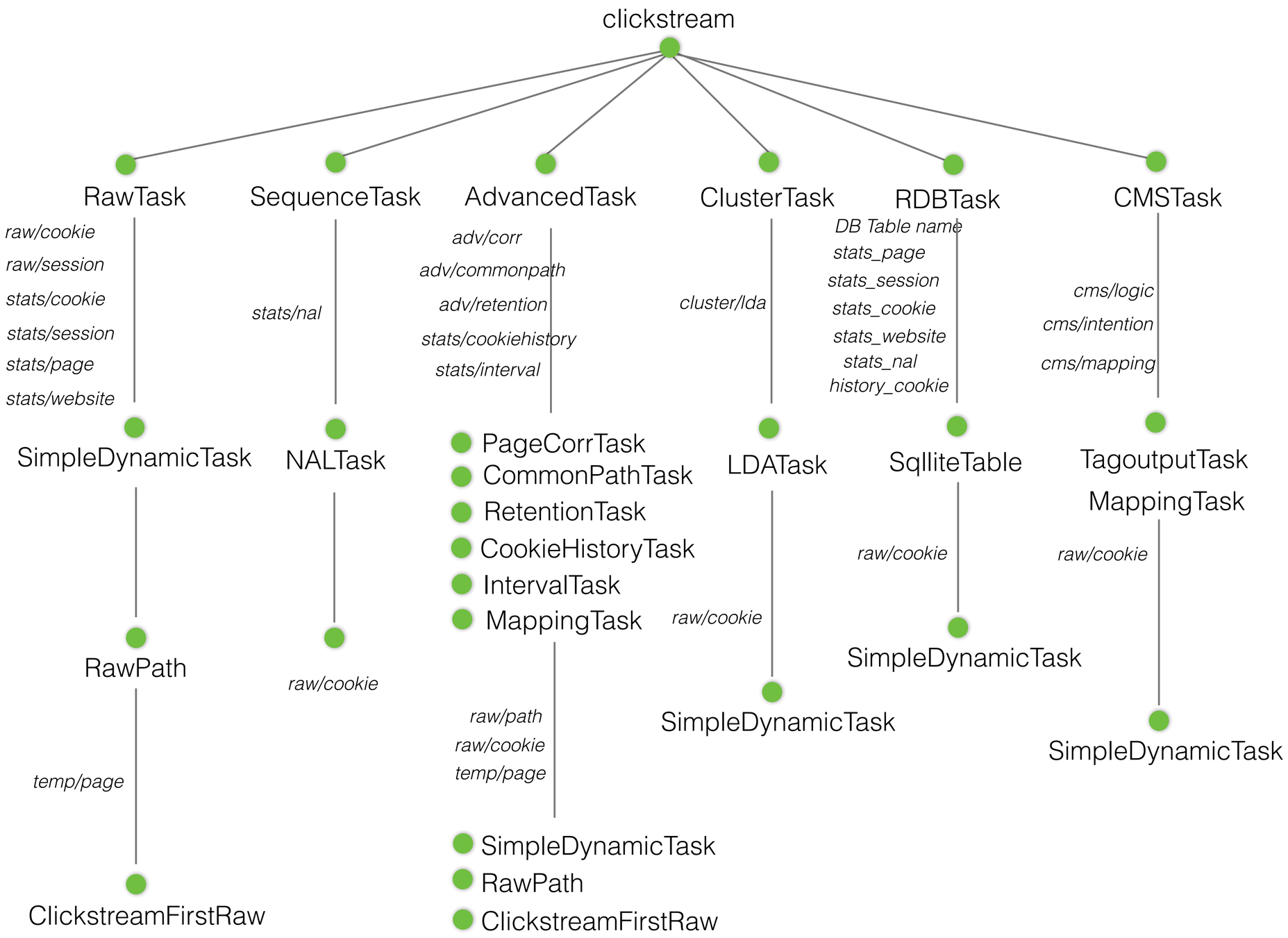
進階分析

DB

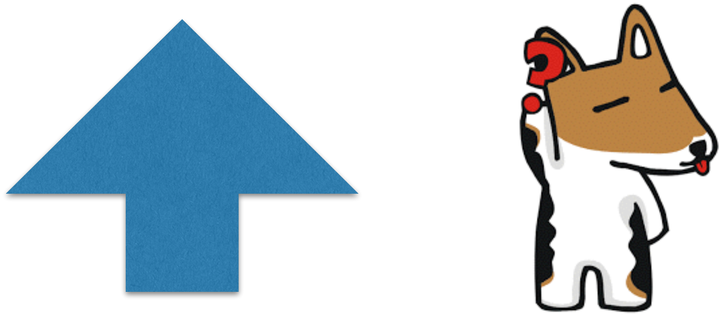
Cookie歷史

標籤分群

CMS線上標籤


clickstream
RawTask
raw/cookie
raw/session
stats/cookie
stats/session
stats/page
stats/website
SimpleDynamicTask
RawPath
temp/page
ClickstreamFirstRaw
SequenceTask
stats/nal
NALTask
raw/cookie
AdvancedTask
adv/corr
adv/commonpath
adv/retention
stats/cookiehistory
stats/interval
PageCorrTask
CommonPathTask
RetentionTask
CookieHistoryTask
IntervalTask
MappingTask
raw/path
raw/cookie
temp/page
SimpleDynamicTask
RawPath
ClickstreamFirstRaw
ClusterTask
cluster/lda
LDATask
raw/cookie
SimpleDynamicTask
RDBTask
DB Table name
stats_page
stats_session
stats_cookie
stats_website
stats_nal
history_cookie
SqlliteTable
raw/cookie
SimpleDynamicTask
CMSTask
cms/logic
cms/intention
cms/mapping
TagoutputTask
MappingTask
raw/cookie
SimpleDynamicTask

```
{'creation_datetime': '2016-09-02 23:32:34.915000',
 'logic1': {'logic1_網銀': 2, 'logic1_cub平台': 2},
 'cookie_id': 'a1e4bfb99a3342c696490797c9209999',
 'loading_duration': -4.0,
 'duration': 24786.0,
 'active_duration': 24786.0,
 'logic2': {'logic2_其他': 2, 'logic2_cub平台': 2},
 'intention': {'intention_其他': 4},
 'individual_id': 'None',
 'function': {'function_功能_login': 2, 'function_登入': 2}}
```


```
session_id      cookie_id       individual_id   session_seq     url     creation_datetime
      duration        active_duration loading_time    ip
35553330        9b1fc926bc374459a793193352630d0f        A2B811D5EC7C580C14      2       https://www.mybank.com.tw/mybank        20
16-09-01 00:05:29.767000        20729   20729   -1      ip
