Reproducible research tools to increase efficiency and reduce errors

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Outline

- Introduction and Motivation
- The Tools of the Trade
- Examples
- Benefits to You and HTG

Section 1

Introduction

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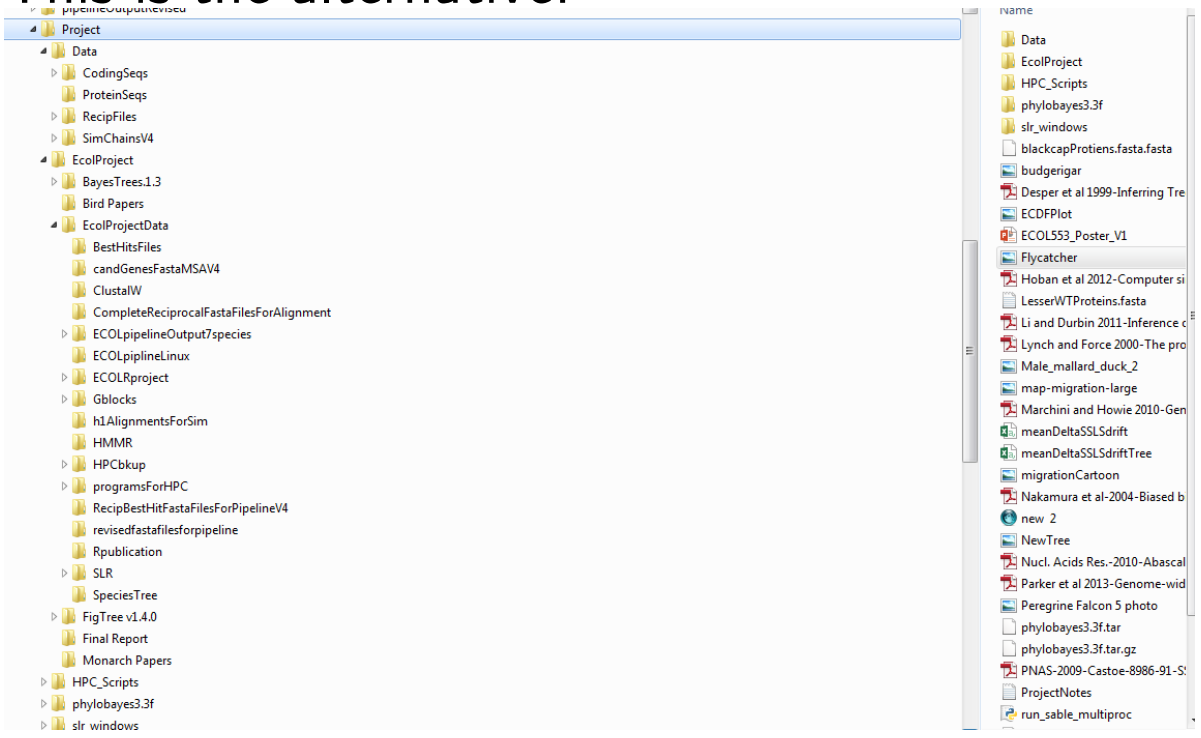
- Three questions:
  1.) Can you reproduce the results right now?
  2.) Can you reproduce the results a year from now?
  3.) Can someone else reproduce the results in 5 years?

Why Reproducible Research?

This is the alternative!



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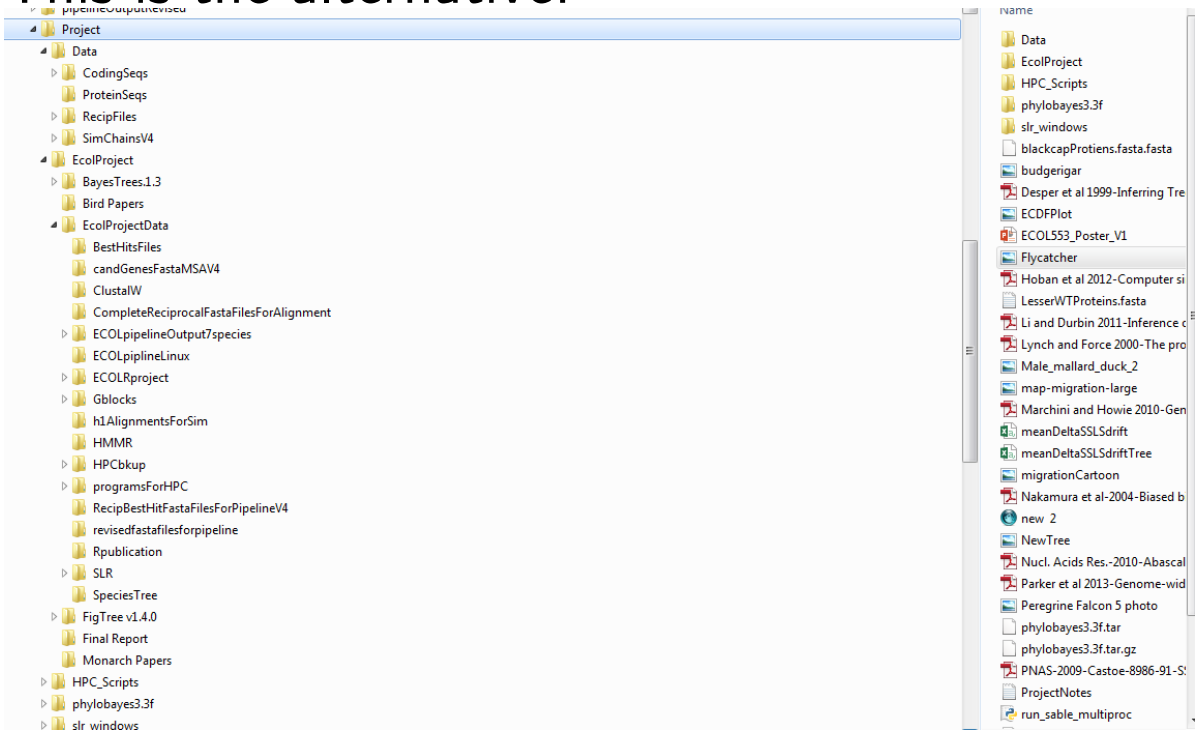

