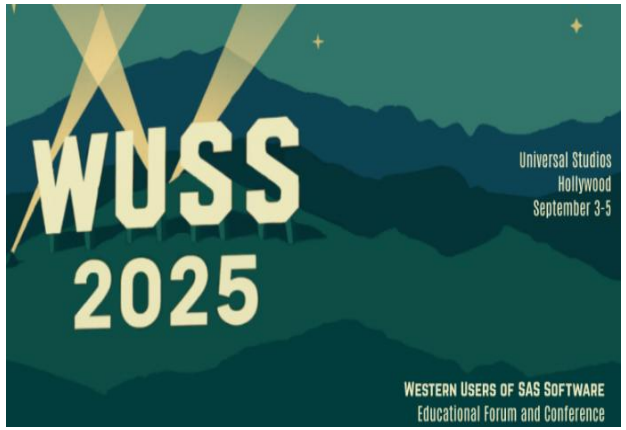
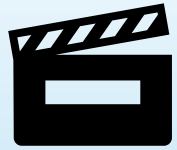
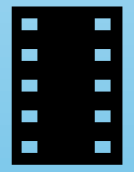


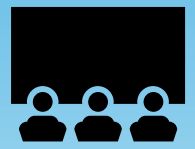
Paper 184-2025

Fun With SAS® and Emoji

What Might a Rebus-Influenced Programming Language Look Like?







SHOOT SCHEDULE

SCENE	DESCRIPTION
1	THE BIG IDEA
2	YOU OUGHT TO BE IN PICTURES
3	WORDS AND PICTURES
4	A SIMPLE PLAN
5	IT'S COMPLICATED
6	WHO YA GONNA CALL? SAS K FUNCTIONS!
7	WHO YA GONNA CALL II? PYTHON REGEX FUNCTIONS!
8	THAT'S ALL FOLKS!

Would You Use a "Running Semicolon" Character?

RUN;

Would You Use a "Running Semicolon" Character?

Posted 02-20-2022 04:06 PM (3248 views)

"Running Semicolon"

"I cringe at the notion..."

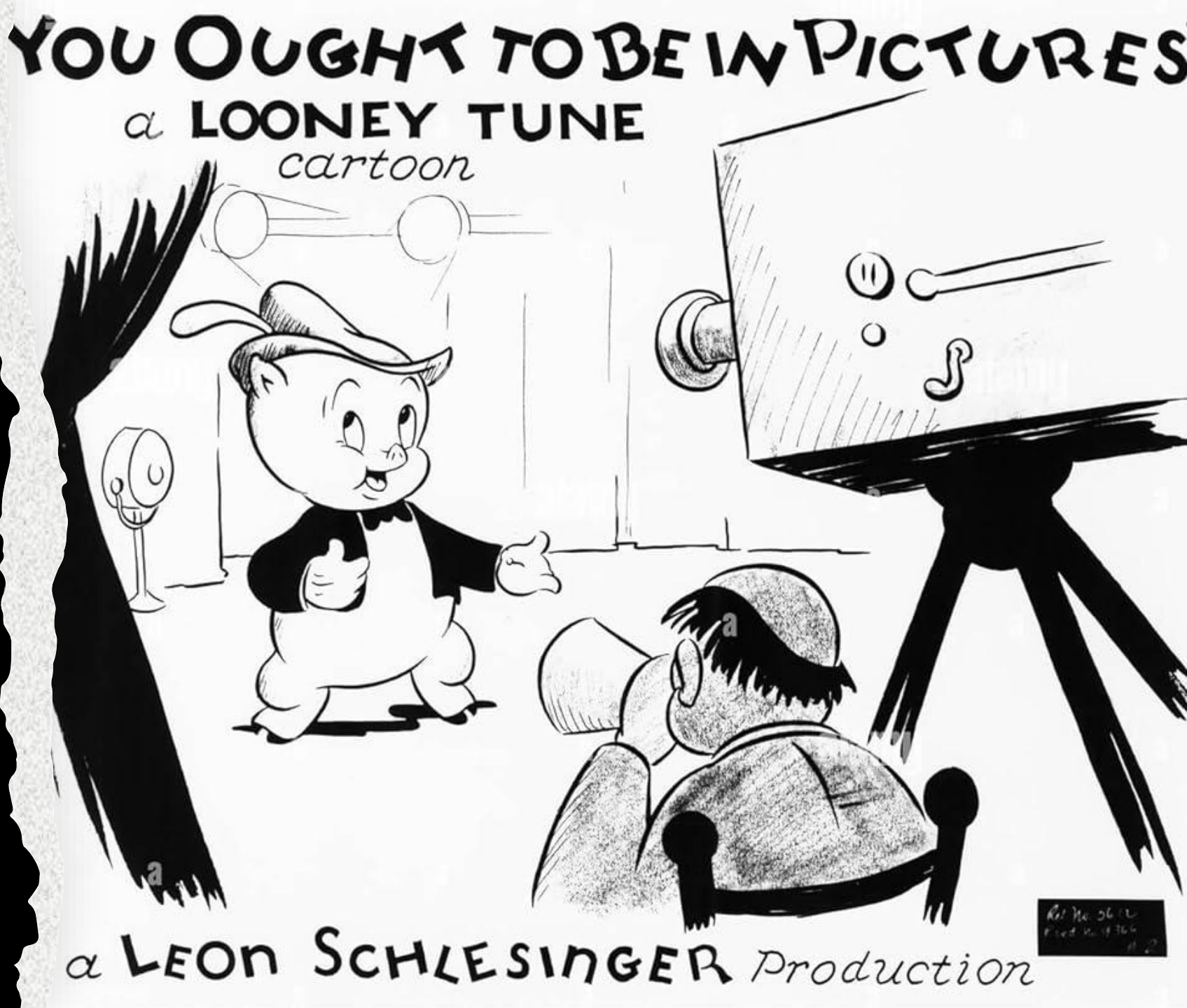
"Bad idea IMO..."

"Programming languages shouldn't have decoration: save that for places like Twitter..."

As HBO's Silicon Valley amusingly showed us, programmers can get into heated arguments over the use of Tabs vs. Spaces.

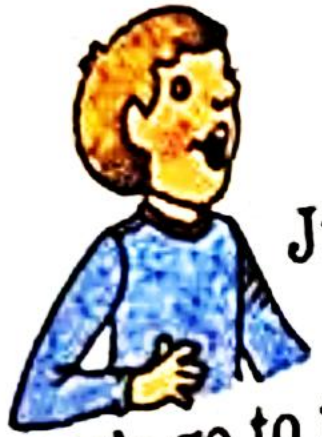
In the SAS world, debates can arise over whether every DATA step and PROC should be terminated with a RUN or QUIT statement - large SAS programs may include 100+ "RUN;" statements - many technically 'unnecessary' (depending on who you ask!) - making some SAS programmers happy while irritating others. So, a question for lovers and haters of the RUN-even-if-unnecessary rule: If a "running semicolon" or "RUN character" was available, would you be okay with the use of that? 👍👎

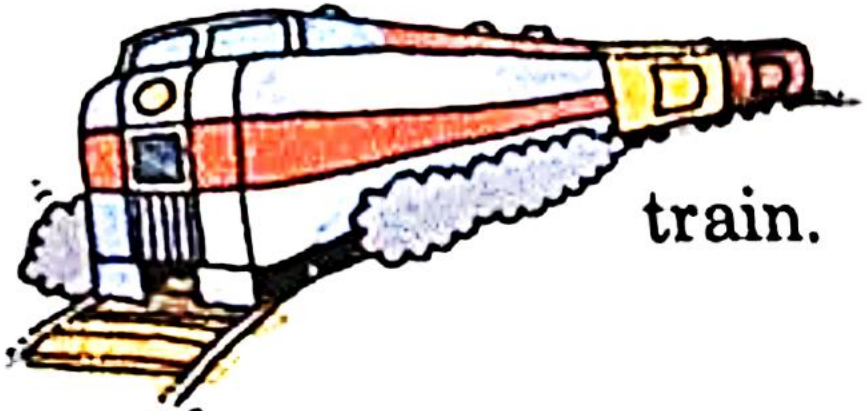
Code With Pictures?
How? Why?



Jimmy Goes to the Library

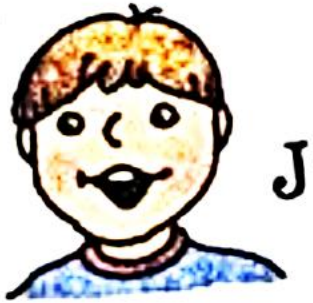
By Pat Kite



Jimmy wanted a book about a  train.

"Let's go to the library,"  Mother said.

They took a  bus to the library.

"How will I be able to find the book I want?"  Jimmy asked.

Mother said.

