# BIO 401-01 / BIO 598-02:
# GIS for Bio & Enviro Sciences


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**&**
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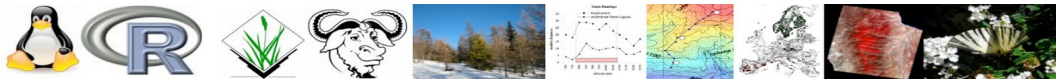


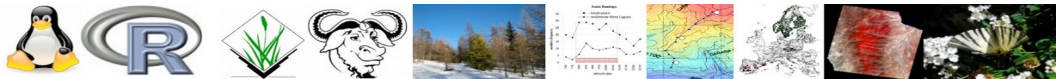
# Learning objectives

**With continuous practice through the weeks, students will become familiar with command lines and cover numerous topics, including:**

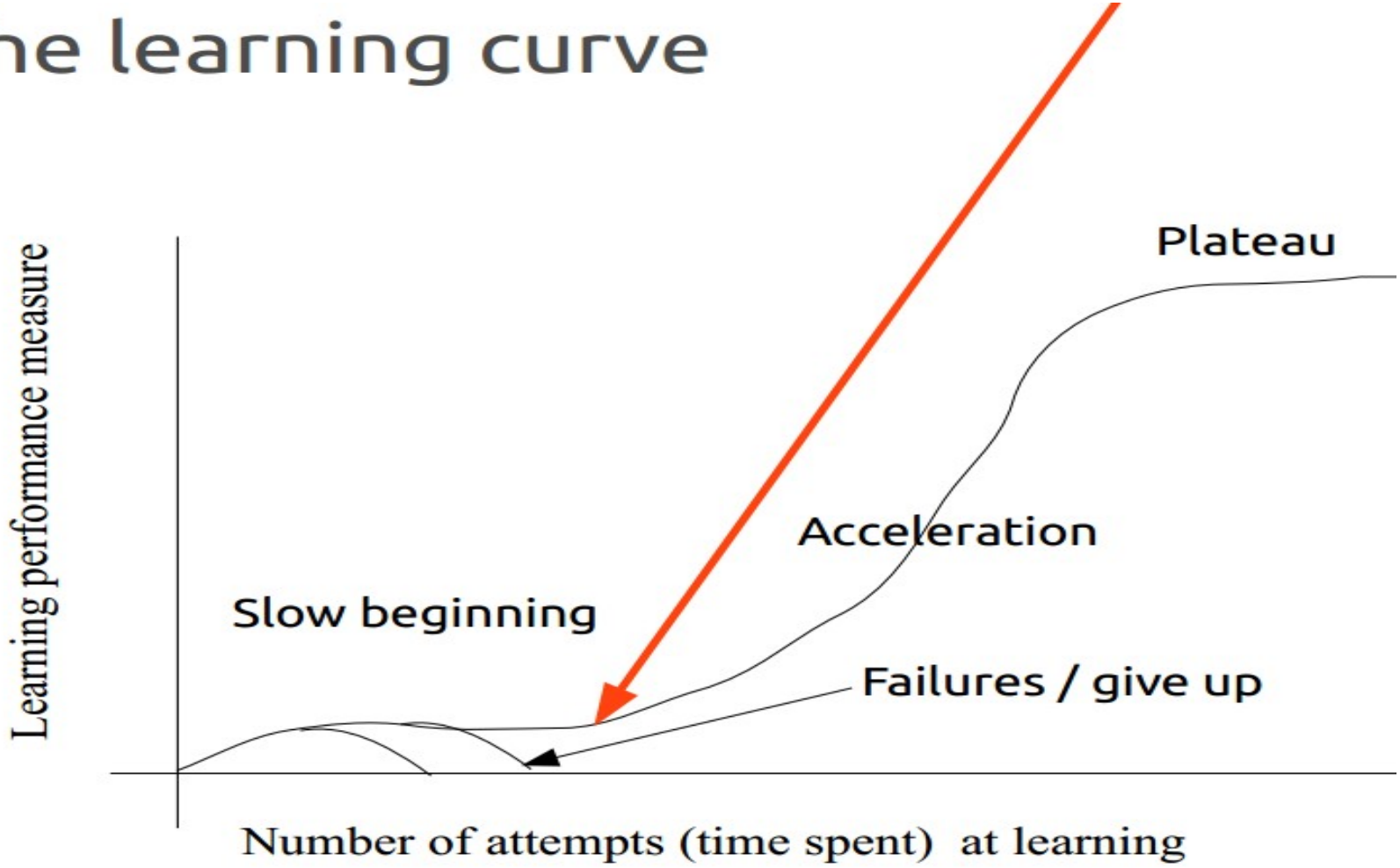
- **Learning open source tools for GIS and RS applications.**
- **Acquiring command line utilities for spatial/temporal data under Linux OS.**
- **Developing data processing skills.**
- **Independent learning, critical thinking, problem solving.**

