



BRIDGING LANGUAGES: BUILDING INTEGRATED ANALYTICAL TOOLS WITH SAS LANGUAGE, R AND PYTHON FOR CLINICAL DATA

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Introduction

Finding a novel approach for integrating the SAS-language, R and Python into unified programs for streamlined clinical trial analysis.

In the rapidly evolving landscape of clinical trials, how can we overcome the limitations of single-language analysis?



Challenges

- Complex datasets
- Diverse analytical needs
- Reproducibility requirements



SAS-Language - The Regulatory Backbone

Strengths:

- Robust Data Management: Proven reliability for handling complex datasets.
- Regulatory Compliance: de facto choice for meeting stringent industry standards.



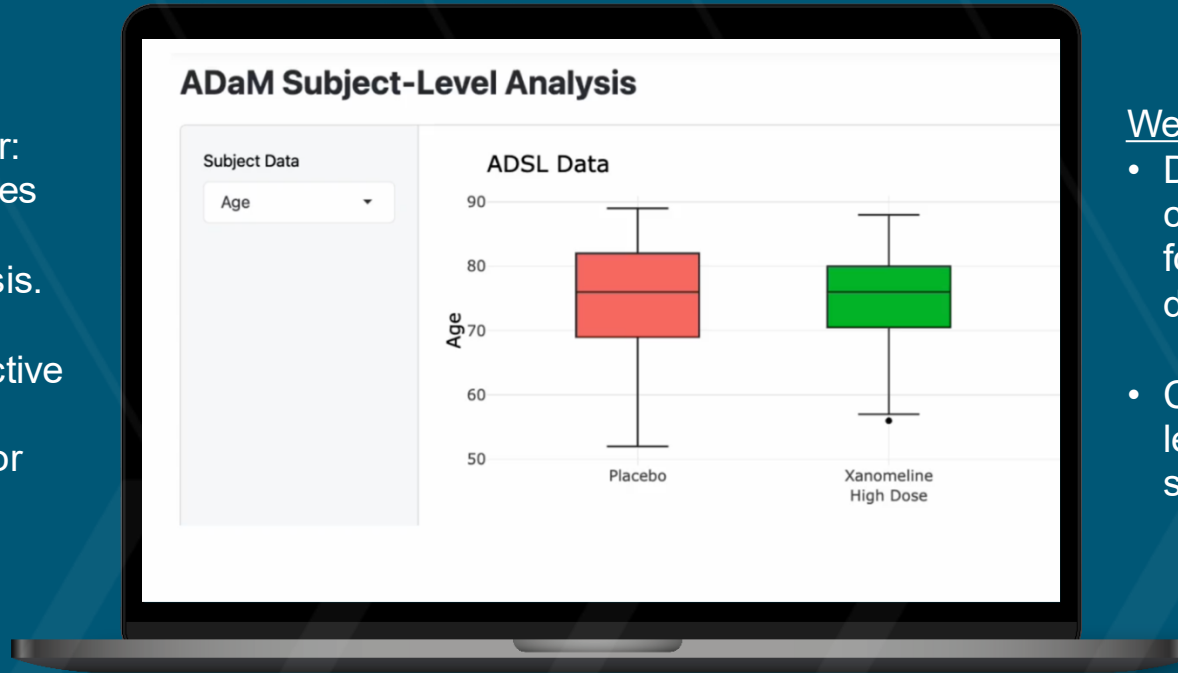
Weaknesses:

- Limited flexibility in modern statistical and machine learning applications.
- Can be less efficient for rapid prototyping and exploratory data analysis.

R - The Statistical Powerhouse

Strengths:

- Statistical Power: Extensive libraries for advanced statistical analysis.
- Shiny for Interactive Visualizations: Dynamic tools for exploring data.



Weaknesses:

- Data management can be less robust for very large datasets.
- Can have a steeper learning curve for some users.

Python: The Data Science Frontier

Strengths:

- Machine Learning: Powerful libraries for predictive modeling and AI.
- Data Science Ecosystem: Versatile tools for data manipulation and analysis.



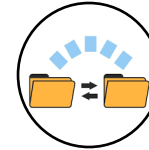
Weaknesses:

- Regulatory compliance functionality may require custom development.
- Statistical depth is different than R and requires different libraries.