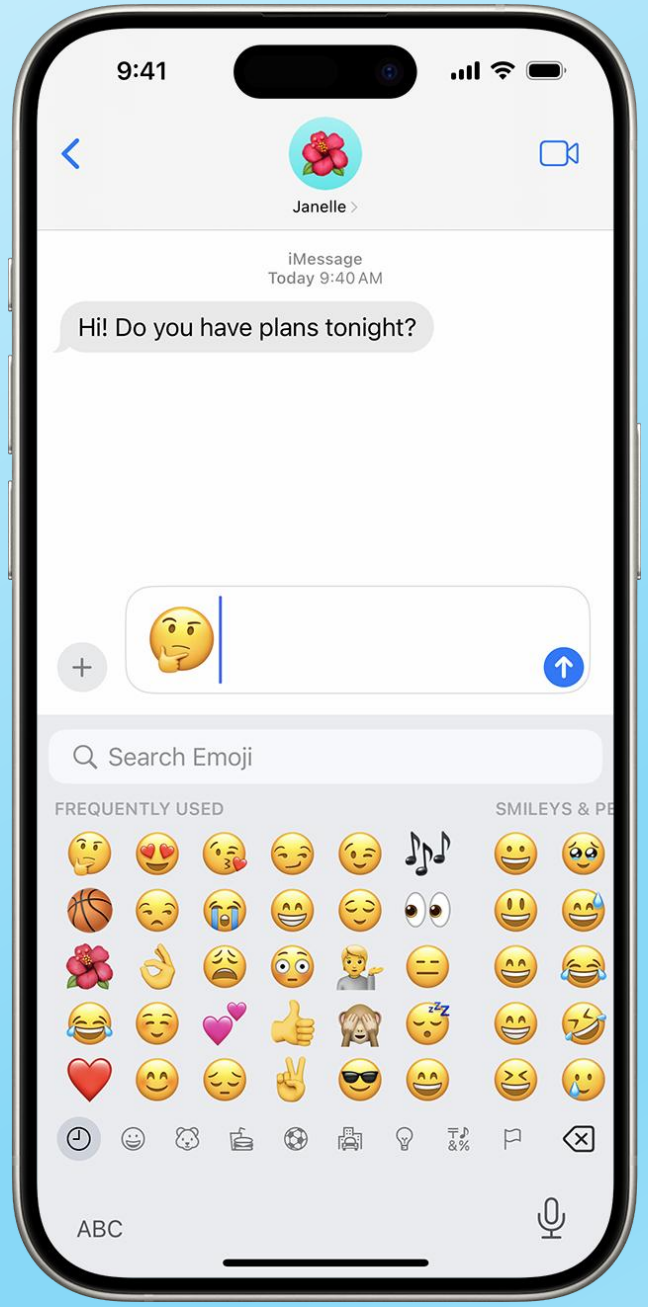
Baa, baa  .

Have you any  ?

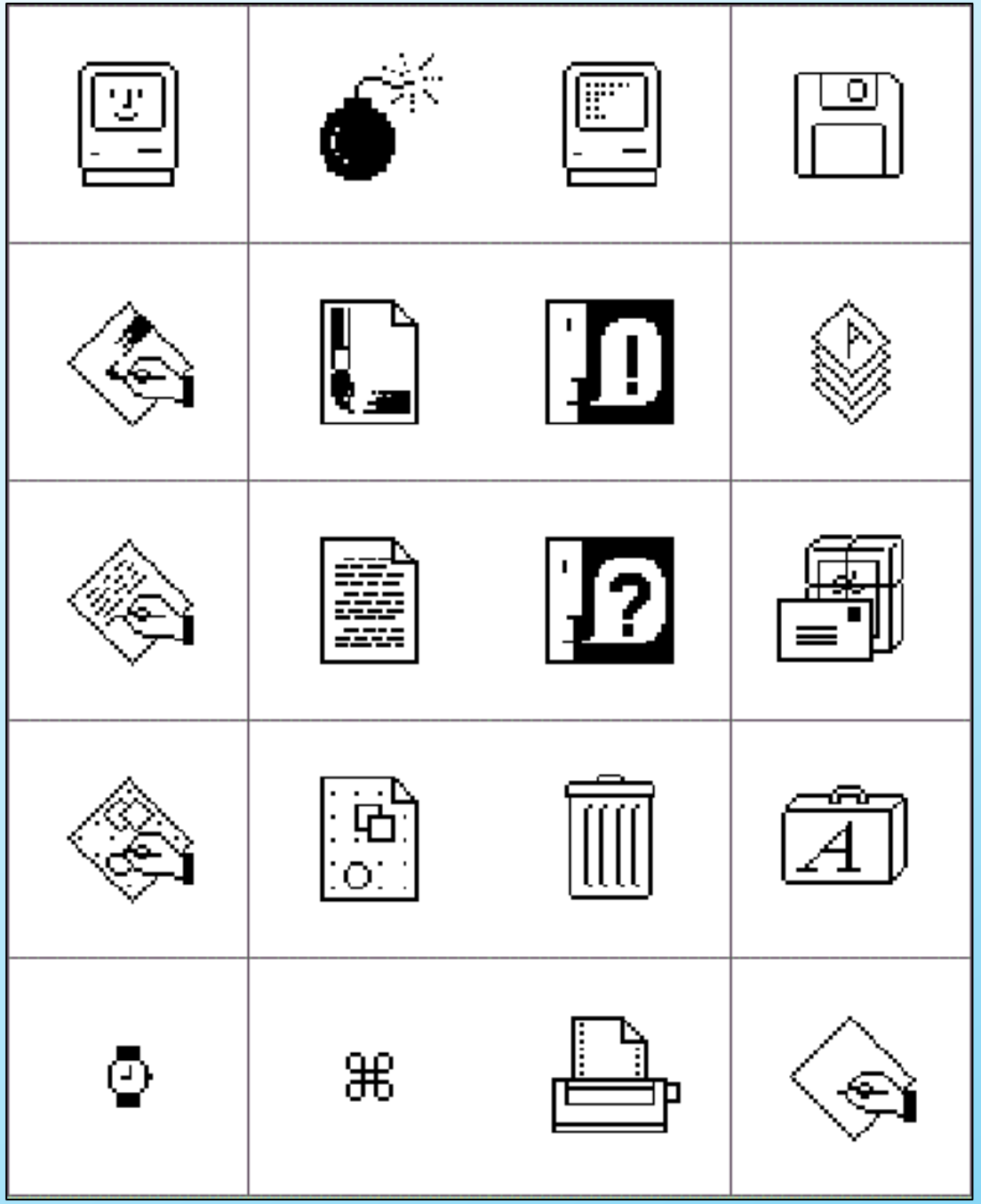
Yes, sir. Yes, sir.

 full.

