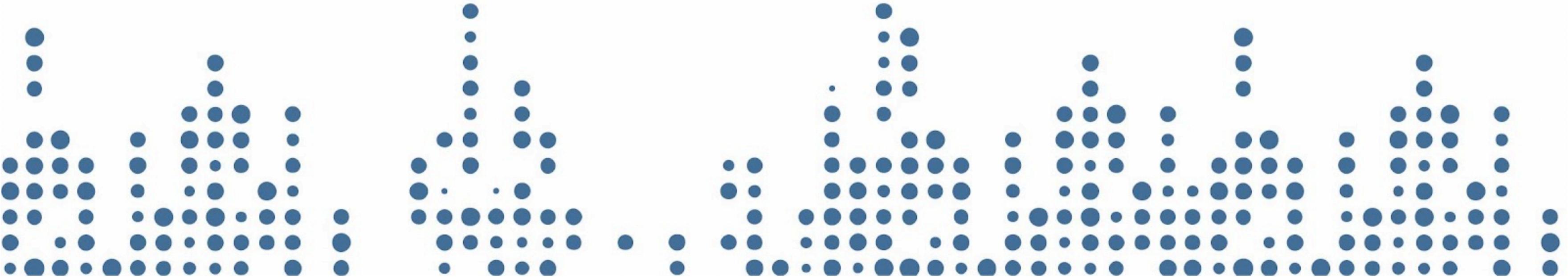




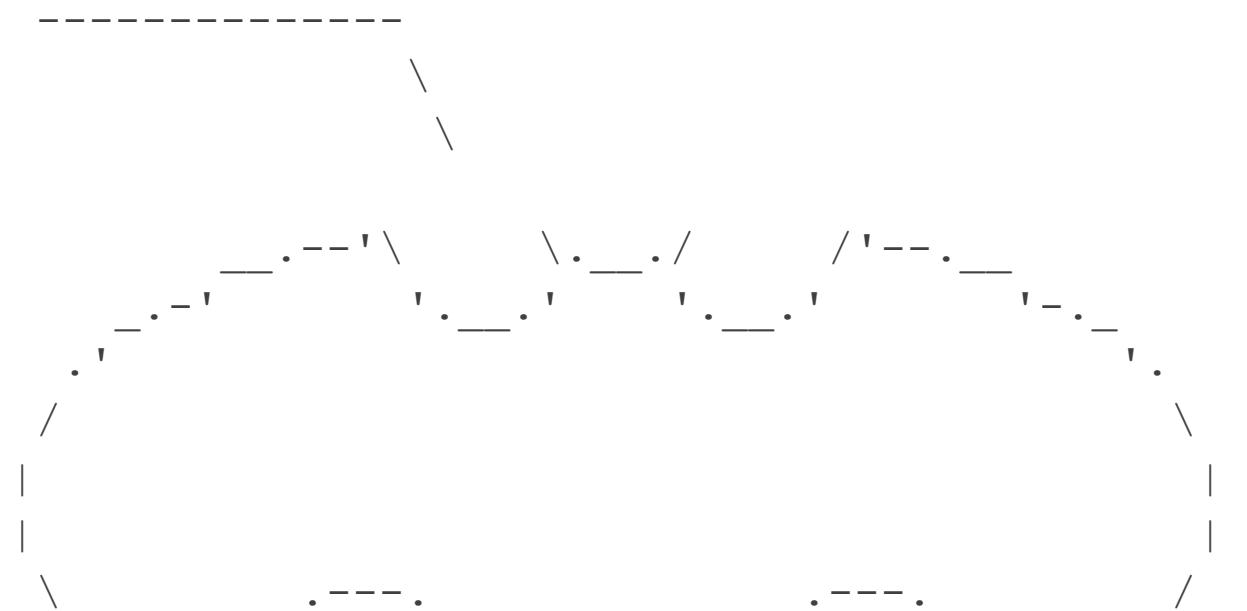
Shiny & LLMs: Landscape and Applications in Pharma

Phil Bowsher | 2025 May 29



Hello!

< hi PharmaSUG >



Hello!