I dare you to try and reproduce my results!
(or check them for accuracy)

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What did I do again???

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- Literate Programming
  - Well documented code
  - "Human readable"
- Version control
  - Tracked changes from project inception
  - software and package versions controlled

Section 2

The Vision

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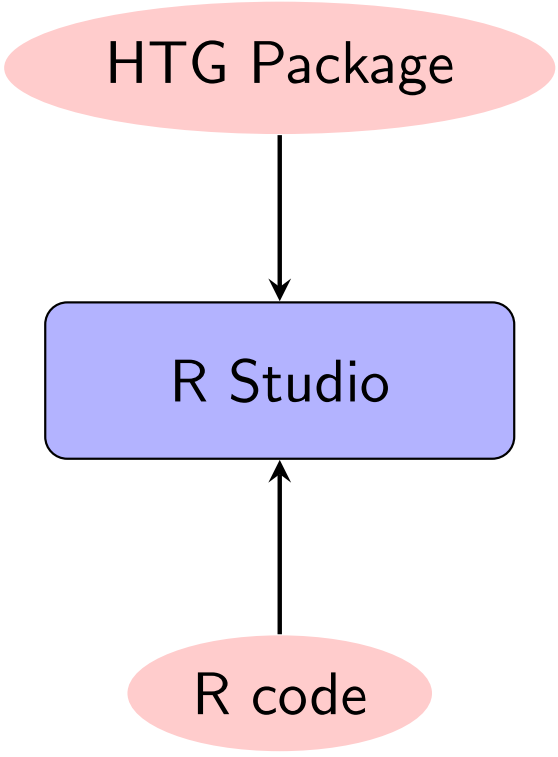
Use these tools together to create a seamless analysis $\rightarrow$ report pipeline.

System Overview



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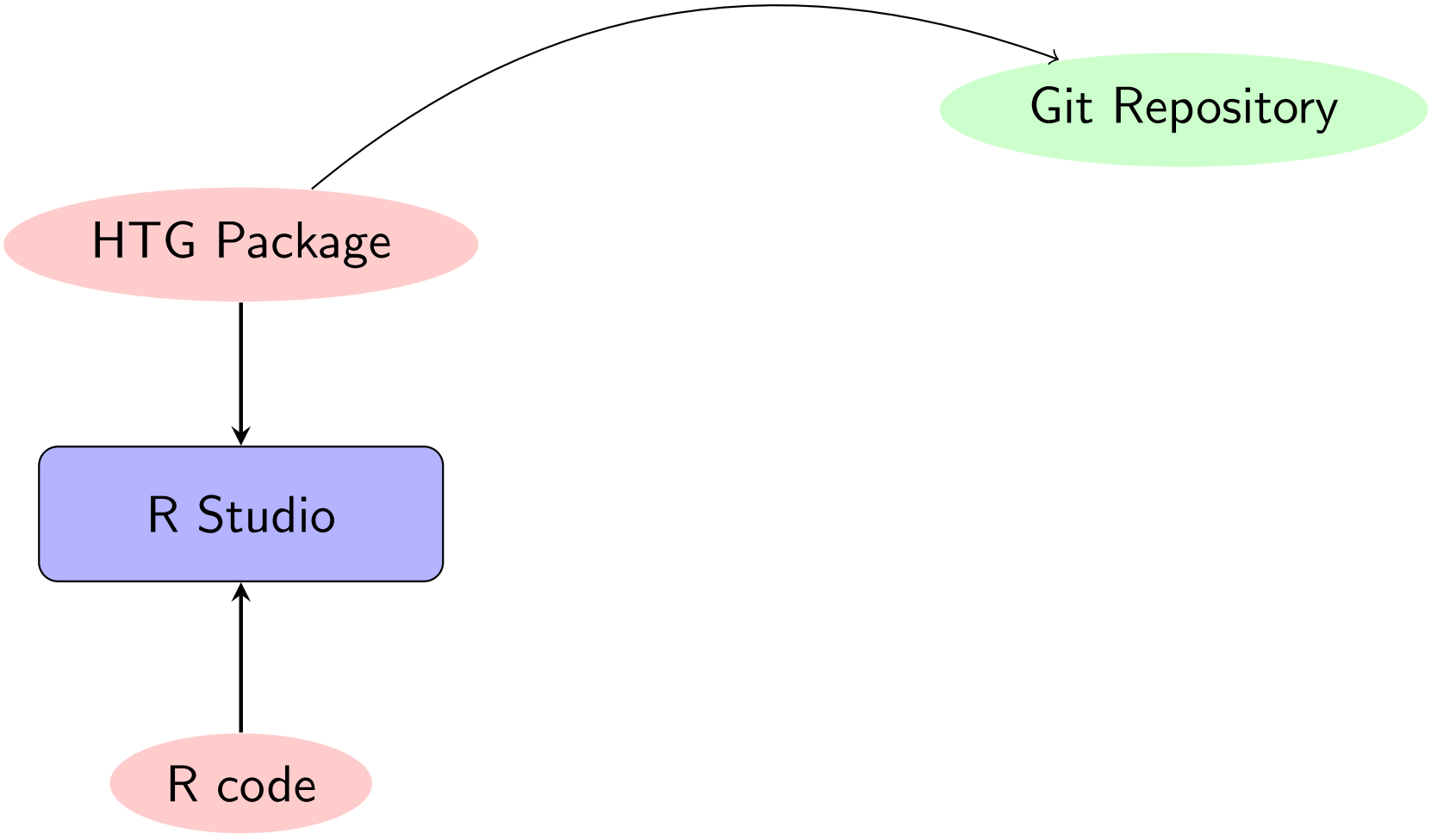

