CIBiG

# Certificat International en Bioinformatique & Génomique 2025

*Bioinformatics in practice: learn by doing!*

17 November - 12 December 2025

Abidjan, Côte d'Ivoire

bioinfo@wave-center.org

*Version 1.3 – September 3, 2025*

## What is the CIBiG?

The International Certificate in Bioinformatics and Genomics (CIBiG) is an intensive training program designed for PhD students and researchers working with sequencing technologies and data. The course provides a comprehensive introduction to genomics and bioinformatics, with practical sessions focused on applying bioinformatics methods to sequencing data — particularly in the context of health and agriculture.

The program includes an online phase, followed by an on-site session in Abidjan, and ends with a practical internship/project of 2 months.

## Our objectives

- Gain a thorough understanding of fundamental bioinformatics concepts.
- Develop practical skills in sequencing data analysis.
- Apply bioinformatics to real-world challenges in agriculture and health in Africa.
- Master Linux and bioinformatics tools to carry out your own analysis independently.
- Collaborate on practical projects to directly apply acquired skills.
- Communicate for training and knowledge transfe, both orally and in writing.
- Integrate open science and reproducibility into your work.

## Practical information

**Date:** 17 November - 12 December

**Place:** WAVE Regional Center of Excellence, Univ. Félix Houphouët-Boigny
Bingerville, Abidjan

**Target audience:** Students, researchers, computer engineers in companies or public institutions.

**Admission requirements:** Master's degree (or equivalent) in life or health sciences. Bachelor's degree + 5 years of experience for professionals from research institutes or technical ministries.

**Fees:**
- 2,000,000 FCFA (3050 euros)
- 2,500,000 FCFA (3800 euros) funded by a sponsoring institution

**Application:** Open with selection — 15 places

`https://wave-centre.github.io/cibig/`

`bioinfo@wave-center.org`

## Key Dates

- **Applications open:** 15 May
- **Applications deadline:** 16 June
- **Acceptance notification:** 1 July
- **3-minute icebreaker video deadline:** 19 Sept.
- **Online courses:** 3 Nov. – 14 Nov.
- **On-site session:** 17 Nov. – 12 Dec.
- **Internship orientation meeting:** 26 Nov, 3 Dec, 10 Dec
- **Final restitution:** 12 Dec. at 16 pm
- **Internship period:** 15 Jan.– 15 Mar.
- **Internship restitution:** 25, 26, 27 Mar.

## Online Courses (3–14 Nov.)

*9 half-days sessions (4h) over two weeks — mornings, 8:00-12:00 GMT*

- **Microorganism Biology Overview** - 3 Nov.
  Prokaryotic cell structures, diversity and pathogenicity.
- **Eukaryotic Cell Biology Overview** - 4 Nov.
  Key cellular processes, organelles, and regulation.
- **Genome Structure & Variation** - 5 Nov.
  Chromosomes, mutations, structural and functional elements.
- **Mendelian Genetics & Diversity** - 6 Nov.
  Principles of inheritance, alleles, population variation.
- **Sequencing Methods and Application** - 10 Nov.
  Overview of main technologies and their uses in genomics
- **Bioinformatics Roadmap: Concepts and Application in Genomics** - 11-12 Nov.
  An essential overview of bioinformatics concepts with a focus on key genomics applications.
  *2 half-days*
- **Applications in Health & Environment** - 13-14 Nov. (to be confirmed)
  Case studies: human health, agriculture and plant genomics.
  *2 half-days, 2 speakers per session*

# On-site Course Modules Overview

### Sequencing

Intro to sequencing technologies and practical session on raw data generation and quality checks.

### Biological Databases

Explore public biological databases and learn how to extract and interpret biological information.

### Linux & Markdown

Use the Linux terminal and Markdown for scripting, documentation, and data handling.

### Algorithmics

Discover algorithmic foundations like complexity and pattern matching relevant to bioinformatics.

### Programming (Python/R)

Hands-on training with Python and R for data analysis, scripting, and visualization.

### OMICS

Understand omics data types and analytical pipelines with real biological datasets.

### Project Work

Apply your skills in a mini-project on omics or programming with real data.

### Cluster Computing

Get started with HPC: run jobs on a cluster and manage computational resources.

### Reproducibility

Learn reproducible science practices including documentation and data lifecycle.

### Git

Master version control using Git and GitHub-GitLab for collaborative projects.

### Conda

Use Conda to manage packages and environments for portable and reproducible workflows.

