Proc Python - Zwei Sprachen, ein Workflow

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Was ist eigentlich die SAS Sprache?

Wie viele Sprachen/Syntaxen gibt es?

- Data Step
- Standard Proc‘s
- SQL
- TPL/PCL
- DS2
- Lua
- Groovy
- X-Kommando
- Java Object
- IML
- IML-R Interface
- REST
- SCL
- CASL
- Macro
- Optmodel
- LITI
- Proc FCMP

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Eine Mehr…

Proc Python – Die Prozedur der Kokosnuss

Timeline

Proc FCMP kann doch Python?

- Proc FCMP kann bereits seit SAS 9.4 M3 Python aufrufen
- Aufruf als Funktion z.B. im Data Step
- Keine tiefere Integration, reine Wertübergabe

Und von Python nach SAS

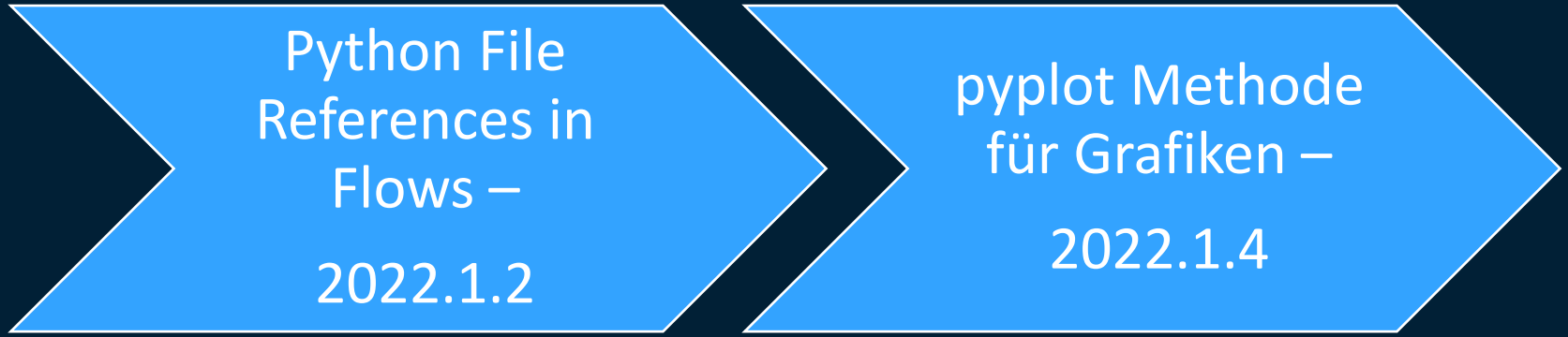
Das geht doch auch schon lange

- saspy, ermöglicht es SAS Code auszuführen
- Bietet Schnittstellen für den Austausch von Daten
- SAS Funktionalität in Pythonic Syntax
- Aber nur der Aufruf von SAS aus Python, nicht die andere Richtung

Timeline

SAS Viya 2021.1.3+

Timeline (2)



PROC PYTHON

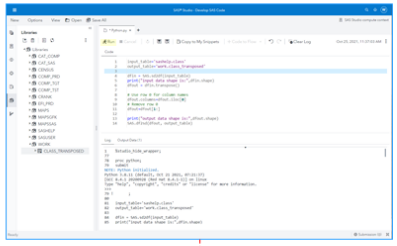
Wie funktioniert es?

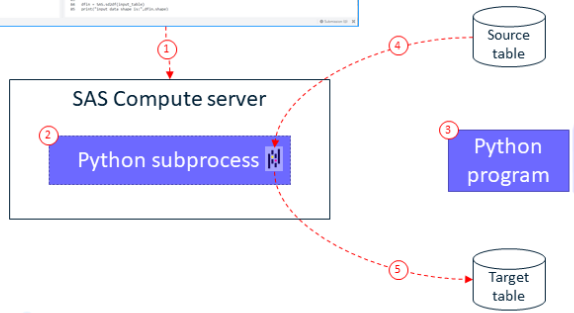
Starten eines Python Subprozesses

Hinzufügen des SAS-Moduls mit Funktionen zum Austausch von Daten und Informationen zwischen einem SAS-Prozess und einem Python-Unterprozess