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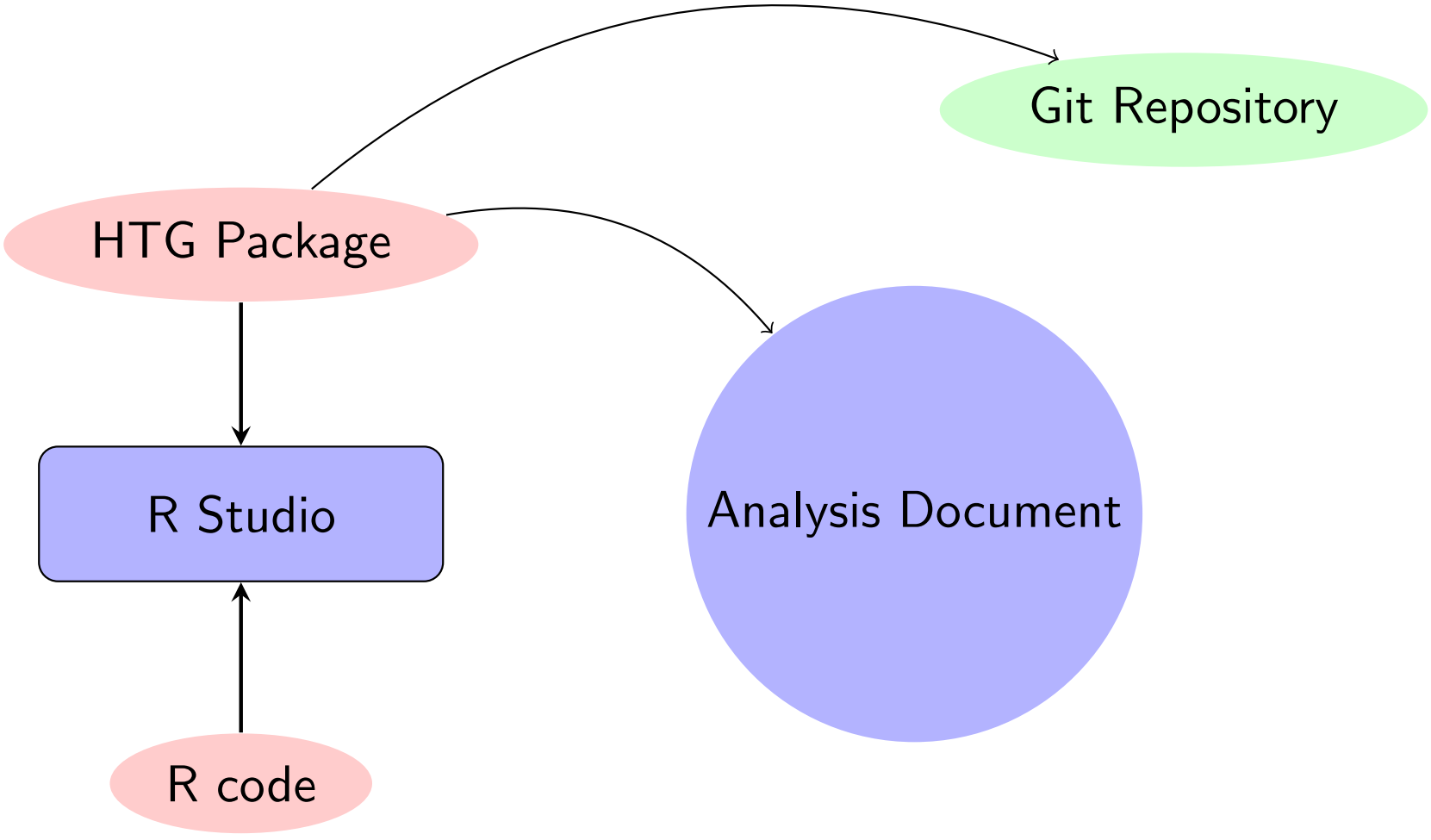