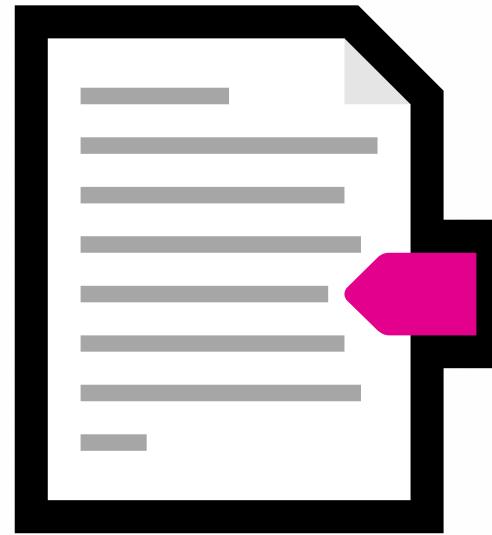


 @philbowsher

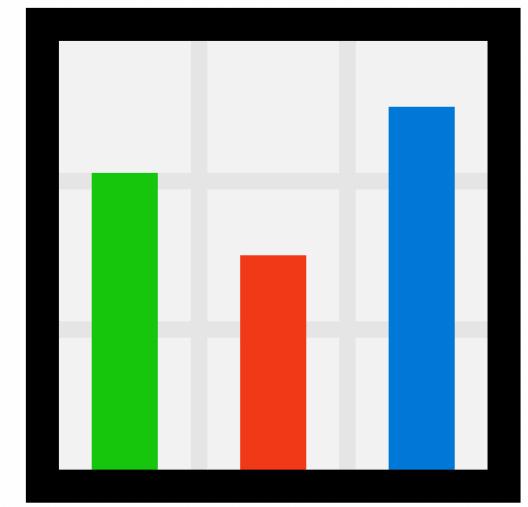
 youtube.com/rinpharma

 rinpharma.com

>

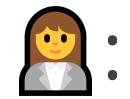


posit.ai



<

Shiny is...



:

Easy web apps for pharma in **R or Python!**

Shiny is...



:

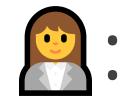
Easy web apps for pharma in R or Python **that works well with LLMs!**

Shiny is...



Easy web apps for pharma in R or Python that works well with LLMs **in many ways!**

Shiny is...



:

Easy web apps for pharma in R or Pythone that works well with LLMs in many ways
and is Evolving Quickly!

GenAI in Pharma 2024



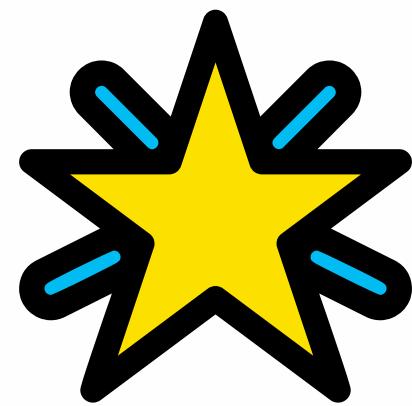
GENAI IN PHARMA



Foundation tools:

- ellmer for R
- chatlas for Python
- Users will specify the provider/model choice
- Obtaining an API key from the model organization and then store that securely in your environment
- Applications of Shiny and GenAI utilizing ellmer and chatlas

>



1. Chatbots



<

>

Chatbots via Shiny for R

- shinychat for Shiny for R
- Prompt and chat into, output streams down the page
- shinychat is a Chat UI component for Shiny for R
- Works by creating a stream that contains the user input
- Uses ellmer, and model can local or vendor provided
- <https://posit-dev.github.io/shinychat/>

<

>

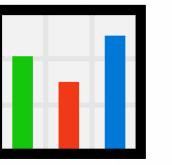
```
1 library(shiny)
2 library(shinychat)
3
4 ui <- bslib::page_fluid(
5   chat_ui("chat")
6 )
7
8 server <- function(input, output, session) {
9   chat <- ellmer::chat_openai(system_prompt = "You're a trickster who answers in riddles")
10
11   observeEvent(input$chat_user_input, {
12     stream <- chat$stream_async(input$chat_user_input)
13     chat_append("chat", stream)
14   })
15 }
16
17 shinyApp(ui, server)
```

<

>



jcheng.shinyapps.io/ellmer-assistant/



<



Hi, I'm **Ellmer Assistant**! I'm here to answer questions about [ellmer](#) and [shinychat](#), or to generate code for you.

Enter a message...



>

Chatbot for Shiny for Python

- Shiny for Python chatbot
- Utilize the ui.Chat component
- <https://shiny.posit.co/py/docs/genai-chatbots.html>

<

>

```
1 from chatlas import ChatAnthropic
2 from shiny.express import ui
3
4 chat = ui.Chat(
5     id="ui_chat",
6     messages=["Hi! How can I help you today?"],
7 )
8 chat.ui()
9
10 chat_model = ChatAnthropic()
11
12 @chat.on_user_submit
13 async def handle_user_input():
14     response = chat_model.stream(chat.user_input())
15     await chat.append_message_stream(response)
```

<



Hello! How can I help you today?

Teach me a few Python basics



Sure, I'd be happy to help you learn some Python basics! Let's cover a few fundamental concepts:

1. Variables and Data Types

In Python, you can use variables to store data. Python is dynamically typed, so you don't need to declare the variable type.

```
# Examples of variable assignments
name = "Alice"          # String
age = 30                 # Integer
height = 5.7              # Float
is_student = True         # Boolean
```



Copy to clipboard

2. Basic Data Structures

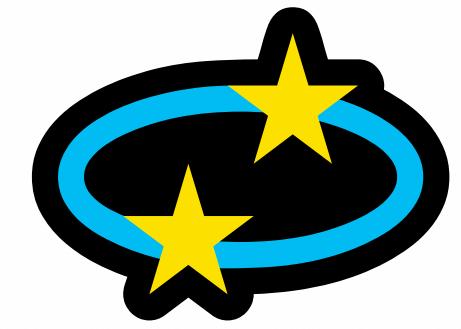
Enter a message...



>



2. Sidebots



<

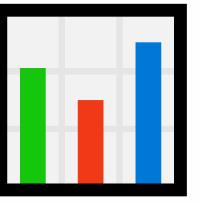
Sidebots via Shiny...

