ETH zürich

551-1119-00L Microbial Community Genomics

Introduction to the course:

Time plan, room plan, assessments

Supervisors

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Learning objectives

- Understand the basics of community genomics and be capable of analyzing genomic information reconstructed from the environment.
- Critically asses current literature in microbial genomics.
- 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 community 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.
- Learn the basics of what genomes-scale metabolic models (GEMs) are and how these can be used.
- Apply data analysis to address molecular, genetic, ecological and/or evolutionary questions.
- Identify and work on research questions you would like to address.

Methods

- Use of diverse bioinformatics software and the programming language R and python.
- Use a collection of marine metagenome assembled genomes (MAGs) together with genome-scale metabolic models (GEMs).
- Use command line software to analyze this data.
- Work on specific research questions in groups.

Assessment

1) Written report (1/2) 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 15th 2023

2) Oral presentation (1/2): 20 min (15+5)

Timing – week 1

	Week 1: 07.-10.11.2022			
	Tue	**Wed**	**Thu**	**Fri**
8:45-10:15		3. Introduction to genomics and metabolic modelling	7. R Hands-on tutorial	11. Introduction: tidyverse & ggplot
Break				
10:45-12:15		4. Metabolic modelling for MAGs	8. Hands-on tutorial	12. Exercise: intro to OMD
LUNCH				
13:30-15:00	1. Introduction	5. R Introduction: base R	9. Hands-on tutorial	13. Exercise: intro to OMD
Break				
15:30-17:30	2. Setup infrastructure UNIX intro	6. Buffer + Seminar (16:30 - 17:30)	10. Hands-on tutorial	14. Explanation of potential group projects

Timing – week 2

	Week 2: 14.-17.11.2022			
	Tue	**Wed**	**Thu**	**Fri**
8:45-10:15		17. Best practices for data analysis	21. Group projects	25. Group project **presentations**
Break				
10:45-12:15		18. Group projects	22. Group projects	26. Group project **presentations**
LUNCH				
13:30-15:00	15. External speaker	19. Group projects	23. Group projects	27. Group project **presentations**
Break				
15:30-17:30	16. Wrap up / Plan group projects	20. Seminar (16:30 - 17:30)	24. Group projects	28. Wrap up / plan next week

Timing – week 3

	Week 3: 21.-24.11.2022			
	Tue	**Wed**	**Thu**	**Fri**
8:45-10:15		31. Group projects	35. Group projects	40. Group project **presentations**
Break				
10:45-12:15		32. Group projects	36. Group projects	41. Group project **presentations**
LUNCH				
13:30-15:00	29. Report writing and presentation skills	33. Group projects	38. Group projects	42. Group project **presentations**
Break				
15:30-17:30	30. Group projects	34. Seminar (16:30 - 17:30)	39. Group projects	43. Wrap up and freeze results

Timing – week 4

	Week 4: 28.-29.11.2022	
	Tue	**Wed**
8:45-10:15		**46. Final Presentations**
Break		
10:45-12:15		**47. Final Presentations**
LUNCH		
13:30-15:00	44. Prep. presentation	**48. Final Presentations**
Break		
15:30-17:30	45. Prep presentation	49. Discuss based on presentations for writing the project

Important information: learning resources

- Main source of material:

https://sunagawalab.ethz.ch/share/teaching/home/551-1119-00L_Fall2023/index.html

Questions and details TBD

- Any question on the overall organization of the course?
- Discussion: Adjusting the schedule