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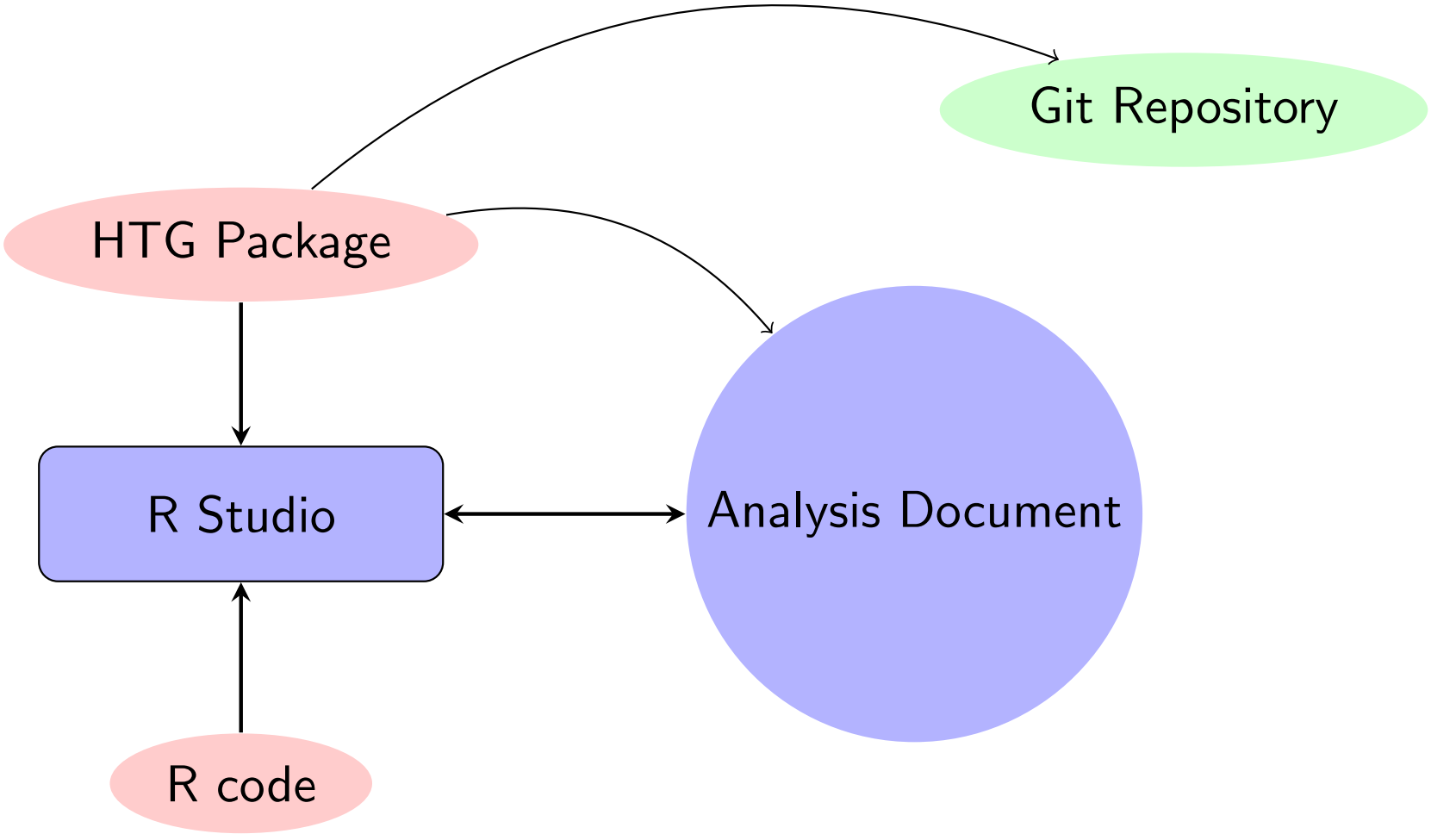

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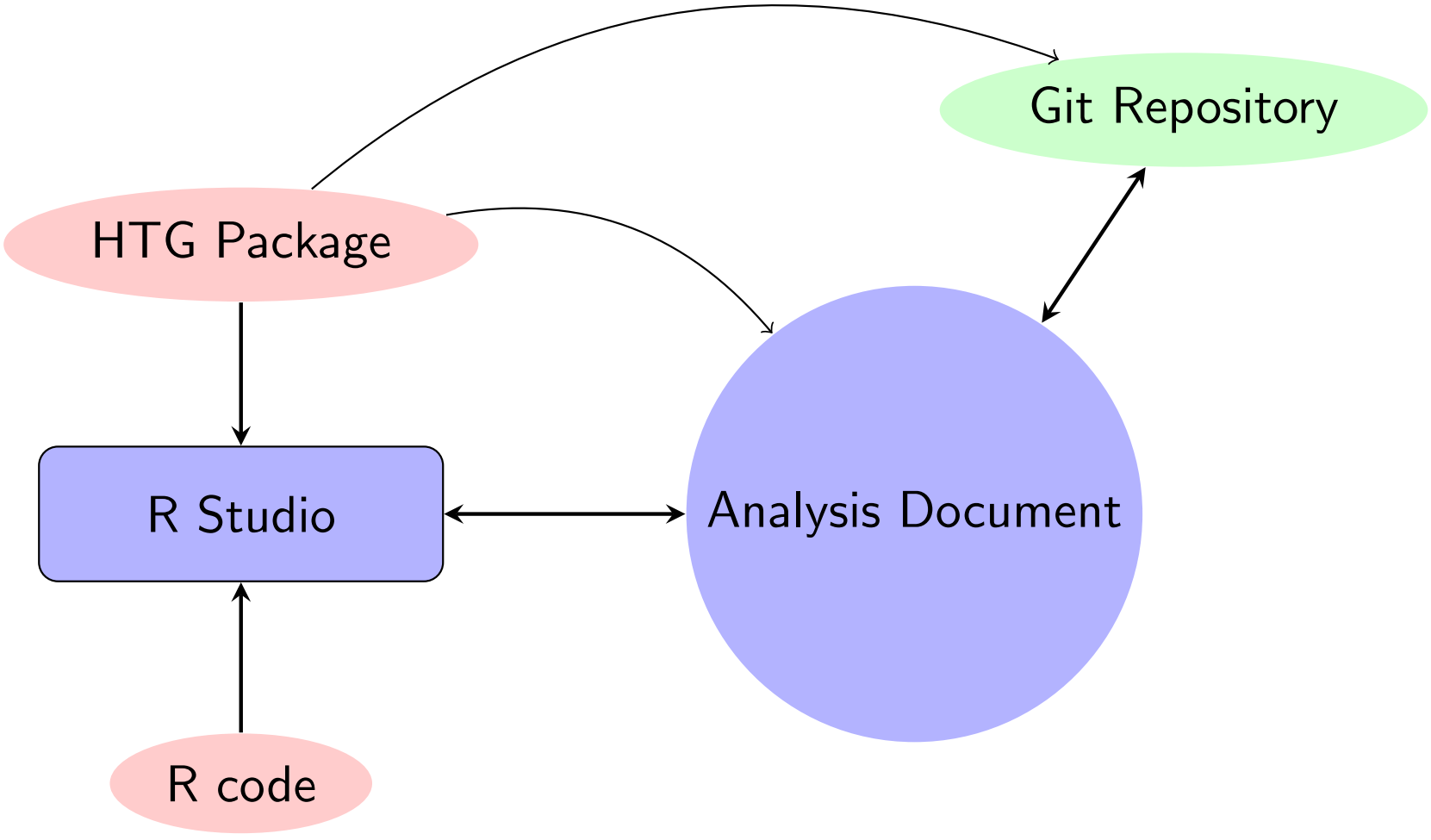

