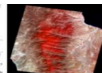


GEOCOMPUTATION AND MACHINE LEARNING FOR ENVIRONMENTAL APPLICATIONS

Date: 6th April 2022, 3.00 - 5:45 PM UTC time
26th May 2022, 3.00 - 5:45 PM UTC time

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Learning objectives

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

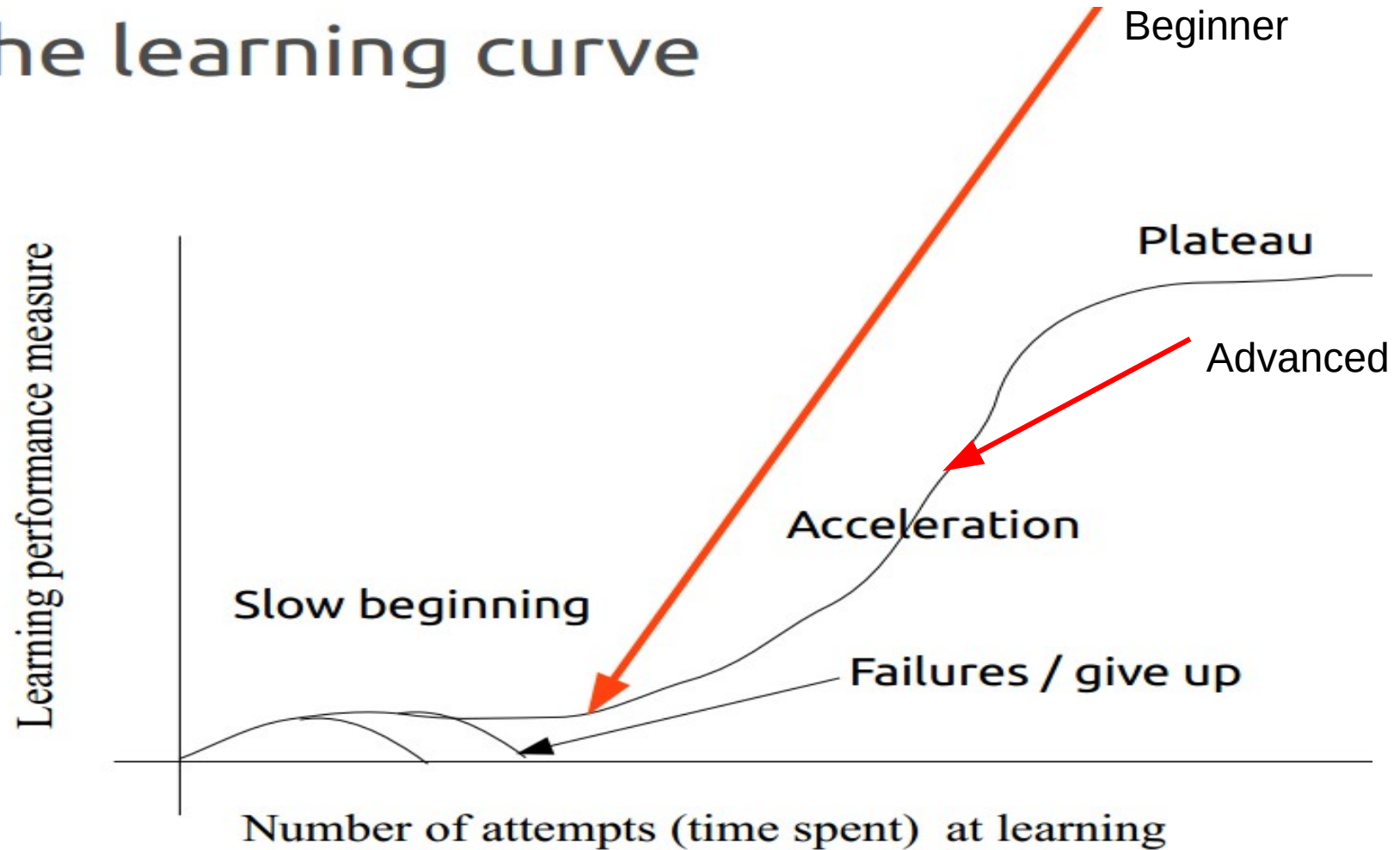
- **Learning open source tools for GIS and RS applications.**
- **Acquiring command line utilities for spatial/temporal data under Linux OS.**
- **Acquiring command line utilities and ML theoretical foundation for environmental application.**
- **Developing data processing skills.**
- **Independent learning, 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 in the framework of ML applications**
- **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?**