- Sidebot for helping to drive the data science within an application
- **querychat** writes SQL queries & uses DuckDB for its SQL engine
- Shiny for R as well as Shiny for Python
- <https://github.com/posit-dev/querychat>
- Query a data frame using natural language
- Results are available in Shiny's reactive data frame

>



jcheng.shinyapps.io/sidebot/



<

Restaurant tipping

>



Total tippers

244



Average tip

16.1%



Average bill

\$19.79

Tips data

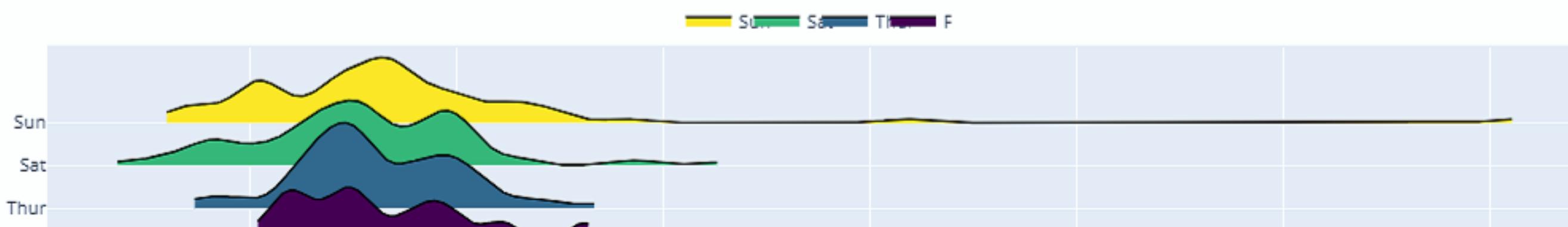
total_bill	tip	sex	smoker	day	time	size	percent
16.99	1.01	Female	No	Sun	Dinner	2	0.05944673
10.34	1.66	Male	No	Sun	Dinner	3	0.16054158
21.01	3.5	Male	No	Sun	Dinner	3	0.16658733
23.68	3.31	Male	No	Sun	Dinner	2	0.13978040
..

Viewing rows 1 through 4 of 244

Total bill vs. tip



Tip percentages





KEYNOTE SUMMER IS COMING: AI FOR R, SHINY, AND PHARMA



Joe Cheng
Posit

TUE, OCT 29, 2024
10:10AM EDT

>

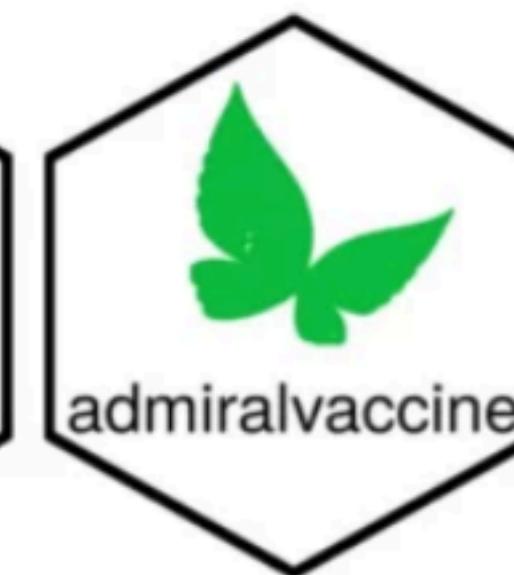


Pharmaverse Data



<





pharmaverse examples



Introduction

SDTM >

ADaM ▾

ADSL

ADPC

ADPPK

ADRS

ADTTE

ADVS

ADAE

ADaM > ADSL

ADSL

Introduction

This guide will show you how four pharmaverse packages, along with some from tidyverse, can be used to create an ADaM such as [ADSL](#) end-to-end, using [{pharmaversesdtm}](#) SDTM data as input.

The four packages used with a brief description of their purpose are as follows:

- [{metacore}](#): provides harmonized metadata/specifications object.
- [{metatools}](#): uses the provided metadata to build/enhance and check the dataset.
- [{admiral}](#): provides the ADaM derivations. (Find functions and related variables by searching [admiraldiscovery](#))
- [{xportr}](#): delivers the SAS transport file (XPT) and eSub checks.

It is important to understand [{metacore}](#) objects by reading through the above linked package site, as these are fundamental to being able to use [{metatools}](#) and [{xportr}](#). Each company may need to build a specification reader to create these objects from their source standard specification templates.

>

```
1 library(pharmaverseadam)
2 adae <- adae
```

<

Back to 2023



Photo credit: [pic](#) on [wikipedia](#)

>

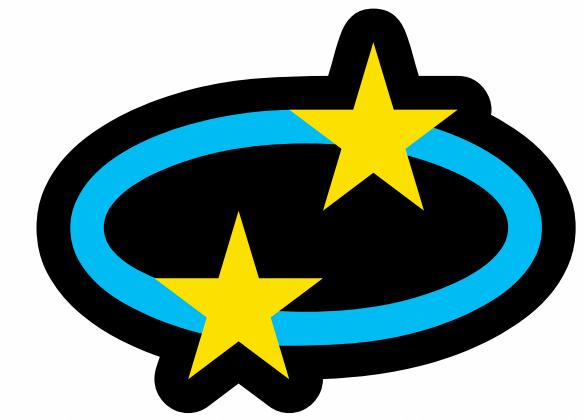
 **Is your copilot Not working well on local data or with your packages :(** 

<

>



Agents

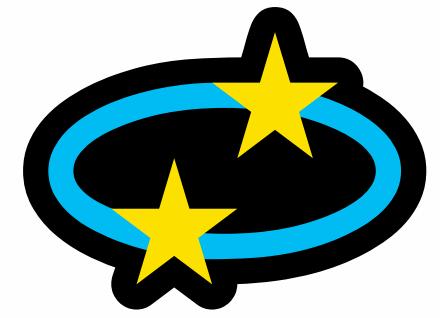


<

>



3. Databots



<

Databot...