Limitations of isolation



Redundant Coding:
Duplication of effort
across multiple
languages.



Data Transfer
Bottlenecks:
Inefficient movement
of data between
platforms.



Difficulty in Leveraging
Diverse Expertise:
Siloed knowledge and
skills.





The Synergy of Integration

By combining the strengths of the SAS-Language, R and Python, we unlock a powerful synergy that enhances efficiency, flexibility, and innovation in clinical trial analysis.

Benefits

Streamlined workflows	Enhanced analytical capabilities	Improved reproducibility
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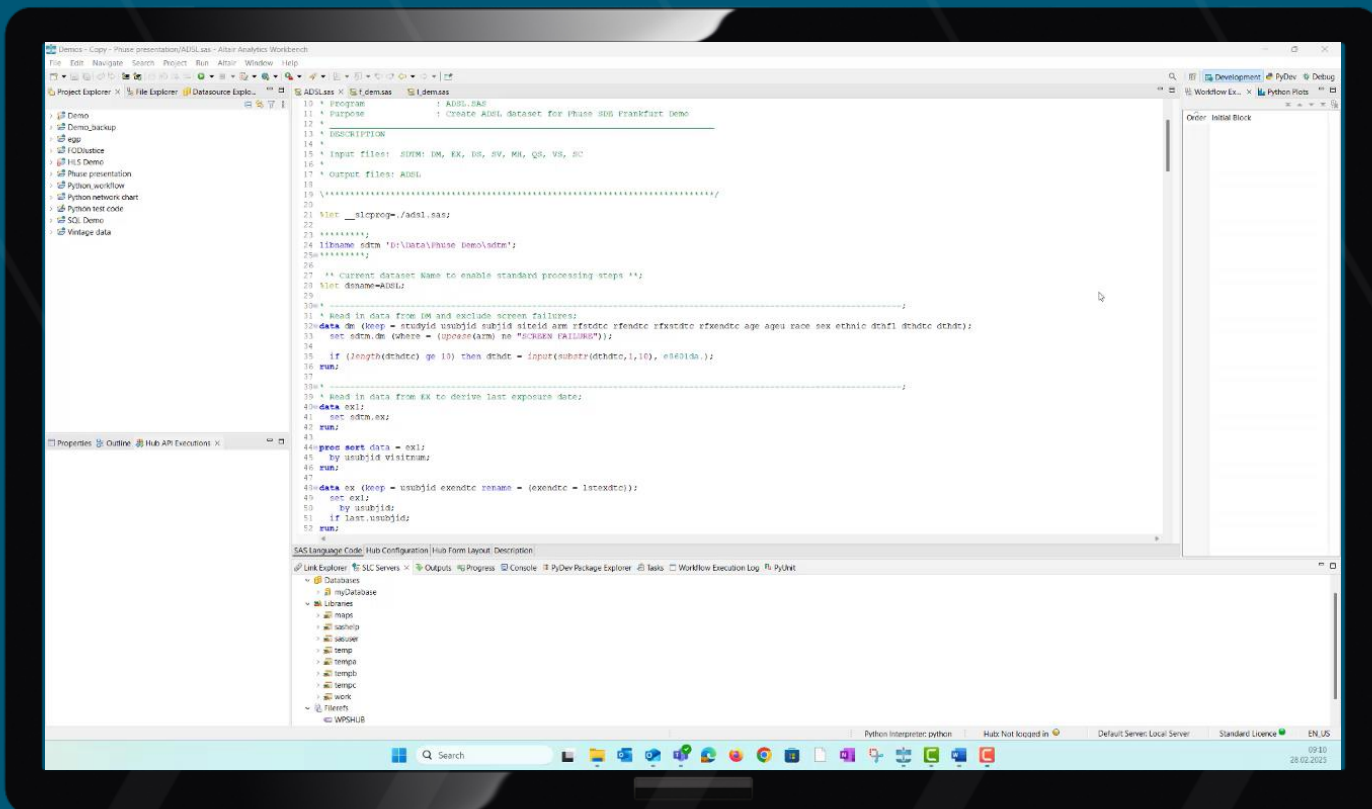
BUILDING UNIFIED CLINICAL TRIAL PROGRAMS