# On-site Course Timetable by Week (17 Nov–12 Dec.)

## week 1 : 17-23 November

| | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|---|---|---|---|---|---|---|
| 08:00 - 09:00 | Welcome<br>Amphi | Sequencing<br>Lab TP | Sequencing<br>Lab TP | Sequencing<br>Lab TP | Biological Database<br>room 1 CM | |
| 09:00 - 10:00 | | | | | | |
| 10:00 - 11:00 | Break | Break | Break | Break | Break | |
| 11:00 - 12:00 | Seminar<br>Amphi presentation | Sequencing<br>Lab TP | Sequencing<br>Lab TP | Sequencing<br>Lab TP | Biological Database<br>room 1 TP | |
| 12:00 - 13:00 | | | | | | |
| 13:00 - 14:00 | Lunch | Lunch | Lunch | Lunch | Lunch | |
| 14:00 - 15:00 | Sequencing<br>Amphi Cours | Sequencing<br>Lab TP | Sequencing<br>Lab TP | Sequencing<br>Lab TP | Biological Database<br>room 1 TP | IDE setup& Markdown Intro<br>room 1 TP |
| 15:00 - 16:00 | Break | Break | Break | Break | Break | |
| 16:00 - 17:00 | Sequencing<br>Amphi Cours | Sequencing<br>Lab TP | Sequencing<br>Lab TP | Lab Session Restitution<br>Amphi presentation | Biological Database<br>room 1 TP | Linux envt setup<br>room 1 TP |
| 17:00 - 18:00 | | | | | | |
| 18:00 - 19:00 | | | | | | |

## week 2 : 24-30 November

| | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|---|---|---|---|---|---|---|
| 08:00 - 09:00 | Biological Database<br>room 1 CM | ALGO<br>room 1 TP | LINUX<br>room1 TP | LINUX<br>room 1 TP | CLUSTER<br>room 1 TP | |
| 09:00 - 10:00 | | | | | | |
| 10:00 - 11:00 | Break | Break | Break | Break | Break | |
| 11:00 - 12:00 | Biological Database<br>room 1 TP | ALGO<br>room 1 TP | LINUX<br>room1 TP | LINUX<br>room 1 TP | CLUSTER<br>room 1 TP | |
| 12:00 - 13:00 | | | | | | |
| 13:00 - 14:00 | Lunch | Lunch | Lunch | Lunch | Lunch | |
| 14:00 - 15:00 | ALGO<br>room 1 | LINUX<br>room 1 TP | *review session*<br>room 1 | LINUX<br>room 1 TP | OMICS<br>room 1 TP | Jupyter book<br>room 1 TP |
| 15:00 - 16:00 | Break | Break | Break | Break | Break | |
| 16:00 - 17:00 | ALGO<br>room 1 | LINUX<br>room 1 | *review session*<br>room 1 | LINUX<br>room 1 TP | OMICS<br>room 1 TP | github configuration<br>room 1 TP |
| 17:00 - 18:00 | | | | | | |
| 18:00 - 19:00 | | | | | | |

## week 3 : 1-7 December

| | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|---|---|---|---|---|---|---|
| 08:00 - 09:00 | OMICS room 1 TP | OMICS room 1 TP | OMICS Room 1 TP | Python R Room 1,2 TP | Python R Room 1,2 TP | |
| 09:00 - 10:00 | | | | | | |
| 10:00 - 11:00 | Break | Break | Break | Break | Break | |
| 11:00 - 12:00 | OMICS room 1 TP | OMICS room 1 TP | OMICS Room 1 TP | Python R Room 1,2 TP | Python R Room 1,2 TP | |
| 12:00 - 13:00 | | | | | | |
| 13:00 - 14:00 | Lunch | Lunch | Lunch | Lunch | Lunch | |
| 14:00 - 15:00 | OMICS room 1 TP | OMICS room 1 TP | *review session* room 1 | Python R Room 1,2 TP | Python R Room 1,2 TP | OMICS project room 1 TP |
| 15:00 - 16:00 | Break | Break | Break | Break | Break | |
| 16:00 - 17:00 | OMICS room 1 TP | OMICS room 1 | *review session* room 1 | Python R Room 1,2 TP | OMICS project room 1,2 group | OMICS project room 1 TP |
| 17:00 - 18:00 | | | | | | |
| 18:00 - 19:00 | | | | | | |

