

Analysis of High Throughput Sequencing RNA-Seq Data

(November 29th -30th); December 6th - December 10th; (December 17th)

Pre-course material (mandatory before Module 2 if Module 1 is skipped)

This will be made available two weeks ahead of the course (November 15th)

- Practice
 - Get access to a terminal, log in with the user: **training** (password: **training**)
(link will be provided in updated schedule on Nov 15)
 - An introduction to the **unix/linux command line**. Do the 10 steps listed on: LinuxCommand.org.
 - An introduction to the **R language and environment**. The website requires to register, but the first lesson of the content linked is accessible for "free":
(link will be provided in updated schedule on Nov 15)
 - For a more in depth introduction to R, check the official one: ["An Introduction to R"](#)

Pre-course material (mandatory)

- Read
 - **For Day 1**
 - [DNA Sequencing in the last 40 years](#)
 - [The original RNA-Seq publication](#)
 - [Best practices for RNA-seq data analysis](#)
 - [Guideline for RNA-Seq data analysis](#)
 - **For Day 3**
 - [Statistical considerations](#)
 - [Normalization Method Comparison](#)
 - **For Day 4**
 - [Differential Expression Methods Comparison](#)
 - [Study size and its effect on analysis](#)
- Watch
 - For Day 1:
[A video on High Throughput Sequencing - Eric Chow from University California San Francisco - Duration: 32 minutes](#)
 - For Day 3:
[Consideration about Study Design and statistical background - includes subtitles to get you used to my french accent - Duration: 29 minutes](#)

Module 1 (optional) - November 29th -30th

Day 1 – 9:00 – 17:00 – Introduction to the Unix Command Line Interface (CLI)

09:00 - 9:30 - Welcome to the course!

Daily Learning Objectives

09:30 - 10:30 - CLI Lecture

10:30 - 10:45 - Coffee break

10:45 - 12:00 - Hands-on practical

12:00 - 13:00 - Lunch break

13:00 - 15:00 - Hands-on continued

15:00 - 15:15 - Coffee break

15:15 - 15:30 - "homework" instructions

15:30 - 15:40 - Feedback

15:40 - 17:00 - Self-study and assessment

Day 2 – 9:00 – 17:00 – Introduction to the R programming language and the R-Studio environment

09:00 - 9:30 - Day 1 Assessment review / revision session

Daily Learning Objectives

09:30 - 10:30 - RStudio environment and R programming lecture

10:30 - 10:45 - Coffee break

10:45 - 12:00 - Hands-on practical

12:00 - 13:00 - Lunch break

13:00 - 15:00 - Hands-on c'ed

15:00 - 15:15 - Coffee break

15:15 - 15:30 - "homework" instructions

15:30 - 15:40 - Feedback

15:40 - 17:00 - Self-study and assessment

Module 2 - December 6th - December 10th - 9:00 - 17:00 every day

Day 1 - 9:00 - 13:00 - High Throughput Sequencing, 2nd generation

09:00 - 9:30 - Welcome to the course!

Daily Learning Objectives

09:30 - 10:30 - High Throughput Sequencing Lecture

10:30 - 10:45 - Coffee break

10:45 - 11:15 - Data pre-processing and analysis workflow

11:15 - 11:30 - Workshop data description

11:30 - 12:40 - Data pre-processing journal club

12:40 - 12:50 - "homework" instructions

12:50 - 13:00 - Feedback

In preparation for Day 2 - Self-study and Daily Assessment

Day 2 - 9:00 - 14:00 - Sequencing data pre-processing

09:00 - 10:00- Revision session AND VOTE for Day 5 content!

Daily Learning Objectives

10:00 - 10:30 - Sequence format and data pre-processing

10:30 - 10:45 - Coffee break

10:45 - 12:00 - Hands-on practical data pre-processing continued

12:00 - 13:00 - Lunch break

13:00 - 13:40 - Pseudo-alignment Lecture

13:40 - 13:50 - "homework" instructions

13:50 - 14:00 - Feedback

In preparation for Day 3 - Self-study and Daily Assessment

Day 3 - 9:00 - 14:00 - Statistical concepts and Quality Assessment

09:00 - 10:00 - Revision session

Daily Learning Objectives

10:00 - 10:30 - Statistical concerns - Lecture

10:30 - 10:45 - Coffee break

10:45 - 11:30 - Statistical concerns - Lecture

11:30 - 13:40 - Differential Expression analysis setup - until the Exploratory analysis and visualization (included)

12:00 - 13:00 - Lunch break

13:00 - 13:40 - Differential Expression analysis setup - until the Exploratory analysis and visualization (included) c'ed

13:40 - 13:50 - "homework" instructions

13:50 - 14:00 - Feedback

In preparation for Day 4 - Self-study and Daily Assessment

Day 4 - 12:00 - 17:00 - Differential Expression

12:00 - 13:00 - Revision session

Charlotte's extracted code

Revisited code

Revisited code as a html report

Daily Learning Objectives

13:00 - 14:30 - Lecture Differential Expression

14:30 - 14:45 - Coffee break

14:45 - 16:40 - Differential Expression analysis practical

Differential Expression analysis setup - R code

16:40 - 16:50 - "homework" instructions

16:50 - 17:00 - Feedback

In preparation for Day 5 - Self-study and Daily Assessment

Day 5 - 9:00 - 14:00 - Gene Network Inference*

09:00 - 10:00 - Revision session

- Annotated version of Charlotte's DE tutorial

10:00 - 10:30 - Hands-on to kick off network inferences

- Data preparation package

10:30 - 10:45 - Coffee break

10:45 - 11:15 - Gene Network Inference Lecture

11:15 - 12:00 - Gene Network Inference Practical
12:00 - 13:00 - Lunch break
13:00 - 13:30 - Gene Network Inference Practical
13:30 - 14:00 - Final Feedback

* This is an exemplary topic; other possible topics are:

Day 5 extra - GSEA Lecture
Day 5 extra - Ensemble GSEA tutorial
Day 5 extra - Machine Learning Lecture
Day 5 extra - Cancer vs. Healthy Machine Learning Prediction
Day 5 extra - Cancer vs. Healthy Machine Learning Classification
Day 5 extra - Single Cell Sequencing lecture
Day 5 extra - Single cell RNA-Seq practical
Day 5 extra - Droplet single cell RNA-Seq practical

Module 3 (optional) - December 17th

Day 1 - 9:00 - 17:00

09:00 - 9:30 - Introduction to the course
9:30 - 10:30 - Interactive sessions to address analysis issues
10:30 - 10:45 - Coffee break
10:45 - 12:00 - Interactive sessions to address analysis issues c'ed
12:00 - 13:00 - Lunch break
13:00 - 14:00 - Presentation preparation
14:00 - 16:00 - Mini-symposium with talks and peer-review
16:00 - 16:45 - Feedback from the trainers on the projects
16:45 - 17:00 - Final Feedback