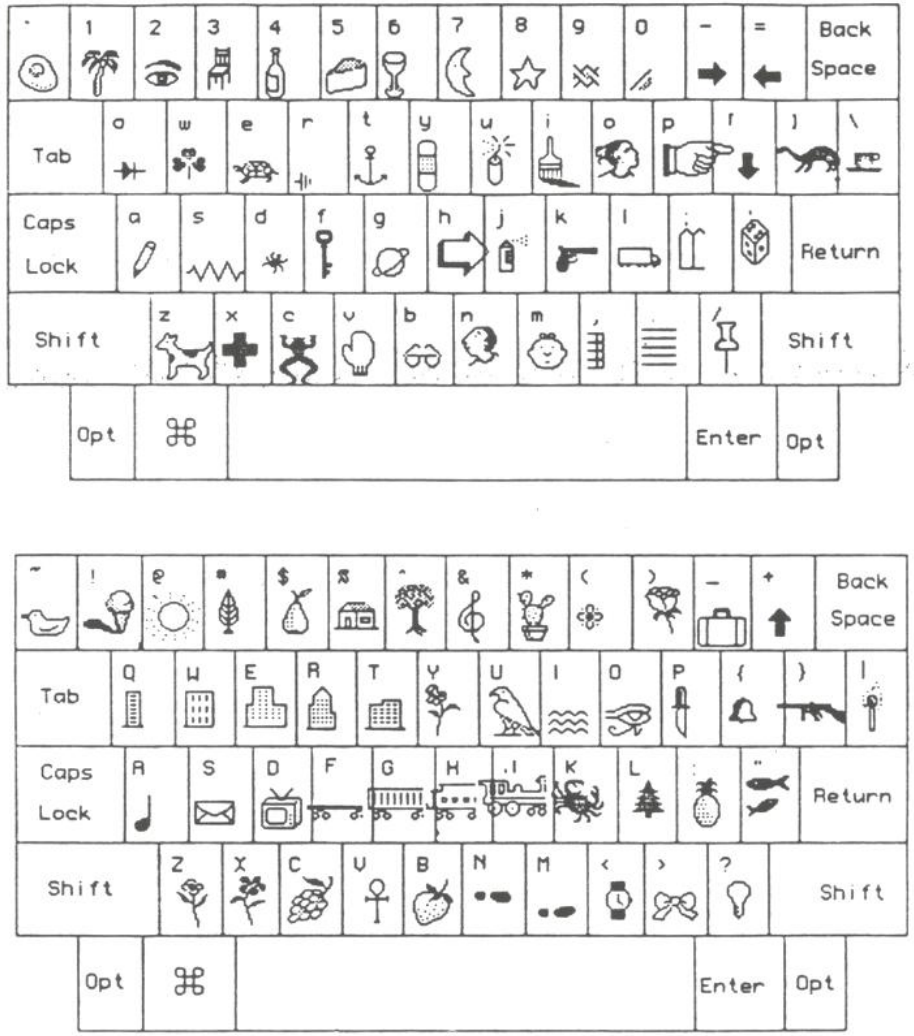
I ♥ NY®



Early Mac Icons & Emoji by Susan Kare



Characters Generated by Cairo Type Font



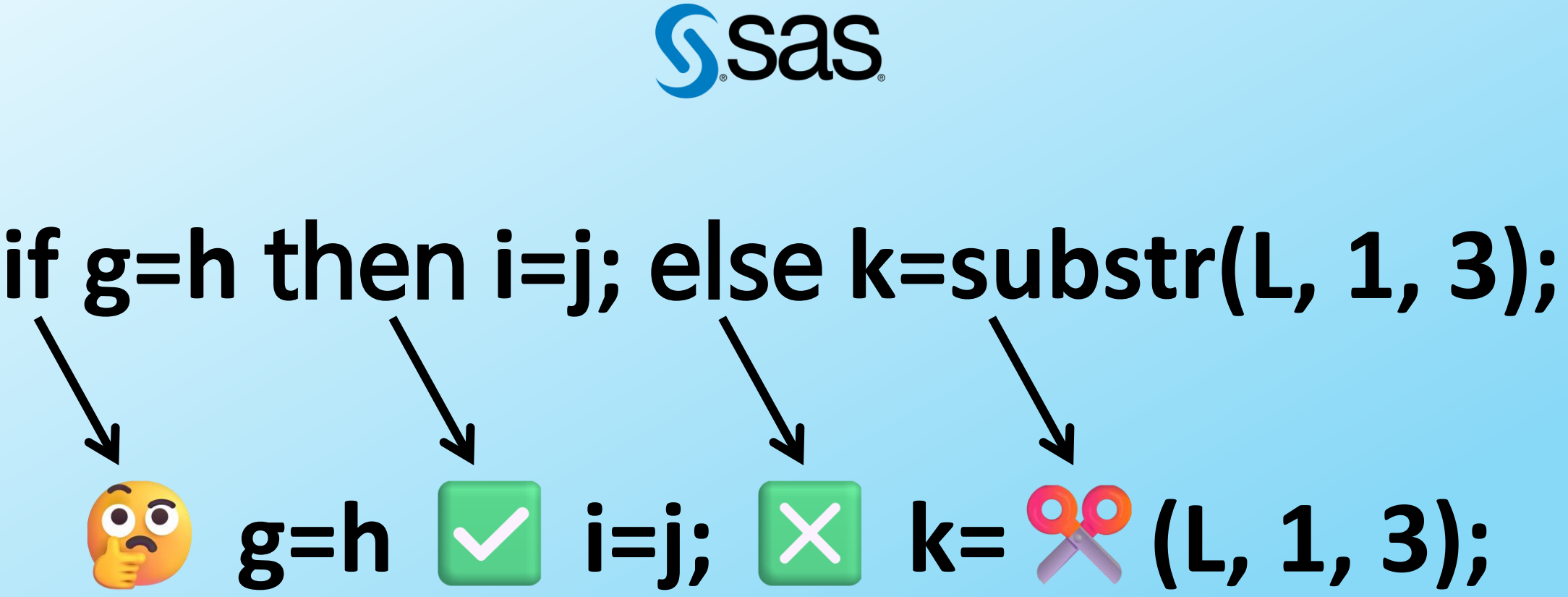
To Insert These Characters in Your Text
Select "Cairo" Font, Size 18 Point

```
life←{↑1 ωV.∧3 4=+/,¯1 0
1∘.⊖¯1 0 1∘.⌽⊂ω}
```

APL – A PROGRAMMING LANGUAGE (Early 1960s)

So, What Might SAS Emoji Coding Look Like?

🤔


if g=h then i=j; else k=substr(L, 1, 3);
g=h
i=j;
k=
(L, 1, 3);

SAS Code (Text)	SAS Code (Text+Emoji)

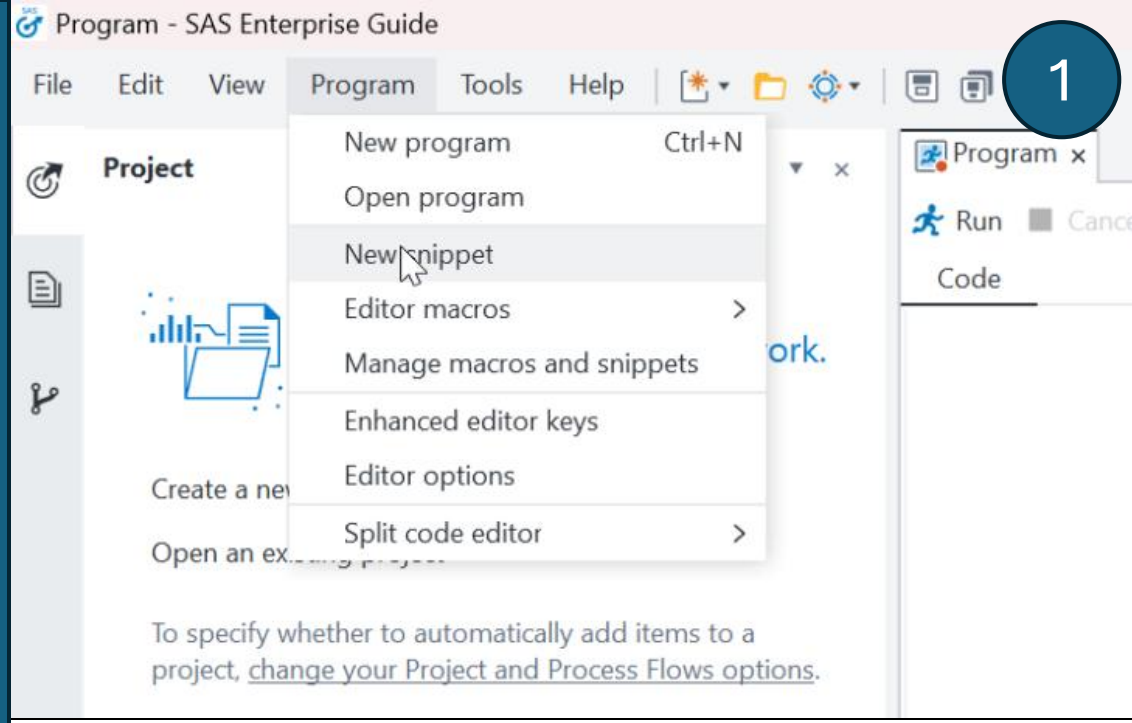
data test;
set;
if a=b then c=d; else e=f;
if g=h then i=j; else k=substr(L, 1, 3);
dt=date(); tm=time();
proc print; run;
	💾 test;
	set;
	🤔 a=b ✅ c=d; ❎ e=f;
	❓ g=h 👍 i=j; 👎 k=✂️(L, 1, 3);
	dt=🗓️(); tm=🕛();
	proc 🖨️; 🏃