Enthält eine Funktion zur Übermittlung von SAS-Code aus einem Python-Unterprozess

SAS Studio Python Code Editor

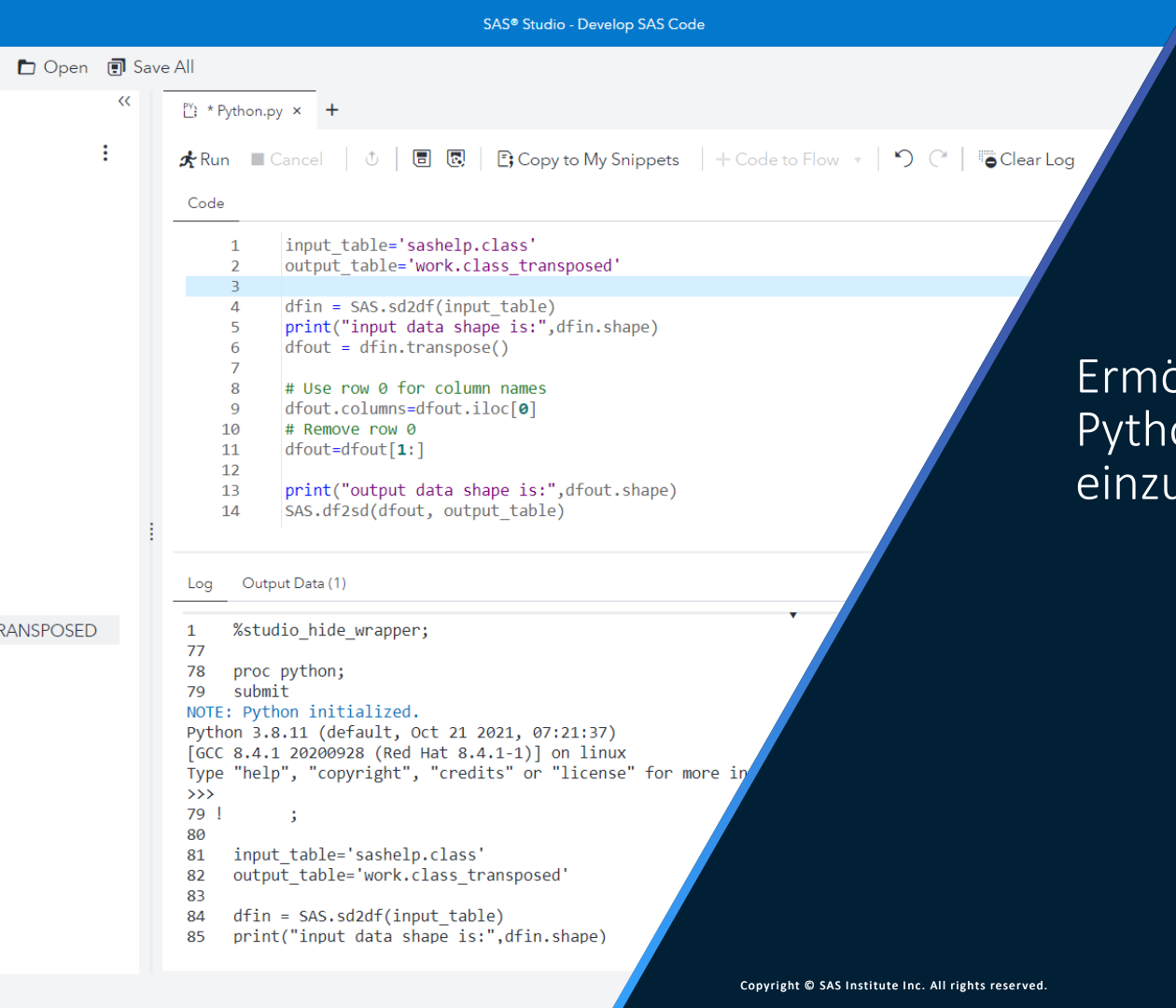




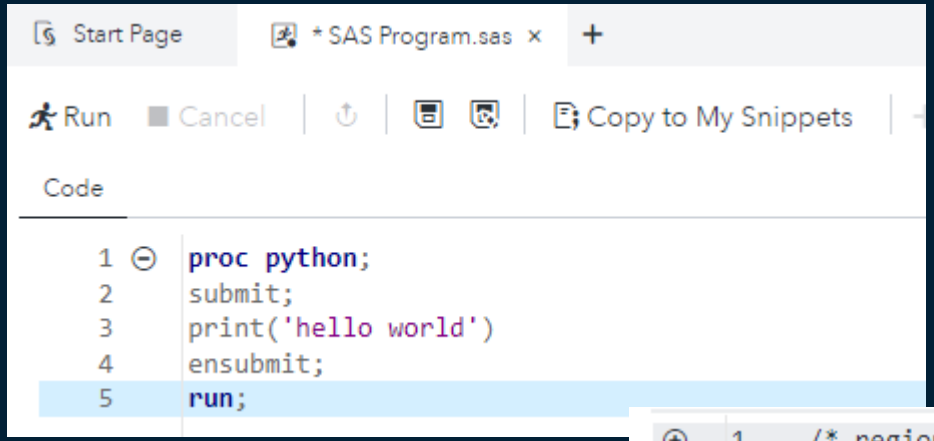

```
proc python; (2)
submit;
```

```
input_table='sashelp.class'
output_table='work.class_transposed'

# get input data from SAS into Pandas DataFrame
dfin = SAS.sd2df(input_table) (4)
print("input data shape is:",dfin.shape)
dfout = dfin.transpose()

# Use row 0 for column names
dfout.columns=dfout.iloc[0]
# Remove row 0
dfout=dfout[1:]

print("output data shape is:",dfout.shape)
# Write Pandas DataFrame to SAS
SAS.df2sd(dfout, output_table) (5)
```

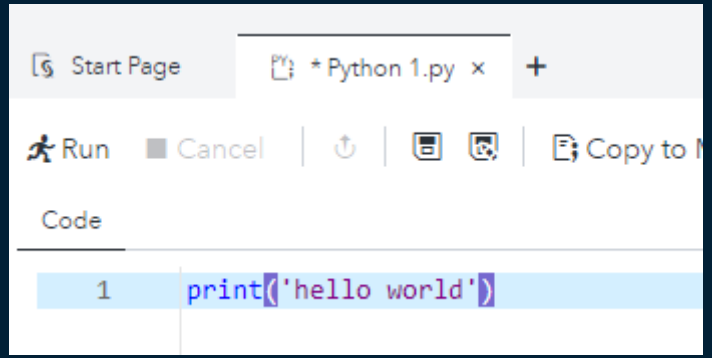
```
endsubmit;
quit;
```



Ermöglicht es SAS-Benutzern Python-Code in SAS-Jobs einzubinden




```
1    /* region: Generated preamble */
79
80   proc python;
81   submit
NOTE: Python initialized.
Python 3.9.10 (main, Apr  5 2022, 17:25:54)
[GCC 4.8.5 20150623 (Red Hat 4.8.5-44)] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>>
81 !       ;
82   print('hello world')
83   ensubmit;
84   run;
85
86   /* region: Generated postamble */
98
```




```
1    /* region: Generated preamble */
79
80   proc python;
81   submit
NOTE: Resuming Python state from previous PROC PYTHON invocation.
81 !       ;
82
83   print('hello world')
84
85   endsubmit;
86   quit;
>>>
hello world
>>>
>>>
```

Prozedur Argumente

- Restart
- Terminate
- Timeout
- Infile

Callback Methods

- sasfnc
- submit
- symget
- symput
- pyplot
- df2sd
- sd2df
- hideLOG
- printLOG

