

Elevate research projects with Quarto

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1 Content

- Introduction (2)
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1 <https://vhgauto.quarto.pub/seminario2-gulich/>



2 Introduction

Research project

To estimate water quality indicators in Paraná River middle basin for algorithm development using satellite remote sensing techniques



Collaborative website with automatic running, interactive and open source.

2.1 Front page

- Authors
- Affiliation
- Last modified date
- Keywords
- More resources links

PROYECTO PARANÁ 2023

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FECHA DE PUBLICACIÓN

21 de febrero de 2025

RESUMEN

La calidad del agua del Río Paraná...

PALABRAS CLAVE

Río Paraná, Calidad de agua, Sentinel-2, Teledetección satelital

ENLACES DE CÓDIGO

[Ver en GitHub](#),
 [Informar un problema](#),
 [Wiki del proyecto](#)

2.2 Table of content

- Sections and subsections
- Ease website navigation
- Variable content according to the development






Contenido

- 1 Introducción
- 2 Área de estudio
- 3 Materiales y métodos
- 4 Muestreos
- 5 Resultados
- 6 Firmas espectrales
- 7 Discusión
- 8 Objetivos
- 9 Ejecución
- 10 Algoritmos
- 11 Contacto

2.3 Notebooks

- Source code description
- Processing data justification
- Calculus methodology explanation to promote reproducibility

Notebooks

-  Lectura de datos
-  Extracción de reflectancia
-  Caracterización de las muestras
-  Ejecución automática
-  Article Notebook

2.4 References

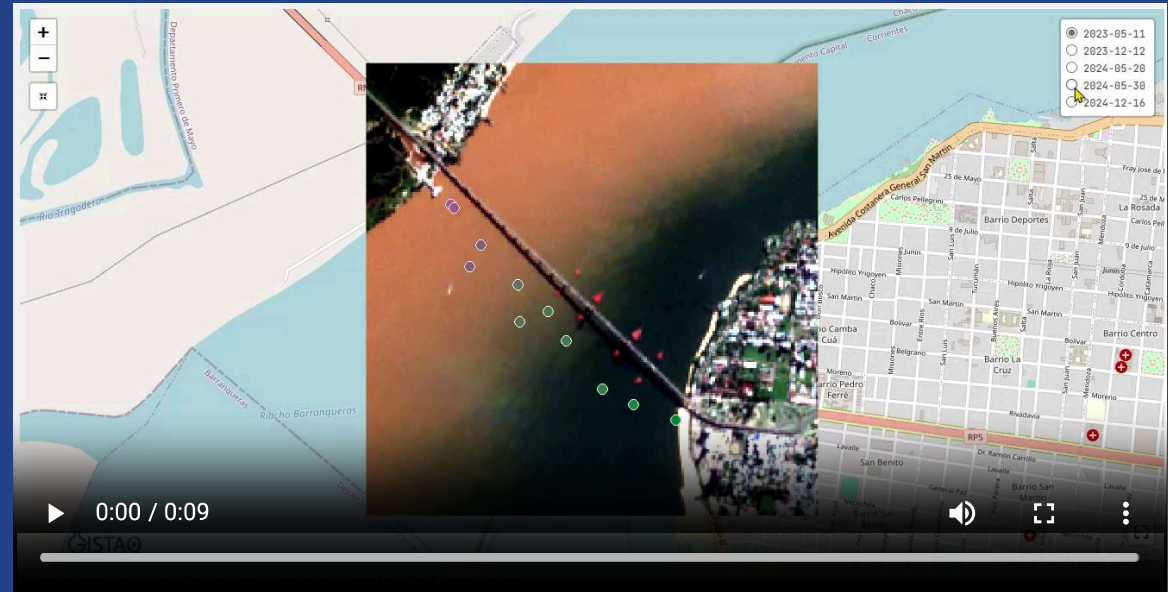
- Formatted references according to desired style (.cs1)
- Reference preview on citation hover