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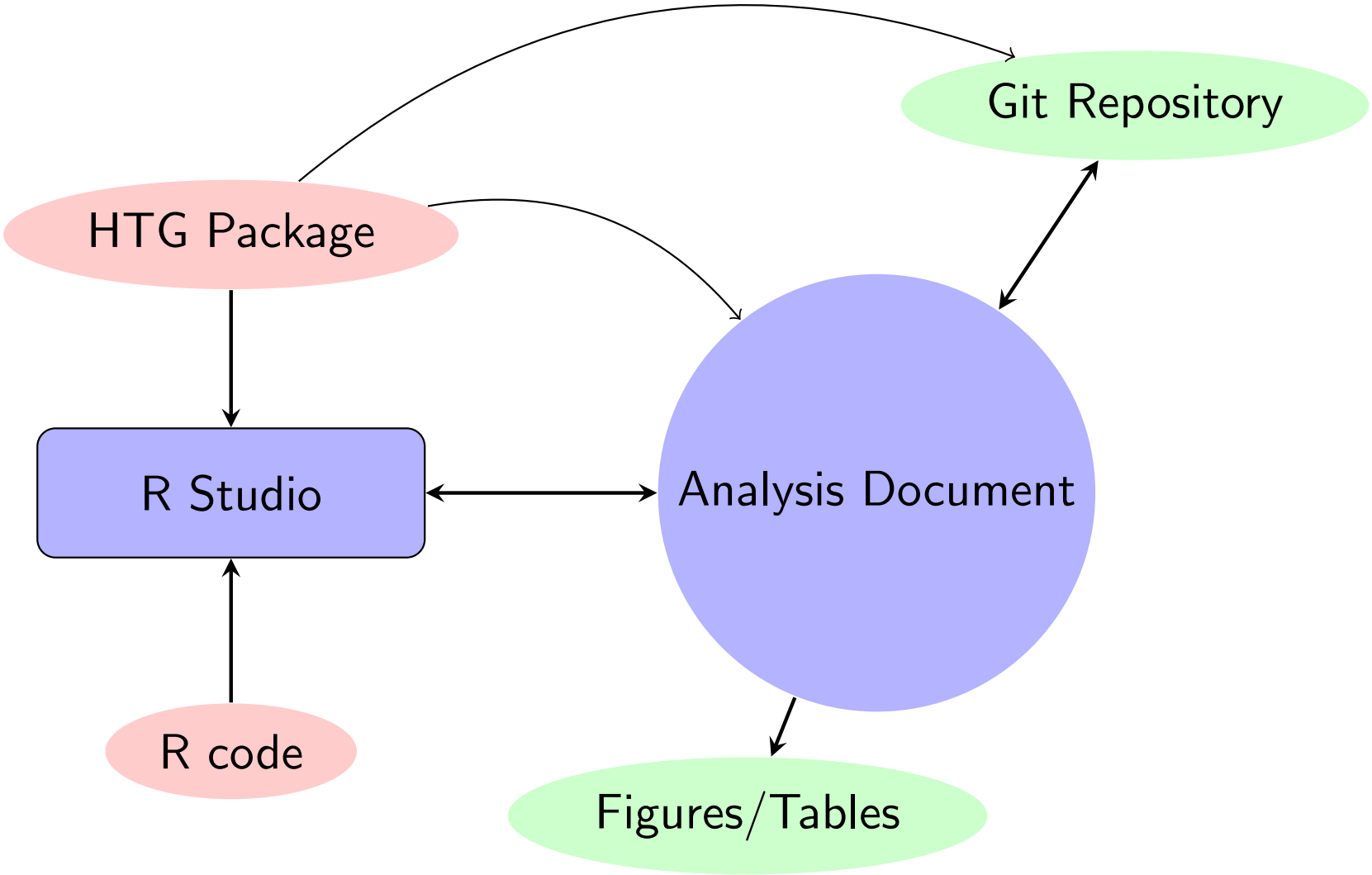