35553330        9b1fc926bc374459a793193352630d0f        A2B811D5EC7C580C14      3       https://www.mybank.com.tw/mybank/quicklink
s/home        2016-09-01 00:05:50.528000      88286   88286   3204    ip
```

RawTask(*mode=range, interval, lib)

raw/cookie_interval1


```
{'creation_datetime': '2016-09-02 23:32:34.915000',
 'logic1': {'logic1_網銀': 2, 'logic1_cub平台': 2},
 'cookie_id': 'a1e4bfb99a3342c696490797c9209999',
 'loading_duration': -4.0,
 'duration': 24786.0,
 'active_duration': 24786.0,
 'logic2': {'logic2_其他': 2, 'logic2_cub平台': 2},
 'intention': {'intention_其他': 4},
 'individual_id': 'None',
 'function': {'function_功能_login': 2, 'function_登入': 2}}
```


SimpleDynamicTask(interval, filter_app=True, ofile, lib)
lib:basic.raw.cookie

RawPath(column, ofile, interval, hour, ntype)

temp/page


```
session_id      cookie_id       individual_id   session_seq     url     creation_datetime
      duration        active_duration loading_time    ip
35553330        9b1fc926bc374459a793193352630d0f        A2B811D5EC7C580C14      2       https://www.mybank.com.tw/mybank        20
16-09-01 00:05:29.767000      20729   20729   -1      ip
35553330        9b1fc926bc374459a793193352630d0f        A2B811D5EC7C580C14      3       https://www.mybank.com.tw/mybank/quicklink
s/home        2016-09-01 00:05:50.528000      8828G   8828G   3204    ip
```


*mode : single - merge whole data during interval
range - separate interval tasks by day,hour…

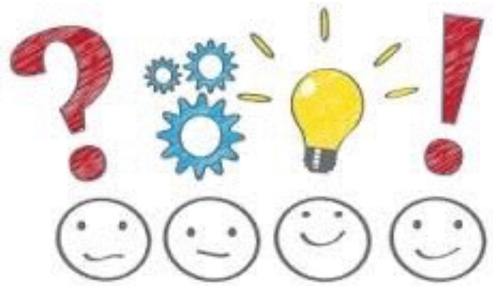
*interval1 : date, interval

*SimpleDynamicTask(RawPath)