Referencias

- [1] United Nations General Assembly, «Work of the Statistical Commission Pertaining to the 2030 Agenda for Sustainable Development», 2017.
- [2] M. Bonansea *et al.*, «Evaluating the feasibility of using Sentinel-2 imagery for water clarity assessment in a reservoir», *Journal of South American Earth Sciences*, vol. 95, nov. 2019, doi: [10.1016/j.jsames.2019.102265](https://doi.org/10.1016/j.jsames.2019.102265).
- [3] M. H. Gholizadeh, A. M. Melesse, y L. Reddi, «A Comprehensive Review on Water Quality Parameters Estimation Using Remote Sensing Techniques», *Sensors (Switzerland)*, vol. 16, n.º 8, 2016, doi: [10.3390/s16081298](https://doi.org/10.3390/s16081298).
- [4] A. Ferral *et al.*, «In-Situ and Satellite Monitoring of Water Quality of an Eutrophic Lake with an Artificial Air Diffusion System», *IEEE Latin America Transactions*, vol. 16, pp. 627-633, 2018, doi: [10.1109/TLA.2018.8327422](https://doi.org/10.1109/TLA.2018.8327422).

2.5 Maps, tables & interactive plots

- Results visualization
- Correlation between parameters exploration
- Spectral properties description
- Sample site location



Web site

1 <https://vhgauto.quarto.pub/gistaq-parana/>



3 Motivation

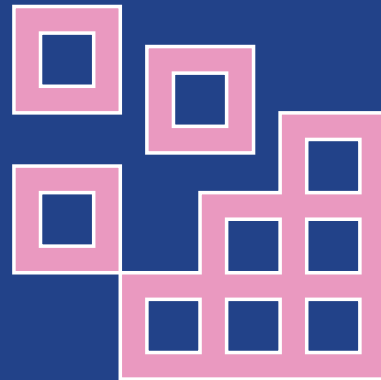
Research project typical life journey.



- Water sampling
- Physicochemical test
- Partial results analyses
- Reference reading
- Other tasks

3.1 During the project development

- Dynamic document, that adapts to the current project state.
- Easy access site to check the latest results.
- Unified reference search.
- Script code execution and results reproducibility.
- All project members can work seamless and without problems and no fear of disarranging the document.
- Consultation resource and to admire all the effort done.



4 Tools

- **R y Python**: reading and data collection; processing and results storage; plots, tables and maps generation.
- **Git y GitHub**: version control management and project members collaboration.
- **Quarto**: to content compilation and website publishing.
 - **manuscript** allows website creation with an emphasis in reproducibility and targeted to scientific and academic documents.