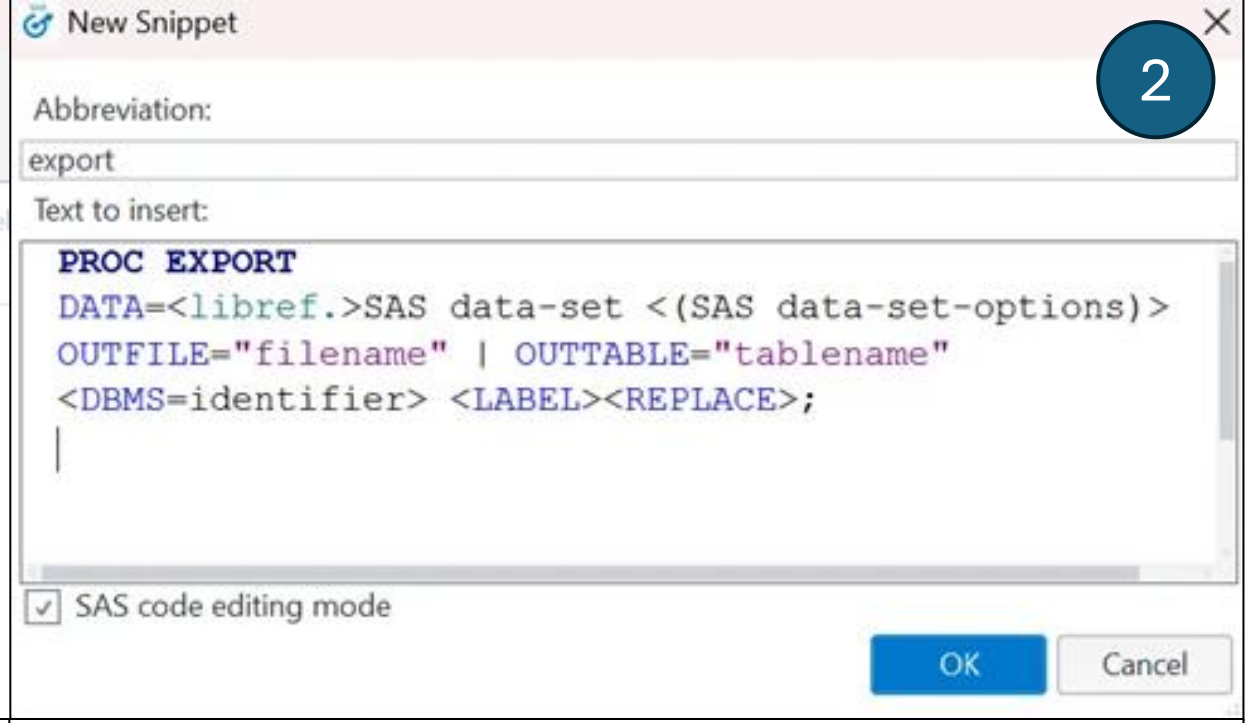
select make from cars group by 1 order by 1 desc;

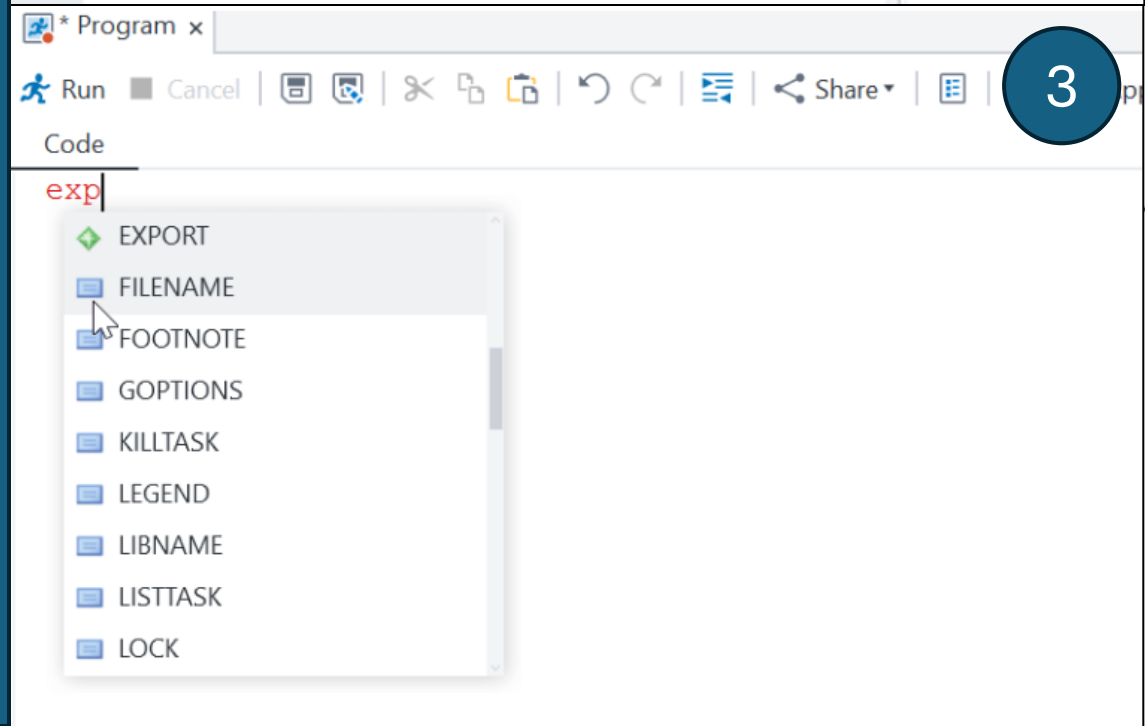
🛒 make ⬅️ cars ∑ 1 ↕️ 1 ⬇️ ;

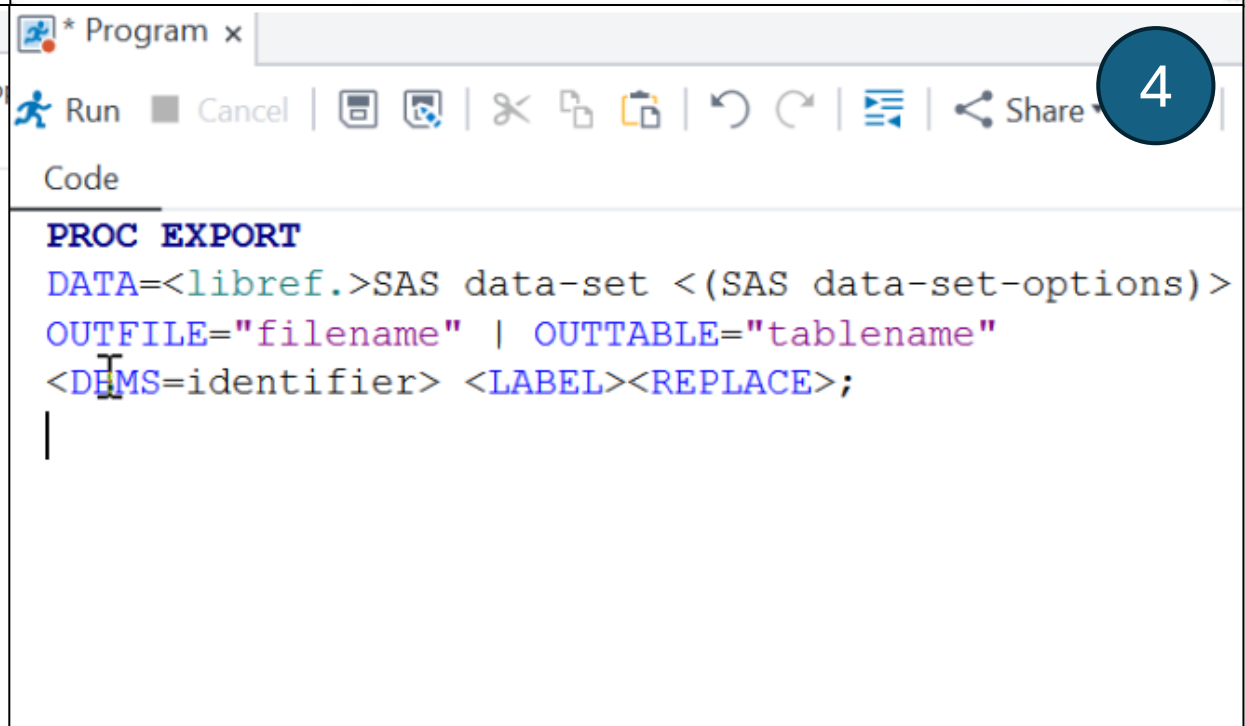
SQL Code (Text)	SQL Code (Text+Emoji)
proc sql nopr.int; create table car_summary as select make, model, max(dt) as maxdate format=date10., min(tm) as mintime format=time8. from sashelp.cars t1 join dt_tm t2 on 1=1 group by make, model order by make, model desc;	proc sql noprint; 🛢 car_summary as 🛒 make, model, max(dt) as max 🗓 format= 🗓 10., min(tm) as min 🕘 format= 🕘 8. ⬅ sashelp.cars t1 🔗 dt_tm t2 on 1=1 ∑ make, model ↕ make, model ⬇;

SAS EG Code Snippet Abbreviations









SAS® Studio

SAS Programmer | Sign Out

copilotunicodesas.sas | *wuss2025example.sas | test_pgm_in.sas | adventofcodeday1.sas | dad.sas | eclipse2024.sas | *emmys2024.sas

CODE | LOG | OUTPUT DATA

```
22 ods graphics / width=16in height=9in noborder outputfmt=svg;          * SVG format to mak
23 proc sgpanel data=emmys noautolegend des="2024 Emmy Awards";          * Draw charts for r
24 panelby award / headerattrs=(weight=bold color=black) novarname nowall noheaderborder nobor
25 hbarparm category=seqx response=probability / nooutline fillattrs=(color=cXA8D8FF); * Bar c
26 text x=minX y=seqx text=nominee / position=right strip contributeoffsets=none textattrs=(si
27 text x=maxX y=seqx text=odds / position=left strip contributeoffsets=none textattrs=(size=9
28 rowaxis display=(nolabel novalues noticks noline);                     * Suppress most axi
29 colaxis display=(nolabel noticks) values=(0 .1 .2 .3) valuesdisplay=('0%' '10%' '20%' '30%
30 run;
31
```