## week 4 : 8-12 December

| | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|---|---|---|---|---|---|---|
| 08:00 - 09:00 | Python R Room 1,2 TP | OMICS project room 1,2 group | REPRO - Git room 1 TP | OMICS project room 1,2 group | OMICS project room 1,2 group | |
| 09:00 - 10:00 | | | | | | |
| 10:00 - 11:00 | Break | Break | Break | Break | Break | |
| 11:00 - 12:00 | Python R Room 1,2 TP | OMICS project room 1,2 group | REPRO - Git room 1 TP | OMICS project room 1,2 group | OMICS restitution | |
| 12:00 - 13:00 | | | | | | |
| 13:00 - 14:00 | Lunch | Lunch | Lunch | Lunch | Lunch | |
| 14:00 - 15:00 | Python R Room 1,2 TP | Repro - Data Lifecycle room 1 TP | *review session* room 1 | REPRO - Conda room 1 TP | OMICS restitution | |
| 15:00 - 16:00 | | Break | Break | | | |
| 16:00 - 17:00 | Break | Repro - Data Lifecycle room 1 TP | *review session* room 1 | Break | Debriefing | |
| 17:00 - 18:00 | OMICS project room 1,2 group | | | *review session* room 1 | Wrap up | |
| 18:00 - 19:00 | | | | | | |

# Pre-course Resources

Before attending the on-site session, participants must review the following online resources. These videos or tutorials cover key concepts and tools needed for the course. Each one has a deadline.

## Sequencing

1 November

| | | |
|---|---|---|
| Why study DNA sequencing and computational genomics? | | 4'30 |
| Sanger DNA Sequencing, From Then to Now. | *(optional)* | 15' |
| NGS - A Step-By-Step Guide to DNA Sequencing. | *(optional)* | 7'40 |
| Overview of Illumina Sequencing | | 5'15 |
| How nanopore sequencing works | | 1'41 |
| Nanopore DNA sequencing | *(optional)* | 4'30 |

## Biological Databases

› 12 Common Bioinformatics File Types Explained

*Watch only the first 10 file formats.*

## Linux & Markdown

› Linux before 24 Nov

| | | |
|---|---|---|
| Essential unix for bioinformatics I | | 18'40 |
| Essential unix for bioinformatics II | | 15'40 |
| Unix superpowers (using pipes and ssh) | *(optional)* | 17'40 |
| The Unix Shell | | - |

› Markdown

| | |
|---|---|
| Quick Start Guide To Markdown | *(optional)* |

*Watch only up to the Markdown editor section included.*

## Algorithmics

24 November

| | |
|---|---|
| Un algorithme c'est quoi? | 5'25 |
| Les variables et les types | 6'45 |
| Les opérateurs | 6'45 |
| Lecture et écriture | 6:39 |
| Les chaînes de caractères | 3:57 |
| Les conditions (Si - Sinon) - Structures conditionnelles | 5:46 |
| Structure sélective Selon | 3:12 |
| Boucle TantQue - Structures | 6:49 |

*Content in French.*

## Programming (Python/R)

›Python before 24 Nov

- Plotting and Programming in Python
- Programmation en Python pour les sciences de la vie *(optional)*

›R before 24 Nov

- R BASICS *(optional)*
- R for Reproducible Scientific Analysis

## Cluster Computing

1 November

- Slurm Tutorial: HPC Job Submission Systems for Beginners 11'30
- HPC Data Management for NGS Analysis 10'30

## Reproducibility

- Jupyter Notebook Complete Beginner Guide *(optional)* 25'30

*Watch only up to the Jupyter Lab section included.*

## Git

- Version Control with Git *(optional)*

## Working Environment

**Shared folder:** *Online course slides & evaluations*

**Public Repository**: `https://github.com/wave-centre/training/blob/main/CIBIG`
*Repository for on-site course teaching materials*

**Slack Channel**: `cibig-wave.slack.com`
*Slack enables real-time communication, resource sharing, and quick support among participants and instructors.*

**Recommended Software** : (to be updated)
Below is a list of recommended tools to install before the on-site session:

| Software | Purpose |
|---|---|
| **Ubuntu/Linux** | Operating system or virtual machine environment |
| **Miniconda** | Package and environment manager (Python/R) |
| **Python** | General-purpose programming language |
| **Jupyter Notebook** | Interactive notebooks for coding and documentation |
| **R / RStudio** | Statistical computing and data visualization |
| **Git** | Version control and code collaboration |
| **Spyder** | Integrated development environment (IDE) for Python |

*The CIBiG program is more than a training —*
*it's a gateway to autonomy, collaboration, and innovation*
*in bioinformatics and genomics for West and Central Africa.*

*We work hard, we learn deeply, and we laugh together —*
*because science grows best in a supportive and engaging community.*

For any further questions,
contact us at `bioinfo@wave-center.org`
or visit our website `https://wave-centre.github.io/cibig/`.
We look forward to welcoming you to the CIBiG 2025 training session in Abidjan!