

Analysis of High Throughput Sequencing RNA-Seq Data

October 7th - 8th; October 14th - October 18th; October 24th

Pre-course material

This will be made available two weeks ahead of the course (September 23rd)

- Practice
 - Get access to a terminal, [updated instructions on Sept 23rd](#)
 - An introduction to the **unix/linux command line**. Do the 10 steps listed on: LinuxCommand.org.
 - An introduction to the **R language and environment**, [updated instructions on Sept 23rd](#)
 - 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**](#)

Part 1, week 1 - October 7th - 8th

Day 1 – 09:00 – 17:00 – Introduction to R

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

09:30 - 10:30 - Setting up your desk/laptop for the course. Meanwhile, RStudio overview.

10:30 - 10:45 - Coffee break
10:45 - 12:00 - Amazing tidyverse
12:00 - 13:00 - Lunch break
13:00 - 14:00 - Amazing tidyverse
14:00 - 14:45 - Hands-on R Basics
14:45 - 15:00 - Coffee break
15:00 - 15:30 - Hands-on R Basics
15:30 - 16:30 - R for Data Science
16:30 - 17:00 - Feedback and Assessment

Day 2 – 09:00 – 17:00 – Introduction to Unix, specifically Linux

09:00 - 09:45 - Revision session
09:45 - 10:30 - Setting up access to the course servers
10:30 - 10:45 - Coffee break
10:45 - 10:50 - Daily Learning Objectives
10:50 - 12:00 - Software carpentry 1-2-3
12:00 - 13:00 - Lunch break
13:00 - 14:45 - Software carpentry 4-5
14:45 - 15:00 - Coffee break
15:00 - 16:30 - Software carpentry 6-7
16:30 - 17:00 - Feedback and Assessment

Part 1, week 2 - October 14th - October 18th - 9:00 - 17:00 every day

Day 1 - 09:00 - 17:00 - High Throughput Sequencing data processing

09:00 - 09:30 - Revision session
Daily Learning Objectives
09:30 - 10:30 - High Throughput Sequencing Lecture
10:30 - 10:45 - Coffee break
10:45 - 11:30 - Data pre-processing and analysis workflow
11:30 - 12:00 - Workshop data description
12:00 - 13:00 - Lunch break
13:00 - 13:30 - Introduction to UPPMAX
13:30 - 14:30 - group work
14:30 - 15:00 - Solution fastqc - multiqc
15:00 - 15:20 - Reproducible Research exposure
15:20 - 16:00 - Introduction to Nextflow
16:00 - 16:30 - Nextflow exposure
16:30 - 17:00 - Feedback and Daily Assessment
17:00 - open ended - Uploading you own data - instructions.

Day 2 - 09:00 - 17:00 - Exploratory Data Analysis

09:00 - 10:00 - Revision session

Daily Learning Objectives

10:00 - 11:00 - Exploratory Data Analysis (EDA) - Section Introduction, Metadata and Count data

11:00 - 12:00 - Exploratory Data Analysis (EDA) - Section Introduction, Metadata and Count data - guided session

12:00 - 13:00 - Lunch break

13:00 - 14:30 - Exploratory Data Analysis (EDA) - Section Exploratory Data Analysis

14:30 - 16:30 - Exploratory Data Analysis (EDA) - Section Exploratory Data Analysis - guided session

16:30 - 17:00 - Feedback and Daily Assessment

Day 3 - 09:00 - 17:00 - EDA + Differential Gene Expression

09:00 - 10:15 - Exploratory Data Analysis (EDA) - Section Exploratory Data Analysis

10:15 - 10:30 - Coffee Break

10:30 - 12:00 - Exploratory Data Analysis (EDA) - Section Exploratory Data Analysis - guided session

12:00 - 13:00 - Lunch break

13:00 - 13:15 - Revision Session

Daily Learning Objectives

13:15 - 14:30 - Differential Gene Expression - Models

14:30 - 15:30 - Differential Expression - Models - guided session

15:30 - 16:30 - Differential Gene Expression - DE Results

16:30 - 17:00 - Feedback and Daily Assessment

Day 4 - 09:00 - 17:00 - Differential Gene Expression + Differential Transcript Usage

09:00 - 09:15 - Revision Session

Daily Learning Objectives

09:15 - 10:15 - Differential Gene Expression - Models - guided session

10:15 - 10:30 - Coffee Break

10:30 - 12:00 - Differential Gene Expression - DE Results

12:00 - 13:00 - Lunch break

13:15 - 14:30 - Differential Gene Expression - DE Results - guided session

14:30 - 16:30 - Differential Transcript Usage - guided session - follow along

16:30 - 17:00 - Feedback and Daily Assessment

Day 5 - 09:00 - 17:00 - Gene Set Enrichment Analysis and Differential Transcript Usage

09:00 - 09:15 - Revision Session

09:15 - 10:00 - Differential Transcript Usage - guided session

10:00 - 10:15 - Coffee break

Daily Learning Objectives

10:15 - 11:45 - Gene Set Enrichment Analysis (GSEA) - guided session

11:45 - 12:00 - Official Feedback (Room: SLUBI2023)

12:00 - 13:00 - Lunch break

13:00 - 15:15 - Gene Set Enrichment Analysis (GSEA) - guided session
15:15 - 15:45 - Feedback and Daily Assessment
15:45 - 17:00 - Discussion session

Part 2 – October 24th

Day 1 - 9:00 - 17:00

09:00 - 09:30 - Introduction to the course
09:30 - 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