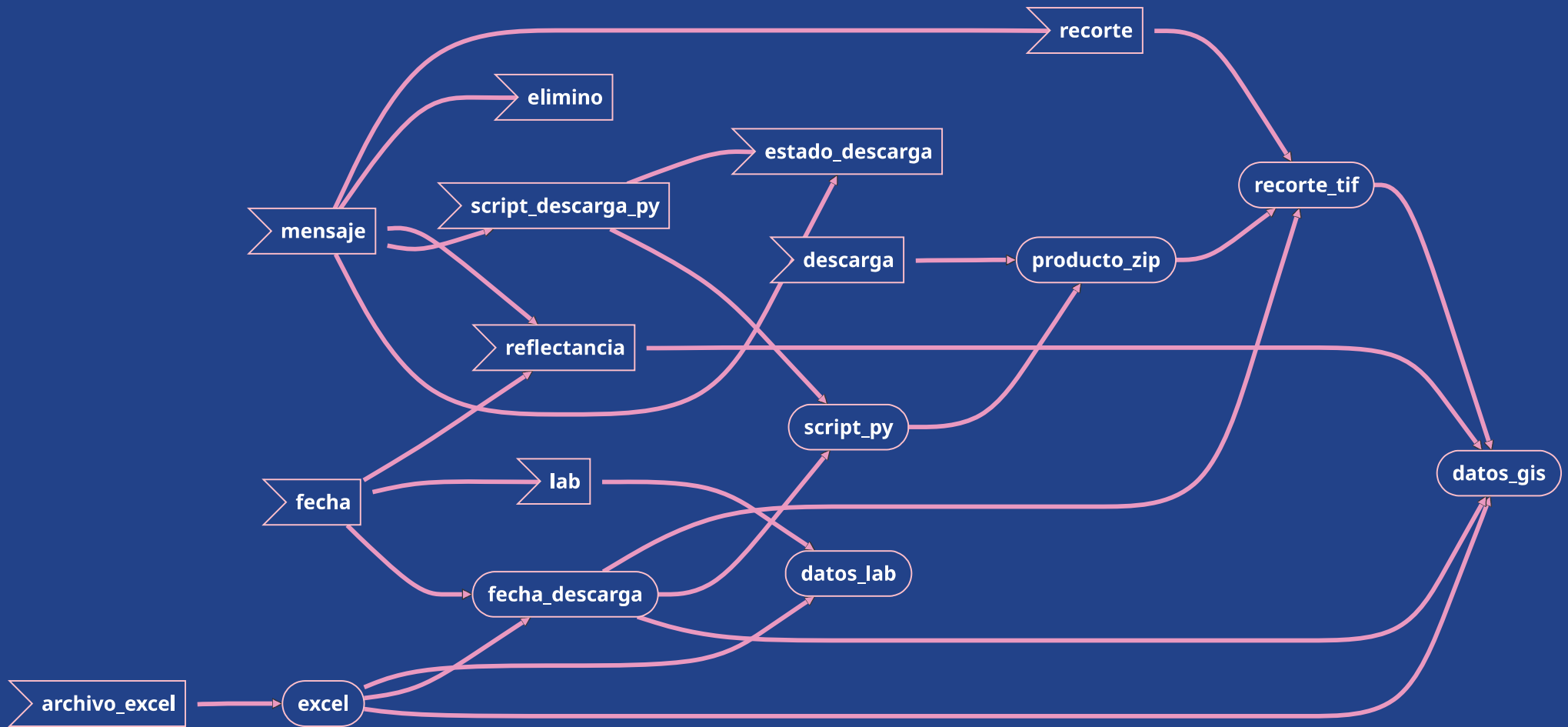
4.1 R



targets allows automatic functions execution and dependencies management between them.

Check current workflow state and execute only outdated targets.
File monitoring and code re-execution when change detection.

4.2 R

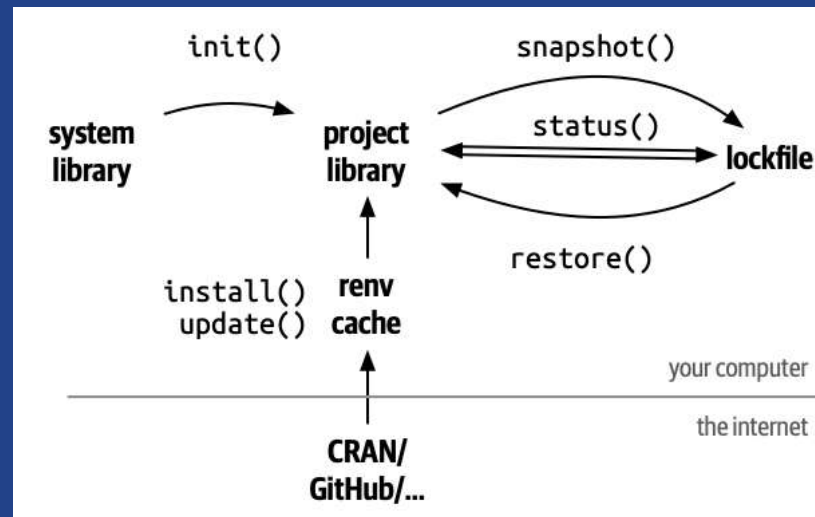


4.3 R



renv execution environment management, package version and its dependencies.

Log file that allows environment reproducibility.



4.4 R



tidyverse with multiple packages for general purpose data processing and manipulation.



terra for geographic data processing and vector and raster reading.



corrr linear correlation coefficient calculation.