- Experimental AI assistant that is designed to help users complete exploratory data analysis
- Performs tasks within your R session
- Databot uses Claude 3.5 Sonnet
- Uses your environment data as well as your installed packages
- Query a data frame using natural language
- Results are available in Shiny's reactive data frame

Run Databot Example in RStudio

 <https://github.com/jcheng5/databot>

 `pak::pak("jcheng5/databot")`

 `databot::chat()`

 `adae`



Hi! I'm here to help you with your data analysis tasks in R. Here are some things I can help you with:

1. [Let's explore what data is currently loaded in the R session](#)
2. [Could you help me analyze a specific dataset?](#)
3. [I'd like to create some visualizations of my data](#)
4. [Could you help me create a reproducible report of my analysis?](#)

Of course, these are just suggestions - I'm happy to help with any other data analysis, manipulation, or visualization tasks you have in mind. What would you like to work on?

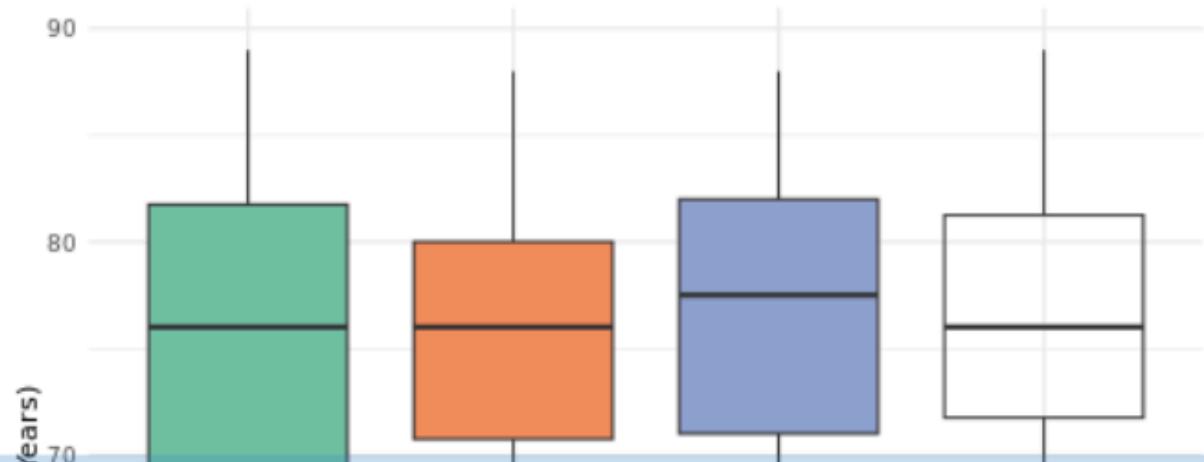


I'll create some visualizations to help us understand the age distribution across treatment arms using ggplot2.

```
library(ggplot2)
library(tidyverse)

# Create a boxplot
ggplot(adsl_raw, aes(x = ARM, y = AGE, fill = ARM)) +
  geom_boxplot() +
  theme_minimal() +
  labs(title = "Age Distribution by Treatment Arm",
       x = "Treatment Arm",
       y = "Age (Years)") +
  theme(axis.text.x = element_text(angle = 45, hjust = 1),
        legend.position = "none") +
  scale_fill_brewer(palette = "Set2")
```

Age Distribution by Treatment Arm

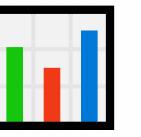


Enter a message...

>



Can create a reproducible report of my analysis!