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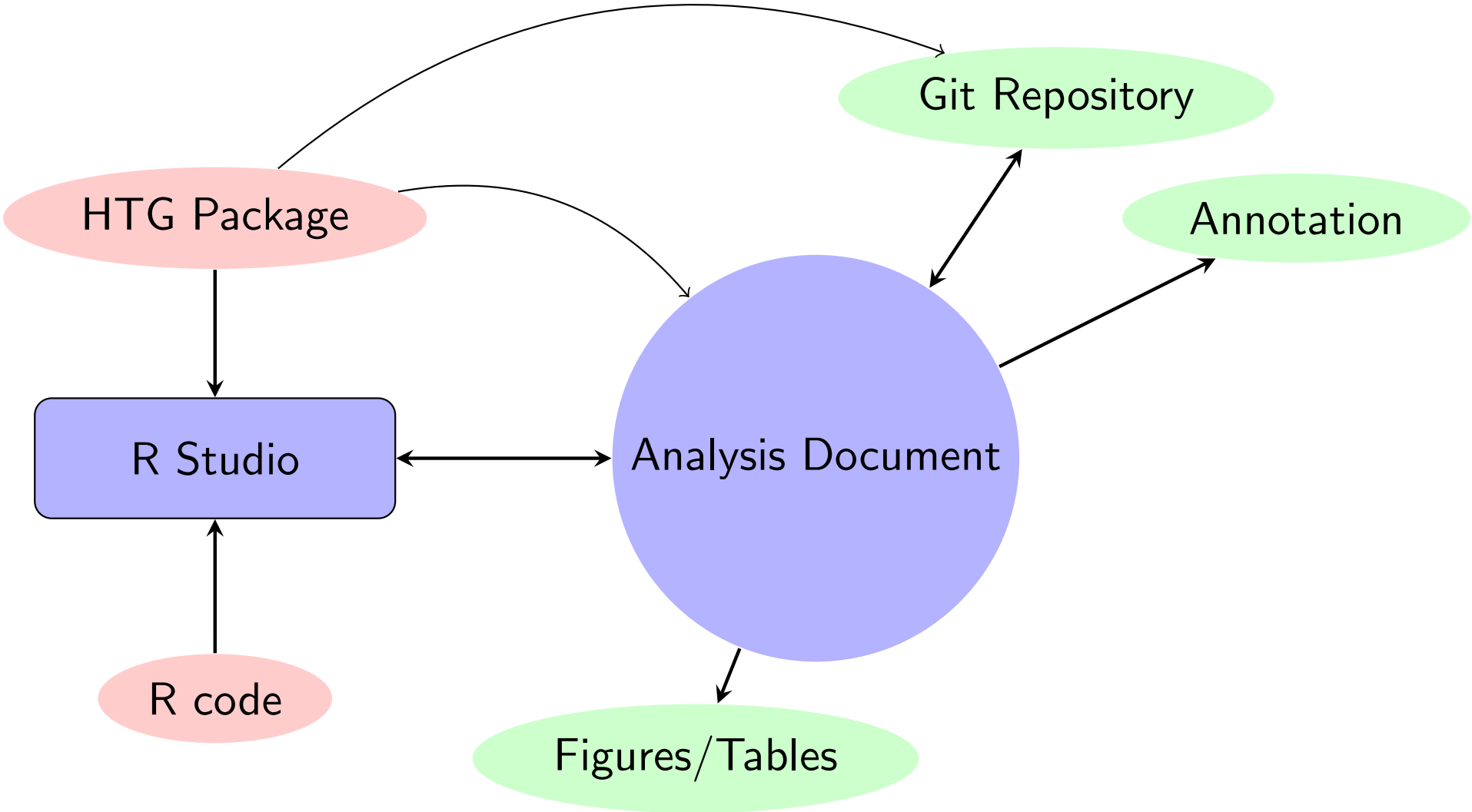