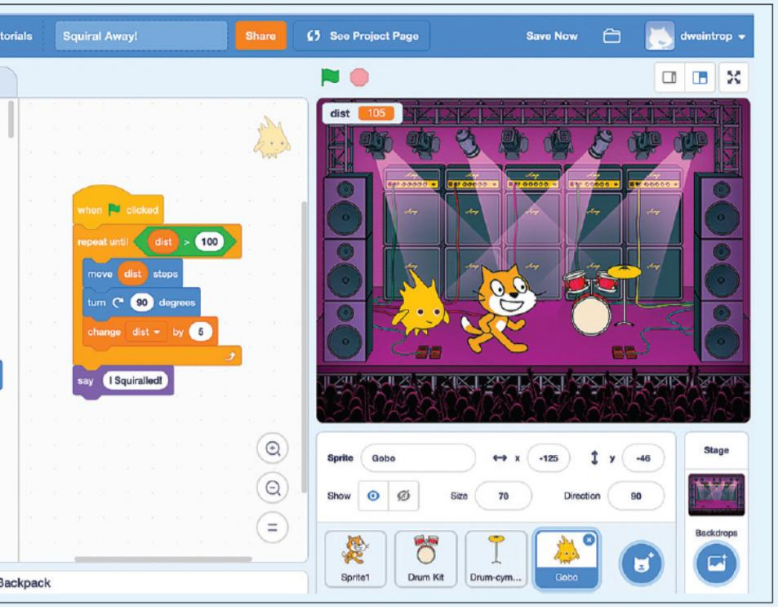
/home/ted.conway/emmys2024.sas Line 17, Column 41 UTF-8

RESULTS

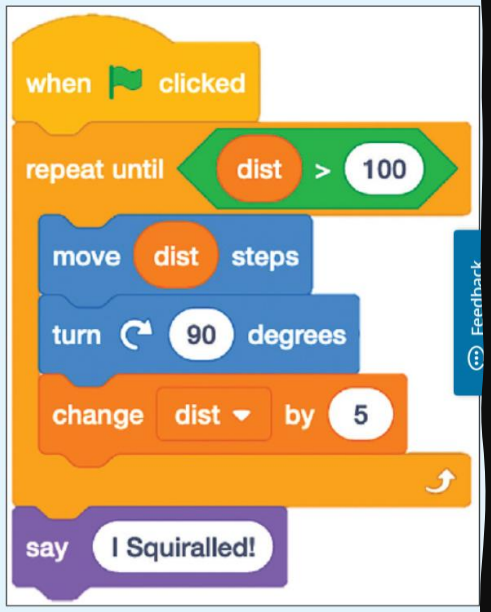
Table of Contents

SAS Syntax Highlighting

Messages: 1 User: ted.conway



(a)



(b)

ork with the Logo language (from which Scratch is based), students would came to be called squirals: the image (and program) reflects that history.

answer_tests.py U | display_tests.py U

src > quizzes > tests > display_tests.py > DisplayQuizViewTests > test_quiz_redirects

```
4   from django.test import TestCase
5   from django.urls import reverse
6
7
8   class DisplayQuizViewTests(TestCase):
9       def test_quiz_404(self):
10          url = reverse("quizzes:display_quiz", args=(12,))
11          response = self.client.get(url)
12          self.assertEqual(response.status_code, 404)
13
14      def test_quiz_redirects(self):
15          quiz, question, _ = create_quiz()
16          url = reverse("quizzes:display_quiz", args=(quiz.pk,))
17          response = self.client.get(url)
18          self.assertRedirects(response, reverse("quizzes:display_question", args=(quiz.pk, question.
19
20
21  class DisplayQuestionViewTests(TestCase):
22      def test_quiz_404(self):
23          url = reverse("quizzes:display_question", args=(12, 1))
24          response = self.client.get(url)
25          self.assertEqual(response.status_code, 404)
26
27      def test_question_404(self):
28          quiz, question, _ = create_quiz()
29          url = reverse("quizzes:display_question", args=(quiz.pk, question.pk + 100))
30          response = self.client.get(url)
```