**Upon completion of the course, you should be able to:**

- **Apply the process of science, by conducting, analyzing, and interpreting findings related to GIS & RS project.**
- **Use quantitative reasoning for statistical/spatial analysis**
- **Convey your understanding of environmental phenomenons**

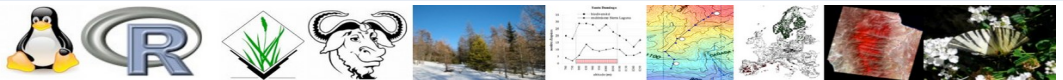


# The learning curve



# Scientific knowledge

- **Spatio/temporal analysis**
- **Spatio/temporal data integration**
- **Spatio/temporal modeling**
- **Geostatistic**
- **Machine Learning**



# Tools

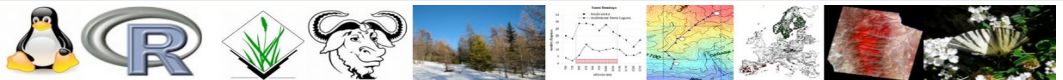
**Grass & Qgis** Geographic Information Systems

Python: GIS, statistic, modeling, text manipulation

**LINUX Bash** shell programming

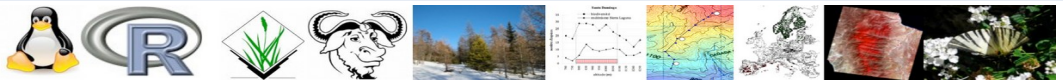
**AWK** for processing text-based data

**GDAL/OGR/PKTOOLS** geotools library for the manipulation of geospatial data



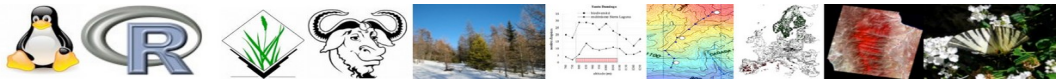
# Knowing each other (3 min)

- Name, where are you coming from….
- What is your background and personal interest?
- Final project / PhD thesis objectives / keywords?
  - What data are you going to analyses?
  - Not sure yet… no problem
- Do you have an experience on Linux OS or other open source software?
- Do you currently use any programming language?
- What are your interests and expectations on this training?



# Syllabus clarification

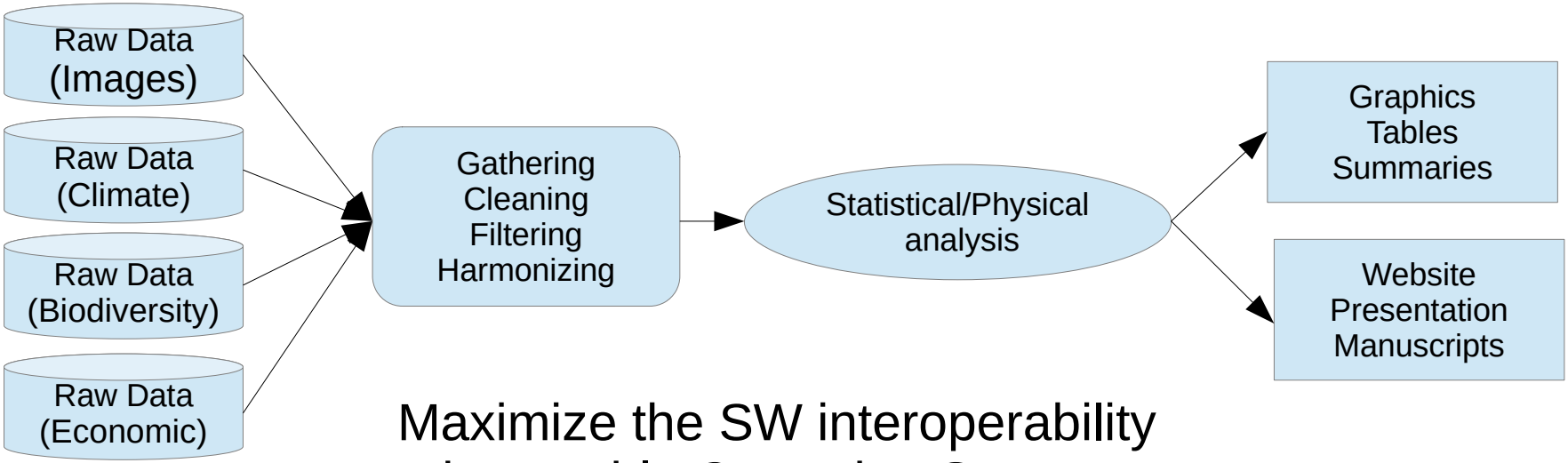
- **Material http://spatial-ecology.net/docs/build/html/index.html**
- **Online recording video lecture later shared in blackboard**
- **Handling assignment via blackboard (pdf) and github (code) (due on Monday)**
- **On-campus IT support for Linux Virtual Machine Installation**
- **Office hours Tuesday/Thursday at 4-5pm.**
  - **open office hours drop-in**
  - **one-by-one office hours via appointment**
- **Community support via slack among students/teachers (setup an account)**



