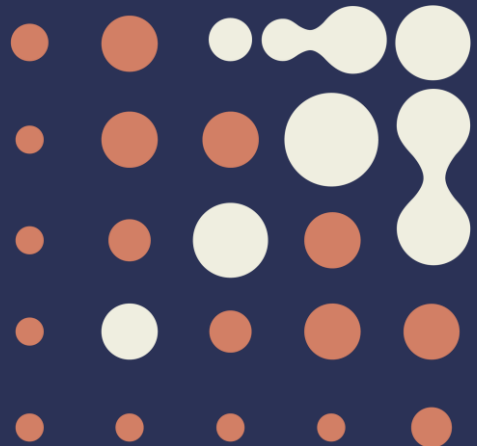
Medical Genomics course

N. Alcala & M. Foll

Rare Cancers Genomics Team

2024



International Agency for Research on Cancer

World Health Organization

RARE CANCERS GENOMICS

Philosophy

Hands-on course with a focus on real-world medical problems

>to know if you want to dedicate your professional career to medical genomics research, you need to **experience what working on a typical medical genomic project is like**

> We will see just enough theory to grasp the main concepts and then **code and do actual data analysis**, and do **team work**

General information

Venue: IARC – WHO: the world's cancer agency https://www.iarc.who.int

Attendees: INSA students + CanBioS doctoral school students + IARC early career scientists (~20 students in total)

IARC nouveau centre in the Gerland biodistrict

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ÉCOLE DOCTORALE 656 CanBioS CANCÉROLOGIE BIOLOGIE SANTÉ UNIVERSITÉ DE LYON

International Agency for Research on Cancer

World Health Organization

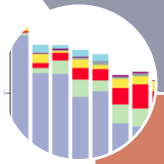
IARC's Mission: research on cancer prevention

- .. is the specialized cancer agency of the World Health Organization (WHO).
- .. promotes international collaboration in cancer research.
- .. identifies the causes of cancer so that preventive measures may be adopted.
- .. conducts research in LMICs through partnerships and collaborations with researchers in these regions.

27 Participating States
+2 who recently joined

Main areas of IARC's research

Pillar 1 Data for action



Cancer Surveillance

Pillar 2 Understanding the causes

Nutrition & Metabolism

Genomic Epidemiology

Laboratory Support & Biobanking

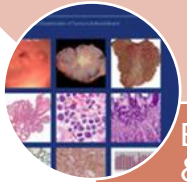
Pillar 3 From understanding to prevention

Early Detection, Infections & Prevention

Environment & Lifestyle

Epigenomics & Mechanisms

Pillar 4 Knowledge mobilization



Evidence Synthesis & Classification

Learning & Capacity Building

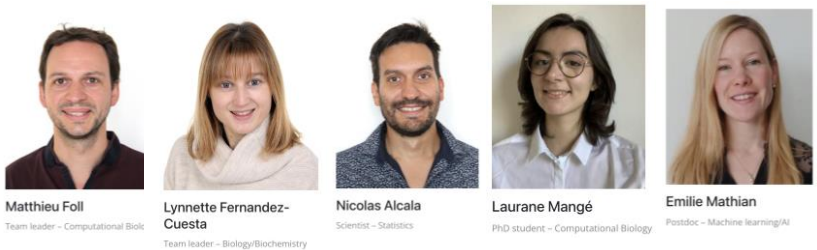
The Computational Cancer Genomics team

Multi-omics characterization of tumors. Identify aggressive phenotypes.

> **Cancers of interest**: mesothelioma, neuroendocrine neoplasms (focus on lung), rare cancers (https://rarecancersgenomics.com)

> **Approaches:** bioinformatics, computational biology, deep-learning, modeling, evolution and ecosystems

> **Techniques:** genome, transcriptome, epigenome, single-cell and spatial omics, images



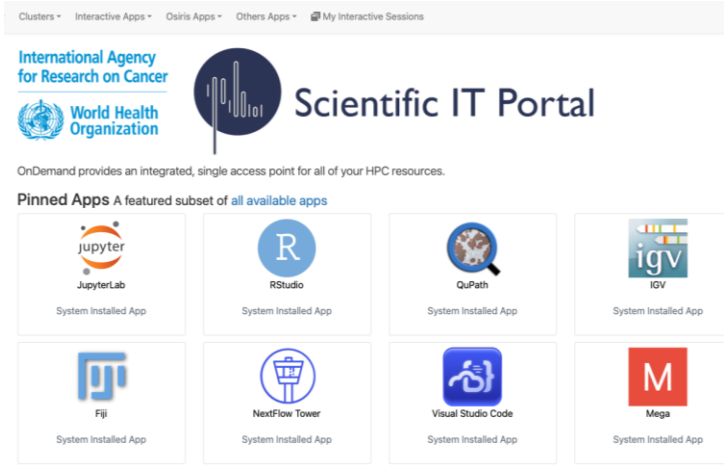
Program

- Monday November 25*th*
  - 11-12:00 welcome and general introduction
  - 13-15:00 genomics lecture
- Tuesday November 26*th*
  - 9-10:00 single-cell RNA-seq lecture
  - 10-12:00 single-cell practical part I
  - 13-14:00 spatial RNA-seq lecture
  - 14-16:00 epigenomics and multi-omic integration lecture
  - 16-18:00 single-cell practical part II
- Wednesday November 27*th*
  - 9-10:00 AI for digital pathology
  - 10-12:00 AI for digital pathology practical part I
  - 13-14:00 AI for multi-modal integration
  - 14-16:00 AI for digital pathology part II
  - 16-18:00 projects
- Friday November 29*th*
  - 9-12:00 projects
- Tuesday December 17*th*
  - 14-16:00 project presentations
  - 16-18:00 networking event

Practical information

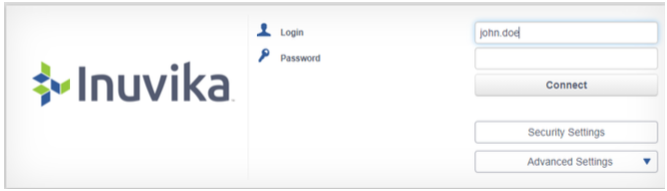
Computing resources

Scientific IT platform: dedicated portal for data analysis
http://portal.sit.iarc.fr / HPC: **`osiris.iarc.lan`**
Training-MG folder on Osiris
Accounts and gateway created for **external participants**:
https://193.51.164.141/
login: firstname.lastname
password: SiT@Temp2024! (to be changed at first login)
Teams channel: IARC-Medical genomics course | General | Microsoft Teams
GitHub page: https://github.com/IARCbioinfo/medical_genomics_course



Lunch / coffee break

Cafeteria on ground floor



Practicals

1. Single-cell and spatial transcriptomic analyses

Data on IARC's HPC Osiris
Access to jupyter or vscode through the IARC SIT platform (web browser)

2. Deep learning analysis of whole-slide pathological images

Access through Google colab notebook for access to GPU

Both using python, use links sent if needed (in particular the R to Python tutorial)

Group projects

5 projects based on actual research done at the agency

- ranging from more bioinformatics oriented to more data analysis oriented
- Groups of 3-4 students

Group presentation in December 17th (10 min + 10 min of questions per group).

Evaluation for INSA students

- grade is 50% supervisor evaluation and 50% presentation evaluation
- Criteria are: understanding of subject, clarity of explanations, organization and structure of the presentation, visuals, engagement, and answer to questions
- All group members should present something