The Core Concept: Language Harmony

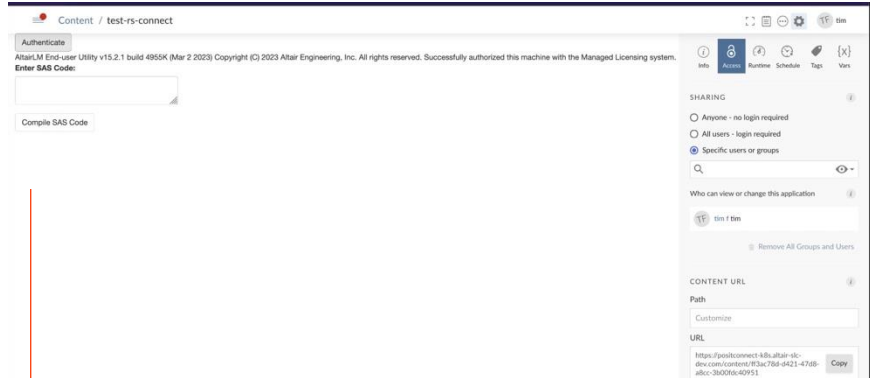
- Create single programs that leverage the strengths of the SAS-language, R and Python.
- This approach eliminates the need for separate scripts and manual data transfers.
- The goal is to create a unified workflow for data management, analysis and visualisation.



Demo



How could R Shiny be incorporated?

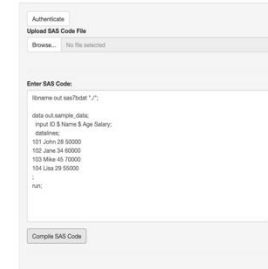


Front end to enable authorized coding in SLC

A package can be implemented to integrate SLC with R Shiny, providing code submission capabilities within the R Shiny environment.



SAS Code IDE



Dataset

ID	Name	Age	Salary
101	John	28.00	50000.00
102	Jane	34.00	60000.00
103	Mike	45.00	75000.00
104	Lisa	29.00	55000.00

Log

```
1 Altair SLC 18:49 Thursday, January 18, 2025

NOTE: Copyright 2002-2024 World Programming, an Altair Company
NOTE: Altair SLC 2024 15.2.1 (15.2L-61.40-901644)
License: Altair Managed Licensing Server, 168 units; expiry: 2025-06-30 23:59
NOTE: This session is executing on the L2000 platform and is running on the 64-bit mode.

1 libname out sas7bdat "/";
NOTE: Library not assigned as follows:
Engine:
Physical Name: /home/rsic/test-rs-connect

2
3 data out.sample_data;
4 input ID $ Name $ Age Salary;
5 do until (last = 1);
NOTE: Data set "out.sample_data" has 4 observation(s) and 4 variable(s)
NOTE: The data step took:
read time = 0.133
cpu time = 0.884

6 101 John 28 50000
7 102 Jane 34 60000
8 103 Mike 45 75000
9 104 Lisa 29 55000
10
11 _
```

Code written and results displayed in R Shiny application

Imagine writing and running code directly within R Shiny, with results and logs appearing instantly! This unlocks the potential for developers to build unique Shiny IDEs and bridge the gap between the SAS-language and R through powerful visual integrations.



Benefits and implications: Transforming Clinical Trial Analysis

Unlocking Efficiency, Innovation and Speed

Key Advantages

Efficiency and Flexibility



- **Enhanced Efficiency:** Reduced coding time and faster data processing.
- **Increased Flexibility:** Seamlessly adapt to diverse analytical needs.
- **Streamlined Data Management:** Simplified data flow and manipulation.
- **Statistical Analysis and Visualisation:** Integrated tools for comprehensive insights.

Reproducibility and Innovation:



- **Improved Reproducibility:** Consistent and transparent analysis workflows.
- **Promotion of Innovation:** Fosters the development of new analytical techniques.
- Allows for the **best tool to be used** for each task.

Broader implications

Impact on Clinical Trial Workflows

- Optimized Workflows: Reduces bottlenecks and accelerates timelines.
- Improved Collaboration: Facilitates communication between statisticians, programmers, and researchers.
- Standardization: Promotes consistent and reliable analysis practices.

Future Directions and Drug Development

- Future Directions: Continued development of integrated tools and methodologies.
- Research and Development: Application to other areas of biomedical research.

CHANGING TOMORROW, TOGETHER.

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