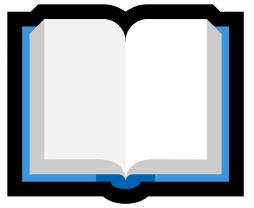


<

>

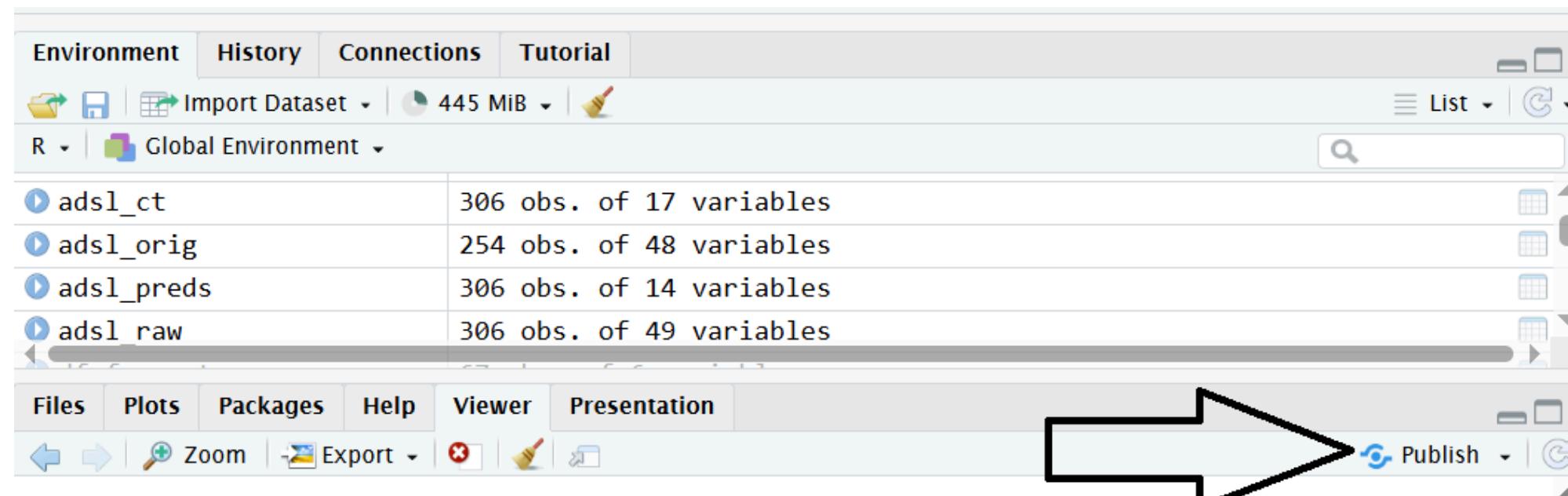


But how do I Share this?



<

Deploy to Connect



The screenshot shows the RStudio interface with the Global Environment tab selected. It lists four datasets: `ads1_ct`, `ads1_orig`, `ads1_preds`, and `ads1_raw`. A large black arrow points from the RStudio interface down to the table caption.

Table 14-2.01
Summary of Demographic and Baseline Characteristics

	Xanomeline			Total (N=254)	p-value ¹
	Placebo (N=86)	Low Dose (N=84)	High Dose (N=84)		
Age (y)					0.593
N Non-missing	86	84	84	254	
Mean	75.2	75.7	74.4	75.1	
SD	8.59	8.29	7.89	8.25	
Median	76.0	77.5	76.0	77.0	
Min	52.0	51.0	56.0	51.0	
Max	89.0	88.0	88.0	89.0	

