ISYA
INTERNATIONAL SCHOOL FOR YOUNG ASTRONOMERS

UNIVERSIDAD YACHAY TECH

PYTHON FOR ASTROPHYSICS

Lecture 1

Wladimir E. Banda-Barragán
Universidad Yachay Tech

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Lecture 1 goals:

1. Tools for research in astronomy and astrophysics.

2. Why use free, open-source OS and languages?

3. Master Google Colab for Linux.

What do you need for the practicals?

- A PC/laptop with any OS.
- Internet access.
- A Google/gmail account.
- A GitHub account (desirable, not strictly needed).

A few words on Git

Git is an **Open Source Distributed Version Control System** for tracking changes in source code or any other set of software files.

- **Control System:** Git is a content tracker.

- **Version Control System:** Code is constantly changing. Many developers can add code in parallel. Keeps history of what changes have been implemented.

- **Branching/Forks:** Also, Git provides features like branches and merges.

- **Distributed Version Control System:** Git has a remote repository stored in a server and a local repository which is stored in the computer of each developer.

About GitHub

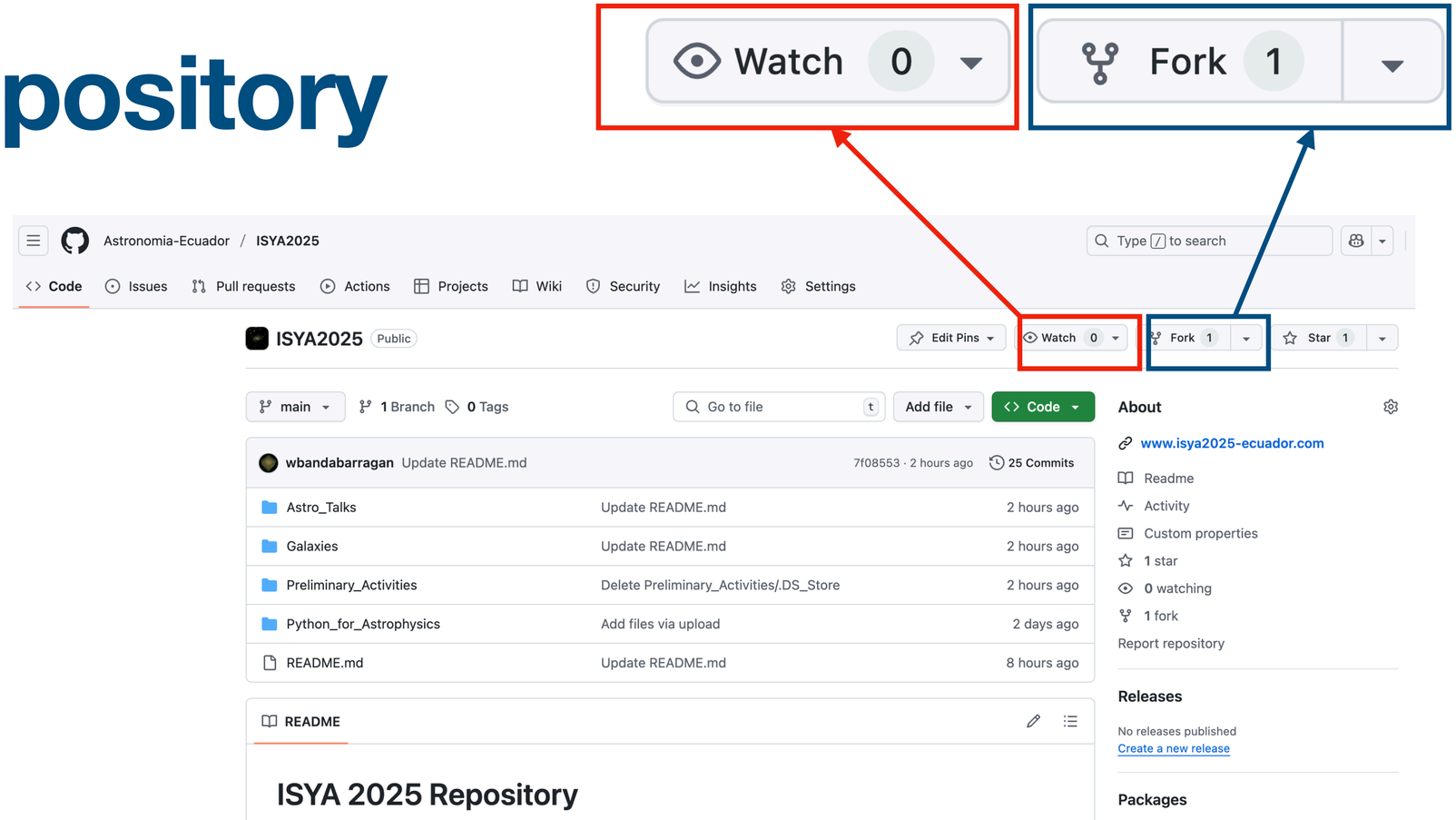
GitHub

GitHub is a web-based platform that provides hosting for software development and version control using Git.

It is an ideal platform to share code with colleagues.

ISYA GitHub Repository

https://github.com/Astronomia-Ecuador/ISYA2025



Linux and the need for open source software

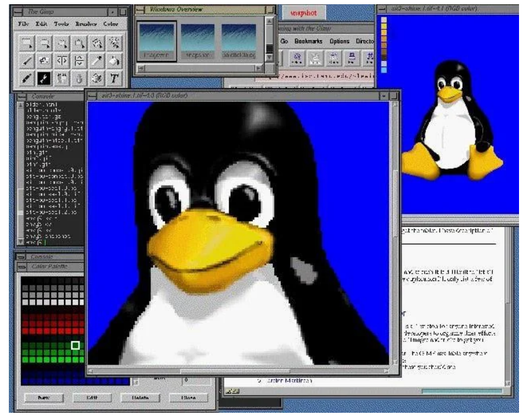
It is an operating system based on Unix, which was developed by Ken Thompson and Dennis Ritchie (at AT&T Bell Laboratories) during the 60's/70's.

Unix was highly portable, so it was adopted, copied, and modified by many companies and universities.

The source code was available, but modification and redistribution were restricted and its commercial version was too expensive.

Finnish student Linus Torvalds decides to create a new free operating system kernel called Linux.

Linux released its first version in 1991.



https://www.reddit.com/r/aggies/comments/vintc1/tamu_linux_released_in_1992_it_was_the_first/

Reference: https://www.greenteapress.com/thinkpython/thinkCSpy/html/chap01.html

Advantages of Linux OS

Linux OS are free and open source.