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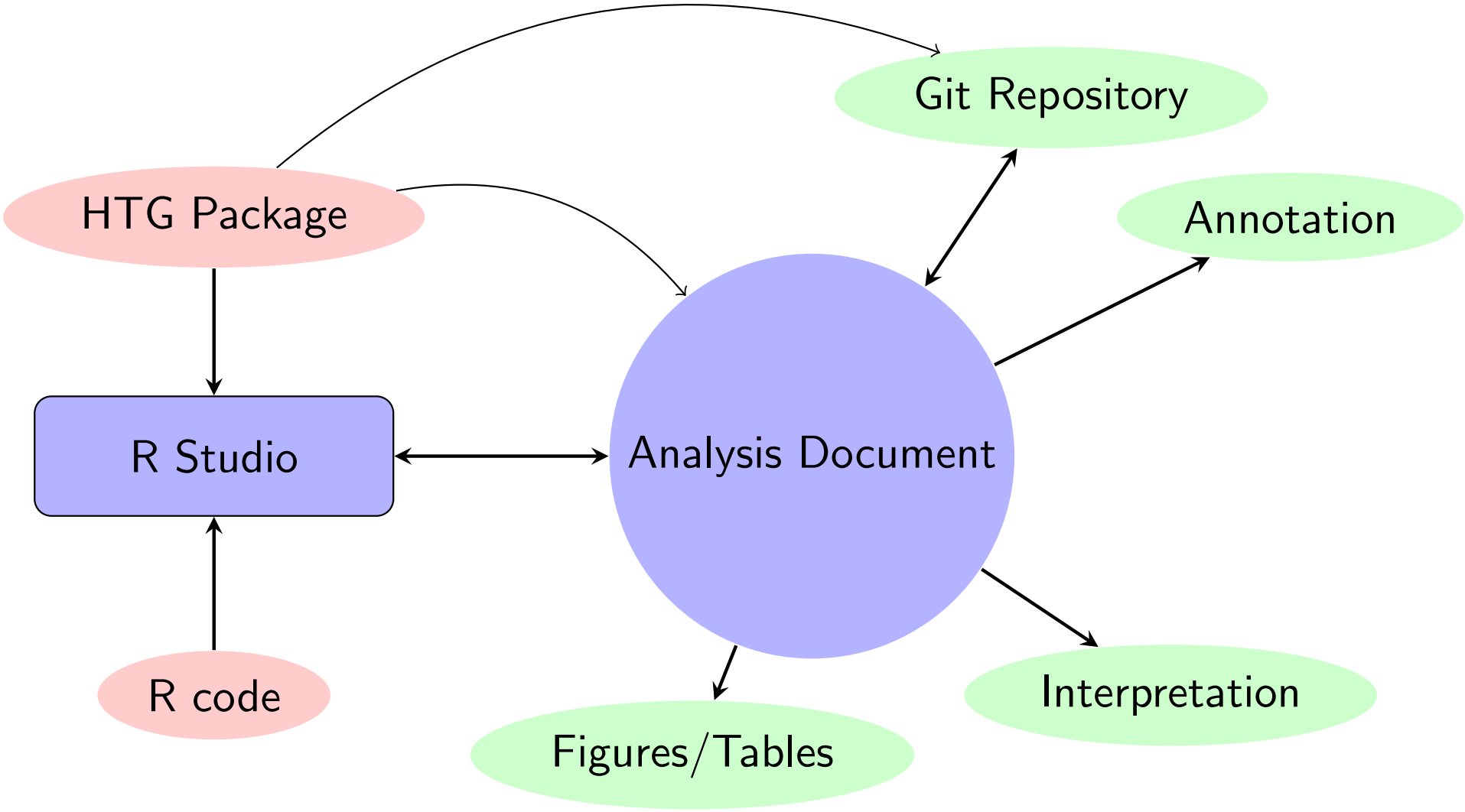

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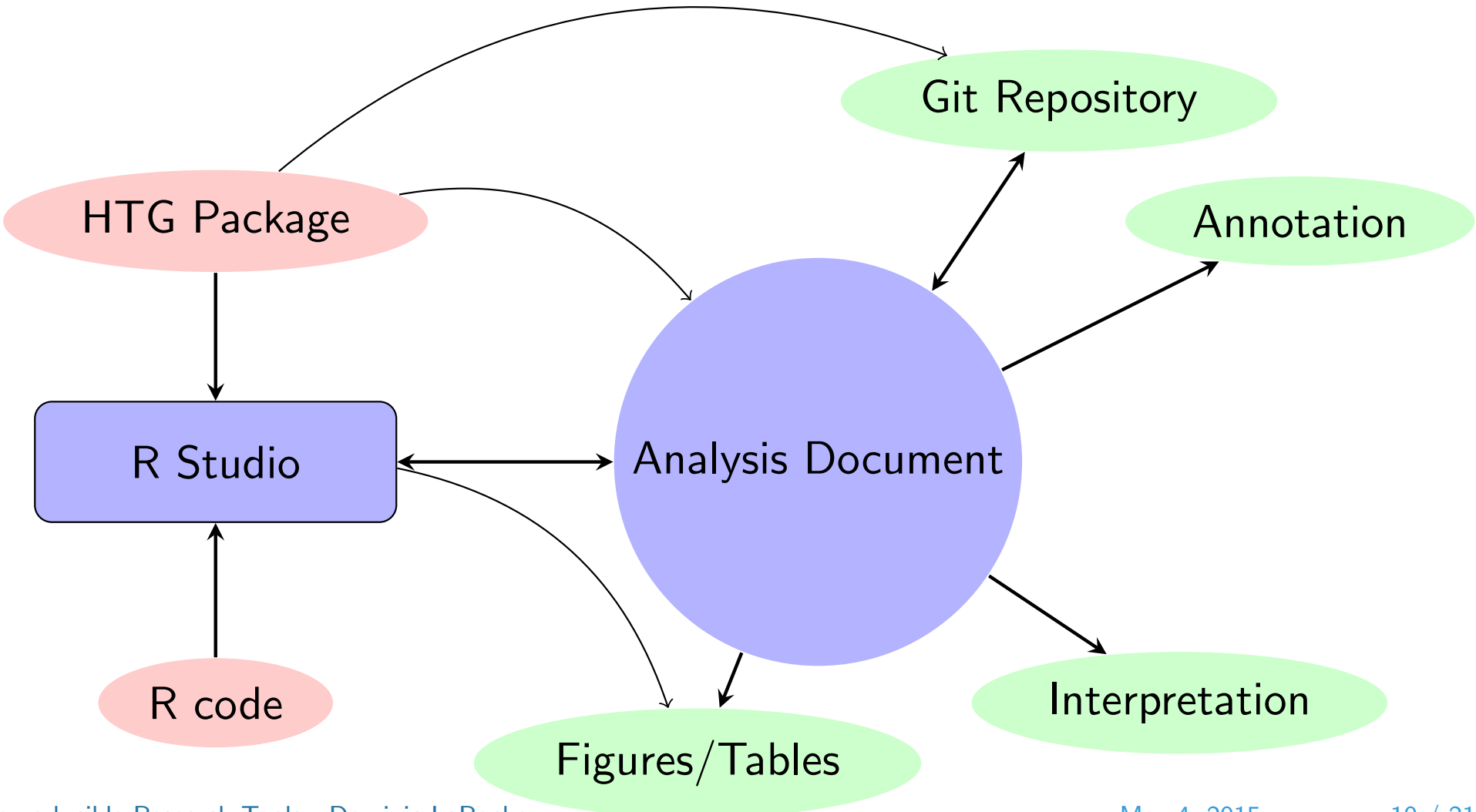