4.5 R



ggplot2 for basic plot creation (`.png`).



ggiraph for interactive plot creation (`.html`).



leaflet for interactive map creation (`.html`).

4.6 PYTHON

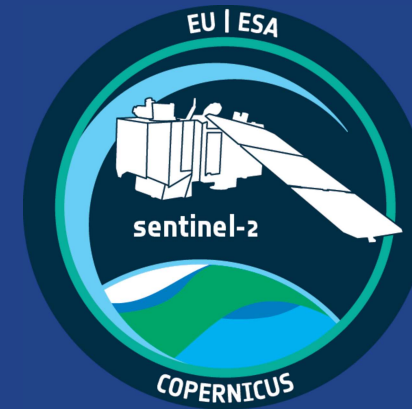
Copernicus Data Space



PROGRAMME OF
THE EUROPEAN UNION



- Collection
- Processing level
- Region of interest
- Time range
- Credentials



4.7 GIT

Version control management and simultaneous collaboration between project members.

`github` cloud storage service.

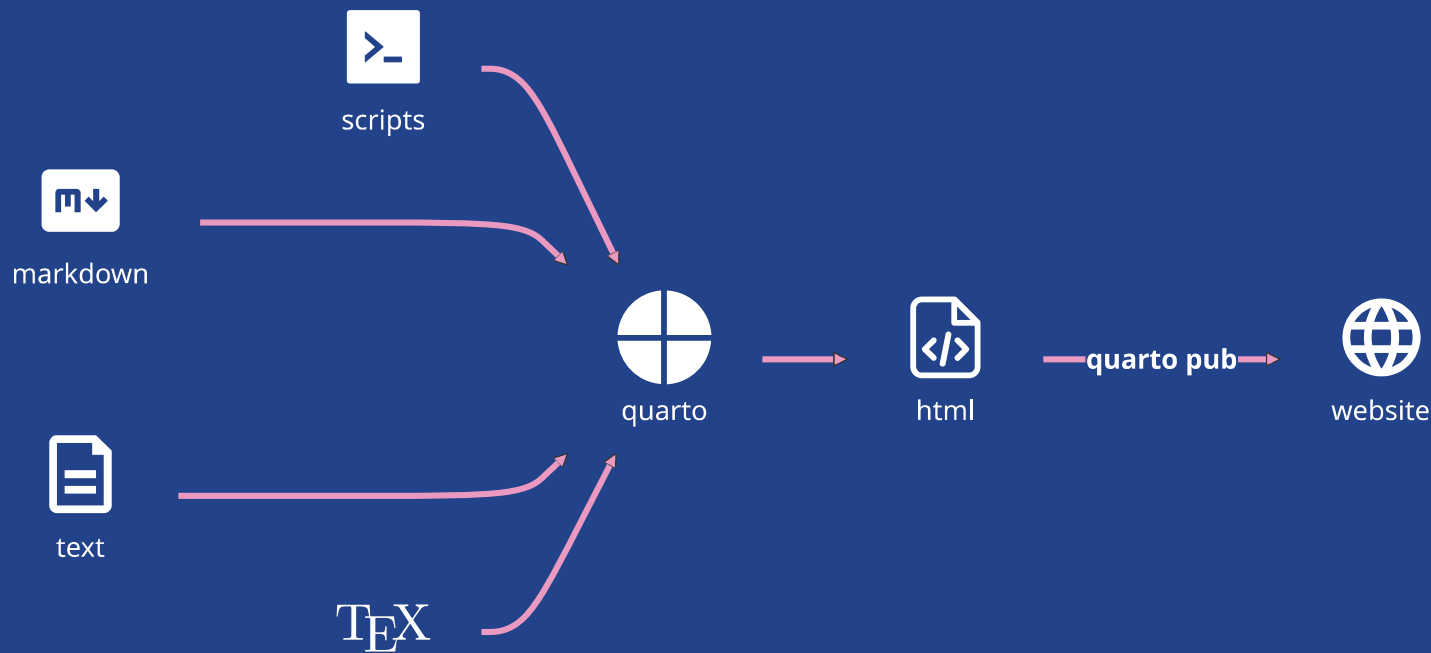
`branch` per member, so each one works in a specific section without interfering with the remaining repository.

