Ulysses: Introducing a workflow R package for assisting in the development of OHDSI studies

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Background

Running an OHDSI study contains lots of organizational complexity in terms of organizing code and proper documentation to communicate the code. While examples for constructing OHDSI studies have been presented, for example the SOS challenge, there is no clear workflow towards developing an OHDSI study as a piece of software available in a github repository. The OHDSI community would benefit from a workflow tool that will help standardize the development of network studies and improve its organization. This gap led to the development of a new R package called *Ulysses* (**U**seful **L**earning **Y**ielded **S**tructuring and **S**etting **E**pidemiology **S**tudies) dedicated towards assisting in the development of an OHDSI study. *Ulysses* is planned to be submitted to the HADES suite of OHDSI R packages.

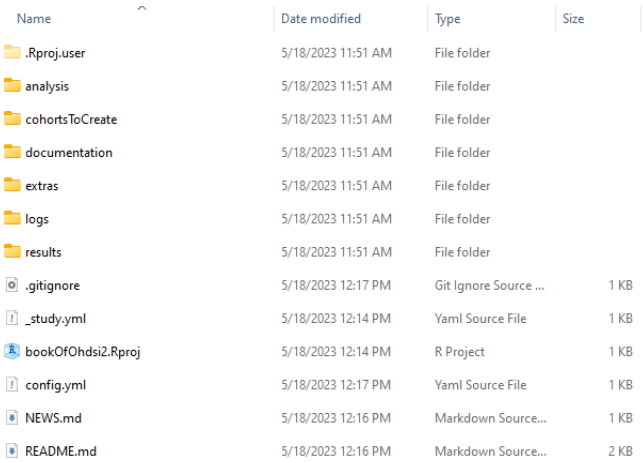
Ulysses draws inspiration from the *usethis* R package[1], which is a workflow tool for the development of R packages. Similar to OHDSI studies, there are several administrative steps and procedures required to develop a stable and transparent R package. *Usethis* helps R programmers navigate R package development by supplying functions that automate simple tasks or other useful steps needed to meet this goal. *Ulysses* can provide a similar solution for OHDSI studies, improving the organization, communication and development of OHDSI studies by supplying simple functions to guide developers towards a study that is transparent, robust and reproducible. The OHDSI community would benefit from a tool that enforces standards and organization in OHDSI studies because it makes it easier for study nodes to execute network studies from a recognizable structure and provide guidance to new researchers seeking to build an OHDSI study if they follow a common workflow. In this software demo, we will showcase an example of how *Ulysses* can be used to start a new OHDSI study and help initiate necessary tasks for organizing and communicating the study to the OHDSI data network.

Methods

Ulysses assists with the development of an OHDSI study by automating repetitive tasks and offering organization to the study. This package intends to host a series of functions intended to assist in both the development (tools for the study host) and execution (tools for the study node) of studies.

The first major feature introduced by *Ulysses* is a standard directory structure to OHDSI studies, as seen in figure 1. This structure is initiated upon calling a function to start a new OHDSI study as a R project.

Figure 1: Snapshot of directory structure proposed by Ulysses for OHDSI Studies



Name	Date modified	Type	Size
.Rproj.user	5/18/2023 11:51 AM	File folder	
analysis	5/18/2023 11:51 AM	File folder	
cohortsToCreate	5/18/2023 11:51 AM	File folder	
documentation	5/18/2023 11:51 AM	File folder	
extras	5/18/2023 11:51 AM	File folder	
logs	5/18/2023 11:51 AM	File folder	
results	5/18/2023 11:51 AM	File folder	
.gitignore	5/18/2023 12:17 PM	Git Ignore Source ...	1 KB
_study.yml	5/18/2023 12:14 PM	Yaml Source File	1 KB
bookOfOhdsi2.Rproj	5/18/2023 12:14 PM	R Project	1 KB
config.yml	5/18/2023 12:17 PM	Yaml Source File	1 KB
NEWS.md	5/18/2023 12:16 PM	Markdown Source...	1 KB
README.md	5/18/2023 12:16 PM	Markdown Source...	2 KB

The directory structure is meant to provide an intuitive and easy to follow means of organization for study files both for developers and study nodes alike. The analysis folder contains files dedicated to the analysis. The *cohortsToCreate* folder stores the cohort definitions required for the study. The documentation folder stores the study documents for the study such as the study protocol, how to run and the contribution guidelines. The extras folder contains all files that are ancillary to the study. The logs folder stores the study logs from the execution and the results folder stores the results of the execution. In addition to these folders, *Ulysses* contains a _study.yml file that stores all the meta information for the study useful for templating documents. By providing a standard directory for OHDSI studies, it will make it easier for study nodes to recognize how to execute studies and for developers to create studies that can be successfully executed.

The second major feature introduced by *Ulysses* is templates for documents that are vital for communicating scientific and technical information about the study. Like *usethis*, *Ulysses* leverages logicless templating using the Mustache implementation for R called *whisker*[2]. Some templates provided by *Ulysses* include: *README.md, NEWS.md, HowToRun.md, StudyProtocol.Rmd, ContributionGuidelines.md, AnalysisScript.R,* and *StudyRepoRequestEmail.txt*. Providing templates makes it quicker to start-up important documentation and suggest best practices for developing a strong OHDSI study.

Results

This software demo of *Ulysses* walks through tasks required for developing an OHDSI study, using examples from the Book of OHDSI. Topics covered in this demo include:

1) Initiating an OHDSI study: *Ulysses::newOhdsiStudy(…)*
2) Reviewing the directory structure for an OHDSI study (as a piece of software)
3) Automating the initiation of essential documentation: *Ulysses::makeReadMe, Ulysses::makeStudyProtocol*
4) Development roadmap

Conclusion

In this software demo, we hope to introduce *Ulysses* to the OHDSI community. *Ulysses* intends to streamline OHDSI studies to conform to a known structure and standard making it easier to communicate, execute and develop studies. We aim to develop this package alongside strategus[3] and continue to incorporate best practices into the R package to help OHDSI study developers and nodes alike. *Ulysses* is an open collaboration for all OHDSI developers intended to source best practices for building network studies across the community.

References

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3. Schuemie M, Sena A (2023). Strategus: Coordinating and Executing Analytics Using HADES Modules. https://ohdsi.github.io/Strategus, https://github.com/OHDSI/Strategus.