SAS Studio

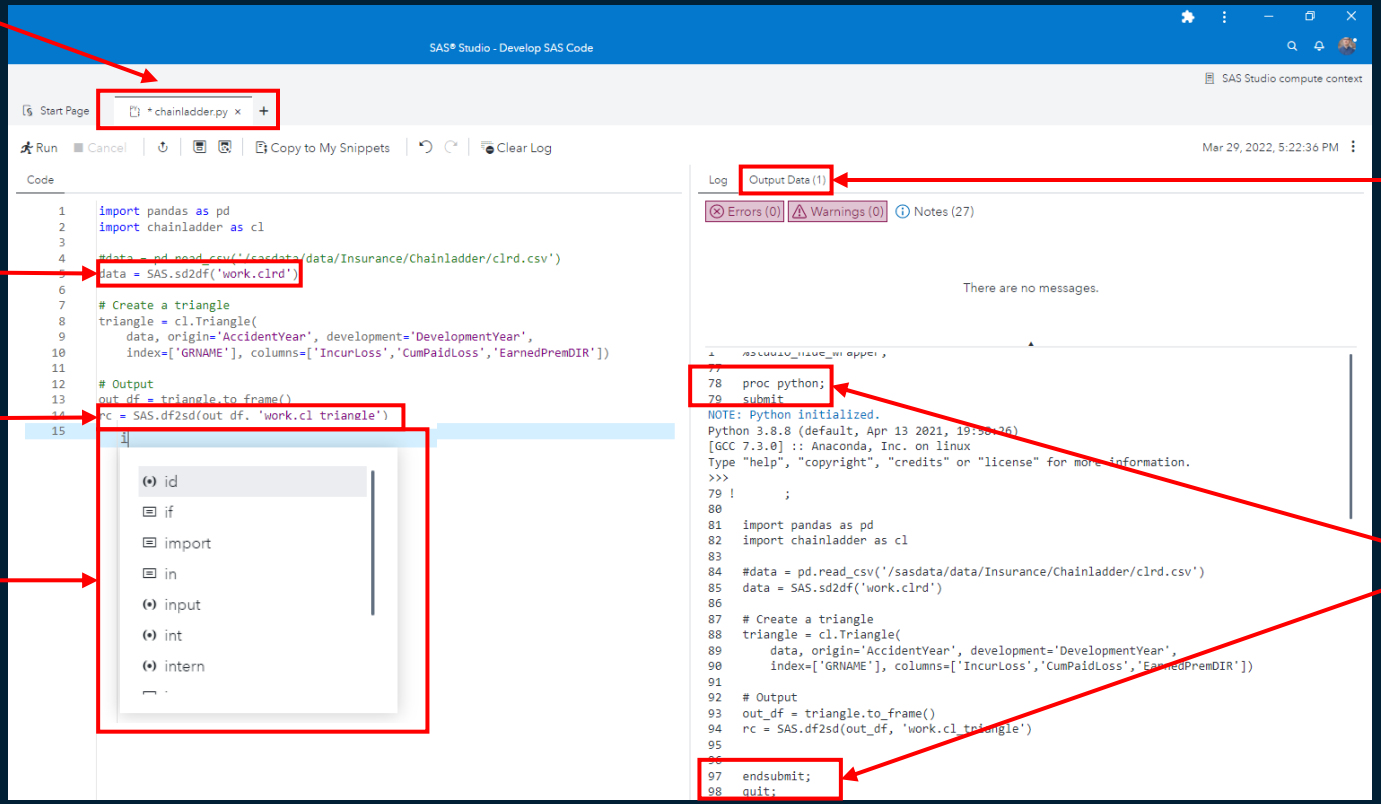
Der Python Code Editor

Python Code Editor

Daten direkt aus SAS als Dataframe

Dataframe zurück zu SAS

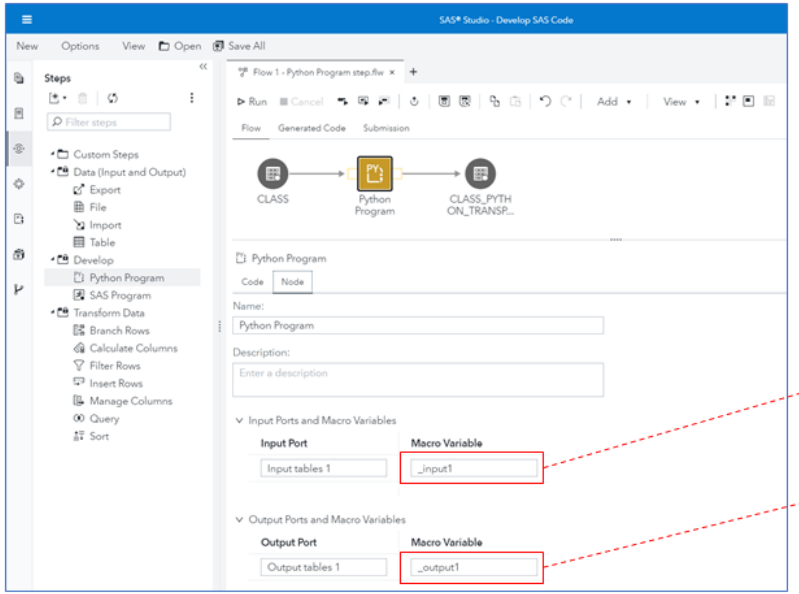
Syntax-Hilfe für Python

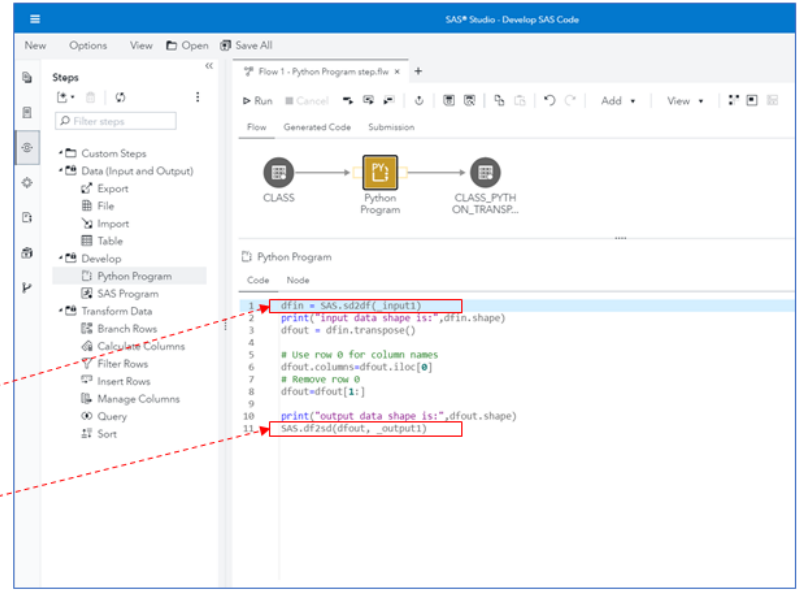


Ausgabe-Tabellen von Python anzeigen

Implizites Wrapping in Proc Python

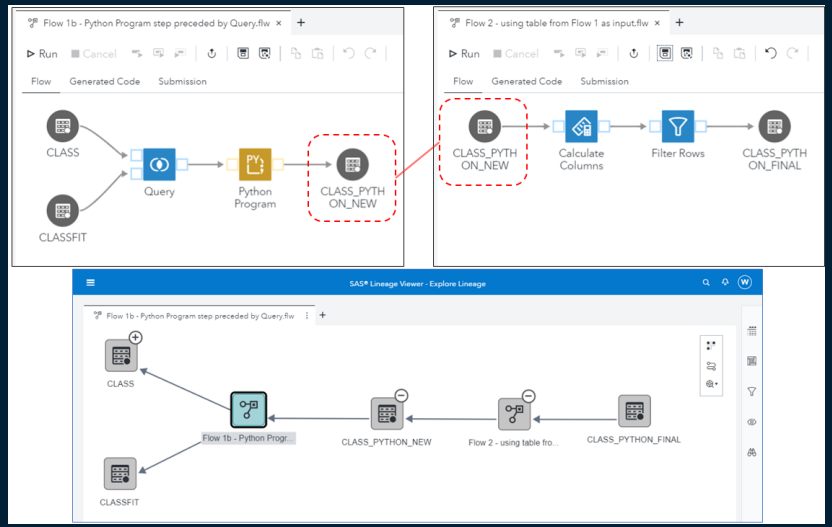
Python Programm Schritt - Studio Flow





- Eingangsport(s) und Ausgangsport(s) sind als Variablen im Python-Prozess verfügbar
- Diese Variablen enthalten Namen von verbundenen Tabellen (libref.tabellenName-Notation)

Integration mit SAS Lineage



- Wo werden die Daten genutzt?
- Woher kommen die Daten?
- In welchen Flows werden die Daten genutzt?