ClickstreamFirstRaw(date, hour, ofile, column)

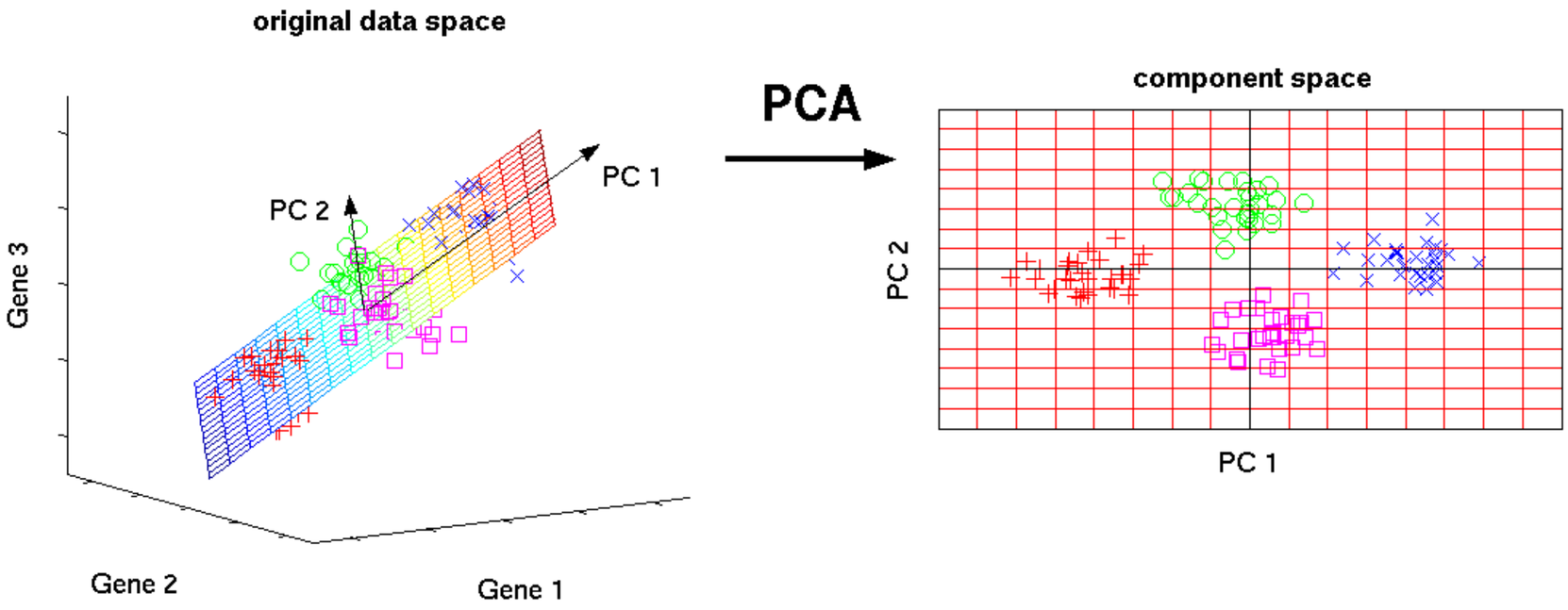
ClickstreamFirstRaw

order	Tables	Description	SQL (column)
*	temp/page_interval	合併所有session瀏覽page所有相關訊息，並加入cookie_id, individual_id, ipAddress等資訊	session_id cookie_id individual_id session_seq url creation_datetime function logic intention duration active_duration loading_time ip
1	VP_OP_ADC.page VP_OP_ADC.pagesummary	抓取在期間內所有session瀏覽page的資訊，並合併page停留時間	SELECT A.sessionnumber, A.pagesequenceinsession, A.pagelocation, A.eventtimestamp, B.PageViewTime, B.PageViewActiveTime, COALESCE(B.PageLoadDuration,-1) FROM VP_OP_ADC.page{table} A LEFT JOIN VP_OP_ADC.pagesummary{table} B ON A.sessionnumber = B.sessionnumber AND A.pageinstanceid = B.pageinstanceid WHERE A.eventtimestamp >= '{date} {hour}:00:00' AND A.eventtimestamp < '{date} {hour}:59:59' ORDER BY A.sessionnumber, A.pagesequenceinsession".format(table=table, date=self.date, hour="{:
2	VP_OP_ADC.vistior	抓取期間內session對應的cookieID，一個session只取一筆	SELECT sessionnumber, MAX(CookieUniqueVisitorTrackingId) FROM VP_OP_ADC.visitor{table} WHERE eventtimestamp >= '{date_1}' AND eventtimestamp < '{date} {hour}:59:59' GROUP BY sessionnumber".format(table=table, date_1=date_1, date=self.date, hour="{:02d}".format(self.hour))