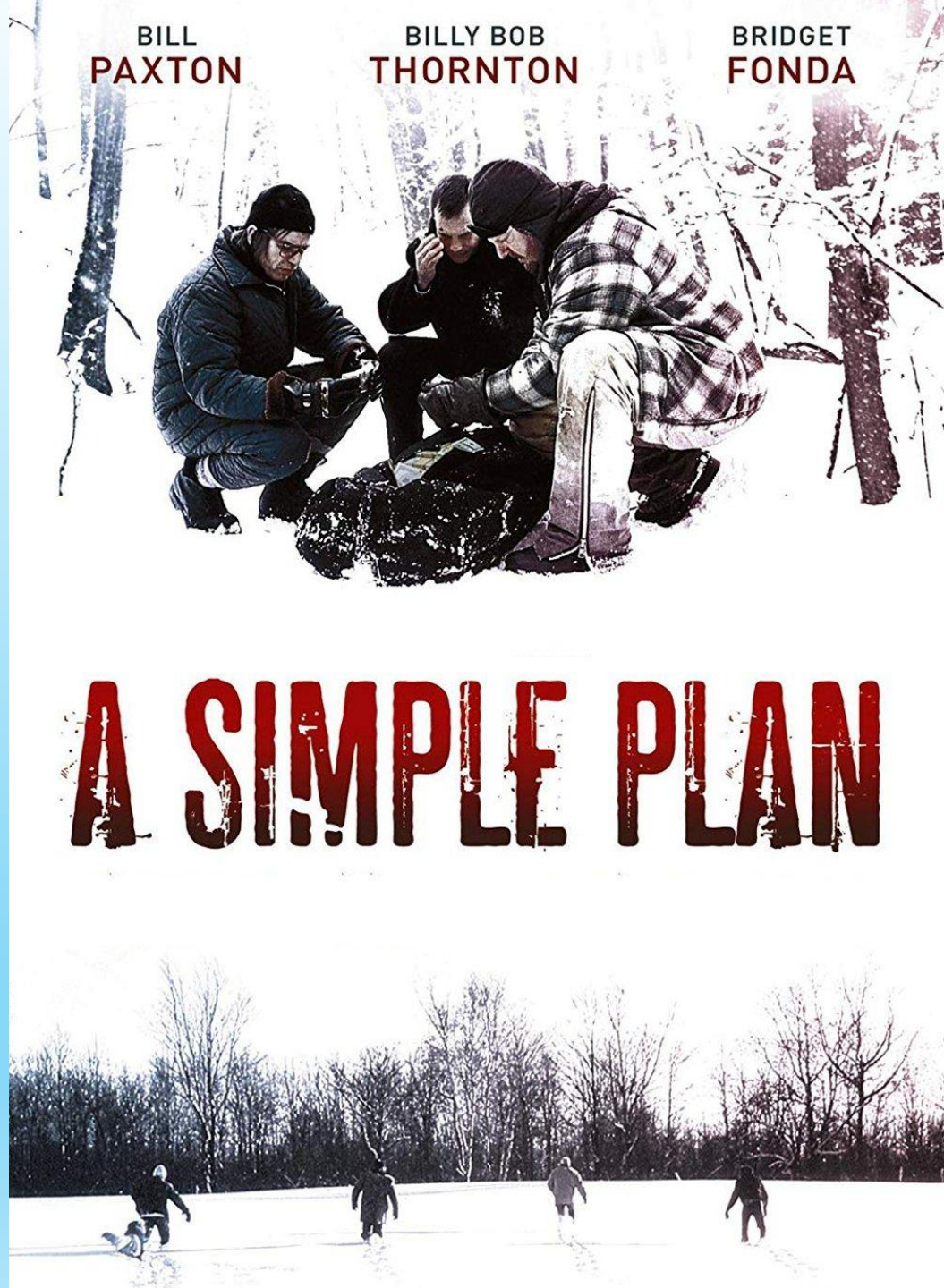
Block-Based vs. Text Programming

A Simple Emoji-to-Text Preprocessor

✂️

⬇️

SUBSTR

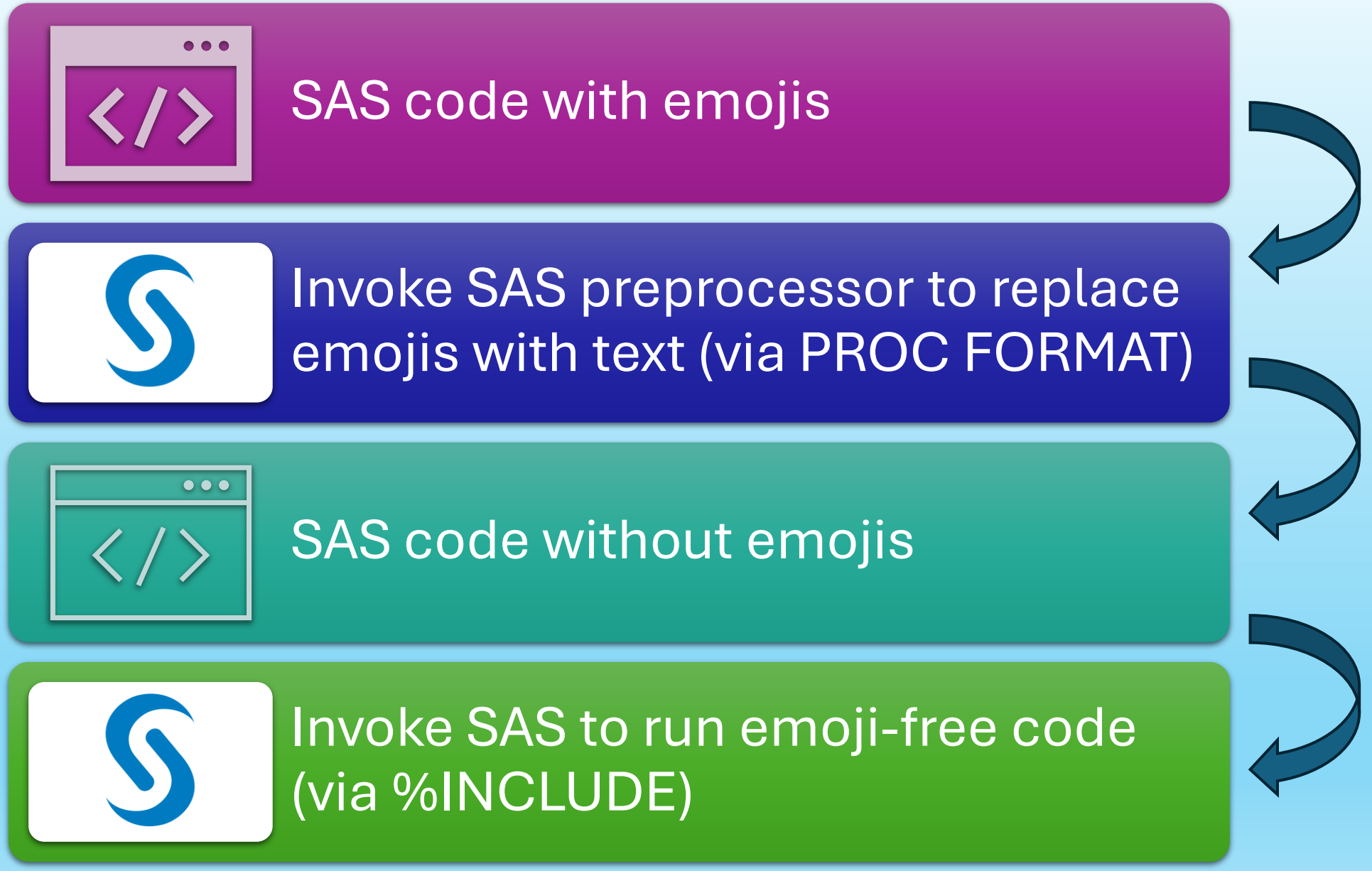


Nice idea, but…

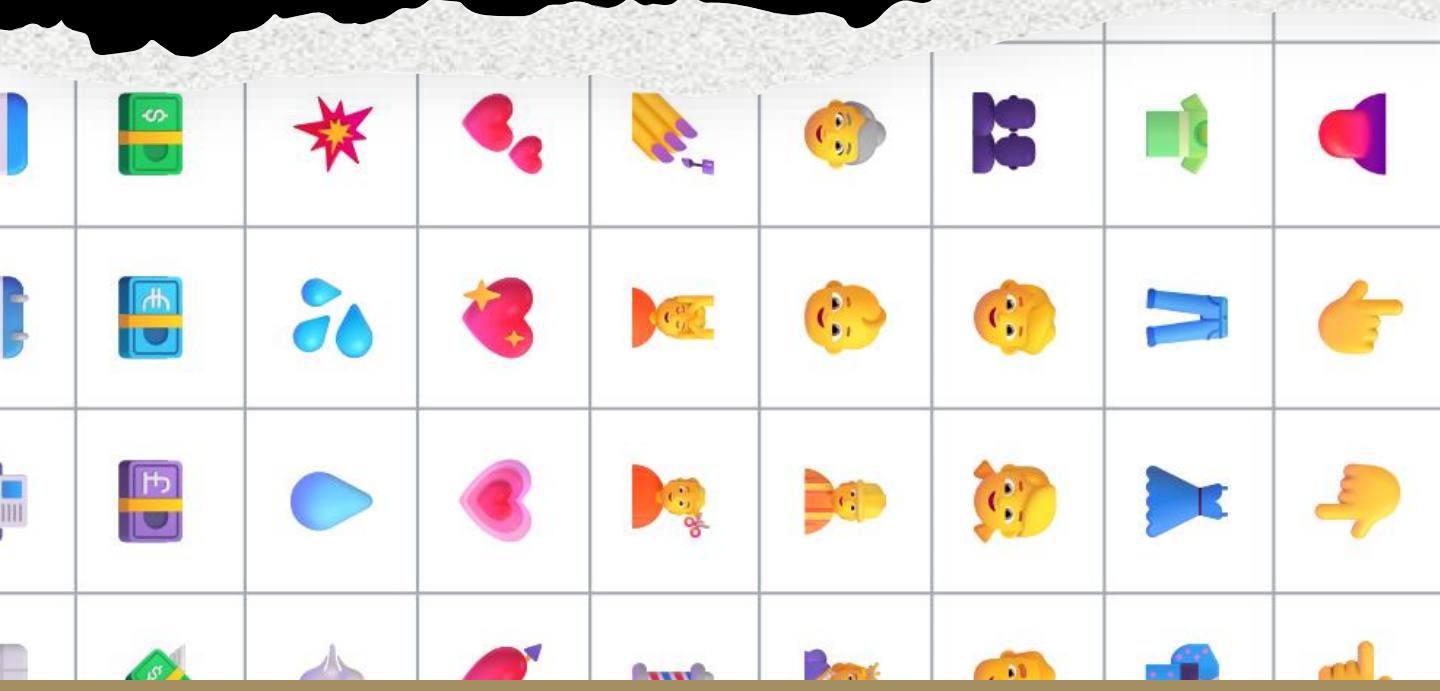
- ⊗ SAS macro variable names **must begin with a letter or an underscore**
- ⊗ Macro names are **subject to standard SAS naming conventions**

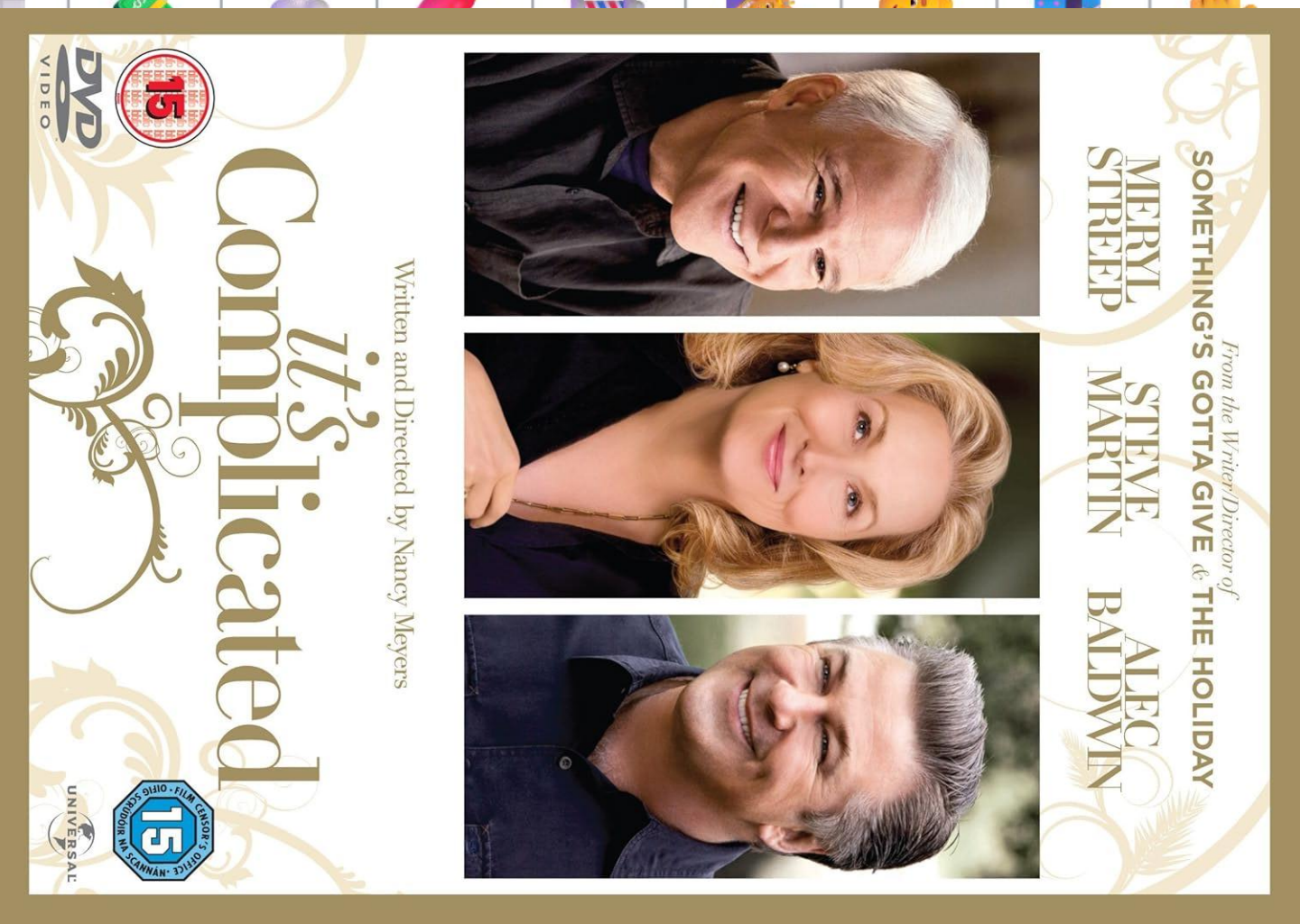
```
%macro ✂ / stmt;
substr
%mend;

data _null_;
x = ✂("abcdef", 2, 3);
run;
```