You can modify the source code and adapt it to your applications at will.

Linux provides security (much harder to hack, nearly no viruses).

https://www.geeksforgeeks.org/blogs/kde-vs-gnome/

Linux distributions come with an in-built platform to do programming.

There are two types of desktops:
KDE and GNOME.

Flavours of Linux OS

You have many options, the most popular ones in physics are:

1. Ubuntu
2. Fedora
3. Debian
4. CentOS

Linux can run on virtual machines / co-exist with other OS.

Linux is installed in (pretty much all) large-scale, high-performance supercomputers.

Linux is the OS of cloud servers (Google Colab).

The backend of GitHub relies heavily on **Linux**.

Basic Linux OS commands

1. man — offline manual, get help about any commands
2. which — find out where a command is defined.
3. <command> --help — Find help on any command
4. cd — Change the current directory (folder)
5. ls — List files in a directory
6. mkdir — Make/create a new directory
7. pwd — Print current directory
8. cp — Copy files and directories
9. rm — Delete files and directories
10. cat file.txt — see contents of file.
11. head file.txt — see the first 10 lines of a file
12. tail file.txt— see the last 10 lines of a file.
13. chmod — change permissions of a file or directory for 3 user groups: user (owner) permission, group permission, and other permission.
14. diff file1.txt file2.txt— show differences between two files
15. file — show the type of a file
16. less — browse the contents of a file, exit with q
17. locate — find files with names matching a pattern
18. touch — Create a new file or update an existing one
19. top — See what is going on, what processes are running, exit with q
20. ping server — check to see if a server is alive
21. df — show free disk space
22. du — show disk space usage
23. uname -a — information on Linux kernel
24. uptime — how long the system has been running
25. date — show current date/time

Thanks to modern coding tools, there is no need to install Linux /Python.

A browser and Colab is all we need!

Tutorial Time

Tutorial Time

1. Please log into your gmail accounts:

2. Open this lecture on GitHub:

https://github.com/Astronomia-Ecuador/ISYA2025/blob/main/Python_for_Astrophysics/01_programming_essentials.ipynb

3. Click on the "**Open in Colab**" icon and you are ready to code!