>

Positron

Extensible, polyglot tool

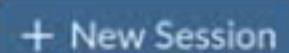
<



Sessions

 New Session

Create a new session

 + New Session

Projects

 typst-css

~/typst-css

LAST USED: 10/7/2024

 quarto-website-test

~/quarto-website-test

LAST USED: 9/24/2024

 test_ws

~/test_ws

LAST USED: 9/24/2024

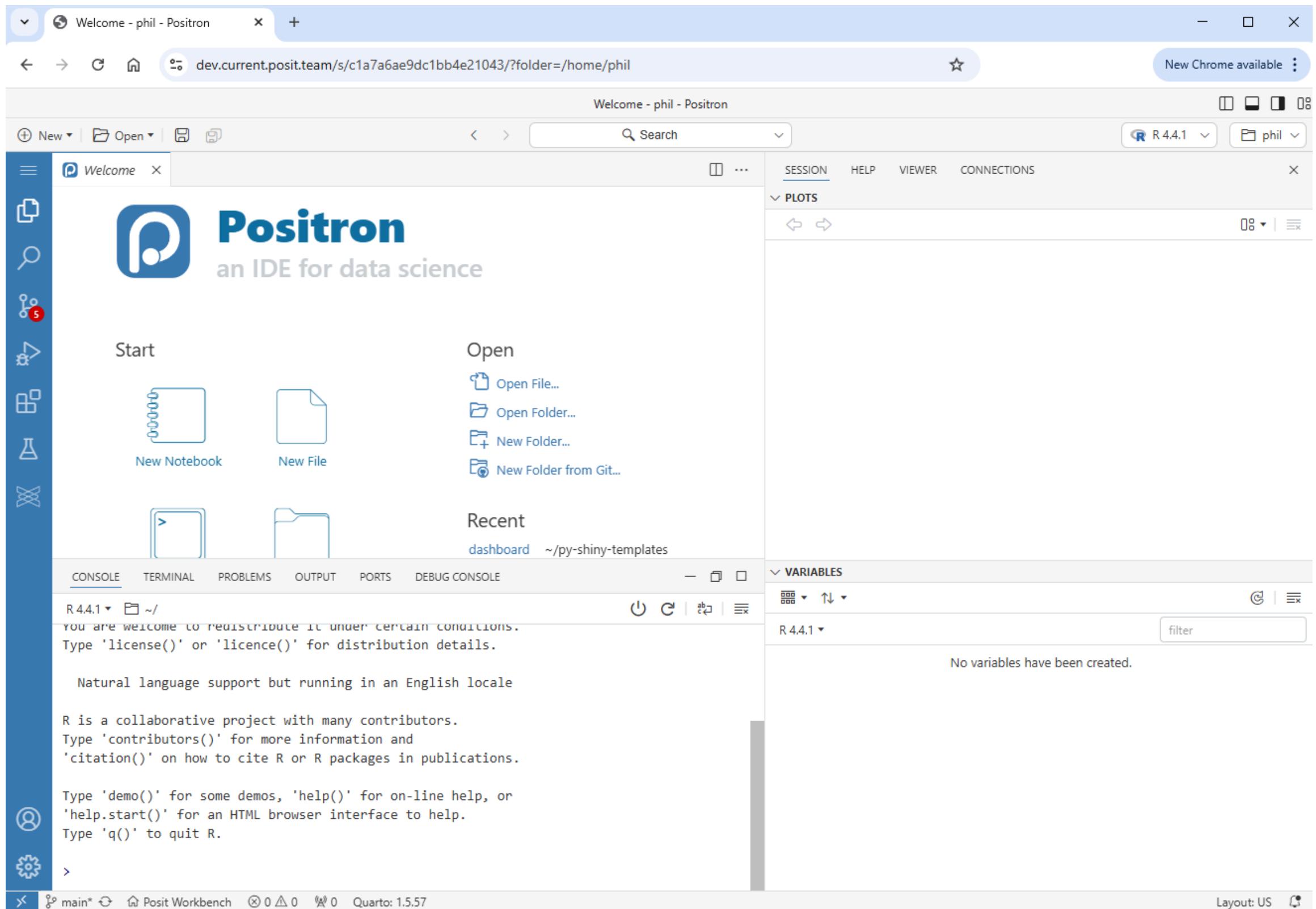
 test123

~/test123

LAST USED: 9/24/2024



Currently in Public Beta!



>

 Familiar environment for reproducible authoring & publishing 

<

← → ⌂ ⌂ dev.current posit.team/s/c1a7a6ae9dc1bb4e21043/?folder=/home/phil/py-shiny-templates/dashboard ⌂ New Chrome available ⌂

app-core.py - dashboard - Positron

EXPLORER DASHB... app-core.py < > Search SESSION HELP VIEWER CONNECTIONS PLOTS

app-core.py > ...

```
1 import seaborn as sns
2 from faicons import icon_svg
3
4 # Import data from shared.py
5 from shared import app_dir, df
6 from shiny import App, reactive, render, ui
7
8 app_ui = ui.page_sidebar(
9     ui.sidebar(
10         ui.input_slider("mass", "Mass", 2000, 6000, 6000),
11         ui.input_checkbox_group(
12             "species",
13             "Species",
14             ["Adelie", "Gentoo", "Chinstrap"],
15             selected=["Adelie", "Gentoo", "Chinstrap"],
16         ),
17         title="Filter controls".
```

CONSOLE TERMINAL PROBLEMS OUTPUT PORTS ...

Python 3.12.6 (Global) ~ /py-shiny-templates/dashboard

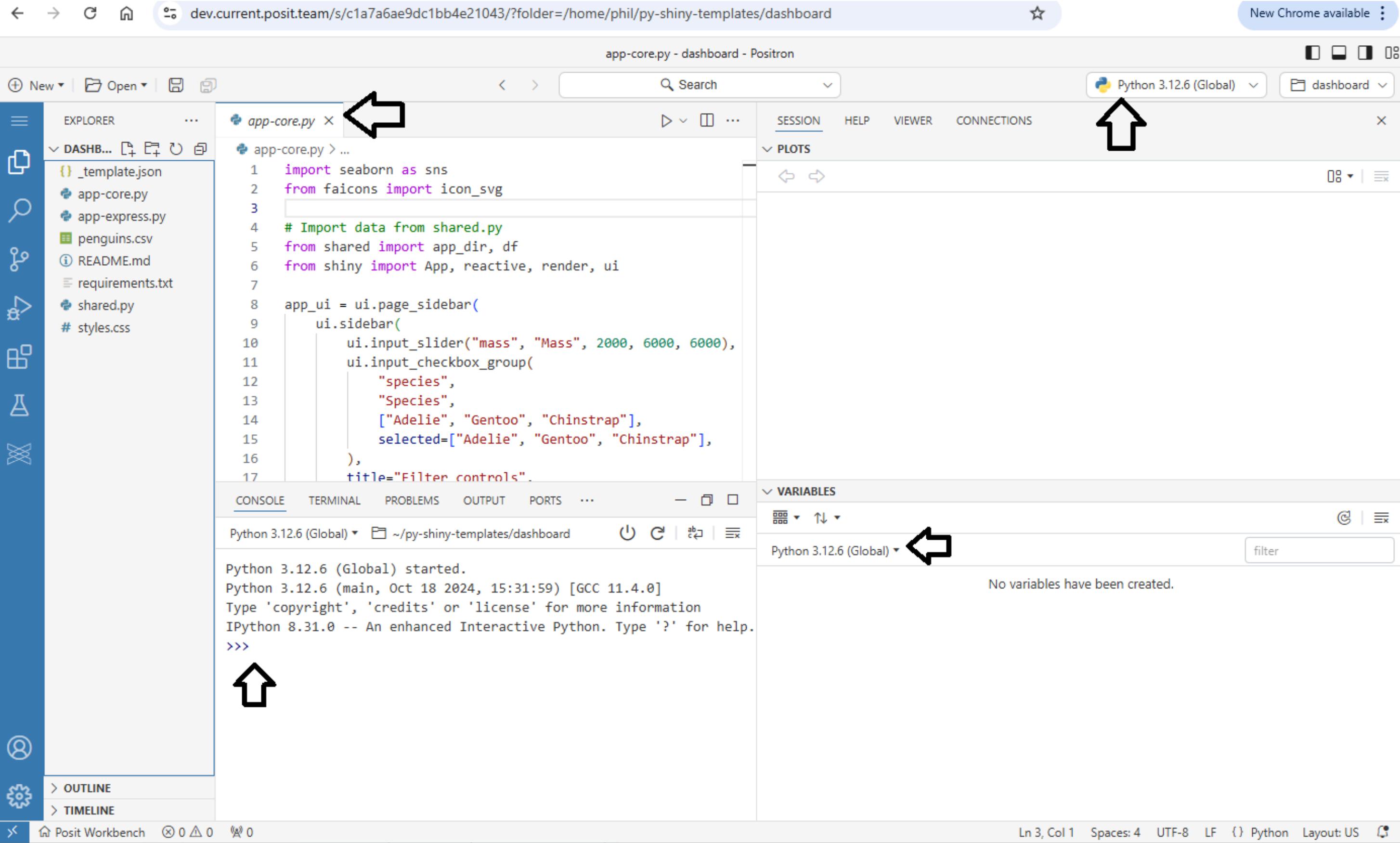
```
Python 3.12.6 (Global) started.
Python 3.12.6 (main, Oct 18 2024, 15:31:59) [GCC 11.4.0]
Type 'copyright', 'credits' or 'license' for more information
IPython 8.31.0 -- An enhanced Interactive Python. Type '?' for help.
>>>
```