Subsection 1

The Tools

R-Studio

R-Studio is a friendly code editor :

- Built in editor support for:
  - R code
  - C++
  - JavaScript
  - CSS
  - DCF
  - Markdown
  - HTML
  - Tex
  - Python
- It can also handle:
  - PERL
  - SAS ...etc
- Can enable emacs key-bindings

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R-Studio combined with LaTeXor Rmarkdown can make:

- Reports
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- Web pages and more...

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(This presentation was made with R-studio)

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- Can "Fork" a project into a new project

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- Checkpoint creates a snapshot of all R packages used in the analysis
- Package versions are maintained on a separate server (using a git style change tracker).
- Can access the working version of any CRAN package at any time
  - No need to worry that, *ahem*, someone is using a really old version of the package
  - Can keep your system up-to-date without worrying about breaking an analysis

HTG Private Package

The HTG package eases implementation of reproducible research

- MakeProject()
  - Single command creates version controlled project folder
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- Can be a place to keep other standard functions

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  - Rmarkdown lowers the bar for making reports
- Has easy interface with Git
  - Can see change history and associated hashes
  - has simple pull, commit and push cammands etc.

Outside Groups

How do we maintain reproducibility outside our group?

Outside Groups

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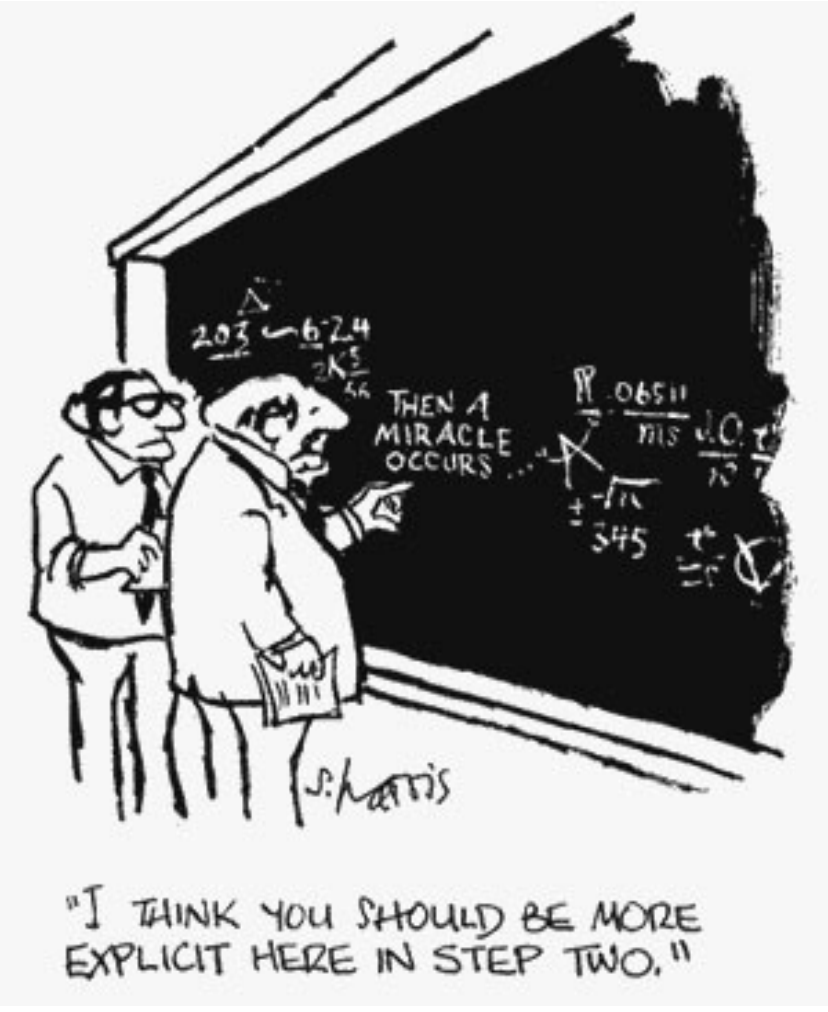
- Provide easy-to-use program to perform a specific task
- Eliminates use of other programs and click-through analyses
- Can incorporate documentation (exported code and report)
- Demo...

Section 3

Conclusions

Benefits

- Standardized file structure
- Access to all previous versions of everything
- HTG package eases set-up and saves time
- Anyone can pick up where you left off or find important figures and documents


THEN A MIRACLE OCCURS...
"I THINK YOU SHOULD BE MORE EXPLICIT HERE IN STEP TWO."

Questions?