

551-1119-00L Microbial Community Genomics

Introduction to the course:
Time plan, room plan, assessments

Supervisors



Guillem Salazar



Samuel Miravet-Verde



Chris Field



Shinichi Sunagawa

Learning objectives

- Understand the basics of comparative genomics and be capable of analyzing genomic information reconstructed from the environment.
- Critically assess current literature in microbial genomics and ecology.
- Gain skills in planning and developing scientific projects.
- Gain skills in data analysis, statistics and critical interpretation of research results.
- Gain skills in oral presentation of scientific results and scientific writing.

What to expect

- Introduction to the research area of microbial comparative genomics
- We will balance tutorials with REAL scientific research for the next 3.5 weeks
 - Things may not work out as planned.
 - Your supervisor will be managing multiple projects as well as yours. Please be patient with them. If you have “spare time”, read papers, practice some of the skills you acquire, etc.
 - You will get out what you put in...
 - You are expected to work professionally and responsibly at all times.

Important points for *real* research

- Scientific Integrity
 - You will be working in an environment and with equipment that is shared with the Microbiome Research laboratory.
 - Be respectful, do not enter experimental laboratories, etc.
 - Do not remove/modify any data on the systems that are unrelated to your work. If in any doubt ASK (we prefer stupid questions to stupid accidents!)
 - When doing original work, you need to document what you do, so that it is reproducible for anyone else.
 - Take time to think and talk through course content so you understand what you are doing.

Plan for the next 3 weeks

- Learn the basics of how genomes are reconstructed from metagenomic data.
- Apply data analysis to understand the drivers of microbial genomic complexity:
 - Describe/Understand the genomic diversity of a global collection of metagenome assembled genomes (MAGs) from the marine environment and relate it to their environmental context.
- Identify and work on research questions you would like to address.

Methods

- Use of diverse bioinformatics software and the programming language R.
- Use a collection of marine metagenome assembled genomes (MAGs) together with the quantification of their abundance across a global marine dataset.
- Use command line software to analyze this data.
- Work on specific research questions in groups.

Assessment

1) Written report (1/3) in the format of a short scientific paper.

→ Title, Abstract, Introduction, Methods, Results, Discussion (+Figure/Table)

- Each student should prepare at least one figure/table with legends/headers
- Each participant should produce their own report. Plagiarism will not be tolerated.
- Font size 12, 1.5 line spacing. Maximum 10 pages in total including figures, legends and references.

→ Hand in by December 16th 2022

2) Written exam (1/3)

3) Oral presentation (1/3): 20 min (15+5)

Timing – week 1

	Tue	Wed	Thu	Fri
8:30-10:00		3. Introduction to comparative genomics	7. MAG Lecture	11. Hands-on tutorial
Break				
10:30-12:00		4. R Introduction: base R	8. Hands-on tutorial	12. Exercise: intro to OMD
LUNCH				
13:00-14:30	1. Introduction	5. R Introduction: tidyverse	9. Hands-on tutorial	12. Exercise: intro to OMD
Break				
15:00-16:30	2. Setup infrastructure UNIX intro	6. R Introduction: ggplot2	10. Hands-on tutorial	Buffer (use session 13 if all is done)

Timing – week 2

	Week 2: 15.-18.11.2022			
	Tue	Wed	Thu	Fri
8:30-10:00		14. Best practices for data analysis	Group projects	Group projects
Break				
10:30-12:00		Group projects	Group projects	Group projects
LUNCH				
13:00-14:30	13. mOTUs presentation (Alessio)	Group projects	Group projects	Group project presentations
Break				
15:00-16:30	Wrap up / Plan group projects	Group projects	Group projects	Wrap up / plan next week

Timing – week 3

	Week 3: 22.-25.11.2022			
	Tue	Wed	Thu	Fri
8:30-10:00		Group projects	Group projects	16. Group meeting
Break				
10:30-12:00		Group projects	Group projects	Group projects freeze results
LUNCH				
13:00-14:30	15. Report writing and presentation skills	Group projects	Group project presentations	Group projects freeze results
Break				
15:00-16:30	Group projects	Group projects	Group projects	Wrap up

Timing – week 4

	Week 4: 29.-30.11.2022	
	Tue	Wed
8:30-10:00		Prep presentation
Break		
10:30-12:00		Prep presentation
LUNCH		
13:00-14:30	Exam	Final Presentations
Break		
15:00-16:30	Prep presentation	Final Presentations

Important information: learning resources

- Main source of material:

https://sunagawalab.ethz.ch/share/teaching/home/551-1119-00L_Fall2022/index.html