VARIABLES

Python 3.12.6 (Global) filter

No variables have been created.

Posit Workbench ⌂ 0 △ 0 ⌂ 0 Ln 3, Col 1 Spaces: 4 UTF-8 LF {} Python Layout: US ⌂



Feel free to try out R

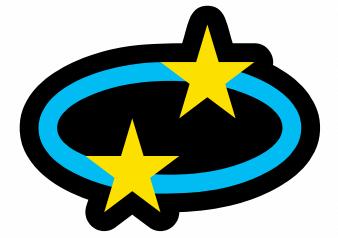
```
1  ````{r}
2  library(ggplot2)
3
4  p <- ggplot(data = diamonds, aes(x = cut, fill = clarity)) +
5      geom_bar(position = "dodge")
6
7  p
8  ````
```

Positron-Assistant

>



4. Shiny Assistant



<

Shiny Assistant...

- Ai-powered tool that helps users create Shiny apps
- Users can create new Shiny applications or ask questions and iterate on existing applications
- Create Shiny apps in both R and in Python
- Chat to ask the assistant to fix mistakes
- Uses the Shinylive web interface (WebAssembly)
- <https://posit.co/blog/ai-powered-shiny-app-prototyping/>

>



gallery.shinyapps.io/assistant/



<

R Python

Concise ▾



Hello, I'm Shiny Assistant! I'm here to help you with [Shiny](#), a web framework for data driven apps. You can ask me questions about how to use Shiny, to explain how certain things work in Shiny, or even ask me to build a Shiny app for you.

Here are some examples:

- "How do I add a plot to an application?"
- "Create an app that shows a normal distribution."
- "Show me how make it so a table will update only after a button is clicked."
- Ask me, "Open the editor", then copy and paste your existing Shiny code into the editor, and then ask me to make changes to it.

Let's get started!

Who can see my activity? ⓘ

Enter a message...



>

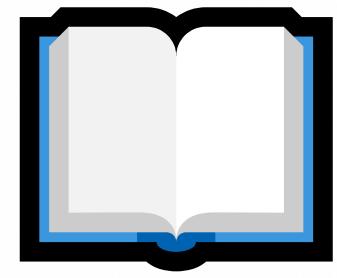
★ 5. Shiny for Python for Custom LLM Interfaces ⚡

<

>



Shiny for Python



<

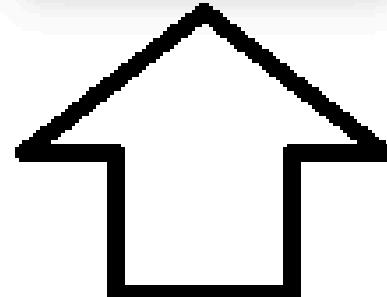
polyglot example

-  clicking the “Run” button = out of the box for R & Python
-  “Publish” Button = Built in with no additional extensions required

Welcome app-core.py X

app-core.py > [o] app_ui

```
1 import seaborn as sns
2 from faicons import icon_svg
3
4 # Import data from shared.py
5 from shared import app_dir, df
6 from shiny import App, reactive, render, ui
7
8 app_ui = ui.page_sidebar(
9     ui.sidebar(
10         ui.input_slider("mass", "Mass", 2000, 6000, 6000),
11         ui.input_checkbox_group(
12             "species",
13             "Species",
14             ["Adelie", "Gentoo", "Chinstrap"],
15             selected=["Adelie", "Gentoo", "Chinstrap"],
16         ),
17         title="Filter controls",
18     ),
19     ui.layout_column_wrap(
20         ui.value_box(
```