Und das gilt auch wenn Python-Programme als Schritt genutzt werden

```
%macro _etm_py_link_meta;
    %do i = 1 %to &_etm_n_links. / 25;
        %let _etm_firstob = %eval(&i. * 25);
        %let _etm_obsCount = %eval(&_etm_firstob. + 25);

        %if &i. = 1 %then %do;
            data work._etm_links;
                set work._etm_distinct_links(obs=25);
            run;

            proc python restart infile=pgm;
            run;

            data work._etm_link_meta_all;
                set work._etm_link_meta;
            run;
        %end;
```

```
data _null_;
    file pgm;

    put "import pandas as pd";
    put "import requests";
    put "from bs4 import BeautifulSoup";

    if &allowUnverifiedRequests. then do;
        put "from urllib3.exceptions import InsecureRequestWarning";
        put "requests.packages.urllib3.disable_warnings(category=InsecureRequestWarning)";
    end;

    put " ";
    put "# Get the unique link table from SAS";
    put "_etm_df = SAS.sd2df('work._etm_links')";
    put " ";
    put "# Function to gather link information for each link";
    put "def get_link_metadata(row):";
    put "    try:";

    if &allowUnverifiedRequests. then do;
        put "        r = requests.get(row['_etm_lnks'], verify=False)";
    end;
    else do;
        put "        r = requests.get(row['_etm_lnks'])";
    end;
```

```
end;

    put "       html = BeautifulSoup(r, 'html.parser')";
    put "       _etm_status_code = r.status_code";
    put "       _etm_title = html.find('meta', attrs={'property': 'og:title'})";
    put "       _etm_description = html.find('meta', attrs={'property': 'og:description'})";
    put "       _etm_url = html.find('meta', attrs={'property': 'og:url'})";
    put "       _etm_site_name = html.find('meta', attrs={'property': 'og:site_name'})";
    put "   except:";
    put "       _etm_status_code = 404";
    put "       _etm_title = 'Not available'";
    put "       _etm_description = 'Not available'";
    put "       _etm_url = 'Not available'";
    put "       _etm_site_name = 'Not available'";
    put "   return _etm_status_code, _etm_title, _etm_description, _etm_url, _etm_site_name";
    put " ";
    put "# Get the information for each link";
    put "_etm_df_meta = _etm_df.apply(get_link_metadata, axis='columns', result_type='expand')";
    put "_etm_df_all = pd.concat([_etm_df, _etm_df_meta], axis='columns')";
    put "_etm_df_all.rename(columns = {0:'_etm_status_code', 1:'_etm_title', 2:'_etm_description', 3:'_etm_url', 4:'_etm_site_name'}, inplace = True)";
    put " ";
    put "# Return the information to SAS";
    put "SAS.df2sd(_etm_df_all, 'work._etm_link_meta')";
run;
```

Extract Text Features

Base Metadata | Custom RegEx Pattern | Link Data | Text Analytics - Start | Text Analytics - Topic Creation | Text Analytics - Bool Rule

Collect additional information from the links in the tweets. This option requires you to have enabled the Options for concatenated and separated columns.

Please note for this step to work your environment needs to be able to make calls to the open internet.

Please be also aware that this step can take a loot of time to run as the individual sites have to be called and their output need to be parsed.

The following five features are extracted for each link:
- HTTP Status Code (basically is it reachable or not)
- Title of the Webpage
- Description of the Webpage
- URL of the Webpage (handy if URL shorteners were used
- Owner of the site

☑ Do you want to collect metadata from Links in the text?

☑ Do you want to allow Unverified Requests (Warning potential impact: Breach of Confidentiality & Breach of Integrity)?