Plan B – A SAS Preprocessor



Emojis are complicated!





Emoji Encoding

- In the Unicode and UTF-8 world of emoji, **one character may now occupy 1-4 bytes**
- Complex graphemes built from **multiple code points, joiners & modifiers** require even more!

Character	Description	Code Points (Sequence)	UTF-8 Encoding (Hex)	Bytes
A	Latin Capital A	U+0041	41	1
🤔	Thinking Face	U+1F914	F0 9F A4 94	4
✅	White Heavy Check Mark	U+2705	E2 9C 85	3
❎	Cross Mark Button	U+274E	E2 9D 8E	3
🏃	Person Running	U+1F3C3	F0 9F 8F 83	4
🏃‍➡️	Man Running Facing Right (ZWJ seq)	U+1F3C3 [🏃] U+200D U+2642 [♂] U+FE0F U+200D U+27A1 [➡] U+FE0F	F0 9F 8F 83 E2 80 8D E2 99 82 EF B8 8F E2 80 8D E2 9E A1 EF B8 8F	22

Who Ya Gonna Call? K Functions!

SAS K Functions

- Traditional SAS string functions are single-byte oriented
  - ✓ LENGTH(‘😀😮🤔’)=12, Not 3!
- K functions operate on characters, not bytes (K is short for Kanji)
- KSUBTR, KLENGTH, KINDEX, etc.
  - ✓ KSUBSTR(‘😀😮🤔’,2,1)=‘😮’
  - ✓ KLENGTH(‘😀😮🤔’)=3
- K functions handle single Unicode code points (🤔) but not more complex grapheme clusters (🏃)

SAS PREPROCESSOR (CODE)

```
proc format; value $emojif
' 💾 '='data' ' 🤔 '='if' ' ✅ '='then' ' ❎ '='else' ' 🏃 '='run;';

data _null_;
length txt varchar(1024);
infile "/home/ted.conway/test_pgm_in.sas"
        lrecl=32767 recfm=n truncover length=l;
file "/home/ted.conway/test_pgm_out.sas";
input pgm $varying32767. l;
do c=1 to klength(pgm);
 txt=put(ksubstr(pgm,c,1),$emojif.);
 txt_len=length(txt);
 put txt $varying. txt_len@;
end;
run;
%include "/home/ted.conway/test_pgm_out.sas";
run;
```

PROC FORMAT MAPPING

READ SAS CODE WITH EMOJIS

REPLACE EMOJIS W/TEXT

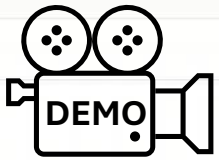
RUN EMOJI-FREE SAS CODE

SAS® Studio

SAS Programmer | Sign Out

test_pgm_in.sas | WussSasDemo.sas

CODE | LOG



Cut code

```
1  _null_;
2  a=1 ✅ b=1; ❎ b=0;
```

/home/ted.conway/test_pgm_in.sas Line 2, Column 24 UTF-8

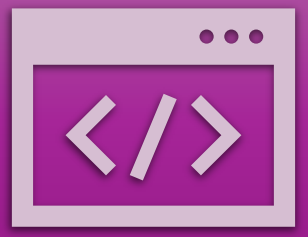
RESULTS

Table of Contents

Messages: 33 User: ted.conway

A Python Preprocessor?

Plan C – A Python Preprocessor



SAS code with emojis

Invoke **Python** preprocessor to replace emojis with text (via regex)

SAS code without emojis

Invoke SAS to run emoji-free code (via SASPy submit)

Who Ya Gonna Call? Python Regex!

A Quick SAS-to-Python Port

- Convert PROC FORMAT to a Python dictionary
- Use **regex** package with **/X** option to get a list of characters and graphemes from SAS code
- Use map functionality + dictionary to replace emojis with text
- Use SASPy to submit emoji-free SAS code to SAS OnDemand for Academics for execution

PYTHON DICTIONARY STARTER SET

```
dict = {'🤔':'if', '✅':'then', '❎':'else',
        '❓':'if', '👍':'then', '👎':'else',
        '💾':'data', '✂️':'substr',
        '🗓️':'date', '🕑':'time',
        '🏃':'run;', '🖨️':'print',
        '🛢️':'create table', '🗑️':'drop table',
        '🛒':'select', '⬅️':'from',
        '🔗':'join', '↕️':'order by',
        '⬇️':'desc', 'Σ':'group by'}
```

PYTHON REGEX EMOJI PARSING

```
import regex, pandas as pd
dict = {'🤔': 'if', '✅': 'then', '❎': 'else', '🏃':'run;'}
str="🤔 a=b ✅ c=d; ❎ e=f; 🏃 "
df = pd.DataFrame([match.group() for match in regex.finditer(r"\X", str)],
                  columns=['grapheme’])
df['text'] = df['grapheme'].map(dict)
df['text'].fillna(df['grapheme'], inplace=True)
df
```

#	Grapheme	Text	#	Grapheme	Text	#	Grapheme	Text	#	Grapheme	Text
0	🤔	if	**6**	✅	then	**12**			**18**	;	;
1			**7**			**13**	❎	else	**19**		
2	a	a	**8**	c	c	**14**			**20**	🏃	run;
3	=	=	**9**	=	=	**15**	e	e			
4	b	b	**10**	d	d	**16**	=	=			
5			**11**	;	;	**17**	f	f			

PYTHON PREPROCESSOR (CODE)

```
sascode="""
data _null_;
🤔 a=b ✅ c=d; ❌ e=f; 🏃
"""
dict = {'🤔': 'if', '✅': 'then', '❌': 'else', '🏃':'run;'}

import regex, json, pandas as pd
def grapheme_positions(text):
   matches = regex.finditer(r'\X', text)
   return [{'grapheme': m.group()} for m in matches]

df = pd.DataFrame.from_dict(grapheme_positions(sascode), orient='columns')
df['replstr'] = df['grapheme'].map(dict)
df['replstr'].fillna(df['grapheme'], inplace=True)
sascodeout="".join(df["replstr"].tolist());

sas_session.submitLST(sascodeout)
```

SAS PROGRAM WITH EMOJIS

PYTHON DICTIONARY

EXTRACT EMOJIS

REPLACE EMOJIS

EXECUTE SAS (VIA SASPy)

Search

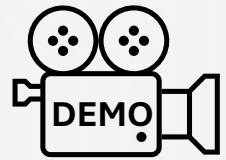
WussPythonDemo.ipynb

C: > Users > tedco > OneDrive > Documents > SAS2023 > WussPythonDemo.ipynb > sascode='''

Generate | Code | Markdown | Run All | Restart | Clear All Outputs | ... | base (Python 3.10.9)

```
sascode='''
data _null_;                          * Test SAS code;
🤔 a=b ✅ c=d; ❎ e=f; 🏃
'''
dict = {'🤔': 'if', '✅': 'then', '❎': 'else', '🏃':'run;'}

import regex, json, pandas as pd     # Extract emojis from text;
def grapheme_positions(text):
    matches = regex.finditer(r'\X', text)
    return [{'grapheme': m.group()} for m in matches]
                                     # Replace emojis with text
df = pd.DataFrame.from_dict(grapheme_positions(sascode), orient='columns')
df['replstr'] = df['grapheme'].map(dict)
df['replstr'].fillna(df['grapheme'], inplace=True)
sascodeout="".join(df["replstr"].tolist());
sas_session.submitLST(sascodeout)    # Run SAS Code using SASPy
                                     # Show input & output SAS code
print(sascode,sascodeout)
```