Run Shiny App

Welcome app-core.py

app-core.py > [app_ui]

```
1 import seaborn as sns
2 from faicons import icon_svg
3
4 # Import data from shared.py
5 from shared import app_dir, df
6 from shiny import App, reactive, render, ui
7
8 app_ui = ui.page_sidebar(
9     ui.sidebar(
10         ui.input_slider("mass", "Mass", 2000, 6000),
11         ui.input_checkbox_group(
12             "species",
13             "Species",
14             ["Adelie", "Gentoo", "Chinstrap"],
15             selected=["Adelie", "Gentoo", "Chinstrap"]
16     ),
```

SESSION HELP VIEWER CONNECTIONS

Deploy with Posit Publisher https://dev.palm.ptd.posit.it/s/062496ae

Penguins dashboard

Filter controls

Mass

2,000 6,000

Species

✓ Adelie
✓ Gentoo
✓ Chinstrap

Nun
33

TERMINAL

```
phil@session-062496ae9dc1b9bf79802-phil---phils-positron-k4
4xm-5vlxn:~/py-shiny-templates/dashboard$ /opt/python/3.12.
4/bin/python -m shiny run --port 35875 --reload --autoreload
d-port 44271 /home/phil/py-shiny-templates/dashboard/app-co
re.py
```

Shiny for Python for Custom LLM Interfaces...

- Host an interface for non-coding professionals
- Internal GenAI infrastructure and services such as Claude API, Amazon Bedrock, Azure OpenAI Studio GPT-4o API
- ui.Chat() component that is now bundled with Shiny for Python
- Uses chatlas to interface with the LLMs
- Run in Terminal “shiny create -template chat-ai-anthropic”
- <https://shiny.posit.co/py/docs/genai-chatbots.html>

Steps...

- Initialize a `chat_client` (e.g., `ChatAnthropic()`) to interact with the LLM using `chatlas`
- Initialize a `Chat()` instance
- Display its UI element with `chat.ui()`
- Decorate a `@chat.on_user_submit` function to fire when the user submits input
- `Chat()` makes it especially easy to use interfaces from OpenAI, Anthropic, Google, LangChain, and Ollama

Welcome app.py U X

chat-ai-anthropic > app.py > handle_user_input

```
1 # -----
2 # A basic Shiny Chat example powered by Anthropic's Claude model.
3 # -----
4 import os
5
6 from app_utils import load_dotenv
7 from chatlas import ChatAnthropic
8
9 from shiny.express import ui
10
11 # ChatAnthropic() requires an API key from Anthropic.
12 # See the docs for more information on how to obtain one.
13 # https://posit-dev.github.io/chatlas/reference/ChatAnthropic.html
14 load_dotenv()
15 chat_client = ChatAnthropic(
16     api_key=os.environ.get("ANTHROPIC_API_KEY"),
```

CONSOLE TERMINAL PROBLEMS OUTPUT PORTS DEBUG CONSOLE

Python 3.12.6 (Global) ~/py-shiny-templates

Python 3.12.6 (main, Feb 25 2025, 22:33:32) [GCC 11.4.0]
Type 'copyright', 'credits' or 'license' for more information
IPython 9.1.0 -- An enhanced Interactive Python. Type '?' for help.
Tip: `?` alone on a line will bring up IPython's help
Python 3.12.6 (Global) was disconnected from the extension host.

Extension host is shutting down
Python 3.12.6 (Global) reconnected.

Python 3.12.6 (Global) shut down successfully.

Python 3.12.6 (Global) restarted.
Python 3.12.6 (main, Feb 25 2025, 22:33:32) [GCC 11.4.0]
Type 'copyright', 'credits' or 'license' for more information
IPython 9.1.0 -- An enhanced Interactive Python. Type '?' for help.
Tip: Run your doctests from within IPython for development and debugging. The special
%doctest_mode command toggles a mode where the prompt, output and exceptions display matches as
closely as possible that of the default Python interpreter.

>>>

SESSION HELP VIEWER CONNECTIONS

https://dev.current.posit.team/s/c1a7a6ae9dc1b5e09ddbf/p/7cf34906/

Hello Anthropic Claude Chat

Hello! How can I help you today?

Create a Shiny for python application for analyzing adverse events and use ADAM data

Shiny for Python: Adverse Event Analysis Application

Below is a complete Shiny for Python application designed to analyze adverse events using ADAM (Analysis Data Model) data. This application allows users to upload ADAM datasets, particularly ADAE (Adverse Events Analysis Dataset), and provides interactive visualization and analysis capabilities.

```
from shiny import App, ui, render, reactive
import pandas as pd
import numpy as np
import plotly.express as px
import plotly.graph_objects as go
from pathlib import Path
import io
```

Enter a message...

Done!

/Q: What do sharks order at McDonald's? A: A quarter\
\ flounder with cheese. /

\
\

/ " " - . _
. . ' - ,
: : ' ' ,
; ; * ' .
' * () ' .
\ \ .

Thank you!



 @philbowsher

 youtube.com/rinpharma

 rinpharma.com