3	VP_OP_ADV.individual	抓取期間內session對應Profileuiid，一個session只取一筆	SELECT sessionnumber, MAX(ProfileUiid) FROM VP_OP_ADC.individual{table} WHERE eventtimestamp >= '{date} {hour}:00:00' AND eventtimestamp < '{date} {hour}:59:59' AND ProfileUiid NOT LIKE '%XXXX%' GROUP BY sessionnumber".format(table=table, date=self.date, hour="{: 02d}".format(self.hour))
4	VP_OP_ADV.sessionstart	抓取期間內session對應IPAddress	SELECT sessionnumber, DeviceIPAddress FROM VP_OP_ADC.sessionstart{table} WHERE eventtimestamp >= '{date_1}' AND eventtimestamp < '{date} {hour}:59:59'".format(table=table, date_1=date_1, date=self.date, hour="{:02d}".format(self.hour))



Principal
Components
Analysis

- 降低所研究的數據空間的維數
- 通過線性投影，將高维的數據映射到低维的空間中
- 將眾多具有一定相關性指標，組成新互相無關的綜合指標
- 多應用在一致性分析、影像分析等等



Principal Components Analysis

- 對原始數據指標變數進行變換後形成了彼此相互獨立的主成分。
- 消除各變數之間的共線性, 減少變數的個數,利於後續的分析。
- 用較少綜合指標依然能代表原眾多變數，維度選擇建議需達85%數據信息。

PCA致命缺點是什麼?

怎樣的資料不適合使用PCA?

Principal Components Analysis

- 對原始數據指標變數進行變換後形成了彼此相互獨立的主成分。
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- 主成分的解釋其含義一般多少帶有點模糊性，不像原始變數的含義那麼清楚、確切
- 變數彼此間相關性不高，則資料做主成分分析就不合適。

image load

```
from sklearn.decomposition import PCA
from pylab import *
from skimage import data, io, color

link = "/Users/yehben/Desktop/Brown.jpeg"
Brown_gray = io.imread(link,as_grey=True)
io.imshow(Brown_gray)
xlabel('Original Image')
io.show()
```