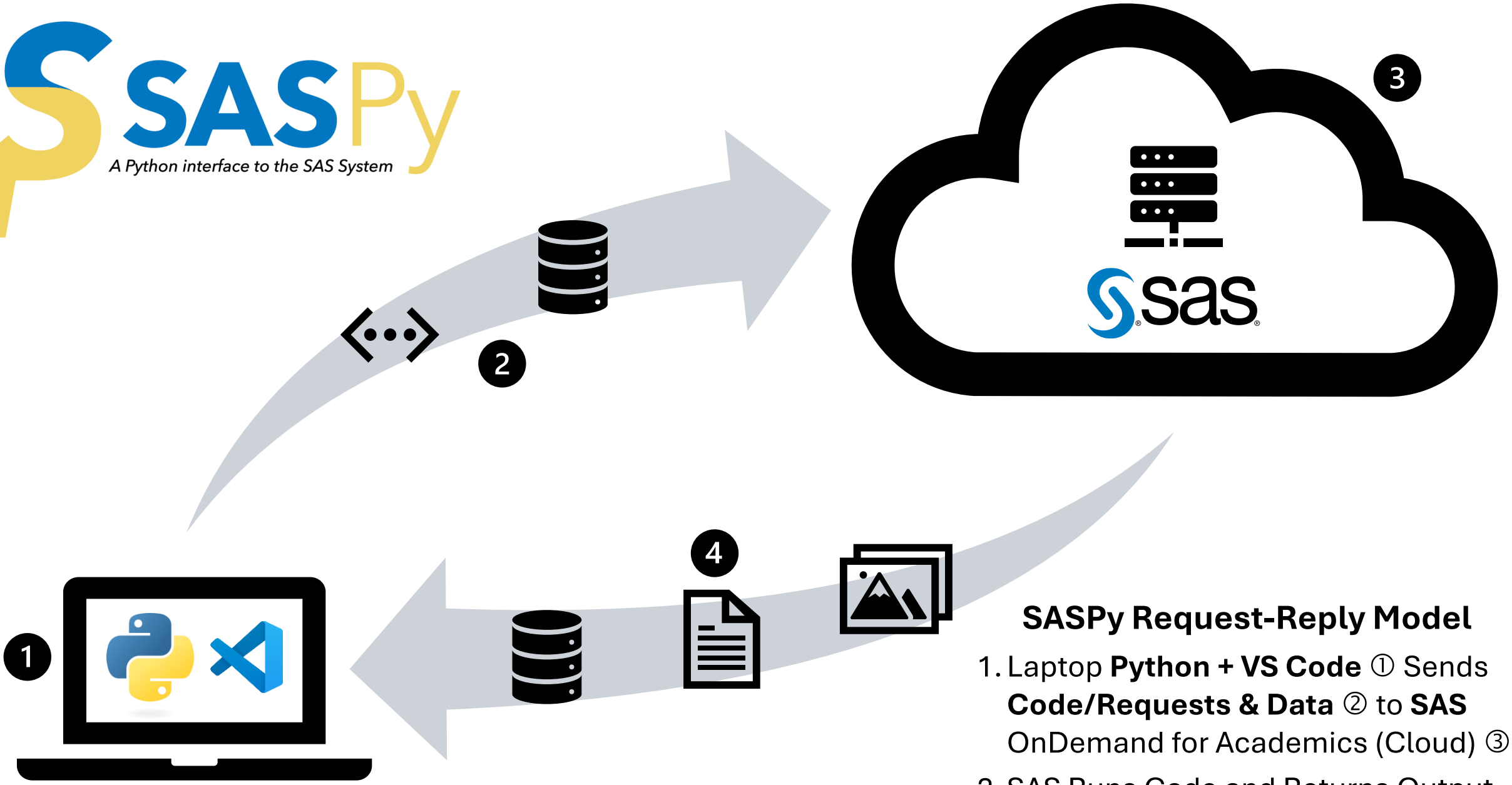
[12]



0 0 | Spaces: 4 | LF | {} | Cell 2 of 2

SASPy

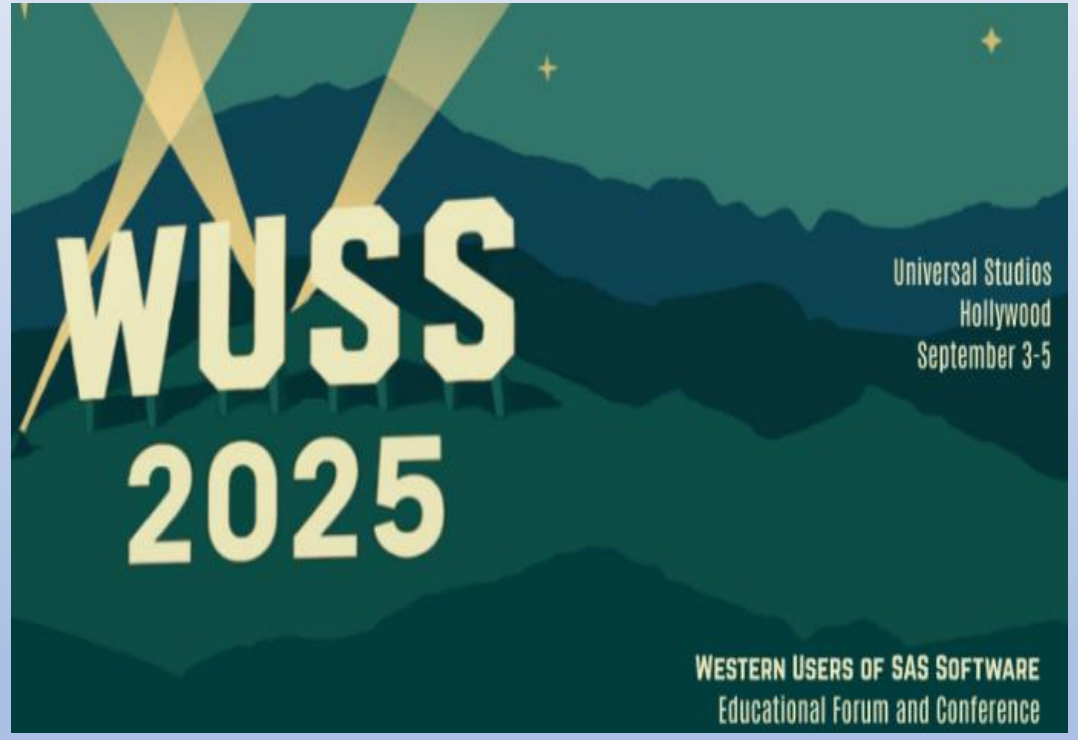
A Python interface to the SAS System



SASPy Request-Reply Model

1. Laptop **Python + VS Code** ① Sends **Code/Requests & Data** ② to **SAS** OnDemand for Academics (Cloud) ③
2. SAS Runs Code and Returns Output (**Images, Reports, Data**) ④ to Python

Contact Information



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SAS PREPROCESSOR (DEMO)

```
proc format;                    * Define emojis and associated text;
value $emojif '💾'='data' '🤔'='if' '✅'='then' '❎'='else' '🏃'='run;';

data _null_;                    * Read in code, replace emojis w/associated text;
length txt varchar(1024);
infile "/home/ted.conway/test_pgm_in.sas" lrecl=32767 recfm=n truncover length=l;
file "/home/ted.conway/test_pgm_out.sas";
input pgm $varying32767. l;
do c=1 to klength(pgm);
  txt=put(ksubstr(pgm,c,1),$emojif.);
  txt_len=length(txt);
  put txt $varying. txt_len@;
end;
run;                            * Run preprocessed, emoji-free code;
%include "/home/ted.conway/test_pgm_out.sas";
                                * Create SAS dataset to show input & output SAS code;
filename pgms '~/test_pgm_*.sas';
data code_in_out; infile pgms filename=fn; input; code=_infile_;
```

PYTHON PREPROCESSOR (DEMO)

```
import saspy                                    # Import SASpy package
sas_session = saspy.SASsession()                # Start SAS OnDemand for Academics session
```

```
sascode='''
data _null_;                                    * Test SAS code;
🤔 a=b ✅ c=d; ❎ e=f; 🏃
'''
dict = {'🤔': 'if', '✅': 'then', '❎': 'else', '🏃':'run;'}

import regex, json, pandas as pd                # Extract emojis from text;
def grapheme_positions(text):
    matches = regex.finditer(r'\X', text)
    return [{'grapheme': m.group()} for m in matches]
                                                # Replace emojis with text
df = pd.DataFrame.from_dict(grapheme_positions(sascode), orient='columns')
df['replstr'] = df['grapheme'].map(dict)
df['replstr'].fillna(df['grapheme'], inplace=True)
sascodeout="".join(df["replstr"].tolist());
sas_session.submitLST(sascodeout)               # Run SAS Code using SASPy

print(sascode,sascodeout)                       # Show input & output SAS code
```