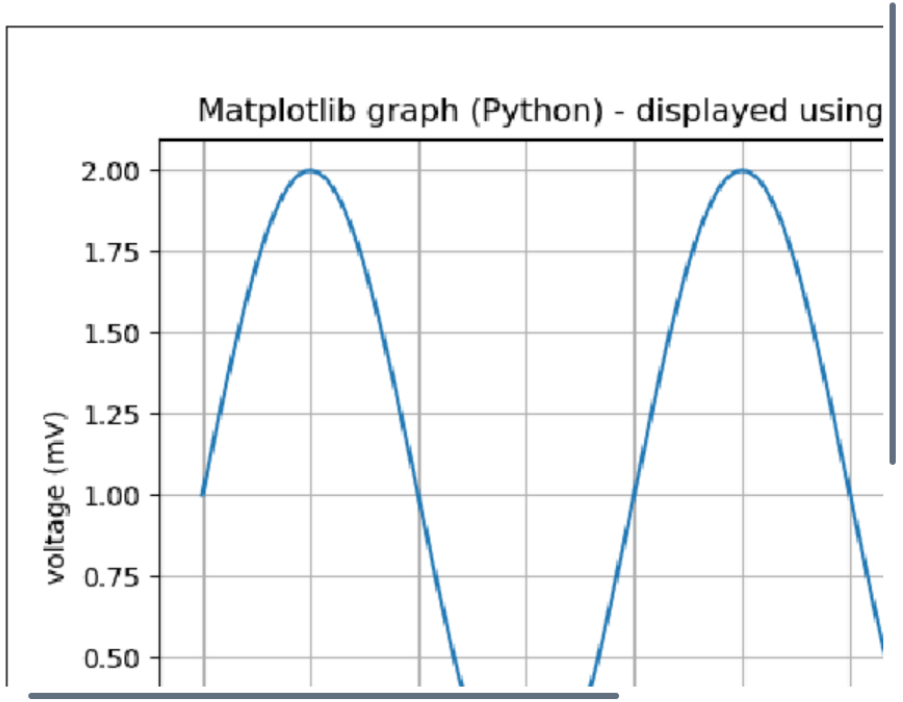
Start Page | * Python.py ×

Run | Cancel | Copy to My Snippets | Code to Flow | Clear Log | Sep 12, 2022, 5:35:40 PM

Code

```
1  import matplotlib.pyplot as plt
2  import numpy as np
3
4  # might have to clear the graph using plt.clf() if you run your
5  plt.clf()
6
7  t = np.arange(0.0, 2.0, 0.01)
8  s = 1 + np.sin(2*np.pi*t)
9  plt.plot(t, s)
10
11 plt.xlabel('time (s)')
12 plt.ylabel('voltage (mV)')
13 plt.title('Matplotlib graph (Python) - displayed using proc gsli
14 plt.grid(True)
15
16 SAS.pyplot(plt)
```

Log | Results



New Options View Open Save All

Explorer

pyplotTest.png

SAS Content

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Code

```
1  import matplotlib.pyplot as plt
2  import numpy as np
3
4  # might have to clear the graph using plt.clf() if you run your (changed) Python co
5  plt.clf()
6
7  t = np.arange(0.0, 2.0, 0.01)
8  s = 1 + np.sin(2*np.pi*t)
9  plt.plot(t, s)
10
11 plt.xlabel('time (s)')
12 plt.ylabel('voltage (mV)')
13 plt.title('Matplotlib graph (Python) - displayed using proc gslide')
14 plt.grid(True)
15
16 SAS.pyplot(plt, filepath='/export/pvs/sasdata/data', filename='pyplotTest')
```

Was kommt noch?

Fehler Erkennung im SAS Log

```
ERROR: Python Exception.
Traceback (most recent call last):
  File "<stdin>", line 5, in <module>
  File "<stdin>", line 2, in <module>
  File "<string>", line 6, in <module>
ZeroDivisionError: division by zero
>>>
NOTE: The SAS System stopped processing this step because of errors.
NOTE: PROCEDURE PYTHON used (Total process time):
      real time           2.32 seconds
      cpu time            0.40 seconds
```