Coding knowledge

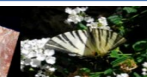
Covered in the course

- **AWK, GDAL, PKTOOLS, CDO, Python, R, ML (keras, TensorFlow, PyTorch)**
- **Parallel processing in bash and python environment**
- **Machine Learning: theoretical foundation and application in the environmental field**
- **Supervised regression application**
- **Image processing / raster processing / large data-set processing in a proper way**
- **Environmental applications (hydrology, forestry)**



Syllabus clarification

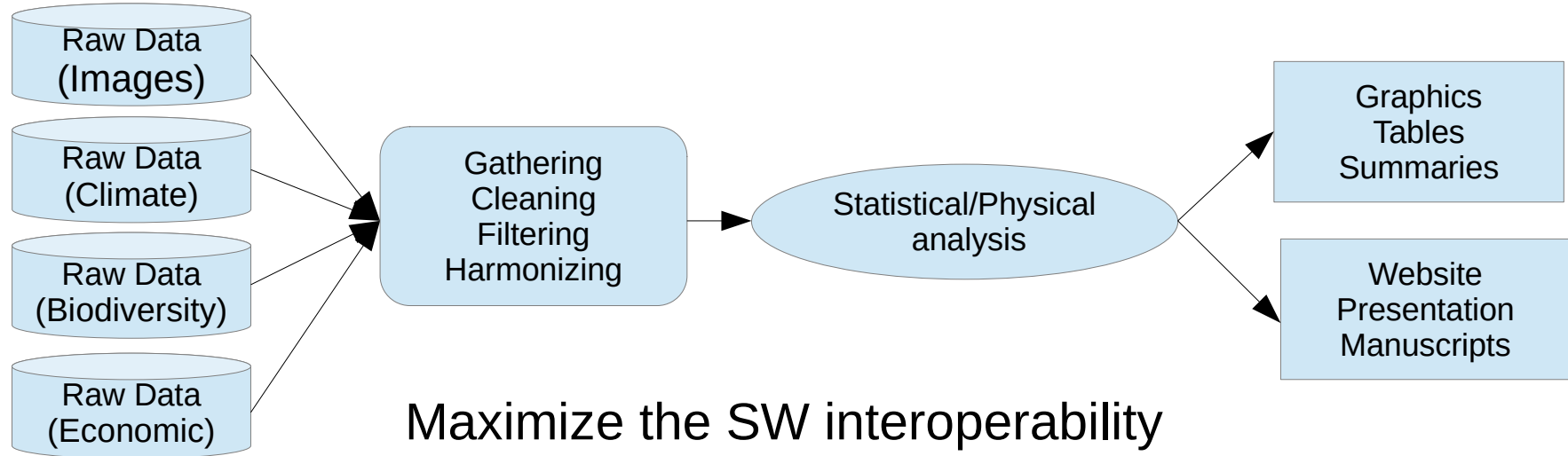
- **Class web-page**
http://spatial-ecology.net/docs/build/html/COURSESAROUNDTHEWORLD/course_geocomp_ml_04-05_2022.html
- **Data via github** https://github.com/selvaje/SE_data
- **Online recording video lecture later shared on**
http://spatial-ecology.net/docs/build/html/COURSESAROUNDTHEWORLD/course_geocomp_ml_04-05_2022.html
- **Handling script and data via github (code)**
- **Community support among us for trouble shouting via slack**



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:

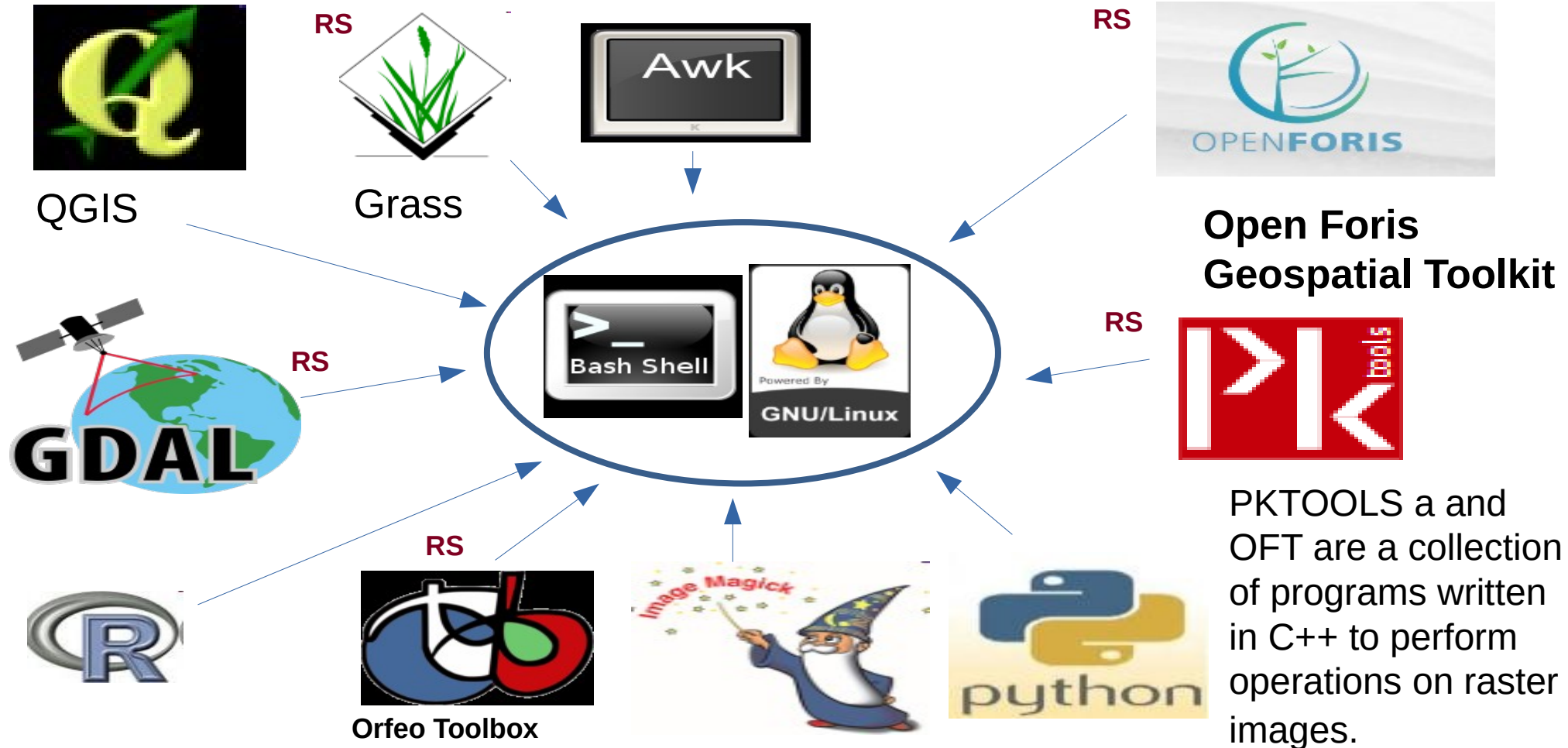
- Storing temporal file in ram rather in the hard-disk, by creating a folder in the ram
- Get the best of different programming languages and create a unique work flow.

Last but not least:

- Enjoy the life in the meantime the PC is working for you!

Ubuntu Linux operating system

Programming languages interaction



Ubuntu Linux operating system

Programming languages interaction



Ubuntu Linux operating system

Programming languages interaction