# Reproducible research & “big data” processing

## Codes that are easily published > no license constraints

## Complex work-flows > integrate different data analysis methods




Maximize the SW interoperability
in a stable Operating System

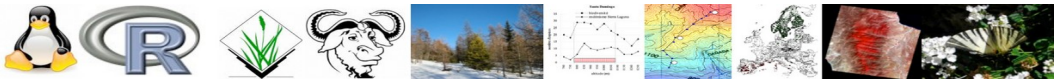
# Why use Linux/OpenSource?

**Security:** extremely stable and reliable, no viruses, interoperable: Unix, Windows, Mac, Android, …

**Applications:** thousands of free programs, programming languages, server services

**Versatility:** minimum HW requirements, extremely portable, very fast performance

**Freedom:** free to download/test/install/modify/ configure/develop/distribute/... it's fun!



# Freedom? and why it's fun?

**Code:**
- Understating the code beyond a process
- Be able to modify the code
- Build up your own algorithm.
- Use all the SW that I want without license constraints

**Help:**
- Get help from mailing list
- Keep in touch with the developers for code adjustment and improvement

**Process:**
- Job priority processing
- Job scheduling
- RAM management

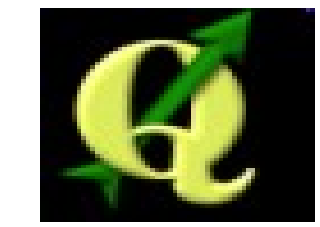
**Remote server:**
- Automatic connection to remote servers
- Overpassing quota issues in remote servers, by creating a folder linked to your PC

**Hardware resources:**
- Storing temporal file in ram rather in the hard-disk, by creating a folder in the ram
- Get the best of different programing languages and create a unique work flow.

**Last but not least:**
- Enjoy the life in the meantime the PC is working for you!

# Ubuntu Linux operating system

## Programming languages interaction



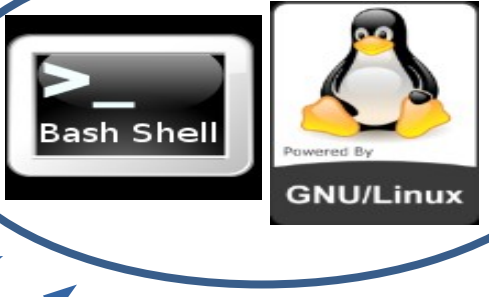
QGIS

RS

Grass


RS

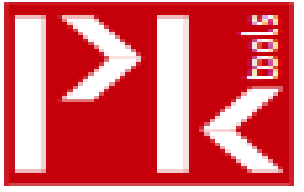

**Open Foris Geospatial Toolkit**





RS

RS




PKTOOLS a and OFT are a collection of programs written in C++ to perform operations on raster images.

RS

**Orfeo Toolbox**


# Ubuntu Linux operating system

## Programming languages interaction

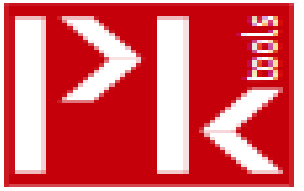
QGIS

Grass



**Open Foris Geospatial Toolkit**



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**Orfeo Toolbox**


# Ubuntu Linux operating system

## Programming languages interaction

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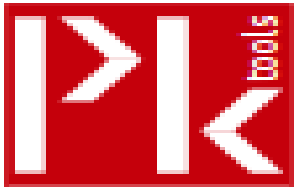


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**Orfeo Toolbox**