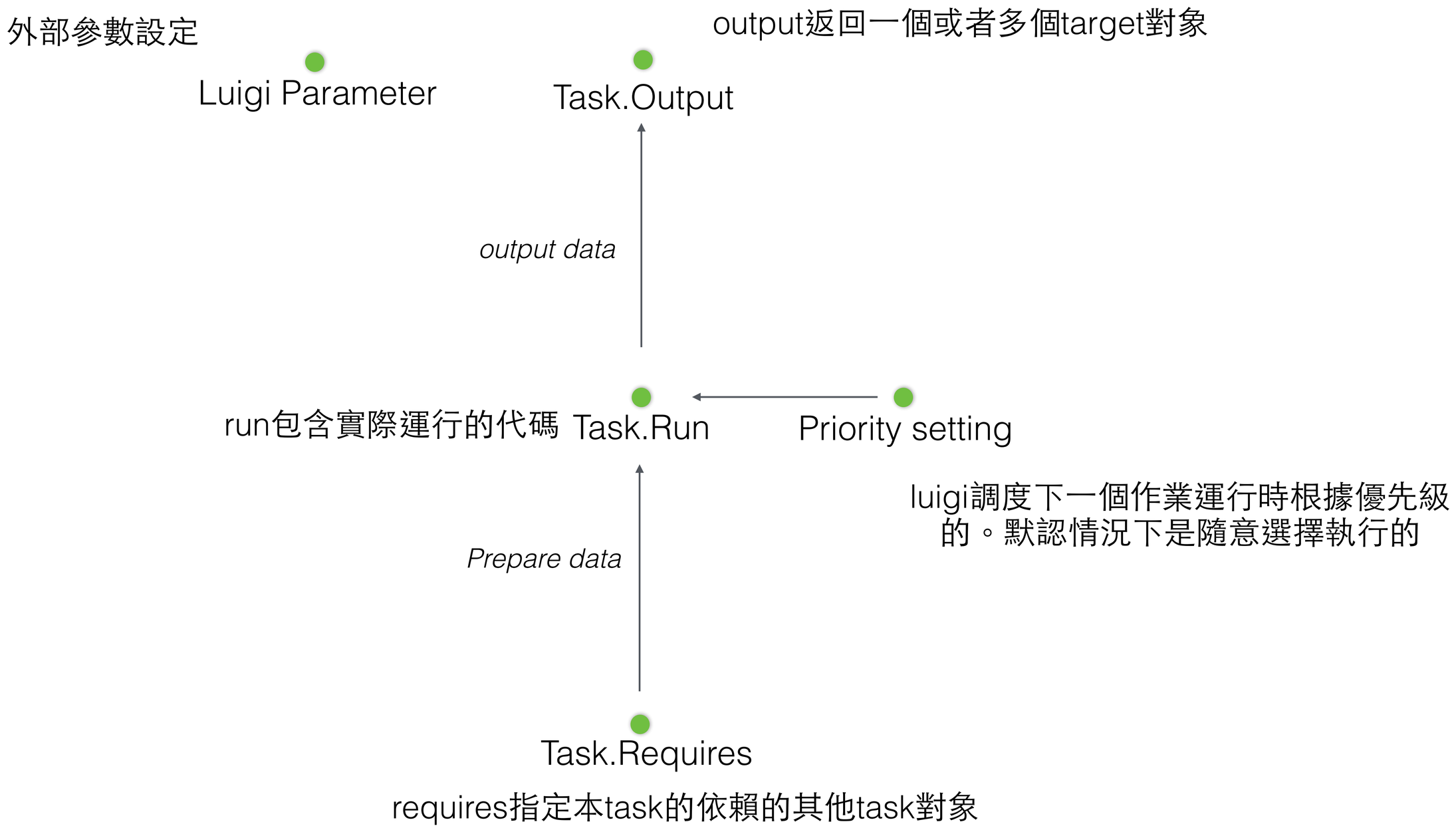
images.jpeg

model fit

```
n_comp = 5
pca = PCA(n_components = n_comp)
pca.fit(Brown_gray)
Brown_gray_pca = pca.fit_transform(Brown_gray)
Brown_gray_restored = pca.inverse_transform(Brown_gray_pca)
io.imshow(Brown_gray_restored)
#xlabel('Restored image n_components = %s' %n_comp)
io.show()
```

Variance Ratio

```
print(pca.explained_variance_ratio_)
```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Prepare data
Task.Requires
requires指定本task的依賴的其他task對象

Task.Output 指出output路徑

photopath:欲分析圖片檔路徑
ratio:累積主成份解釋能力

Luigi Parameter

Task.Run

1. image array require
2. PCA model fit
3. save output image

Task.Requires

1. Load外部image檔案
2. 解析檔案成numpy array
3. 存成numpy檔案

Luigi Parameter

```
class ImageAnalysis(luigi.Task):
    task_namespace = 'image'
    photopath = luigi.Parameter()
    ratio = luigi.IntParameter()
```

```
def output(self):
    outfile = os.path.join(BASEPATH_photo, "Brown_{}.png".format(self.ratio))
    return luigi.LocalTarget(outfile)
```

Task.Output

```
def requires(self):
    imagepath = os.path.join(BASEPATH_photo, "Image_{}.npy".format(self.ratio))
    yield Imageload(photopath = self.photopath, ratio = self.ratio, imagepath = imagepath)

def run(self):
    var_ratio = int(self.ratio)/100
    for input in self.input():
        Brown_gray = numpy.load(input.fn)
    pca_all = PCA(n_components = len(Brown_gray[0]))
    pca_all.fit(Brown_gray)
    n_comp = cc_ratio(var_ratio,pca_all.explained_variance_ratio_)
    pca = PCA(n_components = n_comp)
    pca.fit(Brown_gray)
    Brown_gray_pca = pca.fit_transform(Brown_gray)
    Brown_gray_restored = pca.inverse_transform(Brown_gray_pca)
    plt.imsave(self.output().fn, Brown_gray_restored, cmap=plt.cm.gray)
```

Task.Run

```
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    def run(self):
        link = self.photopath
        Brown_gray = io.imread(link,as_grey=True)
        numpy.save(self.output().fn,Brown_gray)

    def output(self):
        return luigi.LocalTarget(self.imagepath)
```

Task.Requires

Luigi Parameter

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Task.Output

Task.Run

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```