`pull request` to request adding changes.

`merge` to combine changes once checked and accepted.

4.8 QUARTO

- Combines code execution by programming language and narrative text to create a product in multiple formatted options
- Offers a publishing platform for the output and to access it as a website



4.9 QUARTO



4.10 QUARTO

- `quarto manuscript` is design for scientific document authoring, with emphasis in reproducibility, since it encourages the readers to explore processing scripts (notebooks).
- Offers multiple static outputs (`.pdf`, `.docx`) that follow an specific template from a magazine.
- `quarto publish` allows to deploy the website in [Quarto Pub](#) or [GitHub Pages](#) .
- In combination with [targets](#), plots/tables/maps are regenerated with new data input, or script modification, updating the results.



4.11 QUARTO

File and directories tree.

```
1 quarto_manuscript
2 |— bibliography
3 |   |— ieee.csl
4 |   |— reference.bib
5 |— data
6 |   |— laboratory.csv
7 |   |— reflectance.csv
8 |— plot
9 |   |— boxplot.png
10 |   |— time_series.png
11 |— manuscript.qmd
12 |— notebooks
13 |   |— plots.qmd
14 |   |— data_reading.qmd
15 |— _publish.yml
16 |— raster
17 |— scripts
18 |   |— functions.R
19 |   |— support.R
20 |— vectors
21 |— _quarto.yml
22 |— _targets.R
```



4.12 QUARTO

manuscript.qmd

```
1 ---
2 title: Research Project
3 author: Víctor Gauto
4 date: last modified
5 ---
6
7 # Introducción
8
9 Paraná River has water.
10
11 ```{r}
12 ggplot(data, aes(x, y)) +
13   geom_point()
14 ```
```



4.13 QUARTO

_quarto.yml

```
1 project:
2   type: manuscript
3
4 manuscript:
5   article: manuscrito.qmd
6   notebooks:
7     - notebooks/data_reading.qmd
8
9 format:
10  html:
11    lang: es
12    include-in-header:
13      - extras/favicon.html
14    theme:
15      - extras/my_style.scss
16  toc: true
17  code-link: true
18  code-copy: true
19  tbl-cap-location: margin
20  fig-cap-location: bottom
21  bibliography: bibliography/reference.bib
22  csl: bibliography/ieee.csl
23  html-math-method: katex
```



4.14 QUARTO

_publish.yml

```
1 - source: project
2   quarto-pub:
3     - id: ff90d76c-20c0-4210-8791-5d868ede4c50
4       url: https://vhgauto.quarto.pub/gistaq-parana
```



5 Conclusion

The Project Research development allowed us to learn a new set of tools.



6 Future improvements

- Rewrite functions used by `targets`.
 - Define arguments clearly.
 - Return descriptive messages during runtime and in case of errors.
 - Incorporate website rendering.
- Optimize satellite data download, avoiding to get the entire product.
 - Google Earth Engine.
 - `rsi` package.
- Generate a `.pdf` version of the website for easy sharing.
- Organice website visual features (colors, fonts, styles, margins) in the `.scss` file.
- Use the full potential of `quarto manuscript`, so the results are created by the notebooks.



Thanks for your time

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7 Resources

Download

This presentation repository

[Reproducible Manuscripts with Quarto - posit::conf\(2023\)](#)

[Quarto for Academics | Mine Çetinkaya-Rundel](#)

[Quarto | Get started](#)

[Quarto Manuscripts](#)

[The {targets} R package user manual](#)

[Introduction to renv](#)

[R for Data Science \(2e\)](#)

[ggiraph-book](#)

[Quarto: The Definitive Guide](#)

[Website repository](#)

[Quarto Extensions](#)

[Official repository for Citation Style Language \(CSL\) citation styles](#)

The End



